THE SHIPPING INDUSTRY AND **MARINE SPATIAL PLANNING**

A professional approach – November 2013

Version 1

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THE SHIPPING INDUSTRY AND MARINE SPATIAL PLANNING

A professional approach

The Nautical Institute (NI) is an international representative body for maritime professionals involved in the control of sea-going ships. It provides a wide range of services to enhance the professional standing and knowledge of its members, who are drawn from all sectors of the maritime world.
www.nautinst.org

The World Ocean Council (WOC) is a cross-sector industry leadership alliance on Corporate Ocean Responsibility. The WOC is working with a wide range of ocean stakeholders, including commercial shipping, to create an intelligent and professional debate on how to best manage ocean resources and space to serve society in a sustainable manner and maintain a healthy ocean ecosystem.
www.oceancouncil.org

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Marine Spatial Planning (MSP) will become an increasingly important issue for the shipping sector over the next few years. Maritime professionals need to engage with other users of waterways space, from both a sea and shore perspective, and to take part in international, regional, national and local MSP debates, to ensure that the needs of the shipping sector are taken into full consideration and that the sector understands the needs of other marine users and resources.

The Nautical Institute, together with the World Ocean Council, has put together this operational guide to the risks and benefits connected with the shipping industry that should be considered during the MSP process. This guidance seeks to outline just some of the many opportunities for engagement and issues to consider. It should be noted that this guidance only summarises some of the main issues, but does however provide reference to other industry documents for further technical and procedural details.

This guide has been specifically produced to aid maritime professionals to participate in MSP developments. For the purpose of brevity the guide assumes a certain level of maritime expertise and has not sought to clarify a number of maritime terms and definitions. Should this guide be used by non mariners (and we hope it is) it may be useful to seek further explanation of some issues by those familiar with maritime operations.

What is Marine Spatial Planning (MSP)?

MSP is defined by UNESCO as a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that are typically specified through the political process. MSP is an element of sea use management.

Essential characteristics of MSP include that it is ecosystem-based, integrated, place-based or area-based, adaptive, strategic, anticipatory and participatory. It should be based on sound science and be an iterative process.

MSP has the potential to address the impacts of all activities in a specific place, so that marine ecosystems can be productive, resilient to change, and accommodate appropriate, responsible economic activities. Several countries are developing MSP approaches to address fragmented management schemes that do not adequately tackle the complex interactions of the myriad activities that occur simultaneously on and in waterways.

It needs to be recognised that there is a temporal aspect to MSP, such that the same water can be used for different purposes at different times / seasons. It also needs to be recognised that **each instance of MSP will be on a case by case basis**.

The MSP process

Marine Spatial Planning is a process that brings together multiple users of marine areas, including shipping, offshore energy, aquaculture, fishing, government, conservation and recreation, to make informed, co-ordinated decisions about how to use marine resources sustainably and reduce conflict between users.

More detail about this generic approach to MSP, its planning steps and management processes can be found in the UNESCO document *Marine Spatial Planning - a step-by-step approach* at http://www.unesco-ioc-marinesp.be/msp_guide. Examples of regional and national application of MSP are contained in the document. Although this approach may not be used by all authorities, the essence should be adhered to.

The table on page 5 outlines some of the major steps in MSP and indicates how the shipping community might participate to support the planning process.

The changing oceans

Growth in the world economy is expected to result in an increase in ship traffic in certain areas, all in decreasingly available sea space. In addition, there will be challenges for such waters from industries such as oil and gas, offshore renewable energy, commercial fishing, recreational craft, aggregate dredging, mining, fish farms and government imposed restricted areas.

MSP discussions are taking place at international, regional and national levels. However the finer details of where to place such activities as a fish farm, offshore wind farm, environmental protection zone or shipping lane will ultimately depend on local debate. This debate is likely to be both emotive and controversial. It is also important to note that MSP is the 'planning' stage and, although hugely important, will need to be integrated with the full management process including monitoring, enforcement and re-evaluation.

It is all too easy for non-mariners to assume that shipping operations and shipping lanes can be altered without consequence to accommodate new demands such as offshore energy or environmental protection. It is up to maritime professionals to engage in these debates at all levels to ensure that these changes and their consequences are fully understood and are taken into account when finding a solution, as unanticipated consequences may lead to accidents, environmental damage or commercial losses. In some cases the rerouteing of a shipping lane may be justified in order to provide energy and food to a local community. In other cases, a proposal for altering shipping operations may increase the risk of collision or grounding to an unacceptable level, increase shipping costs or change the commercial dynamics of a regional area so that ports or shipping services become uncompetitive.

Developing a common vision for the use of sea space in a particular location is essential to the successful outcome of the MSP process and any and all debates and decisions about use allocation should be based on this common goal. An approach, when conducting training for those participating in MSP, could be scenario development, in which stakeholders are challenged to provide their own vision and then invited, as a group, to find a common starting point for the MSP process.

Maritime professionals, including Nautical Institute members, will need to participate in the discussion and determination of this common vision and the subsequent debates on allocation of uses at international, national and local levels. The aim is to explain the current situation and to ensure that the marine space and resources are used to best support society, they are used sustainably and marine risks are understood and addressed.

While there are many industries competing for the use of waterways and resources, some of them have issues in

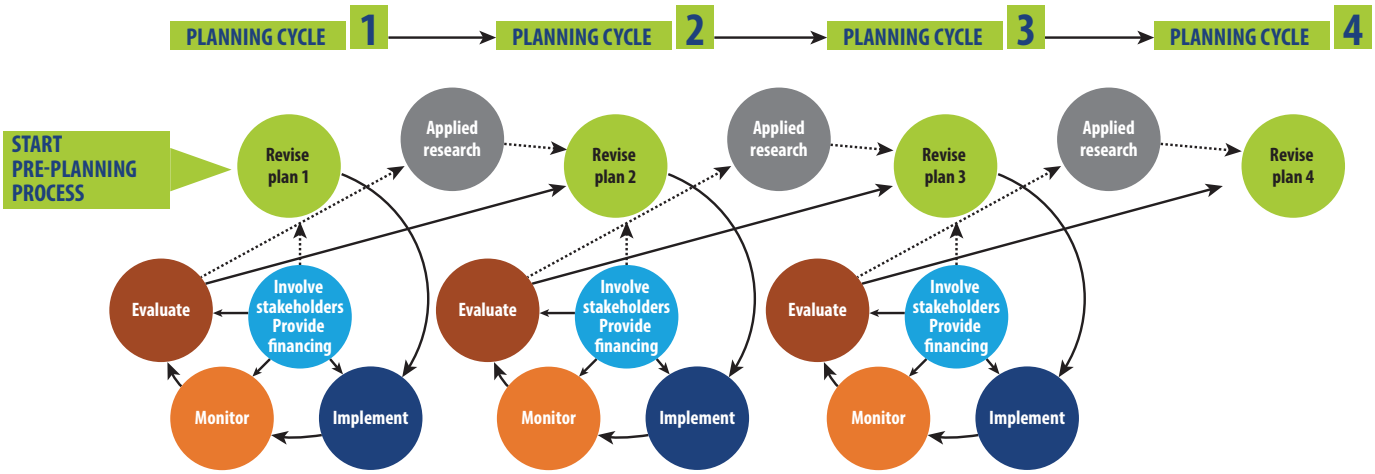


Figure 1 – The UNESCO continuing MSP planning cycle

HOW SHIPPING CAN CONTRIBUTE TO THE MSP PROCESS

STEP	MANAGEMENT PROCESS AND OUTCOME (UNESCO)	SHIPPING CONTRIBUTION
1	**Identifying need and establishing authority**	These planning steps are unlikely to involve stakeholders from the shipping industry
2	**Obtaining financial support**	
3	**Organising the process through pre-planning**	
4	**Organising stakeholder participation** The output is expected to be a plan indicating who, when and how to involve stakeholders throughout the marine spatial planning process	There are a number of maritime shipping stakeholders who might be consulted within this process. These include but are not limited to port authorities, Vessel Traffic Services (VTS), lighthouse authorities, pilots, local/national maritime administrations, shipowners/managers, local mariners, local shipping organisations, maritime academies and NI Branches
5	**Defining and analysing existing conditions** Outputs are expected to include: ● inventory and maps of important biological and ecological areas in the marine management area ● inventory and maps of current human activities (and pressures) in the marine management area ● assessment of possible conflicts and compatibilities among existing human uses ● assessment of possible conflicts and compatibilities between existing human uses and the environment	In addition to the local stakeholders, data to define and analyse the existing conditions should include Automatic Identification and Tracking (AIS) data, Radar, visual surveys, and may also include data from ship reporting schemes, satellite tracking, meteorological offices and data held by such bodies as local ports, VTS and pilots
6	**Defining and analysing future condition** Outputs are expected to include: ● a trend scenario illustrating how the MSP area will look if present conditions continue without new management interventions; ● alternative spatial sea use scenarios illustrating how the management area might look when human activities are redistributed based on new goals and objectives ● a preferred scenario that provides the basis for identifying and selecting management measures in the spatial management plan (Step 7)	In order to define future conditions, in particular, port authorities, ship operators and mariners should be consulted. Potential changes to shipping without any MSP changes or with the variety of MSP options available should be taken into consideration, together with control measures to mitigate changing risk.
7	**Preparing and approving the MSP** Outputs are expected to include: ● an identification and evaluation of alterative management measures for the spatial management plan ● identification of criteria for selecting alternative management measures ● a comprehensive management plan, including if needed, a zoning plan	The plan should identify desired outcomes or observable behavioural changes that represent the achievement of a goal. In terms of shipping, these should be Specific, Measureable, Achievable, Relevant and Time Bound
8	**Implementing and enforcing the MSP** The output is expected to be a clear identification of actions required to implement, ensure compliance with, and enforce the spatial management plan	Outcome of the MSP should be clearly communicated to all maritime transport both locally and internationally as appropriate, and comply with relevant IMO, IALA and IHO recommendations for harmonisation. Such communication should also identify any new responsibilities for ships or shore-based operators
9	**Monitoring and Evaluating performance** Outputs are expected to include: ● a monitoring system designed to measure indicators of the performance of marine spatial management measures ● information on the performance of marine spatial management measures that will be used for evaluation ● periodic reports to decision makers, stakeholders, and the public about the performance of the marine spatial management plan	The effects of MSP implementation on shipping should be monitored in terms of ship tracking (AIS, Radar, visual surveys), safety issues (accidents / near misses), and any impact on local or regional commercial shipping concerns
10	**Adapting the spatial management process** Outputs are expected to include: ● proposals for adapting management goals, objectives, outcomes and strategies for the next round of planning ● identification of applied research needs	Once a plan has been implemented, maritime shipping interests should use the monitoring process to identify the need for future change or refinement. Consideration may be given to proposals for adapting management goals, objectives, outcomes and strategies for the next round of planning

common that provide the basis for engaging and addressing them in a co-ordinated, cost effective manner, such as ship strikes on marine mammals or ocean noise. Within companies, there is a need to co-ordinate across business unit 'silos' relevant to operations or policy roles for waterways, in order to improve the efficiency of marine operations and increase co-ordination of waterway related work.

It is also important to recognise that MSP is not just a one-off activity, and that it must be adoptive, flexible and iterative, to take into account changes in the environment, commercial activities, social demands and even changes in government policies. The marine spatial plan should specify achievable goals that can be monitored, evaluated, enforced and, when necessary, improved.

Why shipping must get involved

Without shipping industry involvement there is a significant risk that MSP will not include full consideration of the existing and potential economic activities in the area under consideration, bearing in mind that the shipping footprint in the waters under consideration may not be as large as other maritime interests. In addition, the maritime industry often has scientific information and data on resources and ecological processes that may not otherwise be available to planners. Constructive maritime industry involvement in the MSP process requires sustained, systematic efforts to build relationships with the relevant stakeholders. This could take place at the local, national or regional level, e.g. within the Baltic Sea. In addition, MSP is now being adapted for consideration in international waters, with significant implications for international shipping.

As a major user of waterways and resources, the shipping industry must constructively engage with MSP discussions and stakeholders to ensure that the process is well informed and balanced. Unfortunately, those currently involved in MSP are often not involved in key shipping sector planning developments and so are not engaged in a constructive, co-ordinated manner that brings together the full range of industries operating in the marine environment. Maritime professionals, including Nautical Institute members, will need to participate in these debates at international, national and local levels. The aim is not to defend the status quo, but to ensure that the seas are used to best support society, that they are used sustainably, and that risks are understood and addressed.

Shipping industry involvement in MSP could be constrained by a number of factors, including:

1. Lack of understanding of the MSP process and momentum behind the input to MSP from others.
2. Limited engagement in the governmental and multi-stakeholder processes where MSP is being developed.
3. Lack of means for engaging the broader maritime business community on marine management and sustainability issues.

It is vital that any form of MSP requiring change to regulations affecting shipping is made in full collaboration with the shipping industry. Speaking at *The Economist* World Ocean Summit in 2012, Spyros Polemis, Chairman of the International Chamber of Shipping (ICS) emphasised that "Politicians should always consult with the industry when considering new regulation for shipping in order to avoid inefficient outcome." It should be emphasised that the International Maritime Organization (IMO) is recognised as the only international body for developing guidelines, criteria and regulations on an international level for ships' routeing systems.

THE MARINE SPATIAL PLAN SHOULD SPECIFY ACHIEVABLE GOALS THAT CAN BE MONITORED, EVALUATED, ENFORCED AND, WHEN NECESSARY, IMPROVED

Legal framework

There is a substantial legal and policy framework relevant to the development of MSP for the global ocean 'commons'. The key international legal regime that needs to be taken into account is the United Nations Convention on the Law of the Sea (UNCLOS), which sets out a State's rights and responsibilities, both in zones subject to coastal State sovereignty (internal waters; archipelagic waters and territorial seas up to 12 miles offshore) and jurisdiction (the Exclusive Economic Zone up to 200 miles offshore and the continental shelf) and in Areas Beyond National Jurisdiction (ABNJ - the high seas and the seabed beyond the continental shelf).

UNCLOS is a treaty among countries that have become party to this international legal instrument. The UN Division of Ocean Affairs and the Law of the Sea (DOALOS) administers the UNCLOS processes, which includes regular meetings of the parties to the convention. The International Maritime Organization (IMO), and other UN agencies addressing issues related to the ocean, all operate within the legal context that UNCLOS has created.

UNCLOS provides that all States are free to use the high seas with due regard for other States' interests. These freedoms include navigation, fishing, marine scientific research, the laying of undersea cables and pipelines, and the construction of artificial islands. High seas freedoms must be exercised under conditions laid down by UNCLOS, including general obligations to protect and preserve the marine environment and to conserve and manage high seas living resources.

UNCLOS also contains a general obligation for States to protect and preserve the marine environment, which applies both within and beyond national jurisdiction. States must take, individually or jointly, all necessary measures to prevent, reduce and control pollution from any source, including land-based sources, pollution of the atmosphere, pollution from vessels, pollution by dumping, pollution from installations and devices used in exploration or exploitation of the natural resources of the seabed, and the intentional or accidental introduction of alien species.

While UNCLOS does not explicitly provide for MSP, States are required to take measures necessary to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened, or endangered species. It also covers responsibility and liability for damage caused by pollution of the marine environment, including in the ABNJ (areas beyond national jurisdiction). In addition, UNCLOS provides for monitoring and environmental assessment, especially regarding the risks or effects of marine pollution and to assess the potential effects of planned activities under their jurisdiction or control that may cause substantial pollution or significant and harmful changes to the marine environment.

Governments are currently negotiating the possibility of an 'implementing agreement' on UNCLOS that is likely to include the means for MSP to be developed for international waters. The World Ocean Council has been the only presence of maritime industry in these UN discussions.

The regional, national and local basis for MSP, or other forms of sea space allocation, is being developed at these various geographic scales in many parts of the world.

ANNEX A contains further detailed references to legal frameworks developed by the Shipping Advisory Board North Sea and the Netherlands Ministry of Transport.

ISSUES TO CONSIDER

After making the decision to participate in the MSP process, maritime industries should bring forward the items that are most vital to their continued operation, business success and efficiency while also being prepared to better understand the points of views and needs of other industries, the environment community, the natural resources and government. The result of a good MSP process is the better understanding and accommodation for the needs of others for sea space.

Below are some suggestions for the shipping industry when engaging in MSP, including suggested input for the planning process.

Manoeuvring characteristics

When considering the rerouteing of shipping lanes or the placement of MSP limitations on sea space i.e. aquaculture, off shore energy installations, the manoeuvring characteristics of vessels must be considered both for normal and abnormal conditions. The following issues should be considered, for the most difficult to manoeuvre ships anticipated in the area:

- Adequate sea room to avoid collision and comply with COLREGS. Route planners should take into consideration anticipated traffic densities, reduced visibility and the presence of leisure craft and increased traffic from craft supporting the offshore installations;
- Ship characteristics such as transfer and squat will also need to be taken into account when addressing sea room and under keel clearances (UKC).
- Adequate sea room for large vessels to make a round turn or hove to;
- Heavy weather: ships may need to find shelter from a lee shore or need access to a safe anchorage;
- Heavy weather also reduces visibility making navigation and the ability to spot other vessels or navigation aids either visually or with radar more difficult.
- Interference on radar displays created by wind farms;
- Deviation from course: ships can also be expected to make unplanned deviations from course or track due to unforeseen circumstances, in addition to weather, these might include malfunctions, emergencies, search and rescue operations or evacuations;
- Allowance must be made for vessels constrained by their draft, vessels limited in their ability to manoeuvre, manoeuvring to pick up or drop off a pilot, or vessels involved in ship to ship (STS) transfer.

Non mariners often consider that offshore sea lanes do not need much more 'corridor width' than in-port channels, which may be measured in hundreds of metres. They fail to take into account that service and support levels in port differ to those offshore, as do navigational accuracy and visual references.

A very good guide is published by the UK's Maritime and Coastguard Agency, titled *Offshore Renewable Energy Installations Guidance on UK Navigational Practice, Safety and Emergency Response Issues (MGN 371)*, which is available from http://www.dft.gov.uk/mca/mgn371-2.pdf. Further technical guidance can be found from other organisations.

Additional guidance can be found in the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) *Recommendation O-139 on the Marking of Offshore Structures*, which is available from www.IALA-AISM.org.

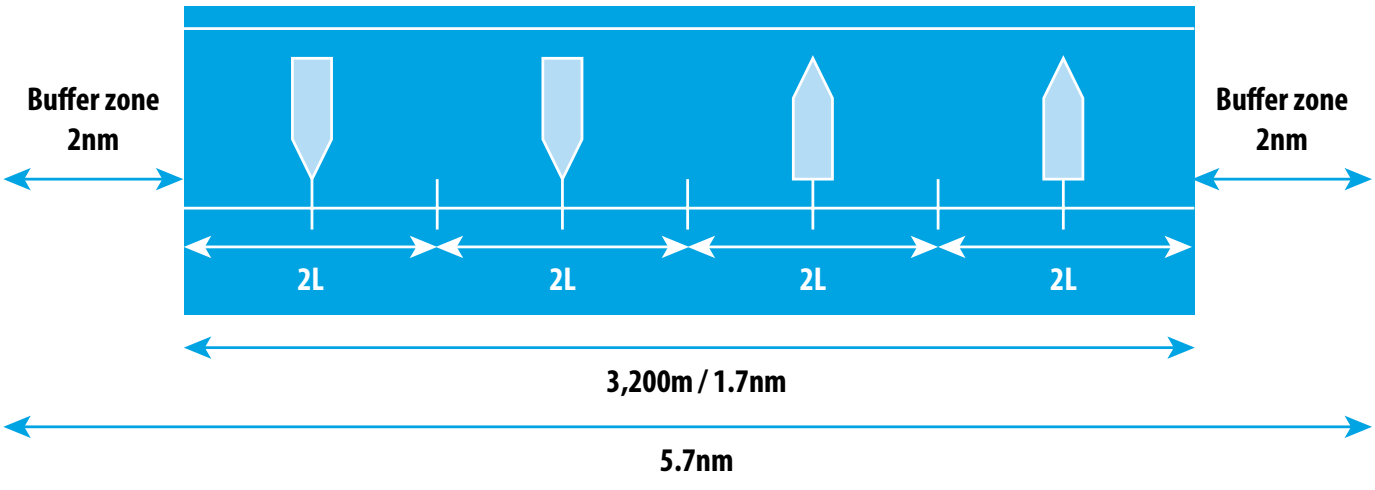
Width of shipping lanes

Standard turning circles for vessels are six times the ship's length. This is a particularly good assumption for vessels on ocean or deep sea passage, which will not have the same manoeuvrability as when engines and systems are prepared for port approach.

Requirements for stopping in an emergency must be considered, for example in case of a steering gear failure. The crash stop distance for a large tanker may be up to 3km.

One study has made an assessment of sea room required, using data supported by the PIANC assessment for channel design. In general it strives for an obstacle free, or buffer zone of 2nm between hazards and shipping lanes (see diagram below).

The possibility of ships overtaking cannot be excluded and should be taken into



An example of recommended minimum shipping lane width between two adjacent windfarms considering vessels of 400m in length (UK NOREL Committee). In every instance a case by case assessment must determine actual requirements

consideration. Consequently the assumption should be that fours ships should safely be able to pass each other in a shipping lane.

A distance between overtaking and meeting vessels of two ship's lengths is normally maintained as a minimum passing distance; this is based on experience gained from ships' masters and deep sea pilots operating in the North Sea and has been verified by simulation trials carried out in the Netherlands (see annex A, p11).

Navigation issues

Any information from other marine users that could impact on the navigation of vessels must be produced on nautical charts and publications with the full participation of the hydrographic community, using international standards and symbology that will be recognised by mariners. It is vital that this information is provided in a timely and safe manner.

Further, in assessing the impact on shipping by other marine users under an MSP plan, anything that might interfere with visibility or radar conspicuity must be taken into account. Such interference might include a physical object, electronic interference or even light pollution, either at sea or on the shoreline.

In the future, greater demands for ships to navigate closer to navigational hazards while ensuring high levels of safety may require new services and technology, in which case serious consideration will need to be given to issues of authority and liability. Evolving navigation technology may provide greater reliability and accuracy of automated electronic position fixing systems. Cheaper communication with greater bandwidth may lead to better provision of critical information and decision support tools for the navigator. Increased traffic density in increasingly constricted water space may require isolation zones for different ocean users such as commercial shipping, fishing and leisure craft. For many years, improved technology has lead to the development of Vessel Traffic Service (VTS) in port areas. However, as technology facilitates the global tracking of ships by using the Automatic Identification System (AIS) and satellite observations; the provision of coastal traffic management may provide for improved safety and commercial efficiencies, for instance by such means as slot management and monitoring distance separation.

Environmental and commercial impact

In the MSP process, solutions for the management of sea space may entail proposals for the rerouteing of commercial traffic to achieve other benefits for society. In addition to navigational safety risks, it is also essential to understand the impact rerouteing may have on the environment and commercial operations.

Some sort of risk assessment, combining both qualitative and quantitative measures, will need to be carried out during any MSP developments. There are many formal tools to choose from including the IALA Waterways Risk Assessment Program (IWRAP Mk2), which is used in conjunction with the Ports and Waterways Safety Assessment (PAWSA) and simulation (see box). Risk assessment should also take into account the increased workboat traffic during construction and maintenance of coastal and offshore projects, and risks posed by broken parts in energy generation, such as underwater turbine blades or wave generator floats coming adrift.

Although ships remain the most environmentally efficient form of commercial transportation, ships are large and do consume a significant amount of fuel. They also, as with any carbon fuel user, emit certain toxins such as sulphur oxides (SOx) and nitrogen oxides (NOx); and although the shipping industry is currently reducing these emissions (in compliance with MARPOL Annex VI), any increase in miles will have a resultant increase on fuel consumption, and therefore the related environmental impact. Other environmental impacts include marine sound, the scouring effect on the seabed in shallow areas and the potential environmental impact from an accident or grounding. Changes to shipping patterns have also had a knock-on effect for other transport chains such as an increase of road traffic and associated environmental impact associated with less efficient modes of transport.

Increased route distances will increase the costs of shipping and goods due not only to the extra cost of fuel, but also due to the significant ship operation costs such as wages, insurance, maintenance and consumables. It may also be that the balance of risk of a major pollution incident and consequential damage to the environment can outweigh the value of a renewable energy installation.

Consideration also needs to be given to any change to the competitive advantage of local ports. Should shipping routes need to be changed; commercial competition between local ports can be fierce and emotive. Shipping is a critical link in most logistics (supply) chains that are based on Just In Time (JIT) delivery, therefore changing shipping routes may have an impact on either the JIT logistics chain or the intermodal transport links it is tied into such as road, rail or feeder vessels.

The need for cooperation

As the world presses for greater use of the world's waterways, within a framework of

USE OF IWRAP MK2 IN MARINE SPATIAL PLANNING

IWRAP Mk2 is a risk-modelling tool developed by IALA in close cooperation with a number of universities and maritime administrations around the world. The tool has been endorsed by the IMO as a useful tool for assessing risk of collisions and groundings in waterways. IWRAP Mk2 is capable of extracting the characteristics of vessel traffic in a given waterway from an AIS dataset. Based on this information a mathematical model of traffic density and geographic distribution is derived, and the probabilities of collisions and groundings can be calculated. Once a model has been calibrated against historical incident data, the analyst can perform what-if analysis. Such analysis could include changing the geometry of a waterway, introduction of a number of fixed objects such as a windmill farm and other similar initiatives. The IWRAP Mk2 model would be modified to reflect any such changes, and the probabilities of collisions and groundings recalculated. The two results can now be compared in order to assess the change in the probabilities. This is a method to compare two or more possible Maritime Spatial Planning scenarios in terms of collision and grounding frequencies.

More information on IWRAP can be found at http://www.iala-aism.org/wiki/iwrap/index.php/Main_Page

THE RESULT OF A GOOD MSP PROCESS IS A BETTER UNDERSTANDING OF THE NEEDS OF OTHERS FOR SEA SPACE

sustainability and economic growth, it is inevitable that established commercial shipping operations will be challenged. Society will need to manage the demands of the multitude of stakeholders all wishing/demanding to use inland waters, coastal and ocean space. Within the embryonic process of MSP, the many stakeholders involved won't always understand the needs and operational requirements of other stakeholders and the impact changes will have upon them and the society that they support.

IT IS ESSENTIAL TO UNDERSTAND THE IMPACT OF REROUTEING ON THE ENVIRONMENT AND COMMERCE

It is essential however that each and every MSP development be taken on its own merits and care is needed that high profile issues are not allowed to obscure potential dangers to shipping. The Case Studies and Annexes included in this guidance document are for example only. Each new development will be unique both in terms of physical properties and political emphasis.

The Nautical Institute firmly believes that our members must engage in MSP debates on an international, regional and national and, most importantly, local basis. Maritime professionals from all disciplines need to be involved, not to be negative with regards to change but explain and support the reasons for the existing situation. It is vital to ensure that all other MSP stakeholders understand the issues critical to shipping and that the full impact of shipping operations are assessed prior to the management of change in the use of our coastal and ocean spaces to best effect. Care must be taken however that disproportionate emphasis of high profile current issues does not cloud real dangers posed to shipping and the marine transport community which could have a long term negative impact on the environment and trade.

The Nautical Institute will maintain a MSP forum on its website, www.nautinst.org to track any further resources that it identifies as being useful.

RESOURCES

IALA

The International Association of Marine Aids to Navigation and Lighthouse Authorities (harmonize aids to navigation worldwide and to ensure that the movements of vessels are safe, expeditious, cost effective and harmless to the environment):

IALA Waterways Risk Assessment Program Mk2 (IWRAP);

Ports and Waterways Safety Assessment (PAWSA);

IALA Recommendation for The Marking of Man–Made Offshore Structures (O–139)

IMO

The International Maritime Organization – the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships;

General Provisions on Ships' Routeing (GPSR)

The International Regulations for Preventing Collisions at Sea, 1972, as amended (COLREGS)

Standards for Ship Manoeuvrability (Res. MSC.137(76))

UN Convention for Safety of Life at Sea, 1974, as amended (SOLAS)

PIANC

The World Association for Waterborne Transport Infrastructure (expert advice on cost–effective, reliable and sustainable infrastructures to facilitate the growth of waterborne transport):

Joint PIANC– IAPH report on approach channels – a guide for design (volume 2);

'Sustainable Maritime Navigation'.

UK Department of Transport

http://www.dft.gov.uk/mca/mcga07–home/shipsandcargoes/mcga–shipsregsandguidance/mcga–windfarms.htm.

UN

The United Nations is an intergovernmental organization whose stated aims include promoting and facilitating cooperation in international law, international security, economic development, social progress, human rights, civil rights, civil liberties, political freedoms, democracy, and the achievement of lasting world peace:

United Nations Convention on the Law of the Sea (UNCLOS)
http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.

UNESCO

United Nations Educational, Scientific and Cultural Organization – known as the 'intellectual' agency of the United Nations:

'Step–by–Step Approach for Marine Spatial Planning toward Ecosystem–based Management'.

A Flood of Space: Towards a Spatial Structure Plan for Management of the North Sea. Belgian Science Policy, Belgium. http://www.unesco-ioc-marinesp.be/uploads/documentenbank/b29ecdecdd3c1025c24b1f6473656633.pdf

WOC

The World Ocean Council is an unprecedented international, cross–sectoral industry leadership alliance on 'Corporate Ocean Responsibility'.

www.oceancouncil.org

The Nautical Institute

The Nautical Institute's website includes information on Marine Spatial Planning and links to a Marine Spatial Planning forum.

http://www.nautinst.org/en/forums/msp/index.cfm

CASE STUDY 1

Adjusting the Boston Shipping Lane to protect endangered whales and improve shipping safety

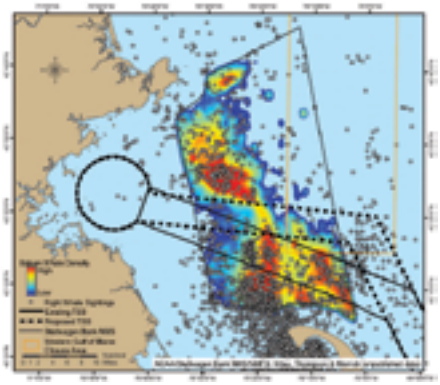
http://stellwagen.noaa.gov/science/tss.html

The adjustment of Boston shipping traffic lanes illustrates how MSP can be used to bring industry, government, the environmental community and science together to address specific needs. A small change to the Boston shipping lanes has helped mariners avoid dangerous collisions with whales, one species of which is critically endangered.

The shipping lanes in and out of Boston harbour take vessels through waters where high concentrations of humpback, right, and other whales are found, especially in the Stellwagen Bank National Marine Sanctuary, putting both the whales and ships at risk of collisions.

Using data on whale sightings collected over a 25-year period, researchers noticed that the shipping lanes were right next to an area where relatively few whales had been spotted. Scientists confirmed these findings, studying whale feeding behaviour and developing maps of the seafloor to get a more complete picture of where the whales spend their time.

Based on this data, it was proposed to move the direction of the approach shipping lanes 12 degrees to the north, to an area with fewer whales. The IMO shifted the shipping lanes in 2007 based on the recommendations of a multi-stakeholder process. The resulting route increases travel time for ships by 10-22 minutes, but cuts down the risk of collisions with critically endangered right whales by an estimated 58% and with all other baleen whales by 81%.



Whale distribution and the proposed shipping lane shift in the Gulf of Maine. Source: NOAA

CASE STUDY 2

Shipping fairways off the north-west coast of Australia

Marine Notice 15/2012 Shipping fairways off the north-west coast of Australia

In 2012, AMSA established a network of shipping fairways off the north-west coast of Australia. The shipping fairways aim to reduce the risk of collision between transiting vessels and offshore infrastructure. The fairways are intended to direct large vessels such as bulk carriers and LNG ships trading to the major ports into pre-defined routes to keep them clear of existing and planned offshore infrastructure. A collision in this area could potentially result in significant loss of life and environmental harm.

The shipping fairways were developed after widespread consultation with the maritime industry and government agencies.

The new shipping fairways are similar to the existing Dampier Shipping Fairway, which was charted in 2007. It has proven to be successful in keeping shipping traffic away from off-shore infrastructure. Such separation is effective in other parts of the world, particularly in the Gulf of Mexico.

Shipping fairways off the north-west coast of Australia

Use of the new fairways is strongly recommended but not mandatory. The International Regulations for Preventing Collisions at Sea 1972 apply to all vessels navigating within or outside the Shipping Fairways. The use of these fairways does not give vessels any special right of way.

The Australian Hydrographic Service (AHS) has incorporated the new fairways in the relevant Electronic Navigational Charts (ENC) and new editions of paper charts. These have been made available progressively from August 2012 onwards.

A small scale diagram of the fairways, indicating their extent, is shown, left.

Australian Maritime Safety Authority.
The above text is largely from AMSA Marine Notice 15/2012 (Shipping fairways off the north-west coast of Australia) which can be found at http://www.amsa.gov.au/vessels/standards-regulations/marine-notices/index.asp

ANNEX A

Netherlands summary of the international regulations and guidelines for maritime spatial planning related to safe distances to multiple offshore structures (e.g. wind farms)

This Annex was compiled by the Shipping Advisory Board North Sea and Ministry of Transport for the Netherlands, including representatives of the:
Royal Association of Netherlands Shipowners
Netherlands Shipmasters' Association
Deep Sea Pilots Association
Netherlands Pilot Corporation
Netherlands Coastguard
Netherlands Fishing Association
Port of Amsterdam
Port of Rotterdam

Overview

This is a summary of the most important international regulations determining the manoeuvring space that vessels need in order to keep a safe distance from multiple structures such as wind farms.

Points to note:

1. 80% of all disasters at sea are caused by human error. It is therefore realistic to maintain certain margins when considering a safe distance.
2. When these provisions and regulations were designed, multiple structures, such as wind farms, did not exist. However, they provide sufficient guidance to help determine a safe distance to such objects.

The following Regulations and Guidelines have been established internationally:

1. General Provisions on Ships' Routeing of the International Maritime Organization (GPSR), 1974, as amended.
2. United Nations Convention on the Law of the Sea (UNCLOS).
3. International Regulations for Preventing Collisions at Sea (COLREGS), 1972, as amended.

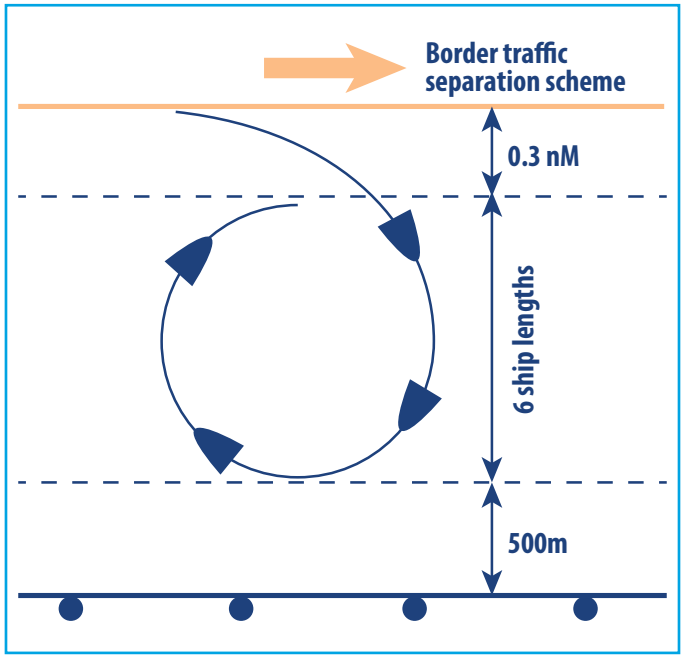
GPSR 1.1

The purpose of ships' routeing is to improve the safety of navigation in converging areas and in areas where the density of traffic is great or where freedom of movement of shipping is inhibited by restricted sea room, the existence of obstructions to navigation, limited depths or unfavourable meteorological conditions.

To demonstrate that the routeing measure improves safety, a Formal Safety Assessment (FSA) is recommended. This FSA can provide arguments for selecting a certain route and is based on a probabilistic risk assessment.

When taking the vessel along this route, the master will make his own risk assessment when passing structures, and will keep a certain distance from them, depending on the size of the vessel, status of the main engine, weather conditions, traffic, so the master can act according to the COLREGS. This risk assessment is deterministic; 0 incidents are required. If masters feel that the routeing measure takes the vessel too close to multiple structures, they will all shift to the same side of the routeing measure, causing the density of shipping to increase to one side, which is not in line with the starting point for GPSR: to improve safety of navigation.

While demonstrating that a new routeing measure improves safety of navigation can be done by means of a FSA, the safe distance to structures along that route should be set using a deterministic approach, using the rules and regulations that masters follow.



CALCULATION FOR A ROUND TURN TO STARBOARD IN A SHIPPING LANE (SEE COLREGS 8, P13)

The required room is:

1 Start of the round turn. A round turn is not started right away. Normally one first deviates from the course, while observing the other vessel. This requires time. In the meantime one deviates from the original track. The minimum distance required for this manoeuvre is 0.3 nautical miles.

GPSR 6.4

Course alterations along a route should be as few as possible and should be avoided in the approaches to convergence areas and route junctions or where crossing traffic may be expected to be heavy.

Bear in mind that a master must keep a safe distance from certain structures. The structures should not be positioned in such a way that vessels will need to change course in order to maintain this safe distance.

GPSR 6.8

*Traffic separation schemes shall be designed so as to enable ships using them to **fully comply at all times** with the International Regulations for Preventing Collisions at Sea (COLREGS), 1972, as amended.*

The safe distances to structures should be determined in such a way that a vessel can act according to the COLREGS at all times – including when sailing on the edge of a routeing measure.

GPSR 6.10

Traffic lanes should be designed to make optimum use of available depths of water and the safe navigable areas, taking into account the maximum depth of water attainable along the length of the route. The width of lanes should take account of the traffic density, the general usage of the area and the sea room available.

It is not easy to determine the safe width of a routeing measure. One guideline that has proved to be accurate is based on an AIS study by Maritime Institute Netherlands (MARIN):

1. Number of vessels: based on AIS study, keeping in mind the future development during the lifespan of the structures;
2. Maximum size of vessels: same;
3. Number of vessels overtaking:
   a < 4400 vessels per year: 2 vessels side to side
   b >4400 vessels and < 18000 vessels: 3 vessels side to side
   c >18000 vessels: 4 vessels side to side
4. Room per vessel: 2 ship lengths

For example: a traffic lane that accommodates 18,000 vessels per year with a maximum size of 400 metres should be at least 3,200 metres wide. This matches most of the present traffic lanes (e.g. Rotterdam approach and TSS Maas West).

Extract from UNCLOS Article 60

1 In the exclusive economic zone, the coastal State shall have the exclusive right to construct and to authorize and regulate the construction, operation and use of:
a Artificial islands;
b Installations and structures for the purposes provided for in article 56 and other economic purposes;
c Installations and structures which may interfere with the exercise of the rights of the coastal State in the zone.

4 The coastal State may, where necessary, establish reasonable safety zones around such artificial islands, installations and structures in which it may take appropriate measures to ensure the safety both of navigation and of the artificial islands, installations and structures.

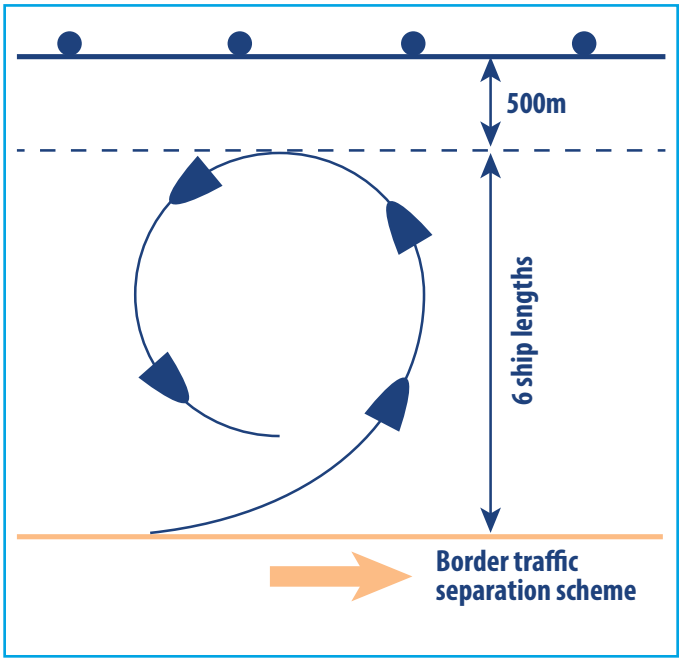
5 The breadth of the safety zones shall be determined by the coastal State, taking into account applicable international standards. Such zones shall be designed to ensure that they are reasonably related to the nature and function of the artificial islands, installations or structures, and shall not exceed a distance of 500 meters around them, measured from each point of their outer edge, except as authorized by generally accepted international standards or as recommended by the competent international organization. Due notice shall be given of the extent of safety zones.

6 All ships must respect these safety zones and shall comply with generally accepted international standards regarding navigation in the vicinity of artificial islands, installations, structures and safety zones.

7 Artificial islands, installations and structures and the safety zones around them may not be established where interference may be caused to the use of recognized sea lanes essential to international navigation

The 500 metre safety zone described in paragraph 6 is for protection of the structure and is not meant to indicate a safe distance for manoeuvring according to the COLREGS.

Interference (paragraph 7, above) means, for example, limited ability to comply with the COLREGS. The COLREGS do not define how much space is required for this. However, with the knowledge of guidance provided to shipbuilders regarding maximum room for full round turns (Standards for Ship Manoeuvrability (Res. MSC.137(76)) and Explanatory notes to the



CALCULATION FOR A ROUND TURN TO PORT IN A SHIPPING LANE (SEE COLREGS 8, P13)

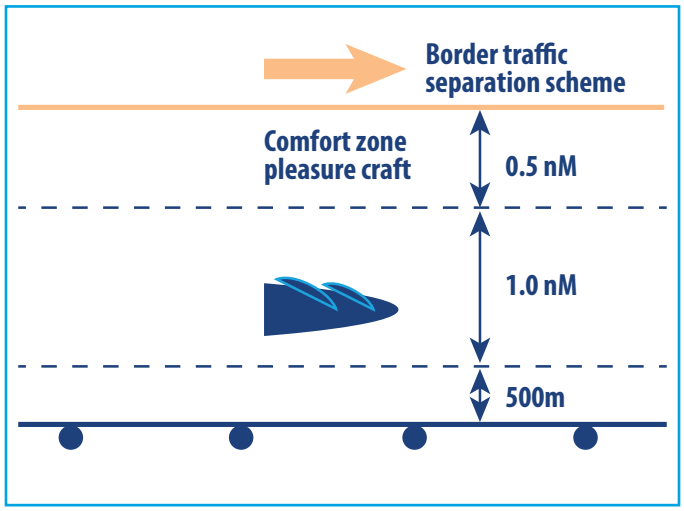
A round turn may also be made to port if, for instance, the starboard aft quarter is blocked due to an overtaking vessel. In this case, the vessel will not first deviate to port, but start a round turn right away:

Points to note for round turns to both port and starboard (see p11):

1. Quite often it happens that after making a round turn a Not Under Command situation occurs, due to mechanical problems (e.g. low oil level alarm).

2. On many vessels the officer on watch will hesitate to use hard rudder – that is, to make a full round turn - at once. Passenger ships and container vessels in particular will be very cautious about starting such a turn as it can result in a lot of damage to passengers, crew and cargo.

3. Round turns are also made in case of a Man Over Board.



COLREGS 10 h), 10 j) MANOEUVRING ROOM

A vessel not using a Traffic Separation Scheme shall avoid it by as wide a margin as is practicable.

A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.

A vessel of less than 20 meters in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane.

Fishing vessels and pleasure craft normally use the area next to the traffic lane. However, the picture left shows that there is little room left for sailing vessels that need to beat up against the wind.

standard for ship manoeuvrability (MSC/Circ. 1053)), there is an argument for the definition of a minimum distance.

COLREGS 2a and 2b

Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or the of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case

In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from the Rules necessary to avoid immediate danger.

The master is held responsible for having mitigating measures in place for unforeseen conditions such as a Not Under Command situation. Sailing very close to islands or multiple structures is not according to the ordinary practice of seamen.

A study regarding Not Under Command situations shows that 90% of vessels drift for one hour (AIS tracks in combination with Dutch Coast Guard reports) – resulting in a drifting distance of 1.7 nautical miles. This distance is a result of local conditions, and should be evaluated per area accordingly.

COLREGS 7c

Assumptions shall not be made on the basis of scanty information, especially scanty radar information.

In an area with multiple structures, radar targets tend to swap to the structures, making it hard to determine the closest point of approach (CPA) of any other vessel in the area. Only when the vessel departs this area can the CPA be determined. The time needed to identify and plot the vessel has been determined to be 6 minutes. If a service vessel exits a wind farm with, for instance, a speed of 10 knots, crossing the course line of a passing vessel, the minimum distance needed to get a reliable CPA is 1.0 nautical miles.

AIS information is available, but a CPA based on AIS information should not be used to avoid collision as the speed input is based on GPS and not on water track.

In addition to the effect of swapping targets, wind farms cause radar interference. The safe distance to avoid interference has been determined by deep sea pilots to be 0.8 nautical miles.

COLREGS 15

When two power driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

COLREGS 8

Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear

If the stand on vessel does not act according to the COLREGS, the give way vessel's last resort is a full round turn to starboard.

The required room for turns to starboard and port is shown in the diagrams on pages 11 and 12 respectively. The space for the round turn itself is determined as follows:

a. Para. 5.3.1: Turning ability: The advance should not exceed 4.5 ship lengths (L) and the tactical diameter should not exceed 5 ship lengths in the turning circle manoeuvre.
b. Para. 1.2.3.5: Turning ability: Turning ability is the measure of the ability to turn the ship using hard-over rudder.' (IMO Resolution MSC.137 (76) and MSC/Circ.1053).

These requirements apply under controlled conditions during sea trials. It is reasonable to take an extra ship's length to compensate for the fact that the officer on duty is not fully prepared for this manoeuvre. Therefore the diameter of the round turn has been determined to be 6 ship's lengths.

The round turn should not bring the vessel closer than the 500 metre distance safety zone.

Anchor areas

There are no regulations that relate to anchorages.

However, safe anchorages should provide sufficient room to manoeuvre:

- when the anchor is dragging;
- in the approach to an anchorage.

A safety study for an off shore platform shows that the space needed for a vessel to start her engines and manoeuvre when an anchor is dragging is 1.7 nautical miles from the safety zone around a multiple structure.

The same distance has been found to be sufficient to approach that anchorage for all vessels making use of that particular area. Again, this study is related to a specific area – different areas might to require a separate study, but it does provide some indication of the required distances.

ANNEX B

Extract from UK MCA MGN 371 (M&F) on Offshore Renewable Energy Installations (OREI) – Guidance on UK Navigational Practice, Safety and Emergency Response Issues

Reference: http://www.dft.gov.uk/mca/mgn371-2.pdf

This guidance note highlights issues that need to be taken into consideration when assessing the impact on navigational safety and emergency response (search and rescue and counter pollution) caused by offshore renewable energy installation developments, proposed for United Kingdom internal waters, territorial sea or in a Renewable Energy Zone beyond the territorial sea.

Key Points

- The recommendations in this guidance note should be used, primarily, by offshore renewable energy installation developers, seeking consent to undertake marine works.
- Specific annexes address particular issues as follows:
  Annex 1: Site position, structures and safety zones.
  Annex 2: Developments, navigation, collision avoidance and communications.
  Annex 3: MCA's wind farm shipping template for assessing wind farm boundary distances from shipping routes.
  Annex 4: Safety and mitigation measures recommended for OREI during construction, operation and decommissioning.
  Annex 5: Search and Rescue (SAR) matters.
- These recommendations should be read in conjunction with the "*Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms*" published by the Department for Business Enterprise and Regulatory Reform (BERR).

The following text, figure and table are reproduced from Annex 3 of the MGN.

It is important to recognise that the template is not a prescriptive tool but needs intelligent application. For example, there may be opportunities for the interactive boundaries to be flexible where, again, for example, vessels may be able to distance themselves from turbines to provide more comfort without significant penalty, conversely turbines could be distanced from shipping nodal points. Domains have been derived from a statistical study of ship domains based on radar simulator performance, and traffic surveys in the North Sea, but it is recognised that larger, high speed, hazmat and passenger carrying vessels may have larger domains.

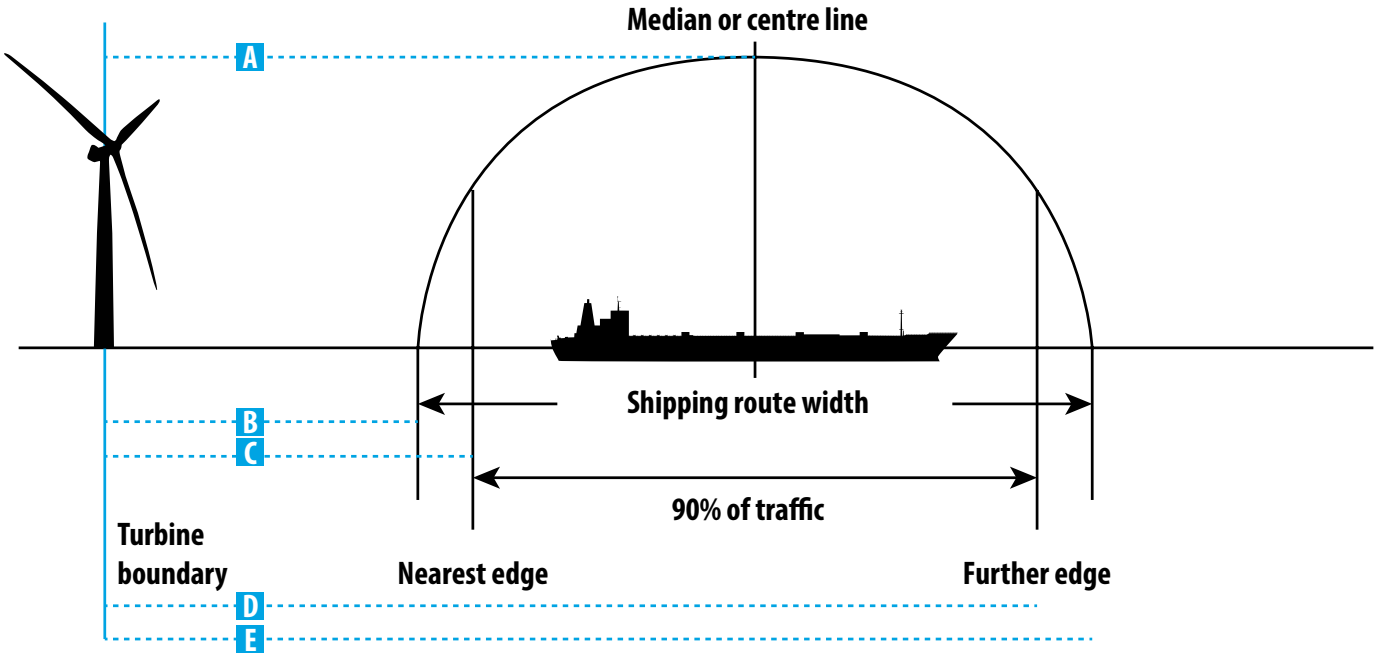
Such traffic surveys would also establish any route traffic bias where mariners may naturally offset themselves to starboard to facilitate passing encounters in accordance with the International Regulations for Preventing Collisions at Sea (COLREGS). Additionally, marine traffic surveys would identify vessel type or category, which may consequently require larger domains. In the approaches to ports this is particularly relevant. This additional information would influence where boundaries need to be established. Mitigation measures are not specifically identified by the template, which necessarily takes a generic approach rather than site specific view. Separate papers may address potential measures, but those envisaged by this template include, but are not necessarily limited to:

a. IMO Routeing measures.
b. Vessel Traffic Services.
c. Aids to navigation.
d. Safety zones.

The mention of the IMO/UNCLOS safety zone at 500 metres does not imply a direct parallel to be applied to wind farms. It is only used to illustrate an existing limitation.

For further guidance, see the Department for Business, Enterprise and Regulatory Reform (BERR) document '*Applying for Safety Zones Around Offshore Energy Installations*'.

Distance in nautical miles (nm) and metres (m) of Turbine Boundary from Shipping Route	Factors	Risk	Tolerability
< 0.25nm (500m)	500m inter-turbine spacing = small craft only recommended	VERY HIGH	
0.25nm (500m)	X band radar interference	VERY HIGH	**INTOLERABLE**
0.45nm (800m)	Vessels may generate multiple echoes on shore based radars	VERY HIGH	
0.5nm (926m)	Mariners' high traffic density domain	HIGH	**TOLERABLE IF ALARP** (As Low As Reasonably Practicable)* * Descriptions of ALARP can be found in: a) Great Britain Health and Safety Executive (2001) Reducing risks protecting people b) IMO (2002) MSC Circ. 1023 dated 5th April 2002 Formal Safety Assessment c) IMO (2007) MSC 83-21- INF2 Consolidated guidelines for Formal Safety Assessment
0.8nm (1481m)	Mariners' ship domain	HIGH	
1 nm (1852m)	Minimum distance to parallel boundary of TSS	MEDIUM	
1.5nm (2778m)	S band radar interference ARPA affected	MEDIUM	
2 nm (3704m)	Compliance with COLREGS becomes less challenging	MEDIUM	
>2nm > (3704m)	But not near TSS	LOW	
3.5nm (6482m)	Minimum separation distance between turbines opposite sides of a route	LOW	
5nm (9260m)	Adjacent wind farm introduces cumulative effect Distance from TSS entry/exit	VERY LOW	**BROADLY ACCEPTABLE**
10nm (18520m)	No other wind farms	VERY LOW	



The position of, or where an interactive boundary lies, either needs definition or agreement – which will require interpretative flexibility. Clearly, marine traffic survey information is required to inform such boundaries.

A = Turbine boundary to the shipping route median or centre line.
B = Turbine boundary to nearest shipping route edge.
C = Turbine boundary to nearest shipping 90% traffic level.*
D = Turbine boundary to further shipping 90% traffic level.*
E = Turbine boundary to further shipping route edge.
(= or another % to be determined.)*