Title: Merchant Shipping (Safety Standards for Passenger Ships on Domestic Voyages) (Miscellaneous Amendments) Regulations 2022 **IA No:** DfT00400 **RPC Reference No:** RPC18- DFT-MCA-42849(1) **Lead department or agency:** Maritime and Coastguard Agency (MCA) **Other departments or agencies:** Department for Transport (DfT)	**Impact Assessment (IA)** **Date:** 25/08/2021 **Stage:** Final **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** dpv**@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**	**Business Impact Target Status**
-£2.5m	-£9.1m	£1.1m	Non-qualifying Regulatory Provision

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

The MCA intervenes in markets, as the regulator for maritime safety, where market failures exist. Where the public makes use of passenger vessels it is important that issues of information asymmetry are addressed. The technical standards applicable to the current domestic passenger fleet vary depending on the age of the vessel. Since 2000, the MCA has introduced more rigorous regulations for domestic passenger vessels. These regulations apply, in general, to new build vessels. It is the MCA policy, in line with previous recommendations, where possible, to apply a single safety standard to new and existing vessels. Government intervention is required to revise the technical standards applied to existing vessels to bridge the safety gap between old and new vessels. This will provide greater certainty to passengers boarding vessels about the level of risk faced, by harmonising standards as far as is reasonably practicable across the passenger fleet. Passengers are unable to make a judgement about risk from purely looking at a vessel and rely upon government regulation to ensure a tolerable level of risk is faced regardless of which vessel is used to make a journey.

What are the policy objectives and the intended effects?

The objective of this policy is to provide suitable regulation for existing domestic passenger vessels which is comparable with modern regulations whilst being proportionate and pragmatic. The aim is to have a consistent domestic passenger ship safety standard irrespective of the age of the vessel.

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

Option 0: Do nothing. This would maintain the regulatory status quo in an environment where risk of collisions is rising in some areas due to increasing traffic density. Promulgate best practice guidance suggesting ways for operators to improve level of vessel safety. This is the baseline or counterfactual against which the options are being appraised against.

Option 1 (Preferred Option): Tailored amendment of the Regulations to achieve improvements in highlighted areas of safety risk. Where possible, alternative arrangements will be allowed for to address safety concerns, applying a risk-based approach to regulation while minimising impacts upon businesses as far as possible. Owners/operators will be required to make suitable adjustments to their vessels to meet the safety standards as set out in the amended regulations. This would provide a balance between the risk to life and impacts upon business across the breadth of the older passenger vessel fleet. However, in some cases achieving an acceptable safety standard may result in significant cost or vessel obsolescence.

Option 2: Compliance in full with requirements applicable to new vessels. This option would involve the complete re-evaluation of all older passenger vessels and modification to each to fully comply with all aspects of regulations for new-build ships. This would achieve full retrospective compliance at much greater cost than option 1 and not follow a risk-based approach. Option 2 would be unfeasible for a large number of vessels, necessitating significant modification to the vessel itself and/or limiting activity/capacity. Costs would either be prohibitive and/or reduce income regardless of the level of risk reduction. The physical changes may also be impossible to achieve for certain vessels, regardless of expenditure.

Will the policy be reviewed? It will be reviewed. If applicable, set review date: October/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: N/A	Non-traded: N/A

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: **Robert Courts** **Date :** 15 June 2022

Summary: Analysis & Evidence

Policy Option 1

Description: **Tailored amendment of the Regulations to achieve improvements in key safety areas**

FULL ECONOMIC ASSESSMENT

Price Base Year: 2019	PV Base Year: 2021	Time Period Years: 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -9.4	High: 4.0	Best Estimate: -2.6

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	4.2	1	0.2	**6.2**
High	10.1		0.3	**12.8**
Best Estimate	7.1		0.3	**9.4**

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

The key costs to business (vessel owners/operators) are related to making the required changes to vessels and purchasing/maintaining the necessary safety equipment as set out in the regulations. The new requirements fall into four broad categories, lifesaving appliances (£4.7m), fire safety (£2.2m), Flood prevention (£1.7m) and Damage stability (£1m). The costs provided here are undiscounted best estimates covering equipment and servicing costs. Familiarisation cost associated with understanding the requirements of the updated regulations total £230,000 (undiscounted). See section 10.1 for a full overview of the scale of the monetised costs in the low, central and high scenarios.

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

The costs associated with the improved damage survivability requirements are bespoke to each vessel and cannot be fully monetised without engineering analysis of each vessel.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0.0	N/A	0.4	**3.4**
High	0.0		1.1	**10.2**
Best Estimate	0.0		0.7	**6.8**

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

For additional liferaft capacity, the monetised benefits of prevented individual fatalities and injuries have been estimated at £7.6m (undiscounted). In the central case and a discount rate of 1.5% has been applied in accordance with HMT Green Book guidance.

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

Higher vessel safety (above the additional liferaft capacity that has been monetised) is the key non-monetised benefit for passengers and businesses. Monetised safety benefits are difficult to estimate for a number of proposed changes due to the lack of available information covering the variety of external factors impacting upon the risk of fatalities, injuries and near misses. It is difficult to accurately predict future accidents.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5% and 1.5%

There is some uncertainty around the costs for equipment and design changes, driven by the heterogeneous nature of vessels. Estimates have been informed by data provided by industry and MCA surveyors. Sensitivity analysis was applied using the range of quotes received to construct a low, central and high scenario in each case. We have assumed the number of passengers on ships is based on estimates for the most common ship operating in similar waters. For costs related to post damage survivability, there is a risk that it may not be viable, either commercially to the operator or practically due to the original ship design, to upgrade certain vessels to meet the new requirements. For the monetised benefits, uncertainty exists over the average value of prevention of a fatal accident for maritime accidents, and the likelihood of events such as a person drowning occurring. Following HMT Green Book guidance a discount rate of 3.5% has been applied to costs and 1.5% to health/life benefits.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m: N/A
Costs: 1.1	Benefits: 0.0	Net: 1.1	

Summary: Analysis & Evidence

Policy Option 2

Description: Compliance in full with requirements applicable to new vessels

FULL ECONOMIC ASSESSMENT

Price Base Year: 2019	PV Base Year: 2021	Time Period Years: 10	Net Benefit (Present Value (PV)) (£m)		
			Low-11.5	High: 2.9	Best Estimate: -4.3

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	5.2	1	0.2	**7.3**
High	12.2		0.3	**14.9**
Best Estimate	8.8		0.3	**11.1**

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

The key costs to business (vessel owners/operators) are related to making the required changes to vessels and purchasing/maintaining the necessary safety equipment as set out in the regulations. The new requirements fall into four broad categories, lifesaving appliances (£4.7m), fire safety (£2.3m), Flood prevention (£1.7m) and Damage stability (£2.5m). The costs provided here are undiscounted best estimates covering equipment and servicing costs. Familiarisation cost associated with understanding the requirements of the updated regulations total £300,000 (undiscounted). See section 10.1 for a full overview of the scale of the monetised costs in the low, central and high scenarios.

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

The costs associated with the improved damage survivability requirements and fire containment are bespoke to each vessel and cannot be fully monetised without engineering analysis of each vessel. The cost of any replacement vessels will be greater under Option 2 due to the addition of Class B vessels which may have greater difficulty complying with newer damage survivability standards. The cost of assessing existing vessels against Classification Society Rules will cost operators through the preparation of pre-classification information packs, surveys and assessments costs.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0.0	N/A	0.4	**3.4**
High	0.0		1.1	**10.2**
Best Estimate	0.0		0.7	**6.8**

Description and scale of key monetised benefits by 'main affected groups' for additional liferaft capacity, the monetised benefits of prevented individual fatalities and injuries have been estimated at £7.6m (undiscounted). In the central case and a discount rate of 1.5% has been applied in accordance with HMT Green Book guidance.

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

Higher vessel safety (above the additional liferaft capacity that has been monetised) is the key non-monetised benefit for passengers and businesses. Monetised safety benefits are difficult to estimate for a number of proposed changes due to the lack of available information covering the variety of external factors impacting upon the risk of fatalities, injuries and near misses. It is difficult to accurately predict future accidents.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5% and 1.5%

There is some uncertainty around the costs for equipment and design changes, driven by the heterogeneous nature of vessels. Estimates have been informed by data provided by industry and MCA surveyors. Sensitivity analysis was applied using the range of quotes received to construct a low, central and high scenario in each case. We have assumed the number of passengers on ships is based on estimates for the most common ship operating in similar waters. For costs related to post damage survivability, there is a risk that it may not be viable, either commercially to the operator or practically due to the original ship design, to upgrade certain vessels to meet the new requirements. For the monetised benefits, uncertainty exists over the average value of prevention of a fatal accident for maritime accidents, and the likelihood of events such as a person drowning occurring. Following HMT Green Book guidance, a discount rate of 3.5% has been applied to costs and 1.5% to health/life benefits.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:	

Costs:1.3	Benefits: 0.0	Net:1.3	**Score for Business Impact Target (qualifying provisions only) £m:** N/A

Evidence Base

1 Background

The technical standards applicable to the current domestic passenger fleet vary depending on the area of operation, hull construction material, length and importantly, age. The table in annex A has been included for the benefit of vessel owners, to allow them to understand the relevant standards applicable for their vessel.

In general, passenger vessels on domestic voyages certified before 6th April 2010 on categorised waters (inland waters) and 1st July 1998 for seagoing vessels are required to meet the standards detailed in several domestic regulations dating from 1998 and 1999[1]. Collectively, these regulations are referred to as the 1998/99 regulations throughout this document.

The technical requirements contained in these regulations remain mostly unchanged since 1980[2] and take little account for advances in technology and modern safety philosophy. Since these regulations were introduced, several new technical standards have subsequently been published over time[3]. Many of these new regulations were implemented in response to the Marchioness disaster and the subsequent safety inquiry (see Section 1.1). The new regulations are largely only applicable to new domestic passenger vessels certified after the legislation was enacted. These modern regulations significantly improve the safety standards of new vessels, in particular regarding fire safety, life-saving appliances and damage survivability.

However, concurrent with the development of new safety standards, the technical standards applicable to existing vessels have remained mostly unchanged. It is considered that the technical standards contained within the 1998/1999 regulations[1] present a lower level of safety compared to regulations introduced more recently. It is acknowledged that many vessels which are certified in accordance with the 1998/99 regulations could not be modified to comply with modern standards without excessive cost. This led to a review of the standards applied to those existing vessels.

The aim of the review was to increase the safety standard applied to existing vessels so that the overall safety of the existing vessels is comparable with the safety of vessels certified in accordance with modern requirements. Key areas identified for improvement are based on research carried out by the Maritime and Coastguard Agency (MCA) and close collaboration with industry.

Vessels which continue to be certified in accordance with the 1998/99 regulations are sometimes referred to as having 'Grandfather Rights'.

1.1 Marchioness

The passenger vessel MARCHIONESS and dredger BOWBELLE collided on the Thames on the 20th August 1989 and 51 people lost their lives. The Marchioness Disaster led to Lord Justice Clark's Thames Safety Inquiry. The Thames Safety Inquiry contained a key recommendation that new safety regulations for ships

[1] Those pertinent to this assessment are:
- The Merchant Shipping (Fire Protection: Small Ships) Regulations 1998, as amended (SI 1998/1011) (Merchant Shipping Notices (MSN) 1665(M), 1666(M), 1667(M), 1668(M),1669(M) and 1670(M));
- The Merchant Shipping (Passenger Ship Construction: Ships of Classes III to VI(A)) Regulations 1998, as amended (SI 1998/2515) (MSN 1699(M));
- The Merchant Shipping (Life-Saving Appliances for Passenger Ships of Classes III to VI(A)) Regulations 1999, as amended (SI 1999/2723) (MSN 1676(M));

[2] Merchant Shipping (Passenger Ship Construction) Regulations 1980 and the Merchant Shipping (Passenger Ship Construction and Survey) Regulations 1984.

[3] These are:
- Directive 2009/45/EC of the European Parliament and of the Council on safety rules and standards for passenger ships as amended by Directives 2010/36 and 2016/844
- Safety Code for Passenger Ships Operating Solely in UK Categorised Waters (MSN 1823) Edition 2
- Small Seagoing Passenger Ship Code

should, as a general rule, be applied equally to both new and existing vessels, subject to a power to grant exemptions. The inquiry said that the exemption power should only be exercised where –

1. compliance by an existing vessel with a new safety standard would be unreasonable, whether on grounds of practicability or for some other reason, **and**
2. the operator can also satisfy the Department **that a satisfactory alternative measure will be put in place, which will achieve an equivalent level of safety**.

It is important to note that significant changes have been made to domestic passenger ship regulation since the Thames Safety Inquiry[4] into the MARCHIONESS accident, which are applicable to new and existing vessels, including the introduction of safety management systems and new Codes for both seagoing ships and those on inland waterways. The proposed regulations in this assessment serve to bridge the remaining gap between the safety standard applied to existing and new vessels built to modern regulations.

The Marine Accident Investigation Branch (MAIB) also carried out an investigation into the incident which can be found on GOV.UK[5]

Consultation feedback snapshot

A ferry operator feels the MARCHIONESS incident that sparked this review is not a comparable business with a lot of those that will be included within the new regulations.

1.2 Research

A Formal Safety Assessment (FSA) was undertaken by the MCA, with consultant facilitation, between 2001 and 2003, which looked at all aspects of domestic passenger vessel safety. This work considered domestic passenger vessels operating on categorised waters (which includes inland waterways) and at sea. The outcome of this led to more detailed research being undertaken by independent consultants who focused on stability, evacuation, fire safety, bridge visibility and safety management standards and covered all operating environments in the UK.

Categorised Waters

Category A: Narrow Rivers and canals where the depth of water is generally less than 1.5 metres.

Category B: Wider rivers and canals where the depth of water is generally 1.5 metres or more and where the significant wave height could not be expected to exceed 0.6 metres at any time.

Category C: Tidal rivers and estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2 metres at any time.

Category D: Tidal rivers and estuaries where the significant wave height could not be expected to exceed 2.0 metres at any time.

The MCA purpose in conducting the research was to provide a baseline for future risk-based regulation of domestic passenger vessels by highlighting any areas where the current regulatory framework could be improved to address the identified risks. These research reports were published in March 2005.

The FSA research concluded that the overall level of safety on passenger vessels on the Thames was within the Health and Safety Executive's "tolerable" range. This means that the level of risk is within that generally accepted by the public, provided risks are demonstrated to be as low as reasonably practicable. The reports

[4] Available from the Stationery Office at www.thestationeryoffice.com

[5] https://www.gov.uk/maib-reports/collision-between-aggregates-dredger-bowbelle-and-passenger-vessel-marchioness-on-the-river-thames-england-resulting-in-marchioness-sinking-with-loss-of-51-lives

identified areas where improvements could be made to current standards, for example by further embedding the safety management concept (which have already been implemented to a certain extent).

Many of the results of the initial FSA have been used to develop policy to date. Results from the Risk Assessment have been used within this Impact Assessment to calculate the monetised benefits associated with reduced risk to life when additional safety equipment is provided.

Information on risk and probability extracted from the FSA study may be found at Annexes C and D to this Impact Assessment.

2 Problem under consideration

Since 2000, the MCA has introduced more rigorous regulations for domestic passenger vessels. These regulations apply, in general, to new build vessels. These standards developed are considered to provide a high safety standard in line with other internationally recognised standards. Concurrent with these developments, the regulations for existing vessels have remained mostly unchanged (this applies to approximately 84% of the domestic passenger vessel fleet). Generally, operators of these existing vessels have not voluntarily installed safety equipment over and above what is required in the regulations, even when a piece of safety equipment would otherwise be required for a new vessel.

This means that the modern standards do not apply currently to the entire passenger fleet, and there is a risk of a major accident occurring that is exacerbated by the older standards relating to fire safety, collision survivability and equipment.

3 Rationale for intervention

Safety is the overarching rationale for revising the standards applied to domestic passenger vessels, with respect to the safety of passengers and crew. The proposed amendments to Regulations aim to raise safety levels for existing vessels to align more closely with those for new vessels. In the interests of encouraging continuous improvement of safety standards, it is necessary to take a pragmatic approach in applying new standards to the existing fleet of older passenger vessels which can include historic vessels. Given that it is difficult for passengers to objectively assess the safety of a vessel, and the impact on passengers compared to freight will be greater if an incident occurs (potentially loss of life), the regulatory framework is built on the principle that a higher standard of safety is warranted relative to non-passenger carrying vessels. Additionally, given that new vessels registrations have been low, in some areas there may be a lack of choice for passengers preventing them from selecting vessels that comply with more recent safety standards even if they had full information of risks.

In summary below are the main market failures that continue to exacerbate this difference in safety standard:

- There is informational asymmetry as passengers do not understand the relative risks of the different vessels they travel on. Passengers are unable to differentiate between the risk profile of vessels that have higher safety standards and those that do not due to the complexity and inherently technical nature of standards on vessels. For some routes and activities alternative vessels are not available. Consequently, there is no incentive for vessel operators to increase safety as vessel operators have difficulty making the distinction clear to passengers in order to charge more and recover the costs of safety improvements. As a result of safety equipment presenting a cost to operators, those who have chosen to install non-mandatory safety equipment following advances in technology and lowering costs, are seen to be at a commercial disadvantage.
- There are negative externalities if low safety standards impact on other parts of industry, passengers and government beyond what is already internalised in the costs to a business if a safety incident occurs. As a result, a two-tier safety level within the UK domestic passenger vessel fleet presents a reputational risk to the industry and the MCA/DfT if an accident were to occur on a vessel constructed and maintained to older regulations.
- Market competitiveness is impacted as existing vessels have an advantage over new entrants into the market due to being able to adhere to lower safety standards at a lower cost. This is not rectified through, for example, higher premiums on insurance for existing vessels, due to the fact that existing

vessel are still certified in the same way as newer vessels, leading to the perception of similar safety levels.

These market failures mean that the level of safety provided on older domestic passenger vessels is likely to be below the socially optimum level. The result is a higher risk of a safety incident occurring on an older domestic passenger vessel leading to a serious injury or loss of life. It can be argued that the public's expectations about the government's role in protecting them have been rightly increasing. It is considered that well-designed government intervention will bridge this gap.

4 Policy objective

The objective of this policy is to provide suitable regulation for existing domestic passenger vessels which is comparable with modern regulations whilst being proportionate and pragmatic. The aim is to have a consistent domestic passenger vessel safety standard irrespective of the age of the vessel. The proposed policy objectives are designed to be SMART in nature, being Specific, Measurable, Achievable, Relevant and Timely. As set out in the policy options specific measures are proposed to improve the safely of older passenger vessels buy addressing post damage survivability, fire and lifesaving equipment requirements to reach standards comparable with more modern vessels. This is deemed to be relevant in terms of

ensuring that key stakeholders such as members of the public and crew onboard vessels do not face excessive risk unknowingly and that accidents such as those seen in the past are avoided. The required changes proposed under option one will be achievable for the majority of operators, with some concessions made post consultation. For some operators the affordability of post damage survivability proposals may be prohibitive and therefore those vessels would have to be taken out of service. The proposals are timely in nature, implementing changes before a catastrophic event could take place and at a time where other (newer) vessels currently adhere to higher standards. Measurability will be challenging, given the number of factors that affect the frequency and magnitude of accidents. Where accidents occur post implementation there will be no counterfactual due to vessels in operation having all made the required changes. Where accidents do not occur, this is a positive outcome but attribution to the specific policy changes may be difficult. Proposed measurement has be put forward in the post implementation review plan.

5 Consultation

We consulted stakeholders and the wider public with regards to both the policy change and the associated costs in this Impact Assessment. This initial consultation explored the viability of each of the separate proposed measures – both from a cost perspective and from a feasibility point of view. It is aimed to identify whether any considerations have been overlooked and provide justification for any areas where the proposals could be scaled back to limit impacts upon businesses as far as possible whilst maintaining an acceptable level of risk to passengers and crew. The costs of the proposals were looked at alongside the estimated benefits of fatalities and injuries averted. A further consultation was later held on the revised policy and the regulatory text.

Two consultations have been completed. Following the first consultation the consultation stage Impact Assessment was revised in the light of stakeholder feedback, evidence provided and subsequent adjustments to policy proposals. The Impact Assessment was then finalised following the second consultation.

<u>Consultation Responses – initial consultation</u>

While most stakeholders supported safety improvements that would align with standards applicable to newer passenger vessels, a number were concerned about the cost and proportionality of some of the proposals. A number cited the good safety record of their company to date or put forward the view that the domestic passenger vessel safety record as a whole did not justify the proposed changes. Others described their approaches to passenger protection which sometimes de-prioritised the use of particular safety equipment, e.g. the fact that their operation was sufficiently close to a canal or riverbank such that time was better spent navigating the vessel to the bank rather than assisting passengers in donning lifejackets.

The original proposals contained within the consultation document did not specify the acceptable standard for fire safety equipment to be installed. Many respondents were concerned that the new requirements would

mandate the use of Marine Equipment Directive (MED) approved equipment. This could make it: unaffordable, impractical (on the basis that MED equipment is designed with larger vessels in mind and may not fit in some smaller vessels) and would be unnecessarily sophisticated for the function on smaller domestic passenger vessels.

Concerns were raised about fire containment being impractical to fit on some vessels and excessively expensive. In some cases, the cost and practicality of fitting additional insulation was considered by respondents to be disproportionate to the increase in safety which would result.

Some concern was also raised about the replacement of hand fire pumps with powered fire pumps on larger vessels, including cost and powering arrangements for these pumps.

Of particular concern to operators was the issue of post-damage survivability – the application of one compartment damage stability, or additional buoyancy, which many said was not feasible on their vessels and would result in vessel obsolescence and redundancy for individuals. For many older vessels this requires major structural modifications within the hull. In some cases, existing vessels accommodate passengers in a lower saloon which would not be possible if sub-division were introduced, so sub-division of the hull would reduce useable passenger space and capacity.

Concerns were also expressed that the two-year phase-in period (i.e., vessel owners/ operators would have until their earliest survey two years after the Regulations coming into force to make their vessels compliant) was too short in some cases to permit some of the more resource intensive work to be carried out in practice, and also that it was insufficient time for operators to budget for the changes required. Some requested 5 or more years to achieve compliance.

Consultation feedback snapshot
Some respondents suggested that as an alternative to the proposed enhancements in equipment, that risks were better mitigated with investment in additional crew training than in better equipment, especially given that human factors are often the causes of accidents rather than lack of equipment or equipment failure. This alternative was not offered in the consultation document.

Government review of original proposals

The government has reviewed all the proposals in light of stakeholder feedback. Subsequently some of the requirements have been removed or made less onerous reducing risks as far as reasonably practicable and providing closer alignment to the standards which currently apply newer vessels. This will achieve an acceptable safety standard for the travelling public at the lowest possible cost.

For example, amongst other changes, the proposal for vessels operating on Category B waters to be required to carry lifejackets **may be relaxed in situations where the surveyor is satisfied that evacuation arrangements are such that, due to the proximity to the bank and optimum evacuation method, persons will not be required to enter the water.**

The proposals about containment of fire, involving the fitting of fire insulation, has been removed. The government considers this can be justified on the basis that other proposals, in the areas of fire detection and fixed firefighting, will themselves enhance standards such that the containment proposals would not result in a proportionate increase in safety. The Maritime and Coastguard Agency's efforts will instead focus on checking compliance with existing standards and producing guidance on upgrading structural fire protection when alterations to a vessel takes place.

Also, further **review of the powered fire pump proposals suggest that this would be challenging and not achieve a proportionate increase in safety,** so this requirement has also been removed from the proposals. (This needs to be distinguished from the proposal to require powered bilge pumps, which is being retained.)

Consultation feedback snapshot

Several operators said that in some cases they were comfortable with the idea of obtaining equipment, such as fixed firefighting systems, but thought that MED approved equipment was of a higher specification than necessary, and of prohibitive cost. They would, however, support the proposed requirement if it could be met using non-MED equipment.

The government **will <u>not</u> require all new equipment fitted as a result of the review to be Marine Equipment Directive (MED) compliant**. Although the original proposals did not specifically say that MED compliance would be required, it did not rule it out either. While portable fire extinguishers have an inherent requirement to be MED approved, and the new Regulations will not change this, new requirements for other types of additional equipment will NOT stipulate that it must be MED compliant. Alternative standards for such equipment will be stipulated to ensure that equipment meets an acceptable standard for the function it is to perform on the vessel which carries it, and to provide certainty for operators and government surveyors about what will meet survey requirements. For example, fire detection equipment will be acceptable if it meets the BS EN 54 standard[6].

The damage stability proposals are arguably standards which effectively cannot be partially implemented – they are either implemented or they are not – so are difficult to "scale down". However, while the government has not revised the damage stability requirements themselves, it has revised the proposed application of those standards, significantly reducing the number of vessels to which it will apply, as follows:

- Firstly, the intention is to remove Class VI vessels from the scope of the new requirements. The government feels this is justifiable on the basis that this Class of vessel is already subject to inherent restrictions on its certification and is limited to daylight operation in favourable weather between April and October.
- Secondly, it is intended to remove daylight only operating Class V vessels on non-tidal waters from scope of the proposed damage stability requirements. This is on the basis partly of their non-tidal nature but also the fact that they do not operate in poor visibility. They also have no opportunity to interact with larger vessels and many of these areas have speed limits.

Although not removing such vessels entirely from scope, the government intends to permit certain Class V vessels which operate on Category C tidal waters with low traffic density, and which do not operate at night, to carry out risk assessments. This is instead of automatically requiring them to meet the post-damage survivability requirements. Such a risk assessment could also take account of vessel features e.g. enhanced bilge pumping that could act as further mitigation to lower the risk.

While the government has no plans to change the existing water category designations, this flexibility recognises the significant differences which exist between different areas of Category C waters. However, the assessment would need to consider traffic density and distribution of the operating area as well as any other mitigating factors. After a number of assessments have been completed it may be possible to produce a list of areas considered to be lower risk, thus eliminating the risk of inconsistent application – although this list would be amended from time to time.

The government recognises that these relaxations will not eliminate the possibility of some vessels having to be taken out of service. However, it considers the revisions will mean that this will only happen where they are unable to provide an acceptable level of safety for the public.

Consultation feedback snapshot

A number of operators reported that they had already made vessel safety enhancements of their own volition. Not only did this demonstrate their commitment to safety, but if overly stringent requirements were introduced which rendered a vessel obsolete, this would have been nugatory expenditure and they would therefore have been penalised for making positive safety improvements. They argue that this, in the future, might discourage

6 https://www.google.co.uk/search?hl=en&as_q=&as_epq=british+standards+institute&as_oq=&as_eq=&as_nlo=&as_nhi=&lr=&cr=&as_qdr=all&as_sitesearch=&as_occt=any&safe=images&as_filetype=&as_rights=

operators from making voluntary improvements, preferring to just meet the minimum requirements of legislation.

In response to concerns which were expressed that the two-year phase-in period, the government recognised that in a few cases there may be genuine difficulty in complying within the deadline, perhaps due to factors within the operating company or resource issues with boatyards not having the capacity for a short-term increase in demand. But it did feel that a blanket extension to the two-year period was not acceptable. The government therefore adjusted the proposal such that the two-year deadline was retained, but that if the owner/ operator draws up an implementation plan which demonstrates to the satisfaction of the Maritime and Coastguard Agency (MCA) that it is not possible to complete all the work required within two years, the MCA may extend this for the period necessary to achieve compliance. This would allow for genuine situations where the two-year period was insufficient but did not allow scope for an operator to continue operation for e.g., 5 years, having made no progress towards compliance, then withdraw the vessel from service.

Annex E contains a summary of the proposals as they appeared during the first consultation, together with their application and any revisions which were proposed as a result of responses from the first consultation.

Second Consultation

There was broad support for most of the proposals, and the revisions made to the proposals following the first consultation were widely welcomed.

The proposal which elicited the greatest amount of opposition was the one relating to damage stability. As might be expected, the strongest opposition to this measure came from operators whose vessels would be most affected by the proposals.

There was also some resistance to the requirement to have lights on lifejackets for vessels operating in hours of darkness.

Some concerns remained about the phase-in period, but the government is content that the flexibility introduced after the first consultation is sufficient to address this.

There was nothing highlighted in the second consultation which the government considered sufficiently novel or compelling to make further revisions to the policy beyond those which had been made following the first consultation.

6 Description of options considered

6.1 Option 0: Do nothing

Do nothing and maintain the regulatory status quo. Promulgate best practice guidance suggesting ways for operators to improve level of vessel safety.

This option would not address the safety gaps between older vessels and those built to new standards. Whilst major improvements have been achieved since the Marchioness tragedy the reality is that safety gaps in some areas mean that the consequences of such an incident have not appreciably changed. Although some operators have chosen to take advantage of safety advances, many have not. Operating vessels with less safety equipment can be seen as commercially attractive due to the reduced capital investment and maintenance required for safety equipment. Therefore, regulation is required to advance the level of safety within the domestic passenger vessel fleet whilst promoting a level playing field.

Furthermore, following formal investigations, FSAs and research undertaken following the Marchioness disaster in 1989, using extensive resources over many years and the findings of which were presented to the public in 2005, Ministers have publicly committed to the implementation of the recommendations and a review of all the safety standards. Failure to implement this would mean that the recognised safety concerns were not being addressed and identified risks would be perpetuated. Such a situation could be seen as a betrayal of the travelling public who are entitled to expect the protection of robust and modern safety standards.

This is the baseline or counterfactual against which the options are being appraised against.

6.2 Option 1: Implement revised standards that provide a balance between not imposing significant costs, whilst ensuring a minimum level of safety for the travelling public

This option would apply tailored amendments of the Regulations to achieve improvements in key safety areas of fire safety, damage stability, protection from water ingress and life-saving appliances rather than compliance with the requirements for a new vessel in full as under Option 2. The vessel would then be evaluated against amended requirements and modified as required.

It is recognised that the cost of installing safety equipment on existing vessels can be substantially more expensive than it would be on new vessels. Where possible, allowances have been made with the equipment that would be accepted for these existing vessels rather than direct application of the equipment requirements for new vessels. The proposed amendments also have allowances, for alternative arrangements which ensure the safety concern is addressed, without it being prohibitively expensive.

In some cases, the requirement that is set for Option 1 is lower than that for a new vessel under Option 2. An example of this is the proposed damage stability requirements where under Option 2 a Category B vessel would need to apply the requirements but under Option 1 the proposed application starts at Category C, which would bring more vessels into scope of the requirement. See annex B for definitions of categories of water.

The derivation of the proposed amendments was carried out in conjunction with industry representatives in a series of working groups. The proposed revised regulations reflect the advances in marine safety equipment and requires the provision of equipment which is, in general, comparable with a modern vessel. Only practicable changes which would provide a substantial increase in safety have been considered, following extensive discussions with affected stakeholders.

Amending and updating only certain areas in the Regulations would substantially increase safety levels of older vessels without causing disproportionate cost. Although it should be noted that to achieve risk reduction in the critical area of post-damage survivability[7], it will still be necessary for affected vessels to make substantial modifications which may not be possible for some vessels. If a vessel cannot make the required modifications, then it will no longer be able to be certified to operate under the same conditions.

This is the preferred option and provides a proportionate and pragmatic approach to raising the standards for existing vessels whilst minimising the impact on industry.

6.3 Option 2: Full compliance with modern standards for all domestic passenger vessels

This option would require compliance in full with requirements applicable to new vessels. Compliance with requirements for new vessels would require evaluation of the vessel against either MSN 1823 edition 2, the SSPS code or Directive 2009/45/EC depending on the vessel type. This evaluation would need to take into account all requirements of the instrument and not just those in the key safety areas identified under Option 1. The vessel would then be modified to achieve this retrospective compliance.

Achieving compliance in full with requirements for new vessels would be extremely costly and, in many cases, require extensive modification of the vessel. Whilst retrospective compliance would close the gap between old standards and new, it would likely render a high number of vessels unable to operate due to the wide-ranging modifications required and the fact that the main requirements for new vessels do not currently take into account the difficulty in retrospective application to older vessels.

Under this option, seagoing vessels in this category would be required to comply with the EC Directive 2009/45/EC as if they were an existing vessel as, unlike the UK Regulations the Directive has separate provisions for new and existing vessels. This option would require a complete re-evaluation of the vessel under the new framework and, depending on the vessel and its operation, could require significant modification. Although the EU directive does contain modified requirements for existing vessels as opposed

[7] Post -damage survivability is the ability for a vessel to stay afloat following damage.

to new vessels it is considered that requirements in some areas such as stability may be difficult to rectify for certain vessels.

This option offers the greatest reduction of risk but at potentially disproportionate economic cost.

7 Overview of Analysis

The costs and benefits of Option 1 and Option 2 have been estimated. In accordance with HM Treasury Green Book guidance, the policy is appraised over a 10-year appraisal period from 2019 to 2028 (inclusive) and a discount rate of 3.5% per year is used to discount all future costs. A rate of discount rate of 1.5% has been used for benefits (avoidance of fatalities) in line with Green Book supplementary guidance and as is typical for health and safety related benefits. We expect the regulations to be implemented, 2019. Costs and benefits are estimated in 2019 prices. All figures are presented as discounted and real unless stated otherwise. Figures presented are rounded when appropriate.

The proposed regulations will affect older existing vessels i.e. vessels currently operating commercially as passenger vessels. Newer vessels are not affected as they are certified via more modern regulations and the cost of this has been estimated in previous impact assessments. The cost to operators will be for additional equipment, modifications associated with the installation of such equipment, structural modifications to vessels and the periodic costs of maintaining additional equipment. Through our first consultation we sought to refine these estimates, and some figures have been changed as a result of feedback received. Other costings offered by consultees fell within the range presented in the consultation stage Impact Assessment, so adjustments to the estimates were not required.

Feedback from the first consultation was varied regarding phase-in period, some consultees requesting 5 years or more, and one suggesting immediate compliance be required. It was generally agreed that some aspects of the proposals could be implemented more easily than others. The government accepts this but is aware that the elements of the requirements which are most easily and quickly implemented differ from operator to operator, so would not lend themselves to arbitrary staggered implementation dates. It also believes that staggered coming into force dates for different requirements would make legislation unnecessarily complex (creating confusion for operators) and would not necessarily achieve implementation as soon as reasonably possible. The government has instead decided to use a two-year phase-in period but with the flexibility to extend this if a plan of implementation spanning a longer period which extends beyond this is agreed with the MCA surveyor for a particular vessel. This allows flexibility for work which cannot be accommodated within the two years. It also helps to avoid situations where compliance work is postponed without reasonable cause, or a large number of operators are competing for scarce supplier resource shortly before the end of a longer phase-in period. Additionally, it combats the approach of an operator running a vessel for the full extent of the phase-in period with no incremental increase in safety during that period. A summary of monetised costs and benefits is presented in section 10.1 for Option 1, and 11.1 for Option 2.

Consultation feedback snapshot

A number of respondents commented on costs cited in this Impact Assessment (IA). Most comments addressed costs by topic. While in some instance's respondents felt that costs reflected were correct, several respondents fed back higher costs on particular topics. Others felt that costs quoted were too low but were not able to provide alternative costs. Where there was sufficient evidence, alternative costs provided have been reflected in updates to the figures in this IA. On some occasions, cost feedback was received but it was uncertain to how many vessels the alternative costs would apply. In such cases references to the feedback has been included in the narrative of this IA, but original figures have not been amended due to the degree of uncertainty.

8 Application and potential number of vessels affected

The total number of vessels that are affected by amending existing regulations is shown in the table below. This information has been obtained from MCA databases and certification records. According to MCA records, there is an estimated 721 vessels in the domestic passenger vessel fleet. The proposed regulatory amendments may affect 606 vessels, 84% of the fleet.

Table 1: The number of vessels affected by class of vessel

	Class of vessel	Category[8] of water	Number of vessels*
Vessels operating on categorised waters	Class V	Category A	93
	Class V	Category B	86
	Class V	Category C	223
	Class IV	Category D	49
Seagoing vessels not under the scope of EC Directive 2009/45/EC	Class VI	N/A	123
	Class VI(A)	N/A	1
EU Restricted Vessels	N/A	N/A	31
Total number of vessels			**606**

*** Some vessels are dual certificated and therefore fall into more than one Class of vessel, plus some vessels operate in more than one Category of Water therefore there may be double counting of some vessel Classes.**
Source: MCA databases and certification records

The proposals put forward under options 1 and 2 cover a suite of requirements differing by vessel type and usage. Different aspects of the proposals will affect different numbers of vessels, identified by a combination of vessel class and category of waters they operate within, as set out in table 1.

The existing regulations place requirements on vessels based on several parameters such as class, category of water, subdivision standard and the number of passengers. As a result, the potential number of vessels affected is different for each of the proposed amendments. The estimate of the number of vessels affected and associated cost for each of the proposed amendments is presented separately in each section within the options appraisal.

It is noted that some vessels operate under different modes, which allows them to operate on different areas of water. The above table represent the most onerous distribution of vessels (i.e. the mode of each vessels which would be most affected by the revised regulations).

On the information received, and further research beyond that which was provided during the consultation on the believed vessel holding of each operator, it is estimated that the 59 individual operators who responded to the first consultation represented 258 vessels, although 35 of these were not certificated at the time the estimate was made. This may have been due to small gaps between certification or longer out-of-service periods. There was overlap between individual responses and those provided by representative bodies. It is not possible to establish exact figures, as some groups were not willing to supply a list of their members, but these collectives have been excluded from the above figure to avoid double counting.

Revision of the scope of the stability proposals (under option 1) removes all Class VI vessels from the application of the proposed damage stability requirements. The additional research conducted suggests that this removes 13 Class VI vessels owned by respondents from scope, although the total number will be larger as this figure does not include non-respondents' vessels.

It is considered the most impacted categories of vessel are those operating on tidal Category C waters, which are the subject of the damage stability proposal, as this is the proposal which is expected to give rise to greatest costs and most significant vessel modifications. As above, the scope of this proposal will now exclude those vessels which operate exclusively as Class VI. The burden of lifejacket lights falls mainly on vessels operating in Category C and D waters, but only if they operate at night.

It is difficult to estimate numbers of vessels for which continued operation could be affected by the damage stability proposals, as for many of them detailed assessments of the vessels concerned will be required. Additionally, some vessels which are unable to comply may be re-deployed to other areas. Consultee comments indicated that amongst respondents the current operation of around 22 vessels could be made obsolete by the need to comply with new damage stability requirements under the first consultation stage's proposals. Following consultation comments concerning the impacts of the previous proposals, the MCA has made subsequent revised proposals, forming the new preferred option (option 1). We have assumed all "heel

[8] See annex B for full definitions of the different categories of water.

test" vessels (i.e. those currently required to do heel tests but which would have to comply with the new damage stability requirements) would not be able to comply and would not be operating in an area considered lower operation risk. This is estimated to cover 83 vessels under option 1, compared to 204 under the previous consultation stage impact assessment.

The 83 vessels considered for the purposes of monetising the impacts of damage stability requirements is considered to be a worst-case scenario as the probability is that some of these vessels could be adapted and some of the operating areas may be deemed to be of lower operational risk. However, to be prudent in the estimation of net benefits it has been assumed that the 83 vessels will all face the same costs. In reality some of these 83 vessels could be re-deployed to areas where less stringent damage stability standards are required. For the purposes of estimating costs relating to damage stability requirements, including familiarisation, a population of 83 vessels has been applied throughout option 1. A population of 204 vessels has been applied to the same calculations for option 2, reflecting the fuller proposals set out at consultation stage.

Consultees indicated that the viability of around 33 businesses could be directly affected. It has not been possible to ascertain if this is a pessimistic estimate.

Category B operators are affected by the requirement to carry lifejackets, which, although not as costly as the damage stability revisions, are likely to fall quite heavily on those affected as they will tend to have less resource to achieve compliance.

The tidal Thames area has a number of the vessels likely to be most affected by these proposals, due to the concentration of vessels and business in that area.

9 Summary of approach to estimating the impact of the regulations to existing vessels

Costs differ substantially between vessels as they have been built or modified to bespoke specifications and operate under different operating models and geographic areas. Equally, costs differ between vessels depending on the existing equipment on board and corresponding additional requirements. Therefore, two vessels are rarely the same when considering the costs associated with proposed regulation. Indicative vessels which best represent the type of vessel are used to estimate prices for the cost of installation.

We have used data from the MCA Certificate Database and Marine Office records to understand the characteristics of individual vessels. The costs faced by each vessel has been estimated wherever possible, and where not, indicative costs have been generated for typical vessel types.

The revised regulations have been separated into the following requirements:

- Life-saving appliances - Liferafts
- Life-saving appliances - Lifejackets
- Life-saving appliances – Lifejacket Lights
- Fire protection – Fire Detection
- Fire protection – Fixed Fire Fighting
- Bilge Pumping Arrangements
- Bilge Alarm Arrangements
- Post Damage Survivability

Where additional equipment is required under the revised regulations, quotes were obtained from suppliers of marine equipment. The information on costs associated with the installation of equipment and modification of vessels is from operators and shipyards. Individual suppliers are not named within this document due to commercial sensitivity.

High and low estimates of the costs are provided to reflect uncertainty caused by vessel owners having the choice of fitting a basic or more sophisticated system. Whilst there is no requirement for vessel owners to go for the more sophisticated system, we expect many may do so as it may have simpler operating requirements.

Note for the calculation of benefits, the high scenario represents the outcome that is consistent with what the high-cost outcome is for overall NPV and vice versa.

Where we have been unable to estimate the monetised cost of a regulatory requirement, the scale of the cost has been provided through consultation with industry or by MCA technical experts.

Operators may choose to relocate vessels to a less onerous category of operation to avoid costs associated with certain proposed regulations. For example, a category C vessel could choose to relocate to category B waters and thus not be required to amend the liferaft provision or to cease operation altogether. Moving the vessel may incur costs associated with the move and potential loss in revenue. This Impact Assessment assumes operators will choose to implement changes to the vessel rather than change the area of operation. Whilst we do expect that some operators may move vessels as this may be more cost effective than complying with the proposed regulations, it is difficult to estimate the likelihood of this occurring and complex to model and therefore not proportionate to do so. We consider this to be a conservative assumption.

10 Monetised and non-monetised costs and benefits of option 1, the preferred option

10.1 Summary of Monetised Costs and Benefits of Option 1, the preferred option

Table 2 presents a summary of all costs and benefits that have been monetised. A full description of each cost and benefit is presented in section 10.2.

Table 2: Summary of monetised costs (undiscounted)

Requirement	Low	Central	High	Number of Vessels
Costs (£ million)				
Life-saving appliances – Liferafts	1.7	1.7	1.7	285
liferaft servicing	1.0	1.0	1.0	285
Life-saving appliances - Lifejackets	0.2	0.3	0.3	86
Life-saving appliances – Lifejacket Lights	0.5	0.9	1.3	261
lifejacket lights servicing	0.5	0.9	1.3	261
life saving appliance - total	3.9	4.8	5.6	NA
Fire protection – Fire Detection	0.4	0.9	1.4	606
Fire Detection Servicing	0.8	0.8	0.8	606
Fire protection – Fixed Fire Fighting	0.1	0.4	0.8	211
Fire protection total	1.3	2.1	3.0	NA
Bilge Pumping Arrangements	0.4	1.0	1.6	539
Bilge Alarm Arrangements	0.1	0.6	1.2	606
Bilge total	0.5	1.6	2.8	NA
Post Damage Survivability	0.7	1.0	1.2	83
Familiarisation Cost	0.1	0.3	0.6	Varies
Total cost (£ million)	**6.5**	**9.8**	**13.2**	**NA**

Source: Calculation of figures drawn from other tables in this IA

Table 1, above, sets out the range of costs of each aspect of the proposals under Option 1. The difference between the best estimates under options 1 and 2 are driven by damage survivability requirements predominantly and fire pumps in addition.

The total EANDCB in the (preferred) central scenario is £1.1m (2019 prices, 2020 present value) combining all the costs detailed above. Comparing costs and benefits, the total NPV of benefits is -£2.6m in the central case with -£9.4m and £4.0m in the low and high cases respectively. See below for a detailed explanation of each impact.

10.2 Calculations of the monetised and non-monetised impacts

10.2.1 Lifesaving appliances – Liferafts

Current requirements allow certain vessels to carry liferafts for fewer than 100% of the persons on board (as little as 60% of the persons on-board) and for the remaining capacity to be made up with buoyant apparatus. As a result, in the event of an evacuation up to 40% of persons on board may need to enter the water.

Consultation feedback snapshot

A group of operators considered the public have an expectation of 100 % liferaft provision.

We are proposing to address this by ensuring that all seagoing vessels and vessels on Category C and D waters are required to fit liferafts to accommodate 100% of the persons on board. This allows for the evacuation of all persons on board into liferafts without the need to enter the water.

10.2.1.1 Monetised costs

Based on a review of MCA databases and certification records, we estimate 285 vessels would require additional liferaft provision. The number of liferafts needed per vessel is dependent on:

a) Existing liferaft provision (estimated using the current applicable requirement for each vessel); and

b) Passenger carrying capacity (taken from administrative records).

Using this data, we have been able to estimate the maximum additional liferaft capacity needed.

The combination of liferafts purchased to meet the necessary carrying capacity will be dependent on the preferences of the vessel owner. However, we have assumed that each vessel owner would prefer the option that takes up the least amount of space, with cost taking a secondary priority. For example, whilst it may be cheaper to go for two liferafts carrying 50 passengers each, a 100-person liferaft would take up less space, therefore we assume in the analysis that a vessel owner would prefer the 100 person liferaft. Using prices quoted by retailers, the following cost assumptions have been used in the analysis:

Table 3: Liferaft Costs

Liferaft Capacity (people)	Cost per Liferaft
25	£2,000
50	£3,210
100	£6,945

Source: MCA databases and records

Liferafts are initially serviced after 12 months and every 24 months thereafter. Therefore, over the appraisal period liferafts will be serviced five times. The average servicing cost using estimates provided to the MCA by marine suppliers is approximately £450.

In addition to the cost of buying a liferaft, buyers would need to get a hydrostatic release unit which has been estimated as £50 per liferaft. A hydrostatic release unit is a device which allows the automatic release of liferafts when needed.

This total cost of liferafts is summarised as follows:

Table 4: The purchasing and maintenance costs of additional Liferaft

Liferaft Capacity	Number of Liferafts required	Purchasing cost	Servicing costs	Total Cost
25	139	£285,000	£265,000	**£550,000**
50	188	£613,000	£358,000	**£971,000**
100	115	£804,000	£219,000	**£1,023,000**
Total	**442**	**£1,702,000**	**£841,000**	**£2,544,000**

Source: Manufacturer instructions

10.2.1.2 Non-monetised costs

Some vessels may need to create additional stowage areas for liferafts. Based upon the advice of surveyors and the small number of responses to this point at consultation, we expect this to affect only a minority of vessels and be low cost when vessels are affected as liferafts are intended to replace buoyant apparatus already on board the vessels. Additional stowage area may, on some vessels, reduce the passenger carrying capacity and have revenue implications for operators. Based upon the advice of surveyors and the small number of responses to this point at consultation we, again, expect the number of instances of this to be minimal. Where additional stowage space is required, this will be unique to each vessel and cannot be calculated without detailed engineering analysis.

Additionally, liferafts will be slightly heavier than buoyant apparatus and may require an additional stability check. The need for a stability check will depend on the specific arrangement of the vessel and its life-saving appliances, and due to this complexity, and the fact that the number of vessels affected in this way cannot be determined, has not been monetised. We expect the scale of this cost to be low as stability checks are carried out routinely as a standard part of a vessel's operations.

10.2.1.3 Monetised benefits

The Formal Safety Assessment (FSA) conducted estimated a risk model which looked at the probability of various incidents involving passenger vessels, and the likelihood of an individual fatality, an injury, or a group fatality. [9] These probabilities are based on databases of historic accidents. We have monetised benefits of prevented *individual* fatalities and injuries only, and do not take into account the fact that society has a greater aversion to multiple fatalities resulting from a single incident.

As would be expected, the risk of an incident varies depending on the location of the journey, with busier waterways at greater risk. The FSA estimates the individual risk of an injury, fatality, or accident, as well as the frequency that different types of accident occur. These are detailed in full in annex C, with only key information presented in this section. The FSA also provides for each accident type an event tree with probabilities. An example event tree for a collision accident is presented in annex D. We assume that any passenger who in the risk model would have drowned, would now be saved due to the provision of a liferaft.

Firstly, we calculate the average probability of a fatality occurring due to drowning per incident. We estimate this by constructing a weighted average of the probability of drowning in each accident category by the chance of that accident category occurring in the event of an incident. Table 5 presents the frequency of incidents by accident category and the probability of a fatality if that accident occurs. For example, collisions represent 10% of all incidents. Where an incident involving a collision does occur, there is a 1.76% chance there will be a fatality, of which there is an 0.07% chance that there will be a fatality due to drowning. The accident category 'Personal' which represent 11% of incidents has been omitted below.

Table 5: Probability of a fatality occurring due to drowning per accident

Accident category	**Frequency of incident (from FSA)**	**Probability of fatality**	
		Total	***of which due to drowning***
Collision	10%	1.76%	0.07%
Grounding	13%	0.01%	0.01%
Contact	49%	0.67%	0.06%
Flooding	1%	2.81%	2.81%
Fire	16%	3.55%	0.04%
Weighted average		1.24%	0.08%

Source: Formal Safety Assessment of Domestic Passenger Ships

Given an incident has occurred, on average there is a 1.24% chance of a fatality, of which the chance of the fatality due to drowning is 0.08%. That means, given an incident has occurred, the provision of a liferaft has reduced the probability of a fatality by 0.08%.

[9] For more information on the FSA see section 1.2 and Annexes C and D to this Impact Assessment.

To calculate the prevented fatalities per vessel per year as shown in Table 6, we first calculate the risk of an incident occurring. Using data from the FSA on the risk of a fatality occurring for each operating environment, we divide this by probability that a fatality occurs given there is an incident. For example, in the case of Tidal/Estuaries, you divide 0.000015% by 1.24% to equal 0.00121%. This is shown using probabilities in Figure 1.

Figure 1: Estimating the Probability of an Incident Occurring

(1) Presents the probability of a fatality occurring given that an incident has occurred:

$$(1) \quad P(Fatality|Incident) = \frac{P(Fatality\ and\ Incident)}{P(Incident)}$$

Given that when a fatality occurs it is always classed as an incident, then we can simplify P(Fatality and Incident) = P(Fatality). We can rearrange (1) to estimate the probability of an incident occurring:

$$(2) \quad P(Incident) = \frac{P(Fatality)}{P(Fatality|Incident)}$$

Taking (2) and the example of vessels operating on Tidal/Estuaries, then we estimate the following:

$$(3) \quad 0.00121\% = \frac{0.000015\%}{1.24\%}$$

Having estimated the probability of a fatality occurring due to drowning given that an incident has occurred (0.08%) and the probability of an incident occurring (0.00121%), we now estimate the risk of drowning. We multiply the risk of an incident occurring by the risk of drowning per incident. In the previous example, this is 0.00121% multiplied by 0.08%, which equals 0.0000010%. This is shown using probabilities in Figure 2.

Figure 2: Estimating the Risk of Drowning

First taking (2) from figure 1:

$$(2) \quad P(Incident) = \frac{P(Fatality)}{P(Fatality|Incident)}$$

We can rearrange (2) to estimate the risk of a fatality occurring due to drowning:

$$(4) \quad P(Fatality) = P(Incident) \times P(Fatality|Incident)$$

Taking (4) and the previous example of vessels operating on Tidal/Estuaries, then we estimate the following:

$$(5) \quad 0.0000010\% = 0.00121\% \times 0.08\%$$

Finally, to calculate the prevented fatalities per vessel per year you multiply the risk of drowning by the average number of passengers per vessel that will be covered by additional liferafts and the number of trips per year (0.0000010% x 99 x 1369 = 0.00131). So, if there were 1000 vessels operating on tidal water or estuaries, we would expect 1.31 fatalities to be prevented as a result of additional liferafts per year. Using MCA records, the average number of passengers per vessel is estimated by taking the average of the passenger capacity of all the vessels affected in each operating environment. Trips per year were estimates as part of the FSA.

Table 6: The fatalities prevented per vessel per year from additional liferafts by operating environment

Operating environment*	Risk of fatality per voyage (from FSA)	Risk of an incident occurring per voyage	Average number of passengers covered by additional liferaft per vessel**	Trips per year (from FSA)	Prevented fatalities per vessel per year from additional liferafts
Tidal/ Estuaries (Class V(C) & IV)	0.000015%	0.00121%	99	1369	0.00131
Coastal Waters (Class VI & VI (A) & EU restricted)	0.000013%	0.00105%	52	3690	0.00161
Lochs and Lakes (Class V (tidal C))	0.000014%	0.00113%	105	1314	0.0012

** The 'Inland Waters' operating environments are omitted in the table as the proposed changes do not affect vessels operating in those waters*

*** Figures assumed from MCA records on capacity, based on 100% occupancy 100% on of voyages to give a "worst case scenario".*

Source: Formal Safety Assessment of Domestic Passenger Ships

To monetise this benefit, we use the WebTAG value of a prevented fatality[10] as presented below:

Table 7: WebTAG average value of prevention of a fatal accident

Casualty type	Lost Output	Human Costs	Ambulance Costs	Total
Fatal	£711,000	£1,356,000	£1,200	£2,068,200

Source: WebTAG TAG data book, May 2021 – Unit A4.1.1,

It should be noted that these are based on land values and therefore does not include search and rescue costs, which due to the sheer variance of costs could not be estimated. This will likely lead to the underestimation of the value of the benefit. The total benefit per year is shown in table 8 by class of vessel affected.

[10] WebTAG TAG data book, May 2021 – Unit A4.1.1, https://www.gov.uk/government/publications/tag-data-book

Table 8: The monetised benefit of additional liferafts in 2021 by vessel class

Class	Area of operation	Monetised benefit per vessel per year	Number of vessels	Monetised benefit in 2021
Class V(C)	Tidal / Estuaries	£2,580	123	£338,000
Class IV	Tidal / Estuaries	£2,580	8	
Class VI	Coastal Waters	£3,340	122	£514,000
Class VI(A)	Coastal Waters	£3,340	1	
EU Restricted	Coastal Waters	£3,340	31	
Class V (Tidal C)	Lochs and Lakes	£2,705	86	£233,000
Total			**371**	**£1,085,000**

Source: Formal Safety Assessment of Domestic Passenger Ships

Applying the value of a prevented fatality of £2,068,200 to the estimated number of prevented fatalities per vessel year, 0.00131 and 0.00161, and 0.0012 gives a monetary benefit of £2,580 and £3,340 and £2,705 per vessel per year for the Tidal/Estuaries, Coastal Waters and Lochs and Lakes areas of operation, respectively. We then multiply this by the number of vessels in each area of operation that will require new liferafts, taken from MCA records. In total for 2021 the provision of liferafts provides a benefit of £1.1m (rounded).

Over the ten-year appraisal period, assuming the value of a prevented fatality increases in line with forecasted growth in GDP per capita[11], the central estimate of monetised benefit is £7.6 million. This is the central estimate is based upon assumptions made regarding the use of capacity in operations, for which no data is recorded. The high benefit estimate assumes vessels always operate at full capacity. The central benefit estimate assumes vessels do not always operate at capacity we have retained 2/3 of this benefit and low benefit estimate, we have reduced benefits to 1/3 of the high benefit scenario. We believe this is a conservative assumption. When constructing the low, central and high net benefits scenarios in the summary sheets we have compared low costs to high benefits and vice versa to present the broader range net benefit estimates, reflecting uncertainty.

Table 9: The total benefit value of liferaft provision in fatalities prevented (undiscounted

Monetised benefit	Low	Central	High
Liferaft provision	**£3.8m**	**£7.6m**	**£11.4m**

10.2.1.4 Non-monetised benefits

Each person not accommodated by a liferaft is provided with buoyant apparatus. Liferafts allow for dry shod evacuation (i.e. without entering water) rather than buoyant apparatus that requires a person to enter the water. Therefore, for vessels with less than 100% liferaft provision, some passengers/crew would need to enter the water during abandonment with the additional associated risks such as cold-water shock that entering the water brings. There is an additional risk to anyone with mobility difficulties or other (including age-related) infirmity.

10.2.2 Lifesaving appliances - Lifejackets

The regulations also require vessels operating in Category B waters to carry lifejackets. Currently they are not required to do so if the vessel was built before 2010. However, following consultation, a provision has been introduced allowing the requirement to be relaxed for vessel operating on Category B waters if the surveyor is satisfied that the evacuation arrangements will not result in persons entering the water during evacuation. As there are no indications at this stage how many vessels may benefit from this, costings have not been adjusted to reflect the change, but it makes it more likely that costings cited represent a “worst case scenario”.

[11] WebTAG TAG data book, May 2018 – Annual Parameters (originally from OBR), https://www.gov.uk/government/publications/webtag-tag-data-book-may-2018

Consultation feedback snapshot

Feedback about whether the proposals to increase lifejacket provision would raise safety standards were mixed. While there was some support for the proposal, some respondents thought the proposal would be of no benefit, given that the preferred method of evacuation on some waters was direct to shore, and that they would simply divert attention from the optimal evacuation method at a crucial time.

10.2.2.1 Monetised costs

Using MCA records, we believe 86 vessels will be affected. Subsequently based on the number of passengers that can be carried on those vessels, 8,417 additional lifejackets will be needed, assuming no vessels have voluntarily gone beyond what is currently required. We obtained a range of cost estimates from industry and quotes from retailers for the cost of a lifejacket. These estimates were used to construct a low, central and high scenario of £24, £30 and £40. This will be a one-off cost incurred in the first year of implementation. The total cost of purchasing lifejackets was calculated as follows:

Table 10: The total costs of additional lifejackets

	Low	Central	High
Number of Lifejackets required	8417	8417	8417
Cost per Lifejacket	£24	£30	£40
Total Cost	**£202,000**	**£253,000**	**£337,000**

Source: Industry and retailers

To estimate, for example, the total cost of additional lifejackets in the central scenario, you multiply the number of lifejackets required, 8417, by the cost per lifejacket, £30 (8417*30 = £252,510)

10.2.2.2 Non-monetised costs

Some vessels may have to create additional storage areas such as additional lockers for lifejackets. This area may, on some vessels, reduce the passenger carrying capacity where vessels are unable to store lifejackets in spaces already available e.g. below seats. Owners of vessels which currently have conventional seats fitted may choose to replace them – where this is feasible - with bench seats comprising under-seat storage areas to accommodate the new requirement. As all this will depend on the specific arrangement and current passenger capacity of each vessels, we are not able to monetise it without disproportionate levels of primary data collection.

10.2.2.3 Non-monetised benefits

Without these changes in the event of an accident where persons had to enter the water a person may not be equipped with a lifejacket. Under new proposals all passengers will be provided with a lifejacket or buoyancy aid, therefore in the unlikely event of entering the water the risk of drowning and cold-water shock would be reduced significantly. This is particularly important during any evacuation, whether this is to liferafts, vessel to vessel or vessel to shore. This benefit has not been monetised due to a lack of sufficient data. The lifejacket relaxation introduced to the proposals after the first consultation available to Category B vessels is designed to support a dry shod evacuation, in that, for some vessels on rivers and canals which are never far from the bank, the most effective emergency evacuation method is to manoeuvre a damaged vessel to the bank and dis-embark passengers directly to shore, and this is the expected course of action in an emergency scenario. Any attempt to don lifejackets could delay such a manoeuvre because crew would focus on assisting passengers with lifejackets when their time would be better spent navigating the vessel to the bank. Also, donning a lifejacket may be seen as preparation for entering the water, which is an outcome which the new proposals seek to avoid if possible.

10.2.3 Lifesaving appliances – Lifejacket lights

Current requirements for existing vessels do not require the fitting of lifejacket lights. It is proposed to amend this by ensuring that seagoing vessels operating in the hours of darkness (more than one hour before or after

twilight) be required to fit lifejacket lights. It is noted that the Class VI limits do not permit operation in the hours of darkness, however some may operate during twilight (in the hour after sunset).

Consultation feedback snapshot

An operator said that the proposal was a "sensible and proportionate response". Another considered "industry generally accepts that when operating at night the provision of lifejacket lights could aid the recovery of someone in the water".

A suggestion received during the first consultation was that retro-reflective tape should be used rather than requiring lifejackets to have lights fitted. Indeed, some operators already have this on their lifejackets.

The government's concern with this suggestion is that reflective materials rely on another source of light being shone directly on them for them to show up, and persons in the water could therefore be easily missed. The RNLI recommend a flashing light or strobe on a lifejacket: *"A flashing light or strobe on our lifejacket makes you much easier to find at night or in poor visibility and can be easily attached."* [9]

10.2.3.1 Monetised costs

There are 272 vessels, 223 Class V (C) and 49 Class IV vessels, that fall within scope of this requirement. We surveyed 69 vessels regarding their operating practices. Of the 69 vessels, 96% of Class V vessels (who operate in Category C waters) and 95% of Class IV vessels, operated at night. We then estimate based on these probabilities that 261 (out of a possible 272) vessels will be affected. Of this, 214 are Class V (C) and 46 are Class IV vessels.

Using data from MCA records, we estimate that 46,519 lifejacket lights are potentially required based on the passenger capacity of the 272 vessels. However, given the number of vessels that do not operate during darkness we estimate a total of 44,525 lifejacket lights are needed for the 261 that operate during darkness, assuming no vessels currently have lifejacket lights unless they are already required. We originally obtained a range of cost estimates for lifejacket lights from industry and from quotes from retailers, and used them in the high, low and central scenario of £11, £12 and £15 respectively. Consultation responses indicated prices could be higher than this and that fitting costs had not been taken into account. We therefore revised these figures to £12, £20 and £30 to take into account not only the higher cost of lights but also to include an allowance for fitting costs in this price.

We also assume that lifejacket lights will be replaced after 5 years, which is the typical lifespan of such lights. The total purchasing costs will be two one-off costs, incurred in the first and sixth years of the regulation. The total cost of purchasing lifejacket lights was calculated as follows:

Table 11: Overview of the cost of additional lifejacket lights

Cost	Low	Central	High
Average cost of a Lifejacket light	£12	£20	£30
Number needed	44,525	44,525	44,525
Total cost	£534,000	£891,000	£1,336,000

Source: Industry quotes and retailers, updated as a result of comments from consultation responses

To calculate, for example, the total cost for lifejacket lights in the central scenario, you multiply the number of lights required, 44,525, by the cost per light, £12 (44,525*12 = £534,300). This cost is also incurred in 2024 and discounted.

10.2.3.2 Non-monetised costs

The cost of installing lifejacket lights to lifejackets will vary depending on the model of jacket and light and the number of lights to be fitted. The associated costs are likely to be very small and have not been monetised. Duration of inspections is not expected to increase as a result of the proposed changes.

10.2.3.3 Non-monetised benefits

Lifejacket lights allow for visibility during night time and during adverse weather. In an event of an incident where passengers and crew have entered the water, a lifejacket light makes it easier for them to be recovered

and therefore reduces the likelihood of a fatality. The Royal National Lifeboat Institution (RNLI) suggests looking for a lifejacket light when purchasing a lifejacket saying, "A flashing light or strobe on our lifejacket makes you much easier to find at night or in poor visibility and can be easily attached." [12] Note that lifejacket lights are active and do not require a light to be shone on the person in water.

10.2.4 Fire protection – Fire detection

Current requirements do not require fire detection. Fire detection allows early awareness of fires and reduces the probability of serious fires developing. The proposed regulations will require fire detection system to be installed in all enclosed machinery spaces (which are where fires are more likely to occur) and any passenger sleeping spaces on all vessels of Class III-VI(A).

Consultation feedback snapshot

There was a large amount of support for this proposal, respondents agreeing that it would raise safety standards.

10.2.4.1 Monetised costs

The requirement to have fire detection leads to equipment purchasing and installation costs as well as servicing costs.

We assumed that no vessels are currently compliant with the requirement, realising this may be a conservative assumption. The number of vessels affected is shown as 606 as detailed in section 8. At consultation nine of 63 operator respondents said that some of their vessels already had detection fitted and one said that their only vessel had it fitted. This indicates that across the domestic passenger vessel fleet there could be as many as 20% of vessels already compliant in this area. However, costs in this Impact Assessment have not been changed due to the uncertainty amount the representativeness of this evidence. Therefore, it is simply asserted that vessel numbers used in this area are "worst case" figures. The total cost of fire detection equipment is shown in the table below.

Table 12: Cost of purchasing, installation and servicing of fire detection equipment

Cost	Low	Central	High
Average Cost for Fire Detection Equipment per vessel	£684	£1,512	£2,340
Average Cost of Annual Service of Equipment per vessel	£150	£150	£150
Total Purchasing Cost	£414,000	£916,000	£1,418,000
Total Servicing Cost	£692,000	£692,000	£692,000
Total Cost	**£1,106,000**	**£1,608,000**	**£2,110,000**

Source: Supplier estimates

A one-off cost is incurred in the first year of the regulation for purchasing and installation of fire detection equipment. Based on the range of estimates provided to us by suppliers, we have assumed a purchasing and installation cost of £684, £1,512, and £2,340 in the low, central and high scenarios respectively. A fire detection system will need servicing annually, though the servicing costs will vary dependent on the type of system installed and the vessel type. Based on retail estimates, we estimate the average cost to be approximately £150 per vessel per year. The equipment is serviced annually, so a cost is estimated from 2020 onwards.

To calculate, for example, the total purchasing and installation cost of additional fire detection equipment in the central scenario, you multiply the number of vessels affected, 606, by the average cost of additional fire detection equipment, £1,512 (606*1,512 = £916,272). The total servicing cost is then the cost of servicing per vessel, £150, multiplied by the number of vessels,606 (606*150 = £90,900) in each year thereafter and discounted.

10.2.4.2 Non-monetised costs

No non-monetised costs have been identified for fire detection equipment.

[12] http://completeguide.rnli.org/lifejackets.html

10.2.4.3 Non-monetised benefits

Early fire detection is essential to prevent a fire spreading and allow rapid fire fighting and/or an orderly abandonment of the vessel. Accident statistics compiled in 2007 during the development of The Inland Waters Passenger Ship Code showed that approximately 14% of accidents to Class IV and V passenger vessels were due to fire or explosion. Fire detection and fixed firefighting systems have contributed to the effective resolution of fires on board vessels in several incidents.[13,14,15] This has not been monetised due to incomplete data.

10.2.5 Fire protection – Fixed firefighting

On some small vessels, the current requirements do not mandate fixed firefighting within main machinery spaces. Fixed firefighting systems are a proven effective method of fighting fires within machinery spaces and are required widely throughout modern standards.

It is proposed to require a fixed firefighting system in all enclosed machinery spaces on all vessels of Class III-VI(A). On smaller vessels with boxed engines, where the installation of fixed firefighting is impracticable, equivalent arrangements will be considered, providing opening of the machinery space is not required to fight the fire.

Consultation feedback snapshot

There was a significant amount of agreement that fixed firefighting would raise safety standards, although some concern was expressed about practicalities and cost should there be a requirement for systems to be MED approved.

10.2.5.1 Monetised costs

Based on the range of estimates provided to us by suppliers, we have assumed the following range of costs for purchasing and installing fixed firefighting systems:

Table 13: The cost per vessel of purchasing and installing fixed firefighting systems

Cost	Low	Central	High
Fixed firefighting	£426	£2,072	£3,840

Source: Supplier estimates

We also originally assumed that no vessels, under 21.34m, are currently compliant with the requirement (as there is no current requirement for these vessels), though we realised this may be a conservative assumption. During the first consultation, 19 operators said that some or all of their vessels already had fixed firefighting systems fitted. However, vessel numbers in Table 14 below have not been reduced, as reliable data was not provided on how many of these were under 21.34 metres, although indications were that a few could possibly fall below that threshold. Therefore, although we have assumed 211 vessels will be affected by the regulations, as outlined in Table 14 below, this is believed to be on the cautious side, and is expected to be a "worst case scenario":

Table 14: The total cost by vessel type affected of purchasing and installing fixed firefighting systems

Vessel type	No of vessels	Low	Central	High
Class V, VI & VI(A) less than 21.34m	200	£85,000	£414,000	£768,000
Class IV less than 21.34m	10	£4,000	£21,000	£38,000
Seagoing EU C&D Restricted less than 21.34m	1	£0	£2,000	£4,000
Total	211	£90,000	£437,000	£810,000

This will be a one-off cost incurred in the first year of the regulation. To estimate the cost in the high scenario, for example, for Class IV vessels less than 21.34m you do the following: Multiply the cost of purchasing and

[13] https://www.gov.uk/maib-reports/fire-in-engine-room-on-tug-sd-dexterous-off-gareloch-scotland

[14] https://www.gov.uk/maib-reports/fire-in-engine-room-of-wind-farm-workboat-windcat-3-in-the-solway-firth-scotland

[15] https://www.gov.uk/maib-reports/fire-in-engine-room-of-general-cargo-vessel-saline-while-in-the-approaches-to-the-humber-estuary-england

installation of equipment, £3,840, by the number of vessels affected, 10 (3,840*10 = £38,400). This is then rounded to the closest £1000.

10.2.5.2 Non-monetised costs

Fixed firefighting systems will need to be inspected and serviced periodically. Inspection will be carried out by the vessel's crew and the servicing intervals and costs will vary dependent on the type of system installed and the vessel type. However, we expect the scale of the servicing costs to be lower than the purchasing costs.

10.2.5.3 Non-monetised benefits

Fixed firefighting in the engine room provides an opportunity to fight a fire without entering the space. This provides several safety benefits:

- Reduced risk associated with entering the space (smoke inhalation, burns, death etc.);
- Increased speed of response to a fire and subsequent reduced risk of fire spreading;
- 'Total flooding' of the space with the firefighting medium (water, gas etc.) which has the ability extinguish all the fire within the space in one 'shot'.

Fixed firefighting is widely regarded as the most effective means of fighting engine room fires, as noted by the Marine Accident Investigation Branch (MAIB) reports[16].

10.2.6 Containment of Fire

Fire containment measures (e.g., the fitting of additional insulation in some areas) which would bring older vessels into line with modern standards, formed part of the original proposals, and were included the version of the Impact Assessment which accompanied the first consultation. Due to the variety of vessel types affected, and the unknown amount of containment already in place, quantification of costs had not been attempted, but costs were expected to be low. However, feedback from the first consultation indicated that the cost would be much higher than originally expected, ranging from £2K to £20K per vessel for vessels which needed updating. Given the other improvements to fire protection in the proposals, namely fire detection and fixed firefighting measures, the original, proposal was reviewed, and it was concluded that the additional safety which would be achieved by implementing the containment measures on top of these would be marginal, and not cost-effective in the light of the feedback received. The containment proposals have therefore been dropped from the preferred Option (Option 1).

10.2.7 Bilge Pumping Arrangements

Current requirement makes use of hand powered pumps for pumping bilges. It is proposed to require bilge pumping capacity to be met with powered pumps. This amendment would cease the use of hand pumps to fulfil capacity and would mean that pumping could be achieved with a more efficient use of limited crew and without the possibility of asking passengers to 'man the pumps' in the event of water ingress.

It is acknowledged that the engines and arrangements of many vessels may be unsuitable for fixed powered bilge pumps. Equivalent arrangements for smaller vessels by the carriage of portable pumps would be acceptable.

Consultation feedback snapshot

There was general agreement that powered bilge pumps would raise safety levels.

10.2.7.1 Monetised costs

The cost of purchasing and installing bilge pumps will be dependent on the specific vessel. However, we have been able to estimate a range of purchasing and installing costs, provided to us by suppliers:

Table 15: Cost of purchasing and installation of Powered Pumps

Cost per vessel	Low	Central	High
Purchasing & Installing	£1,000	£5,000	£10,000

Source: Equipment suppliers

[16] https://www.gov.uk/maib-reports/fire-in-engine-room-of-twin-rig-prawn-stern-trawler-amy-harris-iii-off-the-isle-of-arran-scotland

Based on MCA administrative records, we are able to estimate the number of vessels that will require powered bilge pumps:

Table 16: An overview of the number of vessels affected by additional bilge pump requirements

Class	Category	Number of passengers	No. of Vessels
V	All	All	402
IV	D	>50	6
VI	Seagoing < 10-mile voyage, < 1 mile from land	≤100	111
VI(A)	To Isolated Communities <6 Mile Voyage <3 Mile from Land	≤50	1
VI	Seagoing < 10-mile voyage, < 1 mile from land	≤100	19
Total			539

Source: MCA databases

The total costs are therefore as follows:

Table 17: Overview of the total cost of additional bilge pump requirements

Cost	Low	Central	High
Total Purchasing & Installation Cost	£539,000	£2,695,000	£5,390,000

This is a one-off cost incurred in the first year of the regulation. To estimate, for example, the cost of additional bilge pump requirements in the central scenario, multiply the number of affected vessels, 539 by the cost per vessel of additional powered pumps, £1,895 (539*1,895 = £1,021,405).

10.2.7.2 Non-monetised costs

Bilge pumping systems will need servicing and periodic inspection by the vessel's crew, though the servicing costs will vary dependent on the type of system installed and the vessel type. However, we expect the scale of the servicing costs to be lower than the purchasing costs.

The alarm and electric bilge pumping of the fishing vessel Random Harvest[17] (of similar size and construction to some smaller passenger vessel) contained serious flooding caused by a hull fitting being lost. Powered bilge pumps were able to deal immediately with the flooding of passenger vessel 'Surprise'[18] following grounding and allowed the skipper to manage the situation. This ended in all passengers being successfully rescued and the boat recovered.

10.2.7.3 Non-monetised benefits

As powered pumps are a more effective form of bilge pumping, it reduces the likelihood of passengers and crew being forced to abandon a vessel in the event of a flooding incident.

Hand pumps also require a person to 'man the pump' rather than perform critical duties on-board. Replacement of hand pumps with powered pumps or equivalent frees crew members for other important duties, such as marshalling crew, preparing Life Saving Appliances (LSAs) etc.

10.2.8 Bilge Alarm Arrangements

Currently there is no requirement to fit bilge alarms in compartments where bilge water can accumulate. Such alarms allow the detection of water ingress and hence can help to prevent catastrophic flooding or foundering. It is proposed to require bilge alarms on all vessels of Class III-VI(A).

10.2.8.1 Monetised costs

The cost of bilge alarms can vary significantly depending on whether a vessel owner chooses a relatively basic arrangement or a more sophisticated arrangement. As we believe some owners will choose the costlier system, we have used a wider range of costs for purchasing and installing bilge alarm systems. Using estimates provided to us by industry, we have assumed the following range of costs:

[17] https://www.gov.uk/maib-reports/flooding-of-charter-fishing-vessel-random-harvest-off-brighton-england

[18] https://www.gov.uk/maib-reports/grounding-and-evacuation-of-domestic-passenger-vessel-surprise

Table 18: The cost per vessel of additional bilge alarm requirements

Per vessel cost	Low	Central	High
Purchasing & Installing	£100	£1,050	£2,000

Source: Industry estimates

We have assumed no existing compliance, and all 606 vessels will be affected. The first consultation asked for information on the number of vessels affected to see if an appreciable number of operators already have bilge alarms in affected compartments. A number of respondents reported that some of their vessels already had bilge alarms fitted in some of the necessary spaces, e.g., engine rooms. The government did not consider the data sufficiently meaningful to quantify. Additionally, it was thought that those operating non-compliant vessels were less likely to report they were non-compliant than compliant once were to report their partial or full compliance. The costs have therefore not ben adjusted downwards, but the government is confident that they represent a "worst case scenario".

Therefore, the total cost will be as follows:

Table 19: Overview of the total cost of additional bilge alarm requirements

Cost	**Low**	**Central**	**High**
Total Purchasing & Installation Cost	£60,600	£636,300	£1,212,000

This is a one-off cost incurred in the first year of the regulation. To estimate, for example, the cost of additional bilge alarms in the central scenario, multiply the number of affected vessels, 606 by the cost per vessel of additional bilge alarms, £1,050 (606*1,050 = £636,300)

10.2.8.2 Non-monetised costs

The cost of testing and servicing pumps and alarms. These associated costs are likely to be small relative to the purchasing and installing costs and have not been monetised.

10.2.8.3 Non-monetised benefits

Bilge alarms detect water in the vessel and allow for early intervention by the crew and can prevent a catastrophic event such as flooding or foundering (sinking/capsizing). This is demonstrated in the Millennium City[19] and Vixen[20] MAIB investigations amongst others.[21,22]

The alarm and electric bilge pumping of the fishing vessel Random Harvest[23] (of similar size and construction to some smaller passenger vessel) contained serious flooding due to a hull fitting being lost.

The MAIB has made similar recommendations[24] for vessels of similar size and construction as domestic passenger vessels for the installation of bilge alarms.

10.2.9 Damage Survivability

Many existing vessels need only comply with an intact stability standard and consequentially have no provision for damage stability. This means that these vessels are not required to survive relatively minor damage, such as a collision and subsequent hull failure.

Consultation feedback snapshot

Damage stability elicited the strongest response of all the proposals. While no respondent specifically said they thought it would improve safety standards, only two said they thought it would not. Two respondents reported that their vessel(s) were already compliant.

[19] https://www.gov.uk/maib-reports/contact-made-by-passenger-vessel-millennium-city-with-westminster-bridge-river-thames-england

[20] https://www.gov.uk/maib-reports/sinking-of-small-passenger-ferry-vixen-in-ardlui-marina-loch-lomond-scotland

[21] https://www.gov.uk/maib-reports/flooding-and-sinking-of-seine-netter-neptune-off-the-shetland-isles-scotland

[22] https://assets.publishing.service.gov.uk/media/547c7111ed915d4c0d0000f7/vertrauen.pdf

[23] https://www.gov.uk/maib-reports/flooding-of-charter-fishing-vessel-random-harvest-off-brighton-england

[24] https://www.gov.uk/maib-reports/flooding-and-sinking-of-grab-hopper-dredger-abigail-h-while-alongside-at-the-port-of-heysham-england

Seventeen respondents considered the damage stability proposals would give rise to prohibitive costs, 14 saying it would be impossible to achieve onboard some or all of their vessels. Vessel obsolescence was identified for 22 vessels, and an unknown number of other vessels' operations were considered endangered. Respondents identified an expected 107 redundancies plus several other groups of redundancies of unknown number. Out of the 59 individual operators who responded to the first consultation, 33 said they would go, or would be likely to go, out of business as a result of the measure.

It is proposed to require all vessels operating at sea, on Category D and Category C (tidal) waters to achieve a level of damage survivability, with the exception (following revision after the first consultation) of Class VI non-subdivided vessels, and Class V vessels operating on non-tidal Category C waters in daylight. This can be achieved by providing inherent buoyancy or by subdividing the vessel. It is proposed to include an allowance such that vessels operating on non-tidal Category C waters may be excluded from the requirement subject to the undertaking of a detailed risk assessment and MCA approval. The rationale for the exclusion of Class VI vessels would be based on the fact that Class VI vessels already have inbuilt operational restrictions in their certification and are therefore limited to daylight only operations between April and October in favourable weather only.) Excluding Class V vessels on non-tidal Category C waters is reflects the lower operational risk in these areas due to factors including traffic density and make up, speed limits and daylight only operation. Additionally, Class V vessels operating in tidal waters in daylight only may be permitted, at the discretion of the Secretary of State, to instead to carry out a risk assessment. However, this will depend on MCA surveyors being happy that the operational environment is low risk, based on an assessment of traffic density, the make-up of other vessel traffic, daylight and environmental conditions.

10.2.9.1 Monetised costs

The total number of vessels that may be affected is assumed to be all vessels in tidal Category C waters that are not known to currently meet the new damage survivability standards. Although flexibility has now being introduced for vessels in areas of lower operational risk, this has not been reflected in the number in Table 20 in order to present a worst-case cost scenario.

Table 20: Overview of the number of vessels that do not meet new damage survivability standards

Vessel Type	Number of Vessels Affected
Class V (C) - 'Tidal'	83

Source: MCA databases

The solution to achieve inherent buoyancy or subdivision would be bespoke to each vessel. The cost associated with each vessel cannot be accurately estimated without a detailed engineering analysis having been carried out for each vessel. It is considered that many vessels will be impacted in one of two ways.

i. Firstly, some vessels will have originally been built with subdivision and subsequently would require relatively little work to verify that subdivision of the vessel is in accordance with the proposed standard. This would likely consist of a detailed survey of the vessel and stability calculations using computer software.

ii. Some vessels will not have been built with any subdivision and will require substantial work to meet a satisfactory level of damage survivability. This work could effectively mean rebuilding the vessel and may not be practicable in all cases. To estimate an indicative cost of the above, experts within the MCA have estimated indicative costs for 16 vessels. When selecting the sample of vessels, we have taken a range of vessels by vessel class, age and the number of passengers the vessel can hold. We take these indicative costs to estimate a low, central and high scenario for all the vessels that may require change to meet the new damage survivability standard.

Consultation feedback snapshot

Several operators felt that the cost and/ or feasibility of making the changes necessary to meet the new damage stability requirements could not be ascertained until significant cost had been incurred in establishing this. That initial investment would then be lost should the changes be found to be non-viable or prohibitive.

We have divided the costs to vessels into 3 separate categories. The first is consultancy costs for conducting a detailed survey of the vessel. As this is required to understand what work would need to be carried out on the vessel to bring it in compliance with the proposed regulations we have not included an additional familiarisation cost in section 10.2.10 for this purpose. The second is the actual work that will need to be conducted on each vessel. This is subject to the most variation in cost between vessels. This includes additional steelwork, modifications to decks, additional buoyancy/ballast material, labour costs, equipment installation and testing. The third is costs for plan approvals, stability assessments, on-site surveys, inclining, administration and structural assessments, which are services provided by the MCA for which operators pay a fee.

The central estimate is based on the median estimate of each category (Consultancy Costs, Yard Costs and MCA Costs), with the low and high scenarios representing the 25th and 75th percentile respectively. There is a high variation in the number of vessels that will need very little work and some a substantial amount. The median (rather than the mean) is used to avoid skewness in the data by outliers in our estimates of 16 vessels. The low, central and high scenarios are calculated based on the costs for consultancy, yard upgrades and MCA costs individually rather than the total cost for each example vessel.

We acknowledge that although the average yard cost in the central scenario is £5,000 (surveyor estimates – see table 21 below), in reality, the cost will disproportionately impact particular vessels. Within our estimates of the vessels affected, the cost of yard work ranges from negligible cost to £32,000. During our first consultation with industry we received a number of cost estimates from operators. Some considered consultancy costs could be £10K or more, although overall the costs fell within the range cited in Table 21 as published in the consultation edition of this Impact Assessment, which gives the total cost of achieving compliance with the new damage stability standard in the High Scenario as over £1m. (The Tables has been updated in the light of the revised proposals following the first consultation, resulting in the figures being reduced since this Impact Assessment was published with the first consultation.) These order of costs could mean that a vessel is non-viable, depending on the resources of the operator, but does not take into account the cost of replacing a vessel if it is not cost-effective to modify it. The cost of replacement vessels cannot be quantified as this depends on the type of vessel concerned, which can vary enormously, and the indeterminate number of obsolescent vessels per operator which would result from the changes.

Table 21: An overview of indicative costs of damage survivability requirements

Cost	Low	Central	High
Average Consultancy Cost per Vessel	£4,500	£5,000	£5,500
Average Yard Cost per Vessel	£900	£4,500	£5,700
Average MCA Cost per Vessel	£2,600	£2,900	£3,800
Total Consultancy Cost	£372,500	£413,800	£452,400
Total Yard Cost	£72,600	£373,500	£471,000
Total MCA Cost	£215,800	£240,700	£315,400
Total Cost	**£660,900**	**£1,028,000**	**£1,238,800**

Source: MCA surveyor estimates and known consultant costs

Consultation feedback snapshot

Two respondents said that they could not implement the proposals without grant funding or some other form of financial support.

10.2.9.2 Non-monetised costs

It is likely as a result of vessels not having been built with subdivision, as discussed above, it may not be viable – either practically or commercially – to apply the requirements. We have not monetised the cost of vessels in this situation. We have not been able to monetise this due to having a lack of reliable data of vessel

replacement costs, the type and number of vessels that would need replacing and likelihood that the cost of replacement may be too high for individual operators to purchase a replacement.

There also may be a loss in revenue during upgrade. We have not been able to monetise the lost revenue each revenue will sustain while it is being upgraded rather than in passenger use. This is not feasible to estimate without knowing the revenue of the affected vessels.

We have not monetised any costs related to preparing risk assessments for areas of tidal Category C waters that are being assessed with respect to operational risk with a view to exemption from the proposed requirements. Each individual operator may choose to conduct their risk assessment in a different way and it is considered likely that operators with multiple vessels will be able to apply much of the assessment to all of their vessels – reducing the cost per vessel. It is even considered possible that a group of operators from the same region may join together to produce risk assessments collaboratively. With so many variables it has not been considered proportionate to monetise this cost. In any case the cost of risk assessment is likely to be lower than application of the damage stability requirement.

It has not been possible to ascertain the impact on local businesses and tourist attractions should a vessel have to continue operating on a particular route. In the longer term, if sufficient demand exists, it is expected that operators with compliant vessels will meet this demand.

10.2.9.3 Non-monetised benefits

According to MAIB data[25], there were 144 collisions involving passenger vessels from 1992 to 2016. This is for UK passenger vessels, excluding international vessels with a length greater than 15m and not more than 100m. Although it is not possible to directly link the MAIB data to vessels within scope of the proposed changes, given the composition of the fleet it is likely that the majority of these vessels are covered.

Increasing the post damage survivability would significantly raise safety levels in the event of a collision or other hull breach. Subdivision allows the vessel to remain afloat, in a relatively stable condition, after the hull is holed or hull fitting fails. The aim being to allow for the vessel to survive a level of damage or ultimately provide time for an orderly evacuation of the vessel.

Subdivision can allow for the flooding to be contained long enough for the bilge pumps to maintain the water level and allow the vessel to reach a safe landing. Without subdivision a vessel is vulnerable to uncontrollable flooding – which could result from a small hull breach and then rapid capsize. Conversely in a subdivided vessel the flooding will be limited – as can be seen from the results of various incidents[26].

A vessel's value may also increase as a result of the upgrades to bring it to the proposed damage survivability standards.

10.2.10 Familiarisation costs

Vessels will be subject to a familiarisation cost the first year the regulations come into force. This is split into 2 elements. The first is a general familiarisation time for understanding the regulations and if your vessel is currently compliant. Due to the nature of the changes, relating to various existing regulations, there are sizeable number of pages of legislation to read to understand the changes. However, the MCA plan to release summary guidance in the form of a Marine Guidance Note (MGN) to inform vessels of the requirements, and we anticipate this to take the average vessel on average 2, 3.5 and 7 hours to understand the changes in the low, medium and high scenarios respectively. The second element of familiarisation is specific to each one of the changes and represents the time taken per vessel to understand what is required for their vessel to meet the new requirements and any time to purchase or procure contracts to purchase equipment or carry out work. As each change affects a different number of vessels we have treated these separately. These are summarised below. All familiarisation times are assumed to be the time it takes the average vessel affected to familiarise.

[25] Prepared by MAIB for MCA 25 September 2017

[26] https://assets.publishing.service.gov.uk/media/55c3108aed915d534600000c/MAIBInvReport-18_2015.pdf

Table 22: The time per vessel to familiarise with different elements of the changes

Type	Time to familiarise (Hours)			No. of Vessels Affected
	Low	Central	High	
General Familiarisation	2	3.5	7	606
Life-saving appliances – Liferafts	2	3	5	285
Life-saving appliances - Lifejackets	2	5	7	86
Life-saving appliances – Lifejacket Lights	0.75	1	2	261
Fire protection – Fire Detection	3	5	8	606
Fire protection – Fixed Fire Fighting	4	7	14	211
Bilge Pumping Arrangements	3	6	9	539
Bilge Alarm Arrangements	2	4	6	606
Damage Survivability	See 10.2.9	See 10.2.9	See 10.2.9	83

Source: Estimates by MCA surveyors using methodology described below

The rationale behind the individual familiarisation times is explained below:

- **Liferafts** - Most operators lease their liferafts so the procurement process is not expected to be lengthy as suppliers will take on the majority of the burden of finding suitable liferafts. These times are estimated based on experience and from previous IAs for procurement of Life Saving Appliances (LSA) for each vessel. It is considered that the majority of vessels will fall into the low and central bands with the high cost of procurement being for those vessels where liferafts are not leased.
- **Lifejackets** – The time for procuring lifejackets is likely to be higher than for liferafts as some operators will need to make decisions on the type of jacket or buoyancy aid carried which will likely depend on stowage arrangements. For vessels where the arrangement does not facilitate stowage of the jackets the operator may decide to purchase more compact or even inflatable jackets although these will be higher cost options and for inflatable jackets will have servicing implications.
- **Lifejacket lights** – It is considered that time taken for procurement will be low due to the low level of complexity of lifejacket lights.
- **Fire detection** – Much as with Fixed firefighting, there are many systems available on the market where fire detection is concerned. Currently there is a diverse range of these types of system available, each with their own specific merits. It may well take operators some time to ascertain which type is most suitable for their needs and budget.
- **Fixed Firefighting** – The time for procuring fixed firefighting is likely to be longer than for other safety equipment due to the complexity and variety of the systems available on the market. Operators will need to decide upon which type of system is most suitable for the intended purpose, possibly depending on whether the space is a manned machinery space. Given the nature and size of the spaces on these vessels the MCA intends to allow the use of some of the non-harmful aerosols which are MCA as opposed to Marine Equipment Directive (MED) approved systems.
- **Bilge pumps** – Given that the proposal outlined in the consultation version of this Impact Assessment to require powered fire pumps is not being taken forward, only powered bilge pumps are now required. We do not anticipate the selection of pumps being overly burdensome in terms of time. Vessel operators will need to consider the arrangement of the vessel and the bilge pumping system as well as electrical capacity. It should be noted that many operators have multiple vessels with similar arrangements so will be able to use the same procurement rationale across their fleet

We consulted on these familiarisation times during the first consultation to increase the robustness of the estimates. The overall cost associated with the times above is presented below. Only two respondents provided familiarisation costs. One calculated 41 hours using the central £19.96 figure, totally £818. The other made an assumption of £10K familiarisation costs totalling around £450K for their whole fleet.

Table 23: The total familiarisation cost of the new regulations

Type	Time to familiarise (Hours)		
	Low	Central	High
Total Hourly Wage	£13.79	£16.20	£19.56
General Familiarisation	£17,000	£34,000	£83,000
Life-saving appliances – Liferafts	£8,000	£14,000	£28,000
Life-saving appliances - Lifejackets	£2,000	£7,000	£12,000
Life-saving appliances – Lifejacket Lights	£3,000	£4,000	£10,000
Fire protection – Fire Detection	£25,000	£49,000	£95,000
Fire protection – Fixed Fire Fighting	£12,000	£24,000	£58,000
Fire protection – Hand pumps	£0	£0	£0
Bilge Pumping Arrangements	£22,000	£52,000	£95,000
Bilge Alarm Arrangements	£17,000	£39,000	£71,000
Damage Survivability	£11,638	£23,929	£57,769
Total (exc Damage Survivability)	**£110,000**	**£233,000**	**£474,000**

Source: ASH Survey 2020, Marine and waterways transport operatives)

To estimate, for example, the familiarisation cost of bilge pumping arrangements in the low scenario, the calculations is as follows: 3 hours to familiarise multiplied by the 539 vessels affected multiplied by the hourly wage, £13.79 (3*539*13.79 = £23,000 (rounded)). Gross Earnings data has been sourced from 2019 Annual Survey of Hours and Earnings (ASHE) data for Marine and Waterways Transport Operatives[27]. The size and type of businesses affected due to the nature of market is subject to a large degree of variation. The 30th percentile (£13.79) is used as a low scenario, the median (£16.20) in the central, and the 60th percentile (£19.56) as the high scenario. This wide range reflects this uncertainty. The 30th and 60th percentile were used as ranges due to ranges above the 70th percentile for water transport considered unreliable by the ONS. Following Better Regulation Executive guidance (based upon Eurostat figures for non-wage labour costs), an uplift of 20.2% has been applied to represent non-wage labour cost to business such as national insurance and employer pension contributions. Wages are grown in real terms over time by projected GDP per capita growth.[28]

10.2.11 Other non-monetised costs for Option 1

It is believed that, at least in some cases, if certain older vessels are taken out of service as a result of the Regulations, firms operating newer vessels may not enter the market on the affected routes – or at least not immediately.

This could have an adverse effect on the revenue of tourist attractions and local businesses served by those routes, especially where convenient alternative methods of transport are less enjoyable, limited in their availability or not available at all. Insufficient data is available to quantify these impacts, and it would not be proportionate to collect such data, although it is clear that the impact would be greater under Option 2 than Option 1, as Option 1 is more limited in scope and will therefore threaten the viability of fewer vessels. Also, when served by water transport, it is often difficult to ascertain whether particular visitors to these attractions

[27] ONS ASHE date set table 14.5b – Soc code Marine and Waterways transport operatives: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/datasets/allemployeesashetable1

[28] http://cdn.budgetresponsibility.org.uk/Nov2017EFOwebversion-2.pdf, Up to 2022 and WebTAG 2022-2066 from OBR FSR Jan 17, table 1.1, published 17/01/2017 (adjustment made to convert from FY to CY), from 2023- 2027

and businesses are drawn in the attractions/ businesses themselves or by the method arriving at them, or a mixture of both.

Concerns have also been raised that if vessels are taken out of service this could reduce the revenue of some boatyards, which is also not quantifiable.

Although it could be argued that these are indirect impacts of the proposals, they are nevertheless a concern for some organisations.

11 Monetised and non-monetised costs and benefits of option 2

11.1 Summary of Monetised Costs and Benefits of Option 2

Table 24: summary of undiscounted costs of Option 2

Requirement	Low	Central	High	Number of Vessels
Costs (£ million)				
Life-saving appliances – Liferafts	1.7	1.7	1.7	285
liferaft servicing	1.0	1.0	1.0	285
Life-saving appliances - Lifejackets	0.2	0.3	0.3	86
Life-saving appliances – Lifejacket Lights	0.5	0.9	1.3	261
lifejacket lights servicing	0.5	0.9	1.3	261
life saving appliance - total	3.9	4.8	5.6	NA
Fire protection – Fire Detection	0.4	0.9	1.4	606
Fire Detection Servicing	0.8	0.8	0.8	606
Fire protection – Fixed Fire Fighting	0.1	0.4	0.8	211
Fire pumps	0.1	0.1	0.1	355
Fire pump servicing	0.1	0.1	0.1	355
Fire protection total	1.5	2.3	3.2	NA
Bilge Pumping Arrangements	0.4	1.0	1.6	539
Bilge Alarm Arrangements	0.1	0.6	1.2	606
Bilge total	0.5	1.6	2.8	NA
Post Damage Survivability	1.6	2.5	3.0	204
Familiarisation Cost	0.1	0.3	0.7	Varies
Total cost (£ million)	**7.6**	**11.5**	**15.3**	**NA**

Source: MCA calculations

Table 2, above, sets out the range of costs of each aspect of the proposals under Option2. The difference between the best estimates under options 1 and 2 are driven by damage survivability requirements predominantly and fire pumps in addition.

Comparing costs and benefits, the total EANDCB in the option 2 central scenario is £1.3m (2019 prices, 2020 present value) combining all the costs detailed above. Comparing costs and benefits, the total NPV is -£5.3m in the central case with -£12m and £1.5m in the low and high cases respectively. See below for a detailed explanation of each impact.

All costs detailed under option 1 apply to option 2. To avoid repetition, we only present the additional impacts to option 2 in section 11.2 and have referred to the calculation of the impacts under option 1 where relevant. Note option 2 is still compared to the same 'do-nothing' baseline.

11.2 Calculations of the monetised and non-monetised impacts

11.2.1 Monetised Costs

Please refer to the monetised costs in section 10.2[29] for more details on monetised costs of Option 2. The additional monetisable costs that are only incurred under Option 2 are presented below.

11.2.1.1 Damage Survivability

In addition to the costs to post-damage survivability requirements under option 1 (see section 10.2.9), Option 2 will require more vessels, Category C (Non-Tidal) vessels and Category B vessels, to be fully compliant with current post-damage survivability standards for new vessels. We have estimated this adds a further additional 89 vessels that are affected by the regulations, bringing the total affected to 293. See Table 27 for a full breakdown of vessel affected.

Table 25: Overview of the number of vessels that do not meet new damage survivability standards

Vessel Type	Number of Vessels Affected
Class V (C) - 'Tidal'	83 (included under Option 1 & 2)
Class VI & VI(A)	121 (included under Option 1 & 2)
Class V (C) – 'non-tidal'	38 (Option 2 only)
Class V (B)	51 (Option 2 only)
Total	**293**

Table 26 first presents the additional costs related to the further 89 vessels that are exclusively impacted by option 2, then a total cost which represents the total cost under option 2 compared with the baseline. For example to calculate the additional cost of yard work under option 2 in the central scenario, we take the Yard cost for the average vessel, £4,500, and multiply this by the number of additional vessels, 89, to estimate a total additional cost of £401,000 (rounded). To compare the total cost of option 2 against the baseline, presented in the last row below, we add the costs presented here to the existing costs for the 204 vessels affected that are affected under Option 2, detailed in section 10.2.9.1.

Table 26: An overview of indicative costs of damage survivability requirements

Cost	**Low**	**Central**	**High**
Average Consultancy Cost per Vessel	£4,500	£5,000	£5,500
Average Yard Cost per Vessel	£900	£4,500	£5,700
Average MCA Cost per Vessel	£2,600	£2,900	£3,800
Total **additional** Consultancy Cost	£399,000	£444,000	£485,000
Total **additional** Yard Cost	£78,000	£401,000	£505,000
Total **additional** MCA Cost	£231,000	£258,000	£338,000
Total additional Cost above option 1	£709,000	£1,102,000	£1,328,000
Total Cost	**£2,333,000**	**£3,629,000**	**£4,373,000**

Source: As per section 11.2.1.1 above

[29] See 10.2.1.1, 10.2.2.1, 10.2.3.1, 10.2.4.1, 10.2.5.1, **Error! Reference source not found.**, 10.2.7.1, 10.2.8.1, 10.2.9.1, 10.2.10 for the calculation of the monetised costs that are included under both Option 1 and Option 2.

Calculations for option 2 have followed the same approach as under option 1. The main driver of the difference in costs between options 1 and 2 has been the reduction of scope for damage survivability requirements and associated familiarisation costs. These requirements under option 2 cover 204 vessels compared to 83 under option 1, resulting in a proportionate change in the level of total costs. Fire pumps and servicing costs under option 2 also drive additional costs up.

11.2.2 Non-monetised Costs

Please refer to the non-monetised costs in section 10.2[30] for more details on the non-monetised costs of Option 2. The additional non-monetisable costs that are only incurred under Option 2 are presented below.

11.2.2.1 Assessment against Classification Society Rules

As well as encompassing all of the modifications proposed for Option 1 there is a fundamental difference with the newer regulations that vessels would be required to comply with under Option 2. Newer regulations must have their hull and machinery built to Classification Society rules. A classification society is a non-governmental organization that establishes and maintains technical standards for the construction and operation of vessels and offshore structures. For certain larger vessels this means that they must be surveyed and certified by a Classification Society, for other vessels the assessment can be done by MCA utilising the rules of a Classification Society. The Classification Society requirements cover such fundamental elements of vessel design as hull thickness and dimensions of key structural aspects as well as requirements for machinery. When a vessel is being built this does add an additional cost relative to not using Classification Society rules but as it is done from the beginning it is factored into the cost of build.

To respectively reassess an existing vessel against Classification Society rules is significantly more difficult as it is often hard to determine what it was originally built to. All vessels would need to prepare a pre-classification information pack including detailed plans of the vessel structure and systems. It has previously been estimated that the cost of production of this package is in the order of £30-40k per vessel and that is before the survey and assessment costs of the Classification society. As the vessels in the scope of this review are all certified by the MCA it means that at some point – either at build or on conversion to a passenger vessel their hull structure and machinery has been assessed and accepted by the MCA, this means that the re-assessment against Classification Society rules that would be required by Option 2 is a duplication of cost and effort for operators.

As outlined above retrospective assessment against Classification Society rules would impose a large burden and duplication of cost and effort. For vessels required to be assessed by the Classification Society themselves (as opposed to the MCA) there is also the issue that Classification Societies can be reluctant to take on such vessels as they may not have appropriate rules for assessment and the vessels will not have been built to modern rules. Classification Societies generally view the approval of such vessels as a liability due to not having been involved at build and will often decline involvement.

11.2.2.2 Compliance

Category B vessels will likely have a difficulty complying with the additional post-damage survivability requirements that they will have to adhere to under Option 2 as they are generally quite dimensionally constrained due to width of waterway and bridges etc. We have not been able to monetise this due to having a lack of reliable data of vessel replacement costs, the type and number of vessels that would need replacing and likelihood that the cost of replacement may be too high for individual operators to purchase a replacement. This is however likely to be a significant cost above Option 1 with a relatively small safety benefit.

There are many other areas where requirements of newer Regulations differ from those in existing regulations which may result in the older vessels incurring additional cost for compliance. Such differences occur in areas including guard rail heights and the number of stairways to access upper decks. Some of these requirements would be challenging to retrospectively apply – for example fitting an extra stairway. A full gap analysis and assessment of uplift in cost has not been carried out for Option 2 as to do so is not considered proportionate

[30] See 10.2.1.2, 10.2.2.2, 10.2.3.2, 10.2.4.2, 10.2.5.2, **Error! Reference source not found.**, **Error! Reference source not found.**, 10.2.7.2, 10.2.8.2, 10.2.9.2 for the mon-monetised costs that are included under both Option 1 and Option 2.

given the costs will apply to each vessel individually. This would be a complex and costly process to undertake to obtain the necessary data.

11.2.3 Other non-monetised costs of Option 2

It is believed that, at least in some cases, if certain older vessels are taken out of service as a result of the Regulations, firms operating newer vessels may not enter the market on the affected routes – or at least not immediately.

This could have an adverse effect on the revenue of tourist attractions and local businesses served by those routes, especially where convenient alternative methods of transport are less enjoyable, limited in their availability or not available at all. Insufficient data is available to quantify these impacts, and it would not be proportionate to collect such data, although it is clear that the impact would be greater under Option 2 than Option 1, as Option 1 is more limited in scope and will therefore threaten the viability of fewer vessels . Also, when served by water transport, it is often difficult to ascertain whether particular visitors to these attractions and businesses are drawn in the attractions/ businesses themselves or by the method arriving at them, or a mixture of both.

Concerns have also been raised that if vessels are taken out of service this could reduce the revenue of some boatyards, which is also not quantifiable.

Although it could be argued that these are indirect impacts of the proposals, they are nevertheless a concern for some organisations.

11.2.4 Monetised Benefits

Please refer to section 10.2.1.3 for the monetised benefits of option 2. The benefits calculations remain the same for both options as the monetisation of benefits was only deemed to be reliable and proportionate for the aspects related to life raft requirements.

11.2.5 Non-monetised Benefits

Please refer to the non-monetised benefits in section 10.2[31] for more details on the non-monetised benefits of Option 2. The additional non-monetisable benefits that are only incurred under Option 2 are presented below.

Option 2 would confer some safety benefit over Option 1 most notably in extending the post-damage survivability requirements to Class V(B) vessels and Class V(C) non-tidal. It is considered however that such benefit will be small as vessels in these areas are at lower risk from incurring damage in the first place, principally due to lower risk of collision due to lack of larger vessels.

Whilst there are other areas of the newer Regulations where there will be a safety benefit it is considered that the changes proposed under Option 1 encompass the key safety areas where the changes are most needed and that the safety benefits of making the additional changes that Option 2 requires will not outweigh the additional costs.

From the point of view of certification and enforcement a theoretical benefit of Option 2 is that there would no longer be separate Regulations in force and it would be much simpler to understand what each vessel must do. In reality if Option 2 were pursued it is considered likely that many vessels would be carrying exemptions and in effect have a bespoke compliance regime. Option 2 would remove the incentive to maintain old vessels but potentially at the expense of putting much of the existing fleet out of viable economic operation.

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[31] See 10.2.1.4, 10.2.2.3, 10.2.3.3, 10.2.4.3, 10.2.5.3, **Error! Reference source not found.**, **Error! Reference source not found.**, 10.2.7.3, 10.2.8.3, 10.2.9.3 for the mon-monetised benefits that are included under both Option 1 and Option 2.

12 Proportionality

The impact is not expected to fall disproportionately on a specific group. However, it is recognised that there will be substantial impact across the domestic passenger shipping industry. The effect of the proposed policy has been quantified and monetised wherever possible. Where it has not been possible to monetise the costs and benefits of the proposed regulation, the Impact Assessment has included a qualitative description of the impact.

Costs have not been monetised where there is a very low impact or insufficient information available. Information may not be available due to substantial differences between vessels as they have been built or modified to individual specifications and operate under different operating models and geographic areas. To fully monetise all aspects of the impact, substantial engineering evaluation of each vessel would need to be carried out. To do this, substantial data would need to be gathered, in some instances the required information would need to be produced at the expense of the operators. It is judged that this level of analysis is not proportionate or justified. Similarly, fully monetised costs are not possible due to the lack of vessel specific information.

Data is available, through records and certificates compiled and kept by the MCA. This data has been used throughout this assessment. FSA and cost benefit analysis has previously been carried out and incorporated into this impact assessment.

Formal research into technical aspects has been carried out in the past but has yielded little worthwhile results. Therefore, no new research has been commissioned as it is not felt that this would be cost-effective.

12.1 Certainty of impacts

For many the proposals, the impacts are relatively certain. For some aspects, where specific information is not available, or engineering analysis is required first, the impact is less certain.

It is not possible to give an exact figure for the number of vessels affected by some aspects of the proposed regulations. Where this is the case, sensible technical assumptions have been about the vessels to produce estimate which is as accurate as possible.

12.2 Policy and evidence development

At the early stages of policy development industry working groups were established with operators who may be affected. The working groups were made up of different size of operators which reflect the industry and industry associations. Three working groups were held between 15th April 2016 and 21st July 2016 with a varying number of operators and industry representatives. These groups identified areas in which regulations could be amended and the impact this may have.

Following the working groups an information gathering questionnaire was sent out to industry on 1st December 2016. Twenty-four responses were gathered which represents 94 vessels. This questionnaire informed the impact of the regulations and allowed the policy to be refined where necessary.

Further analysis was carried out by way of industry visits to gather high quality information and refine policy options. This consisted of five visits to operators.

This work was specific to the review and in addition to regular stakeholder engagement as part of the MCAs ongoing commitment to the industry which primarily consists of the Domestic Passenger Ship Steering Group with 42 members and Ro-Ro steering group with 12 members.

Monetised costs were gathered from the wider industry through the information gathering exercise. This was refined using freely available information on the cost of equipment. Targeted consultation and information gathering was carried out with equipment suppliers' shipyards and operators to give fully monetised cost for indicative vessels.

A first formal consultation was launched on 6 November 2018 and lasted until 29 January 2019. During November 2018, shortly after the start of that consultation, a Workshop was held comprising domestic passenger vessel industry safety groups and individual operators. In addition to the discussions during the Workshop, 75 responses were received during the consultation period, which were analysed and the

proposals were reviewed in the light of these, and another Workshop was held on 26 March 2019. As a result of this feedback several revisions were made to the proposals, namely:

a) the scope of application of the damage stability requirements was narrowed, such that Class VI vessels were excluded and Class V vessels operating on non-tidal Category C waters were also removed from scope. Additionally, Class V vessels operating on low risk tidal waters will instead be permitted to carry out a risk assessment;

b) the containment requirements were removed on the basis that, once the fire detection and fixed firefighting requirements have been implemented, further containment measures would not achieve a significant increase safety beyond what will have already been achieved by the former two fire safety measures;

c) the requirement for powered fire pumps on larger vessels was removed on the basis that it would not achieve a significant increase in safety above the other fire safety measures. The proposed bilge pumps requirements have not been altered;

d) the facility for an Exemption from the lifejackets requirements was introduced for vessels on Category B waters, but only in cases where the vessel owner could satisfy the MCA surveyor in attendance that the optimum evacuation method would achieve dry-shod evacuation to the bank of the river or canal and that the supply of lifejackets would not enhance (or might even hinder) this optimal process.

e) The phase-in provision has been kept at 2 years, but a flexibility has been added such that this can be extended if an owner produces an implementation plan which is agreed by the MCA. This would ned to demonstrate why the 2-year deadline could not reasonably be met, but that the plan progresses the changes as quickly as reasonably possible.

13 Risks

13.1 Risks on implementing the proposed changes

The preferred option (option 1) is a tailored approach and would address the most significant safety gaps between regulations for new and existing vessels without requiring a wholesale reassessment of the vessel.

These measures are intended to align the safety standard applied to new and existing vessels in key areas and provide an improvement in safety as identified through a reduced number of fatalities in the event of a major accident. Each accident is different and there is no counterfactual, so the outcomes are difficult to measure to value success, therefore there is a risk that post implementation review will be difficult (see section 16). The proposed changes may not prevent catastrophic accidents from occurring, such as capsizing of vessels following a collision, and in particular there is a risk that an incident occurs to a vessel to which the new requirements are not applied, i.e., the gap between older and newer vessels has not been fully closed. There is a further risk that some operators will find the required changes uneconomical to implement as identified throughout the impact assessment.

13.2 Risks of doing nothing

The consequences of doing nothing is that standards cannot be raised. Any improvements would need to be voluntarily adopted which would lead to an uneven ‘playing field’ for operators and would mean that safety improvements on the worst vessels could not be enforced. The identified risks would thus be perpetuated.

Doing nothing would not address the safety gaps between older vessels and those built to new standards. Whilst major improvements have been achieved since the Marchioness tragedy the reality is that safety gaps in some areas mean that the consequences of such an incident have not appreciably changed. Without regulatory amendment, market failures will continue, and an unnecessarily high level of risk of a high-impact accident with extensive loss of life will therefore remain.

14 Wider impacts

14.1 Equality Impact Assessment

Persons of reduced mobility will benefit from the carriage of liferafts and lifejackets in the event of an emergency. The MCA considers that there are no other effects, positive or negative, on outcomes for persons in relation to their age, disability, gender assignment, pregnancy and maternity, race, religion or belief, sex and sexual orientation.

14.2 Small and Micro Business Assessment

A large proportion of the domestic passenger vessel sector comprises small firms and the new regulations apply across the board, so no one area of this sector is penalised over others. The vessels themselves vary enormously: wooden boats, steam ships and "tunnel" boats all feature in the population, and the effects of the measures vary according to the type of vessel. The thing they all have in common is that they are older vessels, as the whole purpose of the proposals is to bring safety standards in older vessels as close as possible to the standards with which newer vessels have to comply.

The proposed requirements reflect the risks faced by vessels operating on different categories of water. The benefit and costs associated with the requirements vary depending on the area of operation for a specific vessel. It is expected that all businesses, regardless of size, will be affected the same way. Data from the Office for National Statistics (ONS) provides a breakdown of the number of UK businesses for sea, coastal and inland passenger water transport by employment size band.

Table 27 : The number of UK businesses by employment size band and SIC Class (2020)

SIC Class	**Employment Size Band**							
	0-4	**5-9**	**10-19**	**20-49**	**50-99**	**100-249**	**250+**	**Total**
5010 : Sea and coastal passenger water transport	435	50	30	10	5	5	5	540
5030 : Inland passenger water transport	130	30	15	15	5	0	0	190
Total	565	80	45	25	5	5	5	730

Source: ONS, UK business; activity, size and location: 2020[32]

The requirements to which this Impact Assessment refers has been developed in consultation with the Domestic Passenger Ship Steering Group (DPSSG). The formal consultation exercise was be directed at all relevant vessels owners and will seek to identify further information from this sector on potential costs to small businesses.

Following the first consultation, the proposed measures were reviewed, and some classes of vessel were removed from scope of the damage stability proposals, and further routes for exemption was introduced. This will ease the burden on a number of operators including some smaller firms. However, this has only been possible where the government considers that safety levels are not compromised by the exclusion or exemption of such vessels as the safety of the fare paying public remains paramount.

Competition Assessment

Competition impacts of the proposed amendments are uncertain, however following CMA guidance an assessment of competition impact was undertaken, see annex F. The perceived scale of competition effects is considered to be small. Whilst proposed safety improvements will generate costs to businesses, most of whom are small, owner-operated, it is considered that this will provide greater clarity of risk to consumers, alleviating problems of making clear decisions regarding trips based upon risk of an accident, through harmonising standards as far as reasonably practicable.

Some stakeholders raised concerns around impacts upon consumer choice if some operators went out of business. The market for passenger vessels is a localised industry and we are currently reviewing the fleet

[32] UK Business; activity, size and location:2020 - https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/ukbusinessactivitysizeandlocation/2020

size and distribution. The overall impacts upon consumer choice are perceived at this stage to be minimal due to the variety of substitute forms of transport, number of vessels available and the potential for newer vessels to be put into service on pre-existing passenger vessel routes where this is economically viable.

The proposed requirements should have a small positive impact on competition, as it prevents owners of older vessels from undercutting newer vessels by complying with a less burdensome safety regime. However, this will need to be balanced against the fact that these requirements could lead to a reduction in the number of suppliers, where vessel owners are unable to make their vessels comply with the new requirements and are unable to procure a new vessel.

14.3 Justice Impact Test

A separate JIT has not been developed as no offences or penalties are being introduced or re-made by the Regulations..

14.4 Family Test

This measure is not expected to impact families.

14.5 Health Impact Assessment

This measure is not expected to impact health.

14.6 Rural Proofing Toolkit

This measure is not expected to impact those in a rural setting unfairly.

14.7 Sustainable Development

This measure is not expected to impact sustainable development

14.8 Others

We believe there are no other significant wider impacts pertinent to this regulation.

15 Summary and preferred option with description of implementation plan

Option 1, the preferred option, implements technical safety standards in key safety areas which gives a comparable safety standard for new and existing vessels. Allowances have been made, where possible, for alternative arrangements which ensure the safety concern is addressed, without being prohibitively expensive. Although the NPV of the preferred option under the central scenario is negative, we believe the net impact of the non-monetised costs and benefits, especially around safety, would if quantified lead to a positive NPV.

We believe the additional benefits under Option 2, requiring vessels to be fully compliant with current regulations, do not provide value for money due to the excessive additional burden these elements will place onto businesses. Although we have not been able to fully quantify the extent of the additional cost through Option 2, the non-monetised costs are likely to be significant. A tailored approach considered under Option 1 meets our stated policy objectives at a minimum possible burden on industry.

It is planned to amend the relevant Statutory Instruments and Marine Shipping Notices to implement the proposed regulations. Vessels are surveyed and certificated annually and as a result we do not envisage additional monitoring will be required above current practices.

The regulations will be made as soon as possible and will be reviewed five years to assess the impact, the value of the guidance and whether anything can be done to improve the regime. A detailed Post Implementation Review (PIR) plan is included below. In the meantime, the MCA will continue to work with the industry to ensure practical implementation.

16 Post implementation review

1. **Review status:** Please classify with an 'x' and provide any explanations below.

	Sunset clause	X	Other review clause		Political commitment		Other reason		No plan to review

2. **Expected review date** (month and year, xx/xx):

1	0	/	2	6

3. **Rationale for PIR approach:**

Circle the level of evidence and resourcing that will be adopted for this PIR (see Guidance for Conducting PIRs):
low/ medium/ high

Please justify <u>why</u> you propose a low/medium/high evidence approach referring to the PIR guidance. When considering your proposal please note that the approach chosen should be proportionate to the scale of the regulation and that a lack of existing evidence is not a sufficient rationale alone for adopting a low evidence PIR.

Due to the fact that these Regulations are implementing the Grandfather Rights Review, which has been carried out following Lord Justice Clarke's Thames Safety Inquiry (MARCHIONESS), a Formal Safety Assessment of Domestic Passenger Ships carried out for the government and Marine Accident Investigation Branch (MAIB) recommendations, a low evidence approach is appropriate, as collecting additional data would not be proportionate.

Key Objectives, Research Questions and Evidence collection plans
Describe the main objectives of the regulation(s) under review as well as the key questions that will need to be researched to measure whether objectives have been successful. Next, consider any existing data/evidence sources that may help you answer this question as well as any new evidence that you may wish to collect, where proportionate.

Key objectives of the regulation(s) (add rows as appropriate)	**Key research questions to measure success of objective**	**Existing evidence/data** Please consider: a) The data/evidence *sources* b) The *timeframes* they reference	**Any plans to collect primary data to answer questions?** Please consider: a) *If and how* stakeholder views will be collected b) *Timeframes* for evidence collection c) Why collecting new data is (or is not) necessary/proportionate
Survivability of vessel in damaged state.	Have there been emergency incidents in which altered vessels remained afloat following hull damage?	MAIB/ PLA/ MCA/ other relevant local authorities collision data.	Collection of incident data from appropriate authorities.

Dry-shod evacuation of passengers in an emergency	Have there been incidents where dry-shod evacuation has been achieved due to Life-Saving equipment added as a result of the Regulations?	MAIB/ PLA/ MCA/ other relevant local authorities incident data.	Collection of incident data from appropriate authorities.
Detection and extinguishing of fire.	Have there been incidents where fire has been detected/ extinguished by equipment fitted because of these Regulations?	MAIB/ PLA/ MCA/ other relevant local authorities incident data.	Collection of incident data from appropriate authorities.
Detection and pumping of flood water.	Have there been incidents where flood water has been detected/ successfully pumped	MAIB/ PLA/ MCA/ other relevant local authorities incident data.	Collection of incident data from appropriate authorities.

Vessel Particulars					Annex A: Applicable Technical Standards for Passenger Ships on Domestic Voyages				
Area of operation	**Age of vessel**		**Hull construction material**	**Vessel Length[6]**	**UK Class III to VI(A) Regulations[4]**	**Directive 2009/45/EC, as amended**	**Existing Phased in Directive 2009/45/EC, as amended by Directive 2010/36/EU**	**Safety Code for Passenger Ships Operating Solely in UK Categorised waters (MSN 1823)[7]**	**Small Seagoing Passenger Ship (SSPS) Code[1]**
Seagoing	Any[2]		Not steel or equivalent	< 24m					X[1]
	"New"	Constructed on or after 1 July 1998;	Steel or equivalent	≥ 24m		X			
			Not steel or equivalent	Any	X				
	"Existing"	Constructed before 1 July 1998.	Steel or equivalent	≥24m			X[3]		
			Not steel or equivalent	<24m	X				
Non-Seagoing	"New"	Certified[7] on or after 6th April 2010	All	All				X	
	"Existing"	Certified[7] before 6th April 2010	All	All	X				

Notes:

1 This is a voluntary code introduced in June 2015 which provides a comparable standard to Directive 2009/45/EC, as amended by Directive 2010/36/EU and Directive 2016/844 and may be used as an equivalence to UK Class III to VI(A) Regulations. For further guidance see MGN 535 (M).

2 For new vessels operators are encouraged to use the Small Seagoing Passenger Ship Code in lieu of the Class VI/VI(A) regulations as the Code allows for greater plying limits.

3 The European Commission has agreed an equivalence arrangement under which “existing” UK Class III, VI and VI(A) ships (those constructed before 1 July 1998) may continue to operate under the UK regulations applicable to those classes, subject to certain conditions and restrictions. Details of this equivalence arrangement are set out in MSN 1811 (as amended or superseded).

4 The Merchant Shipping (Passenger Ship Construction: Ships of Classes III to VI(A)) Regulations (including MSN 1699 (M)), The Merchant Shipping (Life-Saving Appliances For Passenger Ships Of Classes III To VI(A)) Regulations and The Merchant Shipping (Fire Protection - Small Ships) Regulations.

5 The majority of the requirements for this code are made mandatory by the Merchant Shipping (Passenger Ships) (Safety Code for UK Categorised Waters) Regulations 2010 (SI 2010/680).

6 Loadline length

7 For the purpose of this Code a new passenger ship is any ship not holding a valid passenger ship certificate issued under the regulation 11 of The Merchant Shipping (Survey and Certification) Regulations 1995 (SI 1995/1210) on the date this Code enters into force. Transitional arrangements are permitted in some circumstances as outlined in SI 2010/680. A second edition of MSN 1823 applies to new ships built after 1 January 2018.

Annex B – Definitions

Category of Water

Category A - narrow rivers and canals where the depth of water is generally less than 1.5 metres.

Category B - wider rivers and canals where the depth of water is generally 1.5 metres or more and where the significant wave height could not be expected to exceed 0.6 metres at any time.

Category C - tidal rivers, estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2 metres at any time.

Category D - tidal rivers and estuaries where the significant wave height could not be expected to exceed 2 metres at any time.

Cold water shock - This is the uncontrollable reaction of the body when it is first submerged in cold water (15°C or lower). The water temperature in the UK is 6-10 °C in the winter to 15-20 °C in the summer. In initial submersion, the body will experience a gasp reflex, which is a rapid intake of air. This is followed by a fourfold increase in breathing rate and associated increases in heart rate and blood pressure, making some people susceptible to heart attacks. These symptoms will last up to 3–5 minutes during which even the fittest person is unable to swim or to focus on breathing. Wearing a lifejacket with the correct buoyancy is vital to survival.[1]

Without a lifejacket even the most competent swimmer will suffer from 'swim failure' after around 30 minutes of swimming in cold water. Research[2] has shown significantly longer survival times when using buoyancy aids or lifejackets.

[1] RNLI guide to lifejackets and buoyancy aid

[2] Tipton, M., Mccormack, E. & Turner, C., 2013. International Data Registration for Accidental and Immersion Hypothermia: The UK National Immersion Incident Survey – Revisited. Drowning, pp.921–923.

Annex C: MCA Formal Safety Assessment (FSA) (2001-2003) - Estimates of risk

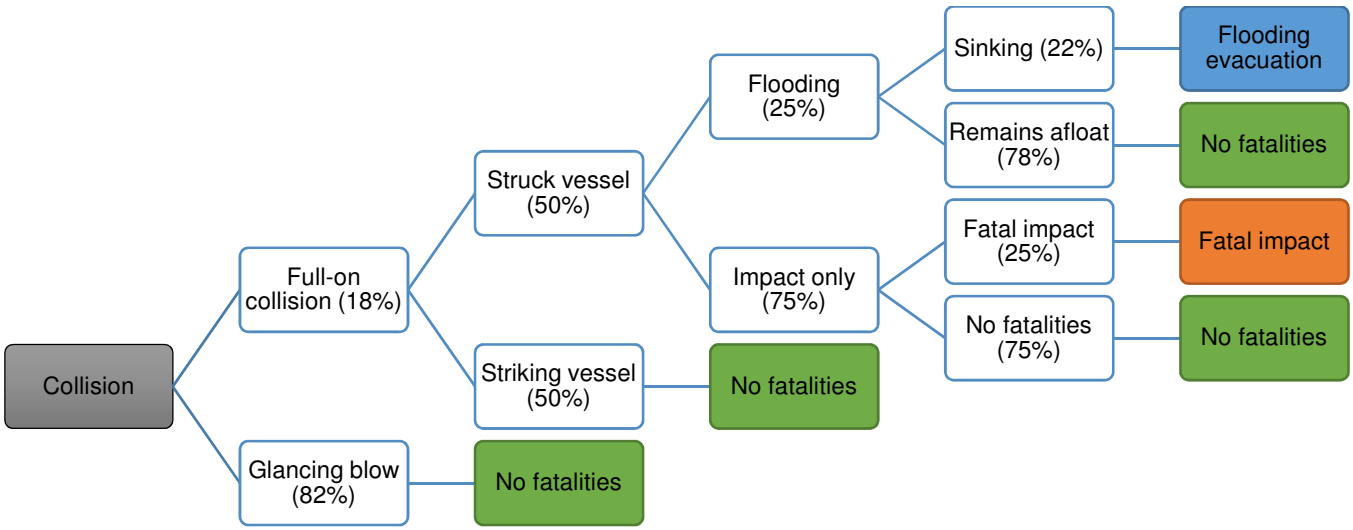
The FSA estimates that the individual risk of an injury, fatality, or accident:

Operating environment	Individual risk of passenger fatality per voyage	Individual risk of passenger injury per voyage	Risk of accident per voyage
Tidal / Estuaries	1.5×10^{-7}	3.6×10^{-2}	4.3×10^{-6}
Inland Waters	9.1×10^{-8}	2.0×10^{-2}	2.3×10^{-6}
Lochs and Lakes	1.4×10^{-7}	3.4×10^{-2}	4.1×10^{-6}
Coastal Waters	1.3×10^{-7}	9.5×10^{-2}	3.8×10^{-6}

The FSA also estimates the frequencies of various types of accident:

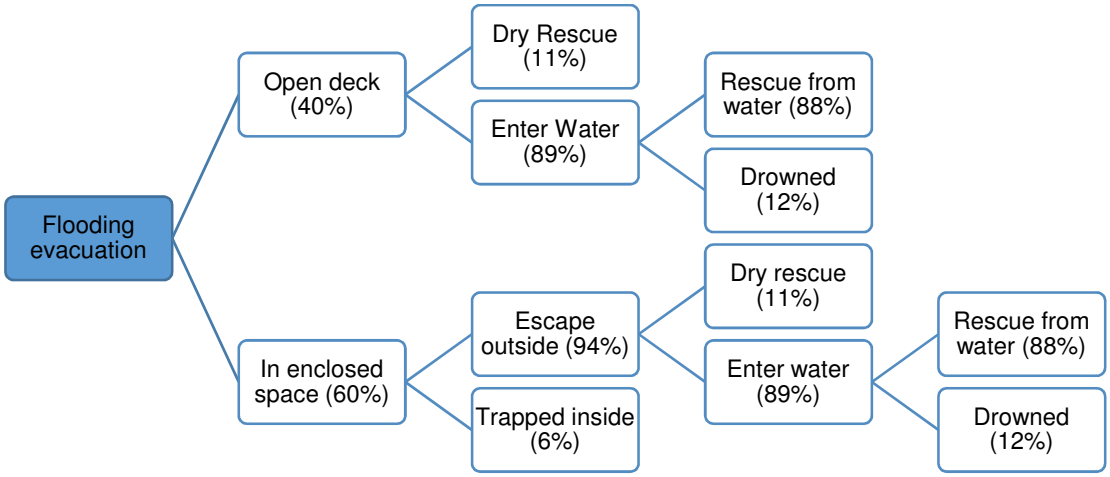
Accident category	Individual risk of passenger fatality
Collision	10%
Grounding	13%
Contact	49%
Flooding	1%
Fire	16%
Personal	11%
Total	100%

Annex D: MCA Formal Safety Assessment (FSA) (2001-2003) – Probability trees



This shows the various different outcomes from a collision and the probability of the outcome occurring. There are three outcomes; no fatalities, a fatal impact and an evacuation of a ship. If the impact is fatal or there are no fatalities the provision of liferafts is irrelevant. As such this analysis only looks at when an evacuation occurs.

A further event tree shows what happens when there is an evacuation and the chances of death:



This shows four outcomes, trapped inside the vessel, drowning, rescue from water and dry rescue (from the boat). For this measure it is assumed the provision of liferafts will not affect deaths by being trapped inside. In addition, if you are rescued from the water, you may gain value from being in a liferaft but there is no change in surviving rates. This measure therefore only takes into account lives that could be saved from a liferaft avoiding drowning.

SUMMARY OF PROPOSALS, AS REVISED FOLLOWING FIRST CONSULTATION

PROPOSAL A - Liferaft provision

1. The current Regulations allow certain vessels to carry liferafts for fewer than 100% of the persons on board (60%) and for the remaining capacity to be made up with buoyant apparatus. This means that, in the event of an evacuation, up to 40% of person on board may need to enter the water. This is out of step with requirements for new-build vessels.

2. **The original proposal** was to require all seagoing vessels and those operating on Category C and D waters to fit liferafts sufficient to accommodate 100% of the persons on board. This would allow for the evacuation of all persons on board into liferafts, without the need to enter the water.

Affected vessels – vessels on category C and D waters and seagoing vessels not currently fitted with liferafts to accommodate 100% of the persons on board.

Revision 1: This proposal has not been revised after the first consultation.

PROPOSAL B - Lifejacket provision

3. The Regulations for older vessels do not currently require lifejackets to be carried on vessels on Category B waters. For new vessels MSN 1823 requires all vessels to carry lifejackets or buoyancy aids except those operating only on Category A waters (where depth is generally less than 1.5m). Category A waterways are narrow and shallow (less than 1.5m deep) and consequentially the evacuation philosophy is based in the fact that persons on board can be evacuated directly to the shore. This is not the case in category B waters, where the waterway will likely be wider and deeper. In the unlikely event of persons having to evacuate the vessel they may need to enter the water (as some category B vessels have buoyant apparatus as opposed to liferafts). If persons are entering the water, then a lifejacket or buoyancy aid will greatly improve safety.

4. **The original proposal** was to require that vessels on Category B waterways carry buoyancy aids or lifejackets for 100% of the persons on board.

Affected vessels – vessels on category B waters not currently carrying lifejackets or buoyancy aids.

Revision 2: This proposal remains in place, but a revision has been added to allow flexibility for owners/operators of vessels operating in Category B waters who can demonstrate to the relevant MCA surveyor's satisfaction that in an emergency, persons can be evacuated to the bank and do not need to enter the water. Such vessels will be allowed an exemption from the new requirement.

PROPOSAL C - Lifejacket lights

5. The present Regulations for existing vessels do not require the fitting of lifejacket lights, lights are required for new vessels (from 1st January 2018) on category C and D waters when a vessel operates at night.

6. **The original proposal** was to require that vessels on Category C and D waters operating outside of daylight hours are fitted with lifejacket lights.

Affected vessels – vessels on C and D waters that operate outside of daylight hours.

Revision 3: This proposal has not been revised after the first consultation.

PROPOSAL D - Fire detection

7. The present Regulations for existing vessels do not require a fire detection system to be fitted in the machinery space – this is out of step with modern standards. A fire detection system would provide early awareness of any fire and hence a chance to swiftly extinguish the fire.

8. **The original proposal** was to require all enclosed machinery spaces and any passenger sleeping spaces on all vessels of Class III-VI(A) be fitted with a fire detection system. This would allow the early detection of fire in such spaces. Note that continuously manned machinery spaces would not require the fitting of additional detection under this proposal.

Affected vessels – all UK passenger vessels of Classes III-VI(A) that have enclosed machinery spaces and/or passenger sleeping spaces without a fire detection system.

Revision 4:

a) This proposal has been clarified since the first consultation, which did not make clear whether fire detection systems would be required to meet Marine Equipment Directive (MED) standards. The proposal now is that such systems will not be required to meet MED standards provided they comply with the BS EN 54 standard.
b) The proposal has also been refined in that the requirement for a fire detection system will not apply in machinery spaces which are permanently manned while the vessel is in operation.

PROPOSAL E - Fixed firefighting

9. The present Regulations do not require the fitting of fixed firefighting systems within main machinery spaces for all vessels. Fixed firefighting systems are a proven effective method of fighting fires within machinery spaces and are extensively required throughout modern standards.

10. **The original proposal** was to require a fixed firefighting system to be fitted in enclosed machinery spaces on all vessels of Class III-VI(A). Under this proposal, on smaller vessels with boxed engines the fixed firefighting requirement could be met with alternative arrangements (such as a permanently fixed fire extinguisher). Alternative arrangements would be conditional on the proviso that opening of the machinery space is not required to fight the fire, and that the surveyor is satisfied with the alternative arrangements.

Affected vessels - all UK passenger vessels of Classes III-VI(A) that do not currently have a fixed firefighting system fitted in the machinery space or, in the case of small vessels with boxed engine housings, an alternate means of fire-fighting that can be operated from outside of the space.

Revisions 5:

a) This proposal has been clarified since the first consultation, which did not make clear whether fixed firefighting systems would be required to meet Marine Equipment Directive (MED) standards. The proposal now is that such systems will not be required to meet MED standards but will need to be approved by the Secretary of State (via the Maritime and Coastguard Agency (MCA)).
b) The proposals has also been further refined in that the intention is now to amend existing Merchant Shipping (Small Ships: Fire Protection) Regulations 1998 in such a way as to

allow for any other firefighting medium which is not covered by the existing Regulation 8 (i.e. not water-based, gas based and high-expansion foam based) provided it is approved by the Secretary of State (via the MCA).

PROPOSAL F - Containment of fire

11. No requirements are currently in place for containment on the vessels affected by the Grandfather Rights proposals.

12. **The original proposals** were to:

a) require that machinery spaces be enclosed by A class divisions insulated to A30 standard;

b) require that galleys be enclosed by an A0 steel boundary;

c) require liferaft stowage positions, embarkation stations and assembly stations not be located in way of the machinery spaces or other spaces with a high fire risk unless the boundaries between the high-risk areas and the liferaft stowage position, embarkation station or assembly station is insulated to the A-30 standard of fire protection;

d) that liferaft launching stations be situated so as to avoid the ship's side in way of a machinery space or other space with a high fire risk unless the side of the ship is insulated to the A-30 fire protection standard.

Affected vessels – all UK passenger vessels of Classes III-VI(A) that do not currently meet the fire containment proposals above.

Revision 6: These fire containment proposals have been dropped. It is considered that, after the improvements in fire detection and fixed firefighting have been implemented, the containment proposals will not achieve a proportionate additional increase in safety in relation to costs incurred by owners.

PROPOSAL G - Mechanically powered fire and bilge pumps

13. Current regulations allow the use of hand pumps for fighting fires and pumping bilges.

14. **The original proposal** was to require fire and bilge pumping capacity to be met with powered pumps. The requirement would cease the use of hand pumps to fulfil capacity and would mean that pumping could be achieved with a more efficient use of limited crew and without the possibility of asking passengers to 'man the pumps'. Noting that the engines and arrangements of many vessels may be unsuitable for fixed powered fire and bilge pumps the proposal would allow for alternative arrangements for smaller vessels, such as additional portable bilge pumps and/or additional portable fire extinguishers.

Affected vessels - all UK passenger vessels of Classes III-VI(A) for which emergency bilge pumps and fire pumps are specified.

Revision 7:
1. The element of the proposal which requires powered fire pumps has been dropped.
2. The proposal for powered bilge pumps remains unchanged.

PROPOSAL H - Bilge alarms

15. At present there is no requirement to fit bilge alarms in compartments where bilge water can accumulate. Such alarms allow the detection of water ingress and hence can help to prevent catastrophic flooding or foundering.

16. **The original proposal** was to require bilge alarms in all compartments containing propulsion machinery and in any other compartment where bilge water can accumulate.

Affected vessels - all UK passenger vessels of Classes III-VI(A) that do not currently have bilge alarms.

Revision 8: This proposal has not been revised after the first consultation.

PROPOSAL I - Damage stability

17. Many existing vessels have no provision for post damage survivability. This means that these vessels are not required to survive relatively minor damage, such as a minor collision and subsequent hull failure.

18. **The original proposal** was to require all vessels operating on Category C and D waters and seagoing vessels to meet either the one-compartment damage stability standard or achieve compliance with the buoyancy test (110% buoyancy) standard through added buoyancy. Recognising the different operational environment of non-tidal Category C waters, it was proposed that vessels in these areas could continue to operate with their existing requirements subject to a risk assessment carried out to an agreed standard and covering an agreed set of minimum considerations. It was recognised that the determination of feasible options for providing a level of damage stability will be specific for each vessel affected and is likely to require consultant review (this is reflected in the impact assessment).

Affected vessels - vessels on category C and D waters and seagoing vessels applying the heel test standard or that meet the buoyancy test standard by having a watertight deck.

Revision 9: While the damage stability requirements themselves have not been changed, the application of the obligations has been narrowed such that:

a) Class VI vessels have been entirely removed from scope. These vessels have inbuilt operational restrictions in their certification and are therefore limited to daylight only operations between April and October in favourable weather only.
b) Class V vessels operating in daylight on Category C non-tidal waters have been removed from scope. This revision reflects the operational environment of these vessels and the nature of other traffic in the area.
c) Class V vessels operating in areas of lower operational risk – as demonstrated by a risk assessment carried out to an agreed standard and covering an agreed set of minimum considerations may be exempted from the new requirements.

PROPOSAL J - Phase-in requirements

19. **The original proposal** was to allow a period of two years following the making of the regulations to bring the requirements into effect. The necessary modifications would be required to have been made prior to the first survey of the vessel within two years of the application of the requirements.

20. With some of the proposals, a great deal of concern was expressed by operators during the first consultation about achieving compliance with some of the proposals within two years. The consensus for other proposals was that two years was not a problem. The view was also expressed that two years was too long.

Revision 10: The two-year phase-in period proposal had been retained, but with the flexibility that this can be extended if the owner draws up an implementation plan which is to be agreed by the Secretary of State (via the MCA).

NB: This avoids unnecessary delay but allows for flexibility where genuinely needed. It is also designed to avoid "clustering" where third parties (e.g., shipyards) are engaged by owners to carry out work required for compliance at a late stage in the phase-in period, as the risk associated with this is that demand may outstrip supply, rendering some vessels non-compliant on the date the obligations come into effect.

Competition Impact Assessment – Domestic Passenger Vessels Review of "Grandfather Rights"

Options

These are the options identified.

Option 1. Do nothing.

Option 2. **(Preferred Option):** Tailored amendment of the Regulations to achieve improvements in highlighted areas of public safety risk. Where possible, alternative arrangements will be adopted to address safety concerns, applying a risk-based approach to regulation whilst minimising impacts upon businesses as far as possible. Owners/operators will be required to make suitable adjustments onboard to meet the safety standards as set out in the amended regulations. This would provide a balance between the risk to life and impacts upon business across the breadth of the older passenger vessels. However, in some cases achieving an acceptable safety standard may result in significant cost or vessel obsolescence.

Option 3. Amend the regulations for older passenger vessels to mirror the standards that apply to new vessels under MSN 1823. This option would involve the complete re-evaluation of all older passenger vessels and modification to each to fully comply with all aspects of regulations equivalent to MSN 1823. This would achieve full retrospective compliance at much greater cost than option 1 and not follow a risk-based approach. Option 2 would be unfeasible for a large number of vessels, necessitating significant modification to the vessel itself and/or limiting activity/capacity. Costs would either be prohibitive and/or reduced income regardless of the level of risk reduction. The physical changes could also be impossible to achieve without redesigning or destabilising certain vessels, regardless of expenditure.

The recommended Option selected is the proportionate approach.

Proposals cover 606 vessels as outline in table 1 of the impact assessment. Of this potentially up to 83 could become obsolete as a result of new damage stability requirements. Consultation responses suggested 22 vessels could be made obsolete.

The impact assessment has assumed that obsolete vessels would be sold, repurposed and/or replaced.

Examination of the impact of the proposals on competition using the Competition and Markets Authority (CMA) framework

Do the proposals:

1. Directly or indirectly limit the number or range of suppliers

Yes, at least in the short term. However, in the context of vessel operators, few of the routes affected can be considered to be "essential services", and it is expected that where demand

continues to exist, alternative suppliers, operating more modern, therefore safer, vessels to enter the market to pick up the slack. Most vessels operate on tourist routes or as vessels which can be chartered for events such as parties/ celebrations. For the minority of vessels which are used simply for normal transport services, such as commuting, (land- based) alternatives are invariably available.

Boatyards may see an increase in business in the short term, as vessel owners seek contractors to bring their vessels onto compliance with the new standards, but a decline in the longer term as some of the older vessels are taken out of service so there will be less work around. Any longer-term decline in work is expected to be mitigated by the fact that more modern vessels will enter the market and provide some work, albeit that they may require less work in the way of repairs and maintenance until they age.

2. Limit the ability of suppliers to compete

No, in that any supplier is free to enter the market with a compliant vessel. Yes, in that a number of operators may not be able to adapt the vessels they currently operate and may not be able to afford to replace them.

3. Limit suppliers' incentives to compete vigorously

No, it is not believed that vessel operators will be disincentivized by these proposals.

4. Limit the choices and information available to consumers

Yes, in the medium term. However, in the context of vessel operators, few of the routes affected can be considered to be "essential services", and it is expected that where demand continues to exist, alternative suppliers, operating more modern, therefore safer, vessels to enter the market to pick up the slack.

In addition to a medium-term decrease in supply if some vessels are taken out of service, there may be a further, temporary, decrease in supply as a result of vessels being taken out of service temporarily for structural alterations to bring them into compliance with the new requirements. However, it is expected that these periods will be staggered – not least as the boatyards carrying out the work will not be able to accommodate all the vessels requiring work at the same time - and will therefore not make a significant difference to supply levels.

Mitigations

Currently the phase-in period proposed is two years from the date the Regulations come into force, with the possibility of extension if the MCA is satisfied that it would be impractical to complete the work within the two-year timescale and has agreed with the owner/ operator a plan for implementation. The plan would be expected to achieve compliance as soon as reasonably possible. This caters for the scenario where there is lack of availability of shipyard resource when the owner/ operator has done everything within their power to secure it in a prudent timescale for compliance.

There is not expected to be any source of funding to mitigate costs to vessel owners of making the modifications to their vessels required for compliance.

Subject to the outcome of the consultation and the proposed policy there is potentially a risk that competition will be distorted as a result of additional costs. However, the overall outcomes for

consumers are expected be enhanced because the safety of vessels is improved. Furthermore, the nature of competition may change, with all operators competing on a level playing field.

At present passengers may choose to travel on a vessel on the assumption that it is compliant with modern standards, or indeed may not actively consider the safety of the vessel. Should some vessels exit the market, there is scope for new vessels or operators to enter the market and compete on a different range of factors including more modern facilities.