Title: The Merchant Shipping (Ballast Water Management) Regulations 2021 **IA No:** DFT00407 **RPC Reference No:** RPC-DFT-MCA-4428(1) **Lead department or agency:** Maritime & Coastguard Agency **Other departments or agencies:** Department for Transport	Impact Assessment (IA) **Date:** 06/08/2019 **Stage:** Consultation **Source of intervention:** International **Type of measure:** Secondary legislation **Contact for enquiries:** environment@mcga.gov.uk
Summary: Intervention and Options	**RPC Opinion:** GREEN

Cost of Preferred (or more likely) Option			
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANDCB in 2019 prices)	**Business Impact Target Status**
-£74.9m	-£74.9m	£8.7m	Non qualifying provision

What is the problem under consideration? Why is government intervention necessary?

The International Maritime Organisation's Convention on Ballast Water Management was adopted on the 13th February 2004 and came into force on 8th September 2017. This impact assessment is written to estimate the costs of the Convention to the UK.

Vessels take on ballast water to ensure they are operating under optimum conditions. When ballast water is taken on, it is not just water that is brought onboard; a range of viruses, pathogens and other organisms are also within the water. Research has proved that the risk of receiving non-native species via ballast water is high. The UK has already been the victim of invasive species, for example the Chinese Mitten Crab, the costs of which have been extensive both economically and environmentally. Non-native invasive species introduced as a result of vessels transporting ballast water represent a negative externality; such that significant costs, which are not incurred by those taking part in the economic activity itself, are imposed on third parties. Sufficient voluntary action to date has not occurred in the industry despite growing concern. Government intervention is therefore necessary as there is no business or monetary incentive for ship operators or owners to act to reduce the threat from invasive species.

What are the policy objectives and the intended effects?

(i) To introduce UK legislation "the Regulations" to implement the Ballast Water Management Convention, ensuring that UK ships comply with requirements that will enable them to continue to trade internationally; and (ii) to control the discharge of ballast water to prevent the introduction of unwanted organisms and pathogens into UK waters. The intended effect is to control where ships may take on and discharge ballast and to ensure that ballast is appropriately managed prior to its discharge. The intent is to prevent further introduction of new non-native species to UK waters and prevent the spread of species that may already be present.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

1) Counterfactual, Do nothing – Do not introduce legislation to implement the Convention or 2) Introduce legislation implementing the requirements of the Convention.

Option 1 may result in reputational damage to the UK within the IMO and impact on future negotiating capabilities. Doing nothing may also result in UK waters becoming a haven for non-compliant ships, exposing the UK to greater risk of environmental damage. However, it is expected that vessels trading internationally will comply with the

Convention whether or not the UK accedes to it and implements its requirements in UK law, because they will need to comply with the Convention when in the waters of the other States.

Option 2 is the preferred option as it allows the UK to reduce the probability of a non-native invasive species being introduced into UK waters, potentially saving the UK from the impact of an invasive species or from the need to remove a species that becomes established. Option 2 also ensures that UK flagged vessels can continue to operate internationally without additional port checks as the UK's legislation will be compliant with international laws. It will also ensure the UK complies with international requirements as a signatory to the Ballast Water Convention.

It will be reviewed. Review date: July/2026

Is this measure likely to impact on international trade and investment?		No		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)		**Traded:** 0	**Non-traded:** 0	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: _____ **Date :** Enter a date

Summary: Analysis & Evidence

Policy Option

Description: INTRODUCE LEGISLATION IMPLEMENTING REQUIREMENTS OF THE CONVENTION

FULL ECONOMIC ASSESSMENT

Price Base Year: 2019	PV Base Year: 2019	Time Period Years: 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -£102.6m	**High:** -£63.3m	**Best Estimate:** -£72.3m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£62.6m	5	£0.8m	£63.3m
High	£102.2m		£1.2m	£102.6m
Best Estimate	£72.4m		£0.8m	**£72.3m**

Description and scale of key monetised costs by 'main affected groups'

As this is an international convention, UK operators will need to comply with it regardless of whether it is transposed into law, if they wish to continue operating internationally without hinderance. Consequently, this implies that even in the 'Do Nothing' scenario the full costs (as in option 2) will be incurred. Therefore, the costs associated with compliance are considered as neutral given that they will be incurred in either option (no additionality). The more controversial aspects of the proposed changes are mitigated by the fact that equivalent standards will be adopted internationally, effectively shifting the status quo, and ensuring all operators will adopt changes regardless of flag state. For these reasons the costs and benefits are considered to have zero impact overall. In order to follow best practice, set out by the RPC, this IA explores the potential costs and benefits against a counterfactual where the proposed changes are considered in isolation of international adoption of equivalent standards.

The monetised costs included in this impact assessment are equivalent in the counterfactual scenario and the policy option. The direct costs are to the UK flagged shipping industry and have been estimated in this impact assessment. The costs estimated are made up exclusively of the costs related to training, purchasing and operating Ballast Water Management Systems (BWMSs) within the appraisal period.

To cost these we've created a comprehensive methodology to value the capital expenditure (Capex) and operational expenditure (Opex). Taking current UK registered vessels data (provided by Clarksons), which could need a BWMS for compliance with this convention, we assume that all these vessels would choose to install a BWMS for ease of compliance.

We've assigned them an indicative system based on vessels of a similar gross tonnage assuming that vessels of a similar size will opt for similar equipment (manufacturers provided costs of equipment and maintenance). It's assumed that all vessels would have this equipment installed by 2024 when the D2 phase starts, with an assumed uptake being employed to demonstrate when equipment will be installed based on IMO papers and MCA judgment, with only operational costs incurred after 2024.

To take into account the uncertainty around the Capex and Opex faced by operators we've conducted sensitivity analysis to produce a high, central (best estimate) and low-cost scenario.

- High Cost scenario – Capex increased by 40% and OPEX by 50%
- Central cost scenario – No changes from our base assumptions
- Low cost scenario – Capex decreased by 15%

Under our central scenario we estimate that the total cost to industry for a BWMS is £72m and range between £63 - £102m depending on the Capex, Opex and the uptake of BWMS. Additional training to operate this equipment has been estimated to cost between £50,000 to £202,000 based on MCA assumption, depending on the time and salary

of those going through the training. With the cost to operators for familiarising themselves with the new regulation being estimated to cost between £4700 to £32500.

Other key non-monetised costs by 'main affected groups'

The key cost the counterfactual and 'doing nothing' by not signing into law the Ballast Water Management Convention, is that the UK risks its position as a 'low risk flag state' and UK flagged vessels could face greater hinderance at foreign ports slowing down maritime trade. By transposing the convention into UK law, the potential non-monetised costs and risks disappear as the UK will be fully compliant with the international convention.

BENEFITS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Cost** (Present Value)
Low	£0m		£0m	**£0m**
High	£0m	0	£0m	**£0m**
Best Estimate	£0m		£0m	**£0m**

Description and scale of key monetised benefits by 'main affected groups'

All benefits are non-monetised for this impact assessment and are equivalent in the counterfactual and policy options.

Other key non-monetised benefits by 'main affected groups'

The key benefits of this convention are the protection of the UKs marine environment and the benefits that brings to tourism and industry requiring access to the UK marine environment. The benefits are a result of the reduction in invasive species being introduced to the UK, therefore, marine habitats have higher levels of protection from international shipping. Industries requiring direct access to UK waters are likely to have the most benefits from this legislation the benefits to these industries are generated through an avoidance of costs. Section 11 explores the benefits of this Convention through a review of academic literature.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5%

Given that this is an international convention it is assumed that UK flagged vessels, that make international voyages will comply with the Convention regardless of whether the it is transposed into UK law. This is because to continue trading internationally without hinderance UK flagged vessels will need to be in compliance in foreign ports to avoid detention. Therefore, the monetised costs of the counterfactual are the same as those of the Do Something position. However, key non-monetised benefits are realised by signing the Convention into UK law such the avoidance of significant non-monetised risks and costs. Sensitivity testing has showed that the monetised costs incurred in the do-nothing scenario and Option 2 are sensitive to the capital costs of BWMS equipment, yet this does not affect the marginal cost of Option 2. In all scenarios we've assumed that all vessels which could need BWMS for compliance will get one for ease, this may not be an accurate representation of what will happen, as it will be dependent on the individual characteristics of the vessels. Therefore, our estimated costs could be overestimated if the adoption of BWMS's is not as high.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			**Score for Business Impact Target (qualifying provisions only): N/A**
Costs: 8.4	Benefits: 0	Net: 8.4	

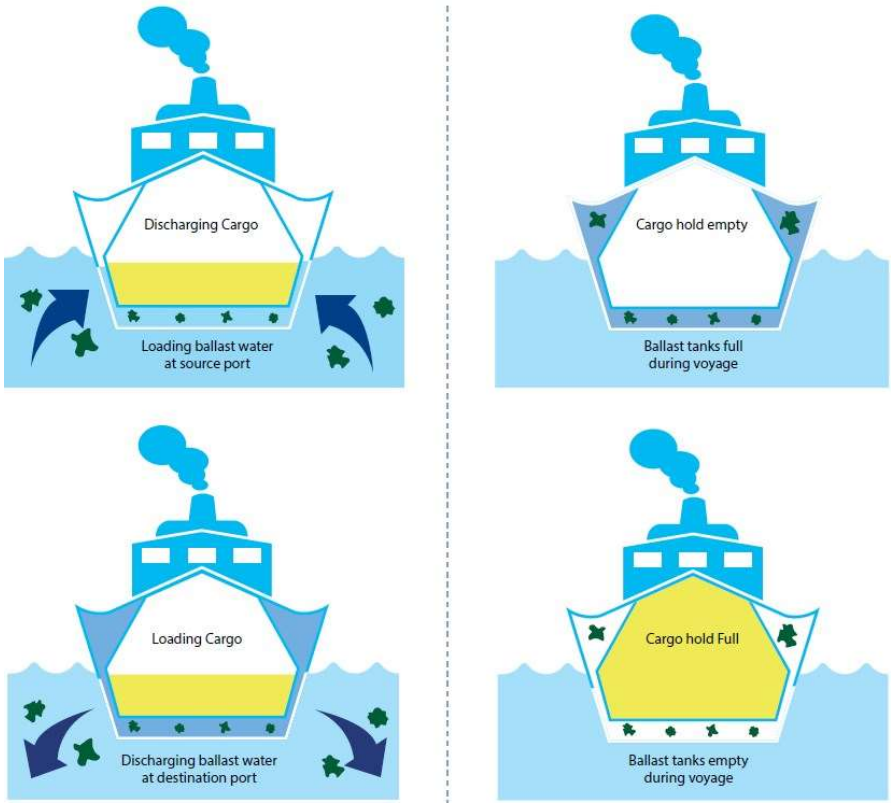
1 Introduction

1.1 Ships are designed and built to move through water carrying cargo. If the ship is travelling without cargo or is only part loaded and is on route to its next port of call, ballast may be taken on board to achieve the required safe and optimum operating conditions.

1.2 Safety, weather conditions, a ship's load, and the route taken can all determine how much ballast water is taken on board a vessel. More ballast is necessary for ships to sit lower in the water during stormy weather, or to allow for passage under a bridge. Ballast water is also used to balance the ship as it uses up fuel during a long voyage, or during loading and unloading operations.

1.3 The number and size of ballast tanks vary according to the vessel type and design and are positioned in order to minimize hull stresses. Most ships are equipped with a range of ballast capabilities and capacities, but generally it is 25 to 30 per cent of their dead weight tonnage[1].

1.4 When a vessel is departing a port, water and any sediment that may be stirred up, are pumped into the ballast tanks through grated intake pipes. The water is then released, or additional water taken on, as per the requirements at the next port of call. As ballast may be used during a transit to pick up a product, or after dropping off a portion of the cargo before continuing on to the next port, it is possible for ballast waters to be a mix of waters from many different ports or regions. Shipping transports approximately 90% of the world's commodities, in doing so it is estimated that annually between 5 and 7 billion tonnes of ballast water is taken up or discharged[2],This makes ballast water one of the most effective vectors for the transport of species around the globe.



Source: WILHELMSEN GROUP , https://www.wilhelmsen.com/media-news-and-events/industry-perspectives/2017/bwm-preparation/

[1] Transport Canada, http://www.tc.gc.ca/eng/marinesafety/oep-environment-ballastwater-defined-249.htm

[2] http://www.ics-shipping.org/shipping-facts/shipping-and-world-trade

2 Background

2.1 Non-native species (NNS) are organisms or pathogens which have been introduced, through human activities (either directly or indirectly), into ecosystems which have not previously included the species within the native ecosystem. NNS can become invasive (INNS), resulting in environmental, economic and social impacts, which are often intricately interlinked. An estimated 20-30%[3] of all introduced species worldwide become invasive and the number of NNS introductions is increasing as a result of increased travel, transport, trade and tourism. With the rate of spread of INNS often being exponential.

2.2 There are thousands of marine species that may be carried in ships' ballast water; the only limitation is that the organism must be small enough to pass through ships' ballast water intake pipes and pumps. These include bacteria and other microbes, small invertebrates and the eggs, cysts and larvae of various species. The problem is compounded by the fact that virtually all marine species have life cycles that include a planktonic stage or stages. Even species in which the adults are unlikely to be taken on in ballast water, for example because they are too large or live attached to the seabed, may be transferred in ballast during their planktonic phase.

2.3 When a ship takes on ballast water it is known that organisms found within the water column are also taken on-board. As the vessel travels around the world and loads or discharges ballast it is therefore possible for organisms from one region to be deposited in another part of the world. Whilst in the majority of cases the change in environmental conditions mean that the organisms that are contained within the discharged ballast water do not survive, it is possible for some species to survive or even flourish in the new environment.

2.4 The introduction of non-native species can be considered to be either chronic or acute. Acute bio-invasions have a strong and immediate impact on an ecosystem. Chronic invasive species have an ongoing impact on the environment and ecosystem to which they are introduced. It should be noted that once a species has been introduced and established it is extremely difficult, if not impossible to remove.

2.5 Species that do survive in ballast tanks have the ability to impact on the aquatic environment by becoming invasive, out-competing native species and multiplying into pest proportions. Their effects can also impact on the economy of a country as tourism and commercial shellfish and fish industries can be undermined. Public health risks have arisen from shellfish being contaminated by toxic algae and it is possible that the disease Cholera can be transported in ballast water.

2.6 90 marine and brackish non-native species have been identified within the UK, 58 of which have become established[4]. Not all of these have been introduced via ballast water; however, some such as the Chinese Mitten Crab, Zebra Mussel and Carpet Sea Squirt are known to be found in the ballast tanks of ships. Further details on non-native species and their impacts can be found at: http://www.nonnativespecies.org//home/index.cfm?

3 Ballast Water Convention

3.1 Scientific concern regarding the introduction of invasive species was first raised in the 1970s when the scientific community began reviewing the problem in detail. In the late 1980s, Canada and Australia were among the countries that brought their concerns to the attention of IMO's Marine Environment Protection Committee (MEPC). In 1991 the MEPC adopted MEPC resolution 50(31) - Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment Discharges; while the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, recognized the issue as a major international concern.

3.2 In November 1993, the IMO Assembly adopted resolution A.774 (18) - Guidelines for Preventing the Introduction of Unwanted Organisms and Pathogens from Ships' Ballast Water and Sediment

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[3] Pimentel et al. 2001. Pimentel D.A., McNair S., Janecka J., Wightman J., Simmonds C., O'Connell C., Wong E., Russel L., Zem J., Aquino T., Tsomondo T. Economic and environmental threats of alien plant, animal and microbe invasions. Agric Ecosys Env 2001; 84: 1–20

[4] Natural England, 2016, NECR22:Investigating the Impact of Marine Invasive Non-native Species

Discharges, based on the Guidelines adopted in 1991. The resolution requested the MEPC keep the Guidelines under review with a view to developing internationally applicable, legally binding provisions.

3.3 The 20th Assembly of IMO in November 1997 adopted resolution A.868(20) - Guidelines for the control and management of ships' ballast water to minimize the transfer of harmful aquatic organisms and pathogens. The development of the draft mandatory instrument, the Ballast Water Management (BWM) Convention, continued, until its adoption as the International Convention on the Control and Management of Ships' Ballast Water and Sediments in February 2004.

3.4 Having acquired the required number of ratifications to adequately represent world tonnage, the Convention entered into force on 8th September 2017[5]. The UK will accede to the Convention and subsequently implement its requirements with the Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations 2021.

3.5 The UK Chaired the Conference during which the Convention was agreed and has been instrumental in the development of the Convention, playing a proactive role at the IMO during the Convention's developmental stages and in the years prior to entry into force where several key issues, including the efficacy of treatment equipment and the implementation schedule for discharge standards were robustly discussed and negotiated. The UK was also involved in the North Sea Ballast Water Opportunity project; the aim of which was to expand the scope of territorial cooperation and focus on high quality projects in innovation, the environment, accessibility and sustainable and competitive communities.

4 Rationale for Intervention

4.1 Shipping provides a mechanism for many species to be translocated across geographical distances far greater than natural range dispersal would allow. The relative stability of a ballast tank can allow organisms to "side-step" natural biogeographic barriers which would otherwise prevent their spread between isolated habitats resulting in a range of viruses, pathogens and other organisms being introduced being introduced to non-native environments.

4.2 Scientific evidence has shown invasive species introduced through ballast water have the potential to harm biodiversity, economic and social interests.

4.3 INNS introduced as a result of vessels transporting ballast water is a market failure that represents a negative externality; such that significant costs, which are not incurred by those taking part in the economic activity itself, are imposed on third parties. In this case, it's a problem of the property rights over the ocean not being allocated properly or are a bit uncertain letting operators of vessels pollute the shoreline with contaminated waters leading to a social cost exceeding that of the private operators' private cost. This could have negative effects on fisheries, tourism etc.

4.4 The scale of the potential threat justifies the need for Government intervention through regulatory measures to prevent further introductions to the UK and bring the private and social costs more inline alleviating the negative externality. The principle benefit is to bring a change in shipboard operating practices to ensure that ballast water is suitably exchanged or treated to prevent introductions of non-native species to UK waters and so prevent the subsequent negative impacts.

4.5 Globally, maritime trade represents over 80% of total world merchandise trade, with UK ports handling some 5% of total maritime trade[6] and it is conservatively estimated that up to 10,000 different aquatic species are transferred daily by international shipping. Of these, at least 850 have been confirmed as establishing in regions outside of their normal range[7][8]. In the UK marine environment alone, over 90 non-native species have been identified, of which 58 have become established[9]. Although it is challenging to confirm which pathway of introduction is responsible when

[5] http://www.imo.org/

[6] Mangden, J.D Future of the Sea: Trends in the Transport of Goods by Sea, Foresight, Government Office for Science (2017)

[7] David, M. & Gollasch, S., 2015. Introduction. In Global Maritime Transport and Ballast Water Management. Dordrecht: Springer Netherlands

[8] This number was probably much higher at the time of writing and will have increased since

[9]. Minchin et al., Alien species in British brackish and marine waters, Aquatic Invasions (2013) Volume 8, Issue 1: 3–19 (2013)

a species is discovered post-introduction, it is estimated that 30%[10] of established non-native marine species are as a result of ballast water introductions. Other pathways of marine INNS include movement through seawater canals and attachment to ship hulls. Figure 1 below shows a list of high impact marine INNS present within the UK likely introduced through ballast water[11].

Species
Acartia Tonsa, Marine Copepod (UKMS)
Amphibalanus amphitrite, Striped barnacle *(*UKMS*)*
Bonnemaisonia hamifera, Red Seaweeds (UKMS)
Dyspanopeus sayi, Say mud crab (UKMS)
Eriocheir sinensis, Chinese mitten crab (UKMS)
Heterosigma akashiwo, A dinoflagelette (UKMS)
Spartina anglica, Common cord-grass/Townsend's/grass or rice grass (UKMS)
Alexandrium catenella, A Dinoflagellate (UKMS)
Hemigrapsus takanoi, brush clawed shore crab (UKMS)
Mnemiopsis leidyi, Comb jelly (UKMS)

Figure 1 Marine INNS present in the UK

4.6 Once introduced, Marine INNS are commonly recognized as being almost impossible to remove. Post invasion damage control can be equally challenging and expensive. Therefore, prevention of new introductions is the primary measure for the mitigation of INNS impacts.

4.7 A horizon scanning project undertaken by Natural England[12] identified 7 species already present but not yet established or which are likely to be introduced to UK waters via ballast water. These species included:

- Round Goby (and related species) which may out compete native fish species and be a parasite host.
- False Dark Mussel – similar to the Zebra Mussel, can cause biofouling of machinery and waterways and may smother natural benthic communities
- Colonial Sea Squirt – already sited in some UK waters but not widely spread. Can smother native communities and damage waterway infrastructure, especially destructive to suspended mussel cultivation.
- Red King Crab – A predator of commercial bivalves and epibenthic communities.

4.8 Self-regulation and voluntary action are unlikely to be effective in this instance as the time and money involved in ensuring biosecurity from ballast water mean that ships masters and owners are unlikely to freely invest in or undertake the practices involved. There is also no direct benefit to shipping from the implementation of the proposed regulations to encourage the shipping industry to implement the requirements of the Ballast Water Management Convention.

[10] Eno et al., Non-native marine species in British waters: a review and directory 1997.
[11] Created by Centre for Environment Fisheries and Aquaculture Science (CEFAS).. Further information on specific species can be found here.
[12] Natural England, 2009, NECR009 - Horizon scanning for new invasive non-native animal species in England

4.9 Successfully managing INNS can therefore provide long-term economic and environmental benefits, including conserving biodiversity and health of ecosystems, and maintaining the services they provide. This supports the case for strategic investments in prevention, including ratification of the Ballast Water Management Convention, rather than post-invasion damage control.

Case Study: Eriocheir Sinensis (Chinese Mitten Crab)

Figure 2: GB Non-native Species Secretariat © Crown Copyright

Native to Eastern Asia, first discovered in the Thames Estuary in 1935
Transported in ballast water and fouling on ships' hulls
Impact on native populations through predation and competition for space. Damage to. flood defences and riverbanks through burrowing. Commercial loss in fisheries.

(Chinese Mitten Crab Factsheet: GB non-native species secretariat, n.d.)

5 Policy Objectives

5.1 The objective of the policy is to ensure that the UK coastline is protected from non-native invasive species that may be present within the ballast water carried by vessels visiting the UK shores. The policy will help to ensure that species not yet present in the UK are not introduced and the colonies of those organisms that may already be present are not further supported by new introductions.

5.2 The Policy will also ensure that UK flagged vessels are supported to operate internationally without being penalised by the UK having an unclear legal position ensuring that the market is not distorted and that UK vessels remain competitive on an international scale.

5.3 As a member of the IMO and signatory to the Convention the UK will be obliged under international law to implement the requirements of the Convention into domestic law. Implementing the requirements of the Convention and acceding to the Convention will ensure that the UK maintains its reputation as a word class Administration and active member of the IMO.

6 Scope of this impact assessment

6.1 This impact assessment considers implementing the requirements detailed in the Ballast Water Management Convention into UK domestic legislation. It focusses solely on the requirements set out in the Convention and considers the impact on UK vessels and the UK marine environment. The impact assessment is at consultation stage, which means that some areas of evidence are missing. We invite consultees to help us build the evidence base, especially in areas regarding the monetisation of the costs and benefits of this convention. Further detail is provided throughout this IA regarding the areas we are inviting consultees to comment on.

7 Policy Options

The policy options under consideration are as follow:

- Option 1) Do Nothing (Counterfactual)
- Option 2) Introduce the requirements detailed in the Ballast Water Management Convention into UK domestic legislation

Policy Option 1 – Do Nothing, do not implement the Convention

7.1 This option would leave the discharge and exchange of ballast water unregulated and uncontrolled around the UK coastline and onboard UK flagged vessels. The current situation would continue leaving the UK coast open to non-native invasive species introduced via the ballast water vector. This option does not take into consideration the potential impacts of species not yet introduced to the UK and the financial implication these could have on the UK economy.

7.2 It should be noted that UK vessels that operate on an international basis would still be required to be compliant with the requirements of the Convention when operating in the waters of a State that is a Party to the Convention. Doing nothing would therefore bring little or no benefit to UK flagged vessels that operate internationally.

7.3 By opting for Option 1 the policy objectives outlined would not be met.

Policy Option 2- Introduce the requirements detailed in the Ballast Water Management Convention into UK domestic legislation

7.4 Internationally operating vessels registered under the UK Flag will be required to ensure that ballast water is managed as per the requirements of the Convention unless an exemption issued based on risk assessments and processes detailed under Convention Guideline G7 is held; further details regarding exemptions are included in section 8.4 Depending on the size of the vessel and ballast potential, this may involve the fitting of approved equipment . Vessels will be required to implement a Ballast Water Management Plan, hold a Ballast Water Record Book and participate in a certification and survey regime.

7.5 The requirements of the Convention do not apply to vessels that are; not designed to carry ballast water, vessels carrying permanently sealed water ballast that is not subject to discharge, vessels operating solely within domestic waters of a Party to the Convention , if authorised to do so, vessels involved in domestic trade and on the high seas or to any ship operated by a state and used for Government non-commercial services.

7.6 Vessels, to which the Convention applies will be subject to a survey and certification regime, as required by the Convention, resulting, if appropriate, in the issue of an International Ballast Water Management (IBWM) Certificate.

7.7 The UK will adhere to the phased introduction of the D2 ballast water management standard as outlined within the Convention. Initially, vessels will be required to meet the D1 ballast water exchange standard until they are required to meet the D2 ballast water discharge, which is commonly met using ballast water treatment equipment. The Convention does not prevent vessels from meeting the discharge standard ahead of the scheduled implementation date.

7.8 Ports and terminals that have facilities for the cleaning and repair of ballast tanks will be required to ensure that the facilities are adequate for the reception of sediments.

7.9 This policy option will involve a commitment from the MCA to ensure all vessels covered by the proposed regulations meet the stipulated requirements and to monitor vessels on a regular basis. Monitoring for compliance and investigating reports of non-compliance will also be required.

7.10 Option 2 is the preferred option as it ensures that the policy objectives, as outlined in section 5, will be met. Regulation is the only way to ensure that these objectives are met, as having a voluntary or non – regulatory awareness campaign for example would not ensure that all industry operators would follow the requirements putting the UK at risk of environmental and economic damages from the introduction of invasive species and could cause UK flagged vessels to face greater hinderance at foreign ports slowing down maritime trade. Political benefits are also dependent on the adoption of the preferred option, in the absence of implementation of the new ballast water standards the UK would also risk its 'low risk flag' status with the IMO by failing to implement a convention that's been agreed upon at an international level.

8 The Proposal: Introduce legislation implementing the Convention

8.1 The proposal is that the UK implement the requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (as amended) through the introduction of domestic legislation. The proposed legislation will ensure that UK flagged ships remain compliant with the Convention wherever they may be, and that the UK coastline is protected from the threat of invasive species by ensuring that non-UK ships entering UK waters are also required to be compliant with the Convention's requirements.

8.2 The proposed legislation will exclude the following from its requirements:

- Ships that operate exclusively within the UK Controlled waters
- Ships that operate exclusively in the UK Controlled waters and on the High Seas
- Ships not designed or constructed to carry ballast water
- Permanent ballast water in sealed tanks on a ship that is not subject to discharge.
- Warships, naval auxiliary or other ships owned or operated by a State operated and used for non-commercial services.

8.3 The requirements outlined above mean that the proposed legislation does not apply to domestically operating vessels and or to a large proportion of the UK fleet, particularly the fishing fleet, given that in most instances, they do not operate internationally.

Shipboard Requirements

8.4 Vessels trading internationally to which the Convention applies, will be required to manage their ballast water to either the D1 or D2 standard (as outlined below), to have an approved ballast water management plan, have onboard a ballast water record book and to manage the sediment that the ships accumulates as a part of the ballasting operation. Vessels over 400 GT will be subject to survey and certification to ensure that the provisions of the Convention are complied with, and to hold a IBWM Certificate.

8.5 For vessels under 400GT, plus fixed and floating platforms, the Convention allows member states to use discretion in the area of survey and certification. The UK will make use of the requirements which apply to vessels over 400GT and apply these requirements to all vessels, to which the Convention applies, this will deliver the most minimal impact upon businesses keeping requirements on all internally trading vessels consistent compared to a "do nothing" option. We do not see "do nothing" as viable, since this could risk the occurrence of negative externalities as previously mentioned.

8.6 Alternative arrangements could result in some duplication of MCA survey and inspection costs, that could potentially impact upon fees charged to the industry. The chosen approach will allow for the

additional marginal survey and inspection burdens to be absorbed within the costs of the existing S&I regime.

8.7 The Convention provides two ballast water discharge performance standards for the industry:

- **D1 Standard** - Ballast Water Exchange which requires that ships exchange at least 95% of ballast water at specified minimum distances from the shore and in specified depths of water or within defined ballast water exchange areas.

- **D2 Standard** – The D2 discharge standard sets the number of organisms that may be discharged within ballast water per set volume. Although this standard does not mention equipment or treatment technology the most common way to meet this standard is to fit water treatment equipment that has been tested and approved for meeting the D2 standard.

- As an alternative to the either the D1 or D2 standards ships may also choose to discharge ballast to a ballast water reception facility, apply for an exemption based on an appropriate risk assessment or uptake and discharge ballast water on the high seas or from the Same Location.

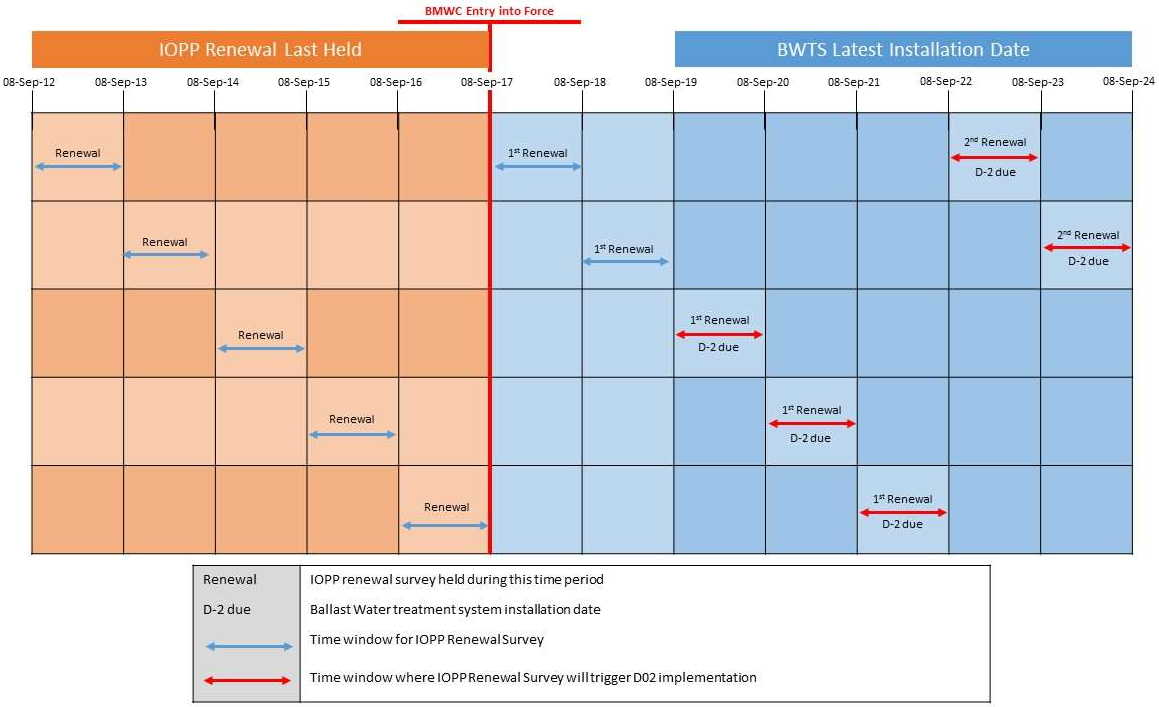
8.8 The Convention was written to provide a phased introduction of the 'higher' D2 standard in order to give all operators, owners, equipment manufacturers etc. time to plan and prepare for the fitting of equipment. Vessel operators are therefore required to first meet the D1 standard, which does not require any additional equipment. The D1 standard remains in place until the vessels are required to meet the D2 standard at which point they are no longer able to rely on ballast water exchange to manage ballast water.

8.9 It was recognised that there was a need to spread the introduction of the D2 standard to ensure sufficient supplies and infrastructure, such as dry dock space and trained personnel, were in place to facilitate the D2 standard. In order to provide the phase in of D2, the Convention ties the D2 compliance deadline of a vessel to the renewal survey of the vessels International Oil Pollution Prevention (IOPP) Certificate, which is renewed on a 5-yearly cycle.

8.10 Ships constructed on or after 8th September 2017 are required to meet the D2 standard. If the renewal survey falls in the two years after entry into force of the Convention (8th September 2017), a vessel has until the second IOPP Certificate renewal survey to meet the D2 standard (unless its prior IOPP survey fell in the period 8th September 201- 7th September 2017. If the renewal survey falls after 8th September 2019, D2 must be met by the first IOPP renewal survey.

8.11 Vessels that do not hold an IOPP certificate are required to meet the D2 standard by a date no later than 8th September 2024.

The table below outlines the D2 implementation schedule based upon a vessels IOPP Certification.



8.12 The Convention entered into force on 8th September 2017. Upon entry into force UK ships that carry ballast water and trade internationally have had to meet the Convention requirements in order to continue trading in those countries that have ratified the Convention and have national legislation in place. In order to enforce the Convention and ensure that the threat from invasive species in ships' ballast is reduced, the UK will need to implement domestic legislation as soon as possible.

8.13 As detailed in the table above, ship operators have the option to delay meeting the D2 discharge standard and fitting equipment until required to do so by the implementation schedule agreed by the IMO. Based on the schedule all ships should be meeting the more stringent D2 standard by 8th September 2024.

8.14 **Exemptions** The proposed legislation allows for vessels to apply for an exemption from the requirement to meet either D1 or D2 standards and may be granted to a ship or ships on voyages exclusively between specified ports or locations or operating within a defined area. The exemption will have a maximum validity of five years, after which it must be renewed, and the mixing of ballast from outside the defined ports or areas is not permitted. An exemption may also be revoked at any time if the potential invasive species threat changes.

8.15 Such an exemption must be risk based with process for undertaking an appropriate risk assessment based upon the Guidelines for Risk Assessment under Regulation A-4 of the BWM Convention (G7) and the Joint HELCOM/OSPAR Harmonised Procedure on granting exemptions from ballast water treatment provisions of the 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) of the International Maritime Organisation (IMO).

8.16 The exemption only applies to the requirement to meet the D1 or D2 standards and does not apply to other requirements such as the need to hold a Ballast Water Record Book or Ballast Water Management Plan.

8.17 **Exceptions** There are several situations under which an exception to meeting the requirements to meet the D1 or D2 standards may be applied. These include the need to discharge ballast in emergency situations in order to ensure the safety of the ship, to save life at sea or to avoid/minimise pollution; the accidental discharge resulting from damage, provided all reasonable precautions have been taken and the damage has not been wilful; the uptake and discharge of the same ballast water and sediments on the high seas; and the uptake and discharge of ballast from the Same Location

where the whole of that ballast water and those sediments originated, provided no mixing of unmanaged ballast water from other areas takes place.

8.18 Exceptions are not expected to be used as an alternative to meet D1 or D2 on a regular basis. However, in some circumstances, such as a ferry operating between two ports, the Same Location exception may be used as a method of compliance. Same location is defined in the draft Regulations as meaning “within one nautical mile of the point of uptake”. When using the same location exception vessels will need to record this in their ballast water record books to ensure its use is suitably monitored. It will also need to be recorded in the vessel’s ballast water management plan which will need to be approved by flag state Administrations providing further scrutiny.

8.19 Ballast water exchange (D1) is expected to be undertaken until such time as the D2 standard is mandated. Due to the fact that there are limited waters that meet the distance from nearest land and depth parameters as dictated by the Convention, the UK has collaborated with other North Sea countries to designate a Ballast Water Exchange Area within the North Sea. This area is applicable to intra-North Sea traffic only as ships operating outside of this region have other ballast water exchange options available. This is a time limited designation that will cease to exist as a compliance option for a ship once it is required to meet the D2 standard.

Enforcement

8.20 Enforcement of the proposed legislation will be achieved through the application of the survey and certification regime. Additionally, ships entering and leaving UK ports may be subject to Port State Control (PSC) inspections which will include elements pertaining to the Ballast Water Management Convention.

8.21 Prior to the introduction of UK legislation to implement the requirements of the BWM Convention, the UK may not be able to protect its coastal waters from the threat posed from non-native species in ballast water and sediments and is not able to directly enforce the requirements of the Convention. Without the introduction of the proposed legislation the relevant organisations, the MCA lacks the ability to prosecute or to issues sanctions for failure to meet the Conventions requirements. This remains the case for UK vessels and for foreign flagged vessels entering UK waters.

8.22 The UK may be able to rely on other legislation, such as the International Safety Management Code requirement that internationally trading ships of greater than 400gt apply all applicable international Conventions and use the associated UK legislation to enforce BWM Convention requirements, but this would not allow the ability to enforce and or prosecute for particular BWM Convention contraventions. As such, the introduction of specific legislation and enforcement requirements are seen are preferable.

8.23 Enforcement is also an issue for the UK overseas territories (OTs) and crown dependencies (CDs) who will also be unable to enforce violations until the UK has acceded to the Convention.

9 Sectors and Groups Affected

Implementation and Enforcement Bodies

9.1 The main bodies tasked with ensuring the implementation and enforcement of the Convention requirements are the Maritime and Coastguard Agency (MCA), as the Government’s maritime regulator, including PSC functions and the UK’s Recognised Organisations, who are authorised to undertake the survey and certification of UK flagged ships on behalf of the UK Government.

Shipowners & Operators, including seafarers

9.2 Shipowners and operators who operate internationally trading ships, will be responsible for ensuring that their ships meet the applicable requirements of the Convention. The Convention does not distinguish between ship types or size which means that ships that may not normally be subject to international environmental or safety standards are included within the scope of the BWM Convention.

9.3 The introduction of legislation to implement the BWM Convention will impact upon the those working onboard ships to which the Convention is applicable, as many will have duties involving the ballast operations of the ship.

Equipment Manufacturers

9.4 Equipment manufacturers include those involved in the design, development, approval and manufacture of ballast water treatment systems and those involved in the manufacturing of sampling and testing equipment that will be used to verify compliance. This group includes the organisations involved in overseeing or undertaking, where appropriate, the type approval testing of the equipment.

Ports, Harbours and Shipyards

9.5 Although the legislation will refer directly only to those ports and harbours that have facilities where the cleaning and repair of ballast tanks can occur, the Convention is likely to have a significant impact on ports and harbours as it is within these areas that vessels undertake the majority of their ballasting operations. It is also within the ports and harbours where any survey and inspection activities are likely to take place. There is therefore the potential for the implementation of the Convention to have both a disruptive influence through additional compliance checks and positive economic impact on the operations of this sector.

Q1 - Comments are invited to provide additional insight in to how the introduction of the proposed legislation could impact upon this sector. Particular consideration is sought on the impacts non-compliant vessels could have on the operation of a facility and potential actions that could be taken to alleviate these impacts.

10 Costs

10.1 The BWM Convention requires that ships manage their ballast water in order to minimise the release of non-native invasive species into the receiving waters, that the contracting Party ensures the requirements of the Convention are met and that ports that have facilities to deal with ballast sediments are adequate; the proposed legislation enacts these requirements into UK law.

10.2 All ships to which the legislation applies will be required to manage their ballast water as per their approved ballast water management plan, hold onboard a ballast water record book and be subject to the survey and inspection regime. Initially, ships will be able to manage their ballast water through ballast water exchange (D1) before having to potentially fit ballast water treatment equipment in order to meet the D2 discharge standard.

10.3 **Given that the regulations are from an International Maritime Organisation Convention the costs will be applicable to all vessels in scope of the convention that operate internationally, regardless of which country they are registered in, and the costs do not emanate from any UK legislation. This impact assessment only focusses on costs from the Convention to the UK maritime industry; the costs covered would be felt even if any UK government action was not to take place because all internationally trading vessels in scope of the convention will need to comply regardless of whether the UK accedes to, and implements, the convention. The marginal costs of implementing the international Convention into UK legislation is nil (no additionality from imposing the regulations). We have therefore compared option 2 with a constructed counterfactual where other countries were not to ratify this convention to demonstrate the costs based on RPC guidance.**

10.4 Once ratification of the Convention is completed, the UK will become a contracting Party to the Convention and as such will have to fulfil all the obligations under the Convention. These obligations include ensuring that ships adequately manage their ballast water, the survey and inspection of ships as required, enforcing the requirements of the Convention, monitoring the effectiveness of the Convention, the provision of details regarding ballast water exchange in UK waters and the communication of any additional requirements. Any future amendments to the convention could be

implemented in the UK, which could potentially impact UK businesses in the future. However, implementation of amendments to the Convention will not be automatic and will go through an evaluation process.

10.5 The Convention and the anticipated legislation puts statutory responsibility on ports or harbours that already have facilities for the cleaning and repair of ballast tanks. Facilities which are capable of completing work on a ship's ballast tank will be required to ensure that those facilities are adequate for the services they offer. Additionally, any port that provides ballast water or ballast sediment reception facilities will need to ensure that the capabilities are developed in line with the guidance provided by the International Maritime Organisation as well as with existing UK legislation regarding the disposal of wastes and wildlife protection.

Administration Burden

10.6 As the competent authority of the UK, with the responsibility of overseeing the implementation and enforcement the legislative requirements, the MCA will incur a range of costs.

10.7 Administrative costs include those associated with the development of related documentation, including the ballast water record book, certificates and reporting processes. Although the majority of the survey requirements will be delegated to the UK's Recognised Organisations, who are authorised to complete survey work on behalf of the UK, MCA surveyors will also need the ability to issue appropriate documentation. Administration and recording of survey and inspection activities will also need to be undertaken by the MCA, but as this will form a small addition to the existing record keeping process this is not expected to result in any significant increase in workloads or costs. The increase in administrative burden associated with the introduction of the new legislation is considered negligible.

10.8 As the proposed legislation introduces a new survey and inspection regime, the major impact on the MCA will be that associated with additional training and equipment needs. Although, as already stated, the majority of surveys will be undertaken by third parties, MCA surveyors must have the ability, skills and knowledge required should they be called upon to undertake such work. Training has already commenced and has been completed in house, as such costs have been kept to a minimum. Training with regards to additional PSC requirements will be undertaken through the Paris MOU, of which the UK is a member/signatory.

10.9 Although the legislation will empower PSC Inspectors with the ability to take ballast water samples, it is not foreseen that this will be undertaken on a routine basis, therefore costs associated with sampling and analysis have not been considered and do not form a part of this narrative.

10.10 The UK, in conjunction with North Sea partners, has designated a Ballast Water Exchange Area within which ships are able to undertake Ballast Water Exchange, even though the distance from land and water depth criteria for Ballast Water Exchange are not met. There are not expected to be any additional costs associated with the administration and implementation of this area and the UK does not expect to designate any additional Ballast Water Exchange Areas at this time.

10.11 Depending on current legislative requirements the introduction of the proposed legislation may result in an additional administrative burden on other governmental departments, such as the Department for Environment, Food and Rural Affairs or the Environment Agency and the equivalent bodies within the Devolved Administrations. This is expected to be a result of the possible need for ballast water and sediment reception facilities to hold relevant licences and permits as required by DEFRA and other regulatory bodies in order to dispose of ballast water and sediments. It is foreseen that, if required, this will impose a negligible cost burden on the affected bodies.

Books and Plans

10.12 Ships to which the proposed legislation applies will be required to fulfil their obligations under the Convention. All ships will be required to develop a ballast water management plan and hold a ballast water record book. Pre-printed ballast water record books can be purchased from The Stationery Office (TSO) at a cost of £9, as such this cost is considered negligible for the purposes of this impact assessment. The cost of producing a ballast water management plan will vary depending upon the requirements of the operator and the vessel as it could take time away from other duties to produce. As such we seek further evidence on the potential costs of producing a ballast water management plan.

Q2. We therefore ask consultees to provide evidence on the estimated cost of producing a ballast water management plan, useful information would be:

- **Total cost to produce and maintain a ballast water management plan?**
- **Time taken to produce a ballast water management plan?**
- **Who would be producing this?**

Familiarisation Costs

10.13 The proposed legislation will only implement the Ballast Water Management Convention which has been in existence for a significant length of time and has been developed in conjunction with vessel operators. Even though it has been developed alongside industry, operators will still need to familiarise themselves with the domestic UK regulations to fully understand the requirements.

10.14 There is a cost associated with operators familiarising themselves with the UK Regulations, as it takes time that could be employed elsewhere in their day to day business. The time taken and cost for the operators to read the Regulations was calculated using the Gross Hourly Earnings data sourced from the 2018 Annual Survey of Hours and Earnings (ASHE) data set[13]. Legal professionals code was used as we assume that this job would be carried out by either legal or equivalent admin. The ONS is assumed to be a reliable source of information.

10.15 A range of hourly labour costs and time taken to read the Regulations have been taken into account to acknowledge the different salaries and reading speeds of the operators. This is all represented by the low, central and high case scenarios of what the total familiarisation costs could be. It has been assumed there is only one operator per vessel who would need to fully read the Regulations.

10.16 The time taken for operators to familiarise themselves with the new Regulations is assumed to be 2hr in our central scenario. This assumption is based on MCA judgment. With the mean wage taken from the 'Legal professionals' salary in the ASHE data set, a 50% up and lower sensitivity has been used on reading time to estimate the low and high case scenarios. With the 30th and 80th percentile wage from the 'Legal Professionals' salary being takin for the low and high case scenario respectively. These cost ranges and assumptions will be tested at consultation.

- **High case scenario**, 3hrs to read and 80th percentile wage
- **Central case scenario**, 2hrs to read and mean wage
- **Low case scenario**, 1 hr to read and 30th percentile wage

Formula: (Time * hourly rate) * number of affected vessels

[13] https://www.ons.gov.uk/releases/analysesbasedonannualsurveyofhoursandearningsprovisional2018andrevised2017 - Table 14.5a Hourly pay - Gross (£) - For all employee jobs: United Kingdom, 2018 ('Legal professionals')

Table 1 – Summary of familiarisation costs

	Low	Central	High
Reading Time (Hrs)	1	2	3
Wage rate	£ 19.15	£ 31.77	£ 44.43
No. of affected operators	252	252	252
Total over appraisal period	£ 4,700	£ 15,500	£ 32,500

Source: MCA estimates (figures rounded, so may not sum)

10.17 The estimated cost for operators to familiarise themselves with the new Regulations is £15,500 in our central cost scenario. This can range between £4700 to £32,500 in our low and high cost scenarios respectively depending on the salary and time taken by each operator.

Equipment; Installation and Operational Costs

10.18 The main monetised costs discussed in this IA are estimated for initial equipment purchase costs and costs of operating that equipment, however, does not include the labour costs involved with installation, the possibility of retrofit costs vessels may incur to fit such equipment onboard and potential loss in revenue due to the time taken for installation and operation that could be used for business because of the bespoke nature of each vessel. This section will detail how estimates of the BWMS installation and operation costs have been estimated.

Q3. We ask consultees to provide evidence on the labour and time costs that are likely to arise from installation of BWMS, these include;

- **Labour cost associated with installation of equipment**
- **Cost of retrofit? (if taken place or needed)**
- **Would the installation of equipment require normal business to cease? How long would this be for and what is the potential loss in revenue?**
- **Would the operation of ballast water treatment disrupt the normal day to day business? How much would this cost?**

10.19 For the purposes of estimating the costs of BWMS's to the UK flagged fleet a comprehensive methodology has been developed. The estimation of BWMS costs has utilised UK fleet data provided by Clarksons[14] which details the UK fleet which currently have BWMSs installed, how much capacity the vessel's BWMS can hold and the type of filtration installed. It also provides information on UK flagged vessels which have yet to install BWMSs.

10.20 Information regarding BWMSs indicative capital and operational costs have been used in the analysis to form the basis of costs that will be faced by the UK fleet. The BWMS information has been supplied directly by manufacturers following an informal consultation conducted by the MCA[15]. Given that the BWMS information was provided in different years and currencies, for consistency the costs of the systems have been converted into a 2019 price base[16] and pounds sterling[17].

10.21 BWMSs with similar capacities were grouped together to calculate the average capital and operational expenditure required for each BWMS group.

[14] UK fleet data provided by Clarksons in February 2019.

[15] Indicative BWMS information was provided by manufactures between January 2018 and March 2019.

[16] Converted using HMTs GDP deflator found here: https://www.gov.uk/government/collections/gdp-deflators-at-market-prices-and-money-gdp

[17] Converted in pound sterling using exchange rates the Office for Budget Responsibility (OBR) March 2017 Economic and Fiscal Outlook

10.22 Using the fleet data, the vessels are split into three categories; vessels with BWMS already installed, vessels that will need a BWMS and vessels that do not need BWMS. Technical advice from the MCA was used to assist in the filtering out of vessels not requiring BWMS under the convention. However, in general vessels excluded from the analysis are those that; operate exclusively on a domestic basis, are in an 'abandoned' status, were built after 2018 and fishing vessels.

10.23 Fishing vessels are not included within this analysis because although many will require BWMS for anti-roll purposes for example, there is no data availability regarding the costs of equipment specifically required for fishing vessels. We have, however, estimated the number of fishing vessels that could be impacted by this regulation based on expert MCA surveyor's advice[18]. Most UK fishing vessels are quite small and only operate on a domestic basis and so will be exempt from the Regulations. It's only the larger vessels which operate internationally which could be impacted and because of this we've assumed that only fishing vessels over 24 metres would undertake ballast operations during their activities.

10.24 However, whilst many vessels over 45 metres could potentially fish or trade internationally, some may not operate outside domestic and high seas which would therefore make them exempt. To take into account uncertainty and limited information we've produced a range with MCA surveyors to demonstrate possible scenarios.

- High Cost scenario – Vessels over 24 metres in length (equivalent to 150 GT and above)
- Central cost scenario – Vessels over 35 metres in length (equivalent to 250 GT and above)
- Low cost scenario – Vessels over 45 metres in length (equivalent to 300 GT and above)

Table 2 – Summary of fishing vessels impacted

	Low (>45 metre)	***Central (>35 metre)***	***High (>24 metre)***
Fishing vessels affected	35	70	200

Source: MCA estimates

10.25 Under our central scenario the number of estimated fishing vessels that would be impacted is around 70 and could range between 35 – 200 vessels depending on the length of the vessels that operate internationally.

Q4. We ask consultees to provide evidence of the number of fishing vessels affected and any capital and operational costs for fishing vessels due to the draft Regulation. If this requires usage of shore side facilities please specify this.

10.26 The analysis then divides the vessels which need BWMS and those already with systems in groups of vessels with similar gross tonnages (GT) and includes vessels like tankers, container, bulk carriers, offshore etc. The table below details how many vessels fall into the defined GT categories.

[18] List of UK flagged fishing vessels obtained from the Registry of shipping & seaman database

Table 3 – Grouped vessels

GT Groups	*Vessels with BWMS*	*Vessels needing BWMS*
Greater than 150,000	7	3
149,999 – 90,000	21	23
89,999 – 50,000	3	39
49,999 – 20,000	20	63
19,999 – 10,000	4	23
Less than 10,000	6	252
Totals	**83**	**403**

Source: Clarksons and MCA estimates

10.27 By using the data on the vessels with BWMS already installed the analysis then assigns a BWMS to each vessel needing a system installing in the future. This assumes that given BWMS choice is a commercial decision, vessels of a similar GT will choose similar size of systems i.e. systems with a similar capacity. Therefore, each GT group is assigned a BWMS grouping based on the evidence of vessels with systems installed. The analysis then assumes that vessels needing a system in the future will make a similar choice of system to the vessels in the same GT group with a system installed.

10.28 Using this method every vessel needing a BWMS is assigned a system of a similar specification to the similar vessels which have already had BWMSs installed. This provides indicative capital and operational costs for each vessel based on data provided by BWMS manufacturers. Not all vessels will opt for the installation of BWMS as they comply through other routes, however, for our costings we have assumed that each vessel needing one inside our criteria will opt for a BWMS for ease of compliance.

10.29 The final stage of the analysis is applying an uptake schedule to the vessels needing BWMSs installed, the assumed distribution of uptake peaks in 2022 with around a third of the fleet installing BWMS in that year[19]. This distributes the capital and operation expenditure over the appraisal period. However, all of the capital expenditure is assumed to occur before 2024 because 2024 is the convention's deadline for having BMWS installed on vessels. Therefore, the costs incurred in this IA for the years 2024 to 2028 are purely for operational purposes.

10.30 The methodology described above would not be possible without a principle set of assumptions. The core assumptions made in this analysis are set out below:

10.31 Operational expenditure of all the BWMSs applied to the UK fleet is equivalent to 2.5% of the initial capital cost of the BWMS per year. For example, a system costing £100,000 will have an assumed yearly operational cost of £2,500. This assumption is backed by communication with manufacturers who have made similar assumptions and by evidence provided to the Department that the average operational expenditure of each BWMS sits between 2% and 3%. Further, this IA has tested this assumption by also calculating costs over the appraisal period where operational expenditure was 50% higher i.e. 3.75% of the initial cost of the system per year.

10.32 The capital expenditure is the most sensitive element of the total BWMS costs faced by the UK fleet. In this IA it is assumed that vessels of a similar gross tonnage will choose a similarly sized capacity BWMS, however, it does not control for vessel type within that assumption. This leads to a risk that this analysis may be over or underestimating the actual BWMS requirements for each vessel, which in turn comes with potentially large cost implications. This IA therefore also explores

[19] This assumption is backed by technical advice from the MCA

capital expenditure sensitivities in scenarios where the costs of BWMSs are increased by 40% and a separate scenario of a decrease of 15%. The indicative costs for equipment and operation can be found in the table below:

Table 4 – Indicative cost of BWMS and operation (£2019, Rounded)

Category	*No. of vessels affected*	*CAPEX*	*OPEX*
Greater than 150,000	3	£308,000	£8,000
90,000 - 149,999	23	£233,000	£6,000
50,000 - 89,999	39	£404,000	£10,000
20,000 - 49,999	63	£163,000	£4,000
10,000 - 19,999	23	£163,000	£4,000
Less than 10,000	252	£114,000	£3,000

Source: MCA estimates using Indicative BWMS information was provided by manufactures

10.33 The uptake distribution of BWMS is based on guidance provided by the MCA, but the reality may be different depending on the availability of the installation facilities and technicians needed to complete the installation. Further, given that timing of installation of the BWMS is a semi-commercial decision, there is a risk that actual installations will be backlogged into the final years before the D2 standard becomes obligatory for all vessels in 2024. Therefore, a sensitivity scenario is also calculated representing this scenario and is broken down in Annex 2.

10.34 Other assumptions that have been used in this work are around the commercial aspects of selling BWMS. In this analysis we have assumed there are no bulk buying discounts or any other form of discounts.

10.35 In terms of assessing the capital and operational costs of BWMSs the indicative costs provided to the Department have been converted into pound sterling, a 2019 price base (table 2) and a discount rate of 3.5% has been applied. It is assumed that over the course of the appraisal period the exchange rate into pounds sterling will not change nor will the discount rate. Once the final figures for costs are calculated all costs are discounted to a 2019 price base to calculate present value (PV).

10.36 For presentational purposes we have summarised the analysis into three main cost scenarios of High, Central and Low with the alternative take up only being used against our central scenario. The high cost scenario comprises the Capex increased by 40% and Opex by 50% and the low-cost scenario comprising the Capex decreased 15%.

- High Cost scenario – Capex increased by 40% and OPEX by 50%
- Central cost scenario – No changes from our base assumptions
- Low cost scenario – Capex decreased by 15%

Table 5 – Estimated cost of BWMS and operation (£2019, Discounted and Rounded)

£m		*Low*		*Best estimate*		*High*
Capex	£	50	£	59	£	83
Opex	£	13	£	13	£	19
Total	£	63	£	72	£	102

Source: MCA estimates

10.37 The total cost of the BWMS equipment in our Central scenario is estimated to be £72m in 2019 prices over a ten-year appraisal period. This includes £59m PV of capital expenditure, the cost of installing and purchasing the equipment and £12m PV of operational expenditure which includes running and maintenance costs over the ten-year period. Just under half of the total capital and

operational costs are taken on by the smallest vessels by gross tonnage in the UK fleet. However, this is mostly because this is by far the largest group of vessels in the parts of the UK fleet that are in scope. On a cost per vessel basis, typically the larger the vessel the higher the costs. A full breakdown of year-on-year costs can be found in annex 2.

10.38 In the high-cost scenario, the operational expenditure per year is increased by 50% above the assumed rate of 2.5% of the cost of the system per year. Therefore, operational costs in this scenario are 3.75% of the installation cost of the system per year. Capital expenditure is increased by 40%, this is a fairly extreme scenario given that the Department has been provided up to date and accurate information regarding BWMS costs from manufacturers. But given that the fishing fleet is not included in the analysis and that this analysis may have under-estimated the size of BWMS required for different vessels, it gives a useful estimate that captures the varying costs that fishing vessels could face.

10.39 In this sensitivity test the present value of costs is £102m, £30m more than the best estimate present value of costs. This is made up of an increase of £27m in capital costs for the purchasing of BWMS and a £7m increase in operational costs from use and maintenance around the equipment. This is relatively small compared to capital changes representing how much more sensitive this analysis is to changes in capital expenditure than operational expenditure.

10.40 In our low-cost scenario, the capital expenditure is decreased by 15% with nothing else changing. This scenario is tested because it is likely that in reality the costs of equipment will come down in the future given the increase in uptake and additional competition in the market. Therefore, we have implemented a modest decline in cost. The present value of this scenario is £51m over the ten-year appraisal period, which is a £8m decrease in costs from the best estimate.

Table 6 – Alternative Uptake costs (£2019, Discounted and Rounded)

£m		***Best estimate***		***Alternative Uptake***
Capex	£	59	£	57
Opex	£	12	£	11
Total	£	72	£	68

Source: MCA estimates

10.41 The alternative uptake scenario tested is a plausible uptake scenario whereby the installation of BWMS is backlogged into the final years before the D2 deadline. This scenario is tested because vessel operators could make a commercial decision to delay installation as much as possible before the deadline to lower short term costs. In this scenario the present value of costs over the ten-year is £68m a £4m decrease on the best estimate. The capital costs are the same as the best estimate before discounting, the driver of this cost reduction is due to this scenario pushing operational expenditure out of the appraisal period.

10.42 In summary our best estimate of the costs of purchasing and operating of BWMS equipment is £74m and could range between £63 - £102m in our low and high cost scenarios depending on the Capex and Opex costs faced by operators.

Q5. We ask consultees to provide feedback and evidence on any capital and operational costs including installation and commissioning for the BWMS and if these estimates are accurate?

Training (MCA and Operators)

10.43 The proposed legislation will result in additional training requirements for those authorised to undertake the survey, inspection and enforcement of the Regulations's requirements; this will impact on the MCA as the UK's maritime administration and on the UK's Recognised Organisations who will be authorised to carry out surveys and inspections on behalf of the UK. These costs are considered

negligible as their training will be incorporated in the broader surveyor training regimes and will be undertaken as internal training.

10.44 The legislation will also require that all personnel involved in ballast water management operations onboard a ship are appropriately trained for the tasks allocated to them. Initially, as owners and operators use ballast water exchange as the management method this is not expected to add any appreciable burden to crews. However, once ballast water is required to be managed to the D2 standard, additional training may be required to ensure personnel are suitably trained in the operation of any equipment and handling of consumables associated with meeting the standard.

10.45 We have carried out analysis around the possible training costs which could be incurred for the use of BWMS on board vessels. As no evidence has been collected so far on the training costs the following analysis is based on MCA assumptions and ONS ASHE wages this could result in an under or overestimation of the total costs. To take into account the uncertainties surrounding these assumptions, sensitivity testing has been employed to produce a high and low-cost scenario to showing the varying time taken and wage rates that employees would be on.

10.46 Under our central scenario we've assumed that the training would take two days' worth of time equivalent to 16 hours of work, at the mean wage rate for 'Production and process engineers' from the Gross Annual Pay ONS 2018 ASHE data set[20]. Our high cost scenario assumes the training would take 3 days with the 70th percentile used as their wage and the low-cost scenario taking 1 day at the 30th percentile wage rate.

10.47 These were costed against the number of vessels needing BWMS and the uptake over the appraisal period.

- High Cost scenario – 24 hours of training with 70th percentile wage rate
- Central cost scenario – 16 hours of training with the mean wage rate
- Low cost scenario – 8 hours of training with 30th percentile wage rate

Formula: (Time * hourly rate) * number of affected vessels

Table 7 – BWMS training costs (£2019, Discounted and Rounded)

		Low		***Central***		***High***
Training Time (Hrs)		8		16		24
Wage rate	£	16.87	£	20.24	£	22.77
No. of vessel		403		403		403
Total over appraisal period	£	50,000	£	120,000	£	202,000

Source: MCA estimates

10.48 Under our central cost scenario over the appraisal period, training would cost industry £120,000 for those vessels that are still in need of BWMS to comply with the Regulations. This can range from £50,000 to £202,000 in our low and high costs scenarios depending on the time taken and salary of the employee undertaking the training.

Q6. We ask consultees to provide evidence regarding the costs of training associated with these Regulations on an individual personnel basis and as a total cost where possible.

[20] https://www.ons.gov.uk/releases/analysesbasedonannualsurveyofhoursandearningsprovisional2018andrevised2017 - Table 14.5a Hourly pay - Gross (£) - For all employee jobs: United Kingdom, 2018 ('Production and process engineers')

Ballast water reception facilities

10.49 Ports, harbours, shipyards and repair facilities that offer ballast water tank cleaning and repair services will need to make sure that they have adequate equipment for the reception of sediments in line with the Regulations. This could allow for terrestrial ballast water treatment services allowing vessels to comply with the Regulations without the need for BWMS's onboard, these facilities will no doubt charge operators for their services. We assume that the vessels that would use these services would be small and not use ballast water often, as larger vessels that use ballast water more regularly would not always be able to use the facilities when needed and would need specific deep-water ports that may not have said services available. It's difficult to predict the prevalence and uptake in these facilities going forward.

Q7. We therefore ask consultees to provide evidence regarding:

- **Costs of using terrestrial facilities for the treatment of ballast water in compliance with the Regulations.**
- **The costs to facilities to acquire and maintain equipment that is adequate for the reception of sediments if necessary.**

10.50 Ports, harbours, shipyards and repair facilities may incur additional costs due to the majority of ballast water related operations being conducted at these places; this is mainly due to the potential inspections that will need to be carried out. Currently we do not have any evidence on the impact this could have on the workings of these facilities, however we do not expect this to interfere with their day to day business as these can be integrated with other PSC and general UK inspection of UK ships.

Q8. We therefore ask consultees to provide evidence regarding the potential impacts this could have on these types of facilities due to the conventions.

Fishing vessel competition

10.51 Fishing vessels that are impacted by these Regulations and choose to install BWMS will see their capital and operational expenditure increase. This will mean more revenue would be funnelled into costs than profits potentially driving operators out of the market and presenting a barrier to entry for new entrants. However, due to the small size of the vessels in question we assume that they would not be adversely affected, with the operational costs being small due to the rare use of ballast operations for many vessels. It's assumed the driving capital cost to most fishing vessels for the BWMS would be the retrofitting of their vessels to accommodate such equipment.Vessels constructed since 2017 would likely have been constructed with this in mind or specific vessels could be bought with BWMS mitigating the cost of the Regulations on any new entrants to the fishing market, thereby limiting the potential for these Regulations to pose a barrier to entry for any new operators.

10.52 Whilst all vessels of a similar size would be facing similar costs they might be preforming vastly different fishing operations to each other, most of the time catching different species of fish for example trawlers and longliners. The cost of compliance with the Regulations would not disproportionately affect any size of vessel leaving competition in the UK fishing market unaffected.

Q9. We therefore ask consultees to provide evidence on:

- **Would the costs from installation of a BWMS drive you to leave the market or change your area of operation to avoid said costs?**
- **Could this potentially stop new entrants from entering the fishing industry?**

11 Benefits

Introduction

11.1 This section draws on a wide-ranging evidence base from a variety of different literature studies. The department has worked closely with the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) and would like to thank CEFAS for the briefing material provided regarding the impact of Marine invasive species in relation to ballast water.

11.2 The impacts of INNS on ecosystems are not well understood but species diversity is a key element of ecosystem functioning with any changes in species composition, or relationships among species, affecting how the ecosystem functions. The direct costs associated with INNS can be substantial, but the total cost of associated impacts on biodiversity are likely to be many times greater when including indirect impacts.

11.3 The implementation of Ballast Water Management Convention through the Regulations has the potential to reduce and prevent the risk of further introductions of INNS and reduce the associated economic costs to the UK economy.

Quality of Evidence

11.4 Given the high degree of sensitivity to the assumptions used, the figures presented in this section should be interpreted as indicative estimates. The figures that have been included have been provided to offer a sense of scale of the potential impact as opposed to a monetised point estimate.

Direct Effects

11.5 Economic costs can arise because INNS affect the ordinary functioning of ecosystems to produce the goods and services that humans use. Many of the effects of INNS can have a direct cost to the economy, including control and eradication costs, structural damage to infrastructure, or loss of production due to the presence of an INNS. There are obvious prevention and control costs associated with INNS, as well as costs associated with repairing damage, research and publicity. Other direct costs include decreased yield and productivity, increased flooding and erosion caused directly by the presence of an INNS. Marine-borne human pathogens are also known to be translocated within ballast water; outbreaks of which may have significant cost implications on health services and to human health. INNS will have impacts across a wide range of sectors. More detailed qualitative description of impacts on key sectors is provided below[21].

11.6 The following impacts are associated with INNS across the entire UK marine environment and not all INNS will have been introduced through the ballast water pathway, but instead through other

[21] Full description can be found in Williams et al , The Economic Cost of Invasive Non-Native Species on Great Britain, Cabi.org, (2010.). .

marine pathways. The qualitative description gives an indication of the potential damages INNS can cause to the marine environment once introduced. As outlined by the Williams et al report (2010) there is great difficulty in distinguishing between the different pathways INNS are introduced through. There is also limited information on the proportion of impacts that are attributed with native species or INNS.

Aquaculture

11.7 The most common impacts of INNS on this sector are fouling, competition for resources, predation and vectoring of diseases. The greatest impact on aquaculture is that of fouling (nets, cages, buoys, moorings, boat hulls etc.), which William et.al. (2010) estimated to cost approximately £13 million per annum. Fouling in general including that caused by INNS can cause additional costs to the shellfish industry. Due to the need for additional labour to clean fouled produce has been estimated that the European shellfish industry experiences a loss of 5-10%. The time and cost spent in cleaning shellfish can be 20% of the market price.

11.8 INNS such as the slipper limpet (not solely introduced through ballast water) can also reduce incomes in the shellfish industry by acting as a competitor for space and food. For example, in Brittany, the scallop industry has lost an estimated 97% of the harvestable area which has a significant impact on income which can be generated. The Oyster industry is also impacted by slipper limpets and oyster drills by reducing the ability of young oysters to establish themselves. The American Oyster Drill, which feeds on young oysters and is known commonly to cause 50% mortality in oyster spat[18].

11.9 Other INNS which cause significant costs to the aquaculture sector includes the Chinese mitten crab, these species predate on native fish eggs or can damage nets.

Tourism and Recreation

11.10 Inland waterways are crucial for tourism and recreation as they provide income for local economies as well as the national economy as a whole. The various effects of INNS on recreational activities carried out using inland waterways range from direct effects, such as the presence of mats of floating weeds that may restrict navigation or prevent angling. Furthermore, a number of species can cause damage to waterway infrastructure and may interfere with water control structures, potentially posing a further flood risk. Native species and INNS are attributed to hull fouling but there is limited information on whether INNS play a significant role in hull fouling in regard with recreational vessels.

11.11 INNS are also an issue for recreational vessels, but it is challenging to separate the costs incurred from issues caused by native species. Hull fouling is included in general good maintenance by boat owners, and so they should not incur additional costs due to the presence of INNS. Nonetheless, some of the species contributing to hull fouling will be INNS and therefore a portion of the cost of cleaning recreational vessels could be attributed to non-native species. A report by the Centre for Agriculture and Bioscience International in 2010 estimated the costs of hull fouling due to INNS to recreational craft to be in excess of £21million[22].

11.12 Coastal tourism includes visits to the beach as well as any recreational activity in coastal water. Invasive species in the form of non-native seaweeds can impact on leisure activities and result in clean-up costs. However, to date no significant costs have been attributed to this[19].

Shipping & Commercial Fishing

11.13 A number of INNS including *Steyla clava*, *Elminius modestus* and other algae, some of which have been introduced via ballast water, impact international shipping vessels and commercial fishing vessels through fouling of the hull. It is assumed using Gollach's 2002 study that 50% of the fouling

[22] Williams et al (2010). The Economic Cost of Invasive Non-Native Species on Great Britain, Cabi.org

organisms on ocean-going ships are non-native and therefore attributable to half of the hull cleaning and painting costs. Cleaning and painting hull costs varies significantly dependent on size of the vessel. Commercial fishing vessels are advised to clean the hull once a year and treat the hull with antifouling paint once every five years. Ferries by law are required to be dry docked once a year whilst tankers are required to have an intermediate clean every three years and a major clean every five years. Fouling caused by INNS puts additional costs of cleaning the hull onto owners of the vessels. There are currently around 5,700 fishing vessels in the UK and including the other vessels the annual cost associated with hull fouling from INNS is significant. It is difficult to estimate how much of the costs are associated with INNS introduced through ballast water.

Utilities

11.14 INNS including the Chinese mitten crab when grouped together block water pipes and outlet pipes from power stations. Thousands of tonnes have already been found in London's water pipes, constricting the flow and forcing Thames Water engineers to clear clogged pipes, whilst many other water supplies use specialist contractors. There is approximately 361,402 km of water mains in the UK hence the cost of unclogging these pipes across the UK can be significant[19].

11.15 Power stations are strongly impacted due to the intake of water from fresh in land waterways. However, the variation in the severity of the impact fluctuates based on geographic locality. Many coastal power stations control fouling by chlorination, whilst in freshwater, where one of the most damaging fouling organisms is the zebra mussel, a variety of approaches are used including heat treatment and the use of intake screens. These routine operations are likely to be costly due to the need to regularly clean the intake pipes to avoid blockages[19].

Q10. We ask consultees to provide evidence of any cost or loss of revenue impacts within the utilities industry caused by INNS so that any indirect benefits of the Regulations can be assessed fully.

Summary of Direct Effects

11.16 It is important to note that the precise impact is dependent on the type of INNS and therefore will vary on geographic location and habitats. For example, certain species may affect the operation of power stations, while others cause hull fouling on fishing and shipping vessels. Once introduced, Marine INNS are commonly recognised as being almost impossible to remove. Post invasion damage control can be equally challenging and expensive. Therefore, prevention of new introductions is the primary measure for the mitigation of INNS impacts.

11.17 Despite this, the overall impact of INNS leads to significant costs to the UK economy and has a direct impact on a number of key sectors (outlined above). Introducing the Regulations, will help limit the impact of future incidents caused by INNS.

11.18 Successfully managing INNS can therefore provide long-term economic and environmental benefits, including conserving biodiversity and health of ecosystems, and maintaining the services they provide. This supports the case for strategic investments in prevention, including ratification and implementation of the Ballast Water Management Convention, rather than post-invasion damage control.

11.19 In terms of costs the direct effects of implementing the Convention are substantial at £74.1m in capital and operational expenditure over a 10-year appraisal to the UK shipping industry. These costs are included in both the counterfactual and legislation options and the direct monetised cost of legislation is nil beyond the counterfactual.

11.20 As the BWMS technology is implemented and the market develops further, it is likely that costs will fall over the long run, therefore, reducing the impact on the maritime industry. Additionally, the largest expenditure relating to the Regulations is the BWMS capital expenditure. By comparison the

operational costs are small consequently reducing the long-run costs of the Regulations in both options.

11.21 In the legislation option, un-monetised benefits over the counterfactual have been identified such as ensuring UK flagged vessels do not face delays at ports and additional inspections. Reducing the costs to industry by ensuring legislation is consistent across all the countries they operate in to reduce administrative burden. Finally, the legislation makes the legalities of ballast water management a legal requirement in UK waters to ensure the protection of UK waters.

Indirect Effects

11.22 The economic impact of the displacement of a species, or a change to ecosystem functioning is very difficult to value and some changes to ecosystems may go unnoticed, especially in cases where there is a long lag phase[23]. The valuation of the economic impact of invasive non-native species (INNS) to the marine environment, is therefore challenging. Most ecosystem services do not provide direct cost benefits to the economy but are essential for ecosystem function. The value of ecosystems are often intangible and as result are not directly traded on the market. All INNS are recognised as having ecosystem wide impacts, but in most cases these impacts have not been translated into economic or financial costs.

Non-use Values

11.23 The above effects are those which can be monetised as they are either direct or indirect effects. However, to fully comprehend the scale of the benefits non-use values have to be included as they are un-monetised. Non-use value is the value that consumers assign to a good which the consumer does not use directly or indirectly. For example even those living in the interior of the country may receive some value from simply knowing that coastal resources are well maintained because someday they plan to visit these areas, or people may also want to pass a healthy environment along to the next generation even if they have no immediate interests in these resources for their own enjoyment. INNS introduced through ballast water and other pathways negatively impact the marine ecosystem in the short and long run, this in turn will reduce the marine resource and therefore reduce consumer utility associated with the resource.

Total Effects

11.24 Biodiversity and a well-functioning ecosystem is hugely important to the global economy due to the provisional services they provide. An example of one estimate puts the value of the World's ecosystems at $33 trillion[24].The total loss to the world economy as a result of INNS has been estimated at 5% of annual production[25]. However, the total cost of these species to a country's economy is generally unknown. Some studies have been conducted examining this issue and have revealed that the cost of INNS to a country's economy can be very high, but the estimates vary considerably. A review of these studies also demonstrated that in general only direct, market costs are included in studies, most likely due to a lack of key data. It has been estimated that direct costs represented on average 1.75% of the total estimated annual cost of INNS to a country's economy[26].

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[23] The average lag-phase (time between introduction and successful spread and impact of a species) has been estimated at about 50 years, with a shorter lag-phase for tropical species than temperate species (Daehler 2009).

[24] Costanza et al. (1997). Costanza et al, The value of the world's ecosystem services and natural capital, Nature: volume 387, pages253–260 (1997)

[25] Pimentel et al. 2002. Pimentel D.A. et al., Economic and environmental threats of alien plant, animal and microbe invasions. Agriculture Ecosystem Environments: 84, 1–20 (2001)

[26] A meta-analysis of previous studies of the economic impact of invasive species on the economy of various countries revealed that, on average, direct costs constitute only 1.75% of estimates of total costs. No work has been carried out to confirm or challenge this estimation.

11.25 Williams et al (2010) estimated the total direct annual cost of INNS to the British economy to be approximately £1.7 billion.

11.26 Williams et al (2010) conservatively estimated the direct costs to the UK associated with marine INNS to be in the region of £40m per annum[27]. The direct costs of marine INNS are presented in relation to several sectors, aquaculture, fishing, tourism, shipping and utilities. The previously investigated research shows that direct costs account for around 1.75% of total costs, therefore, the total cost of marine INNS to the UK would be approximately £2.3bn. If it is also assumed that 30%[28] of INNS in the UK have been introduced as a result of ballast water activity, then this would account for £11.8m of direct costs and £607m of total costs.

11.27 As these estimates are based on figures produced in 2010 it is likely to be an under-estimate if new introduction of INNS and inflation are accounted for. Furthermore, the cost estimates produced are likely to be conservative and a possible under-estimate, given the lack of information available. A number of additional assumptions have been applied to the £40m of direct costs associated with INNS in the UK marine environment. This was to provide a further breakdown between direct and indirect costs, which were not part of the original study.

Conclusion

11.28 This Impact Assessment has provided evidence where possible, on the monetisation of costs associated with implementing the Ballast Water Management Convention. Further, it has been identified that, given this is an international Convention; in both options 1 and 2 the costs are equal because it is assumed vessels will comply with the Convention whether it is implemented into UK law or not.

11.29 The benefits of option 2 over option 1 are that acceding to the Convention and implementing it into UK law ensures that UK flagged vessels will not face additional checks in ports and the economic costs of those checks. Further, it does not risk the UK's position as a 'low risk' flag state by ensuring our legislation is up to date.

11.30 It is widely accepted by the scientific and international governance community that INNS pose a significant risk to continued and sustainable ecosystem function. Irrelevant of the costs associated with the implementation of ballast water management, the mitigation of the ballast water pathway is vital for the maintenance and sustainability of the marine ecosystem function.

11.31 Due to the nature of ecosystems it is difficult to provide a monetary value of the costs associated with INNS. However, based on the few examples of sectors affected by INNS it is clear that the costs associated with INNS are significant. This is expected to increase as the population of INNS grows across Britain and is accelerated through the movement of ballast water across international boundaries.

12 Consultation

12.1 During the consultation phase of the draft Regulations we ask that consultees provide wherever possible estimates of the costs of implementing the Convention. Although this assessment contains a comprehensive estimate of the equipment capital and operational costs large evidence gaps exist for the other costs which might be incurred as a result of implementing this Convention. Primarily evidence is required in areas such as;

- costs to fishing vessels;
- BWMS, commissioning and installing costs;

[27] Williams et al (2010). The Economic Cost of Invasive Non-Native Species on Great Britain, Cabi.org

[28] Eno et al. 1997. Non-native marine species in British waters: a review and directory. 1997

- costs to transfer and treat ballast water to terrestrial facilities;
- the costs of any required training of personnel;
- costs associated with the changing of maintenance plans and operation books;
- any other costs associated with this legislation; and
- any cost savings and or benefits associated with the Regulations.

12.2 We also ask consultees for any additional evidence relating to the benefits of the Regulations. There are significant evidence gaps pertaining to the future cost avoidance benefits the Regulations might bring to the UK economy. Further, any evidence relating to direct benefits of the Regulations and what value that may have for the UK economy.

13 Enforcement, Sanctions and Monitoring

13.1 Enforcement would be carried out by the MCA as part of its existing enforcement activities. The proposed Regulations provide for sanctions for non-compliance. These include provisions for a fine not exceeding the statutory maximum (currently £5,000) on summary conviction in some cases, or a fine not exceeding £25,000. In the case of a conviction in the Crown Court, the proposed Regulations do not impose any limit on the amount of the fine. These penalties are in line with those for other maritime pollution offences and are considered to be proportionate to the nature of the offences.

13.2 Provisions also exist whereby a ship may be detained in UK waters where a surveyor of ships suspects that a pollution offence has been committed. The proposed Regulations also provide for inspections to be carried out; this is in line with normal international maritime law.

14 Proportionality of Analysis

14.1 This analysis has only monetised a few categories of costs and all of the benefits remain unmonetized, however, they have been explored through academia and recorded in this assessment.

14.2 This is a proportionate approach to take given that this is an international Convention; therefore, it can be assumed that ship operators will comply with the Convention by installing BWMS whether or not it is required by UK law. This is because by not complying with the Convention, ship operators risk not being able to operate internationally or being able to enter foreign waters significantly diminishing their ability to trade. Therefore, the potential costs of not installing the equipment far outweigh the monetary costs of installing BWMS. Given this, the costs and benefits of this Convention will be applicable to the UK in both the Do Nothing and legislation scenarios in equal measure.

14.3 Further, the equipment capital and operational costs represent the largest portion of costs related to this convention. Many of the other potential costs described in this assessment will be of insignificant value or absorbed into the current operating scheme of the vessel.

14.4 The potential benefits of this Convention outweigh the costs significantly. However, it would be impossible to monetise these benefits in a more definitive way than has already been described previously. This is mostly because there exists no available data on the direct costs INNS pose to the UK economy. Further, even with that data there are only approximations of how many INNS are caused by the transferring of ballast water from vessels travelling internationally. Therefore, the exploration of academia and interpreting its results is a proportionate estimation of the potential monetised benefits of the Convention.

15 Risks and Uncertainties

15.1 There are large risks and uncertainties held within this Impact Assessment. The largest is that given it is based on an international Convention this assessment assumes that ship operators will implement the Convention whether the UK signs it into law or not due to the strong incentive for operators to continue operating freely in foreign seas. Given the incentives for ship operators to act on the Convention, this assessment expects that the Do Nothing and Do Something scenarios have equal costs and benefits. However, if this expectation were not to materialise the UK water would

remain open to INNS and the associated costs of becoming a potential 'safe haven' for non-compliant ships.

15.2 Further, by not acceding to and implementing into UK law this Convention the UK risks its status on the 'white-list'. This would mean UK flagged vessels face higher levels of checks in non-UK ports which in turn leads to higher transactional costs for UK ship operators.

15.3 The analysis underpinning the analysis of the costs of BWMS equipment is heavily reliant on several assumptions which could be misrepresentative. The operational costs for example, are based on a flat 2.5% of the initial equipment cost per year. Analysis of provided costs from manufactures suggests this is a reasonable assumption to make. However, by having a flat rate for all systems it is likely to be misrepresenting the costs somewhat given that evidence shows in general different sized systems have different operational costs; typically, the larger the capacity of the system the higher the cost. Further, this assumption is based on only a moderate usage of the systems therefore only a moderate fuel penalty is implied, and less regular maintenance is needed. Therefore, this analysis has also calculated a scenario which increases the potential levels of operational expenditure required, which shows that the total costs of this Convention are much more sensitive to capital costs rather than operational costs.

15.4 Similarly, the capital costs of the BWMS equipment are based on the average or most likely cost scenarios provided by industry. Therefore, the figures used do not account for installing equipment in difficult to reach or hazardous areas, for example, which comes at a greater expense. Conversely, due to the nature of the design, this analysis likely overestimates the size of system a vessel needs; therefore, a vessel is potentially being assigned a system which is more expensive than the system that will be installed in reality. To mitigate these risks this assessment provides two capital cost scenarios one which increase the costs by 40% and one that decreases costs by 15%. These scenarios provide the basis of the range of values it is expected this Convention will cost the UK maritime industry.

15.5 The final core assumption underpinning the assessed costs are the assumptions used in how many vessels will install equipment to comply and in which given years before the deadline. The uptake assumptions have been provided and approved on technical expertise from the Maritime and Coastguard Agency. For completeness the uptake assumption was tested as a sensitivity which has shown that this assessment is not sensitive to this assumption and the overall costs are not greatly affected by it.

15.6 Risks and uncertainties also exist around the value of the costs and benefits this assessment has left unmonetized. This Impact Assessment wherever possible has provided detail around estimates of the potential costs and benefits of implementing the Convention. Vessel operators will be taking on further potential costs due to administrative burdens and fuel penalties, however, this assessment does not have the information to build a reliable estimate of these costs. Further, these costs should be minor relative to the equipment costs.

Q11. We ask consultees to advise of any costs that have not been investigated or estimated in this assessment and provide evidence of these costs.

15.7 In addition, the benefits on this Convention are unmonetized but where possible have been assessed through academia. Given the lack of accurate data in this field, these values should be considered as estimates of the true benefit of the Convention to the UK economy. It also must be understood that the true value of the Convention is an avoidance of future costs relating to INNS. The continued protection of the marine environment is important, but the value of its protection is not possible to monetise accurately.

16 Small and Medium Business Assessment

16.1 There are Small and Medium Enterprise (SME) ship operators that will be impacted by the Regulations and will need to install BWMS systems. However, the Regulations will not

disproportionately impact them. On average SME ship operators typically have smaller vessel by gross tonnage and therefore require typically smaller systems which are proportionately cheaper to install and operate. Further, if this legislation were to exempt SMEs the policy objectives would not be met as UK waters would still be open to INNS.

16.2 Therefore, this impact assessment concludes that SME ship operators will not be disproportionately impacted by the implementation of this Convention and that it is necessary for the SMEs to be included in the scope of the Regulations.

Annex 1: Post Implementation Review (PIR) Plan

A PIR should be undertaken, usually three to five years after implementation of the policy, but exceptionally a longer period may be more appropriate. A PIR should examine the extent to which the implemented regulations have achieved their objectives, assess their costs and benefits and identify whether they are having any unintended consequences. Please set out the PIR Plan as detailed below. If there is no plan to do a PIR please provide reasons below.

Basis of the review: [The basis of the review could be statutory (forming part of the legislation), it could be to review existing policy or there could be a political commitment to review];

The proposed Regulations will be reviewed domestically through the MCA's normal contact with industry and NGO groups at regular stakeholder meetings. In addition, the UK is active in ongoing work within the international community to tackle pollution from shipping both within the IMO's Marine Environment Protection Committee structure and through other UN initiatives. The input of the industry and NGO's is sought when developing a UK position both through standing meetings before IMO Committee meetings and adhoc consultation.

As the IMO is proposing to undertake an implementation review, known as the Experience Building Phase, that will be completed in 2022, there will be greater scope for assessing the success of the proposed legislation in the broader context of international implementation of the requirements of the BWM Convention.

Review objective: [Is it intended as a proportionate check that regulation is operating as expected to tackle the problem of concern?; or as a wider exploration of the policy approach taken?; or as a link from policy objective to outcome?]

The review will be undertaken to determine the success of the Regulations in ensuring that UK vessels and vessels entering UK waters manage their ballast water prior to discharge. Successful implementation of the management requirements would be seen as a positive indication that the legislation had helped to reduce the risk posed by non-native invasive species that could be introduced through the ballast water vector.

Review approach and rationale: [e.g. describe here the review approach (in-depth evaluation, scope review of monitoring data, scan of stakeholder views, etc.) and the rationale that made choosing such an approach]

The review will take the form of an assessment of the number of vessels that have been issued with valid certification (IBWM Certificates), in conjunction with a review of the number of prosecutions or sanctions issued as a result of a failure to comply with the legislation. Taking this approach will provide an indication as to whether vessels to which the Regulations apply are managing their ballast water appropriately and in line with the requirements of the legislation.

Baseline: [The current (baseline) position against which the change introduced by the legislation can be measured]

At present the UK does not require that vessels manage their ballast water. The baseline is therefore that ballast water is not managed and that there is a greater risk that a non-native invasive species could be introduced to UK waters through the ballast water vector. This translates into ballast water not being managed.

Success criteria: [Criteria showing achievement of the policy objectives as set out in the final impact assessment; criteria for modifying or replacing the policy if it does not achieve its objectives]

The policy would be considered a success if it was found that the majority of UK flagged vessels and vessels entering UK water, to which the Regulations will apply, hold valid certification that indicates they appropriately manage their ballast water. This would give an indication that the threat posed by non-native invasive species in ballast water will have been reduced due to a reduction in exposure to potentially damaging organisms.

Monitoring information arrangements: [Provide further details of the planned/existing arrangements in place that will allow a systematic collection systematic collection of monitoring information for future policy review]

The survey and inspection regimes established by the Regulations should allow for the collection of the relevant data.

Reasons for not planning a PIR: [If there is no plan to do a PIR please provide reasons here]

Annex 2: Equipment Costs

This annex provides a further breakdown of the estimated equipment costs in the best estimate and sensitivity scenarios.

Figure 3 Breakdown of uptake of ballast water equipment costs central scenario

		2019	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*
	Total in Category	5.00%	7.50%	10.00%	15.00%	35.00%	27.50%	0.00%	0.00%	0.00%	0.00%
Greater than 150,000	3	0.15	0.225	0.3	0.45	1.05	0.825	0	0	0	0
90,000 - 149,999	23	1.15	1.725	2.3	3.45	8.05	6.325	0	0	0	0
50,000 - 89,999	39	1.95	2.925	3.9	5.85	13.65	10.725	0	0	0	0
20,000 - 49,999	63	3.15	4.725	6.3	9.45	22.05	17.325	0	0	0	0
10,000 - 19,999	23	1.15	1.725	2.3	3.45	8.05	6.325	0	0	0	0
Less than 10,000	252	12.6	18.9	25.2	37.8	88.2	69.3	0	0	0	0

Figure 4 Breakdown of uptake of ballast water equipment costs alternative scenario (backlog of ballast water equipment being purchased and installed)

		2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
	Total in Category	10.00%	15.00%	20.00%	30.00%	20.00%	5.00%	0.00%	0.00%	0.00%	0.00%
Greater than 150,000	3	0.3	0.45	0.6	0.9	0.6	0.15	0	0	0	0
90,000 - 149,999	23	2.3	3.45	4.6	6.9	4.6	1.15	0	0	0	0
50,000 - 89,999	39	3.9	5.85	7.8	11.7	7.8	1.95	0	0	0	0
20,000 - 49,999	63	6.3	9.45	12.6	18.9	12.6	3.15	0	0	0	0
10,000 - 19,999	23	2.3	3.45	4.6	6.9	4.6	1.15	0	0	0	0
Less than 10,000	252	25.2	37.8	50.4	75.6	50.4	12.6	0	0	0	0

The tables above give a breakdown of the uptake of BWMS per year and the sensitivity analysis conducted within this assessment. From 2024 all vessels are assumed to have BWMS installed.

The alternative uptake analysis assumes there is a risk that actual installations will be backlogged into the final years before the convention comes into full force. Moving the bulk of vessels having this equipment to the final two year (2023 – 2024).

Figure 5 Breakdown of equipment costs in Best Estimate and sensitivity Scenarios, all figures in millions and present valued to a 2019 base year

	2019	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Best Estimate	£6.9	£10.1	£13.1	£18.9	£12.9	£4.4	£1.6	£1.5	£1.5	£1.4
OPEX Sensitivity	£7.2	£10.4	£13.5	£19.6	£13.7	£5.2	£2.4	£2.3	£2.2	£2.2

CAPEX Sensitivity - high	£9.5	£13.8	£17.9	£25.9	£17.4	£5.4	£1.6	£1.5	£1.5	£1.4
CAPEX Sensitivity - low	£6	£8.7	£11.2	£16.3	£11.2	£3.9	£1.6	£1.5	£1.5	£1.4
Uptake Sensitivity	£3.6	£5.2	£6.7	£9.6	£21.0	£16.6	£1.4	£1.6	£1.5	£1.5

The table above gives a breakdown of the estimated costs of the Regulations per year and the sensitivity analysis conducted within this assessment. From 2024 the costs of the best estimate, the CAPEX sensitivities and the uptake sensitivities are all equal because this analysis assumes all vessels will have BWMS installed by the end of 2024. Therefore, the only costs accounted for between 2025 and 2028 are operational costs for the same amount of systems in each scenario.