Inventory of regulations

D2.1

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Executive Summary

This report provides an overview of regulatory framework for operations at sea and specific requirements for health, safety and environmental issues on multi-use platforms. For this purpose, an inventory table of rules and regulations was compiled, which reflects the rules and regulations on HSE issues relevant to floating modules at sea as those being developed within the Space@Sea project.

The offshore industry is known for its thorough health and safety regulations. The harsh maritime environment enforces a top priority for health and safety. In order to insure health and safety on multi-use marine platforms it is important to understand their behaviour in certain environmental conditions.

The assessment of Health Safety and Environmental issues will set standard preconditions for the floating island constructions. Particularly, the potential food and feed safety hazards as well as the associated environmental risks that may result from the multi-use platform environment needs to be investigated.

Health and safety hazards and environmental risks including food safety will be assessed for all steps of the multi-use platform life cycle with a special focus on construction, installation, operation, maintenance and decommissioning. Following from previous analysis of technology options a full HAZID study will be developed reviewing potential hazards for the proposed floating modules being developed in WP 6 (Energy Hub), 7 (Living), 8 (Farming) and 9 (Transport & Logistics). Risk assessments are documented in risk matrixes for WP6 and will be further elaborated for other applications of floating modules. The results of these risk assessment studies will be presented in a HAZID Report, not being part of this Deliverable 2.1.

The framework for risk inventory follows a certification scheme. Processes, systems and components will be defined for which a HAZID will be performed. A risk based methodology is followed to assess the availability and relevance of existing codes and standards for each process, system or component.

In order to carry out hazard identifications and risk assessments, it is essential to be able to refer to relevant HSE-relevant rules and regulations as supporting documents.

Direct regulations for multi-use platforms as those being developed within the Space @ Sea project do not yet exist. Therefore, similar laws and guidelines have been adopted for the applications of the project Energyhub@Sea (WP6), Living@Sea (WP7), Farming@Sea (WP8) and Transport & Logistics@Sea (WP9). It is heavily based on the guidelines from the maritime and offshore sectors.

This document deals ample with nature and content of the HSE Regulations. A leading role is played by the international HSE conventions like ISO 45001, 31000, 14001 and 12100. In particular, however, the German HSE regulations such as DIN standards, national occupational health laws, accident prevention regulations and technical rules of German trade association have been listed many times. The reason why mainly German regulations were detected is that Occupational health and safety plays an important role in Germany and is implemented accordingly stringently. However, these legislations were mainly based on the implementation of EC directives on occupational health and safety since 1989, so that comparable provisions can be expected in all EU countries. However, in individual cases, the EU member states may also go beyond the minimum protection measures provided for in these EC Directives, e.g. when setting national limit values.

Any activity at sea will be subject to a set of environmental regulations. That applies to international conventions referred to environmental issues, as well as relevant European environmental regulations. International Commitments and Conventions apply, such as the UN Convention of the Law of the Sea (UNCLOS), and Regional Sea Conventions (e.g. OSPAR Convention, HELCOM Convention, Barcelona Convention and Bucharest Convention).

The most important general European environmental regulations with regard to the protection of the marine environment are Marine Strategy Framework Directive, Water Framework, Habitats Directive and Bird Directive. Several EU regulations apply to aquaculture and seafood, with regard to the environment, the health and welfare (of cultured animals), and trade of products, consumer information and product certification.

All detected HSE related rules and regulation has been collected in an Inventory table of rules and regulations for health, safety and environmental issues which is attached in Annex 1 of this document. The title and title of HSE rules were also included, as well as the information of the current version and a short description of the content of the regulation. In addition, the affiliation to the corresponding work package 6, 7, 8 and 9 has been defined and which project phase is affected by the regulation.

1. Introduction

1.1 Space@Sea

Space@Sea sets out to provide sustainable and affordable workspace at sea by developing a standardised and cost efficient modular island with low ecological impact. The consortium consists of a strong collaboration between 17 partners spread throughout Europe. Space@Sea will develop and demonstrate a modular floating island approach including four example applications which will result in business cases to be further detailed.

The commission urged in their BG4-2017 call that health and safety issues associated with multi-use marine platforms should be improved and that the environmental viability should also be investigated.

One of the aims is to provide an inventory of the regulatory frameworks for operations at sea and specific requirements for health, safety and environmental issues as identified from (inter)national projects on multiple-use platforms.

1.2 Health, Safety and Environmental issues

Health, Safety and Environmental (HSE) requirements are very relevant aspects for the further development and future implementation of floating island constructions.

The assessment of Health Safety and Environmental issues will set standard preconditions for the floating island constructions. Particularly, the potential food and feed safety hazards as well as the associated environmental risks that may result from the multi-use platform environment will be investigated. An analysis will be made of information from earlier (inter)national projects and scientific publications, and from additional legal information in order to develop a set of indicators for use in the various business cases in Space@Sea, also taking into account the life cycle and disposal of the structures as prepared in WP5. A health and safety guideline, and a list of considerations for environmental aspects will be delivered as final product.

Health, Safety and Environmental issues are inevitably linked to Health, Safety and Environmental risks. Health, safety and environmental risk relates to harm to persons or environment due to the activities associated with the multiple-use platforms at all stages of the process from manufacturing through to installation, operation and decommissioning. The recommended approach to assessment of HSE risk for this context takes into account the key standards and a recommended practice (ISO 12100, ISO 31000/ 31010, ISO 45001 standards and DNV GL Qualification of New Technology recommended practice) and also guidelines, standards and legal requirements specific to health and safety in the offshore construction, maritime and shipping sector. Environmental risk assessment (also known as ecological risk assessment) methodology has been developed from that of human health and safety. The environmental risk assessment and management as part of the Space@Sea project will be based on guidelines, rules and regulations for environmental risk assessment and management.

1.3 Framework for risk inventory

In line with guidance notes Certification Scheme Marine Renewable Energy Technologies (NI 631 DT R00) a methodology is proposed as demonstrated in Figure 1.

Firstly (sub) processes, (sub) systems and (sub) components are defined after which for each process, system or component a HAZID will be performed in relation to HSE. Secondly, a risk based methodology is followed. The purpose of the risk-based methodology is to assess the availability and relevance of existing codes and standards for each unit component/process and to provide adaptations or appropriate requirements when necessary. Risk assessments are considered at two different levels:

- when there is no existing codes and standards

- when there are codes and standards from related sectors, but they need to be adapted to the specific application.

The risk-based methodology for the definition of the reference set of certification requirements is illustrated in Figure 1.

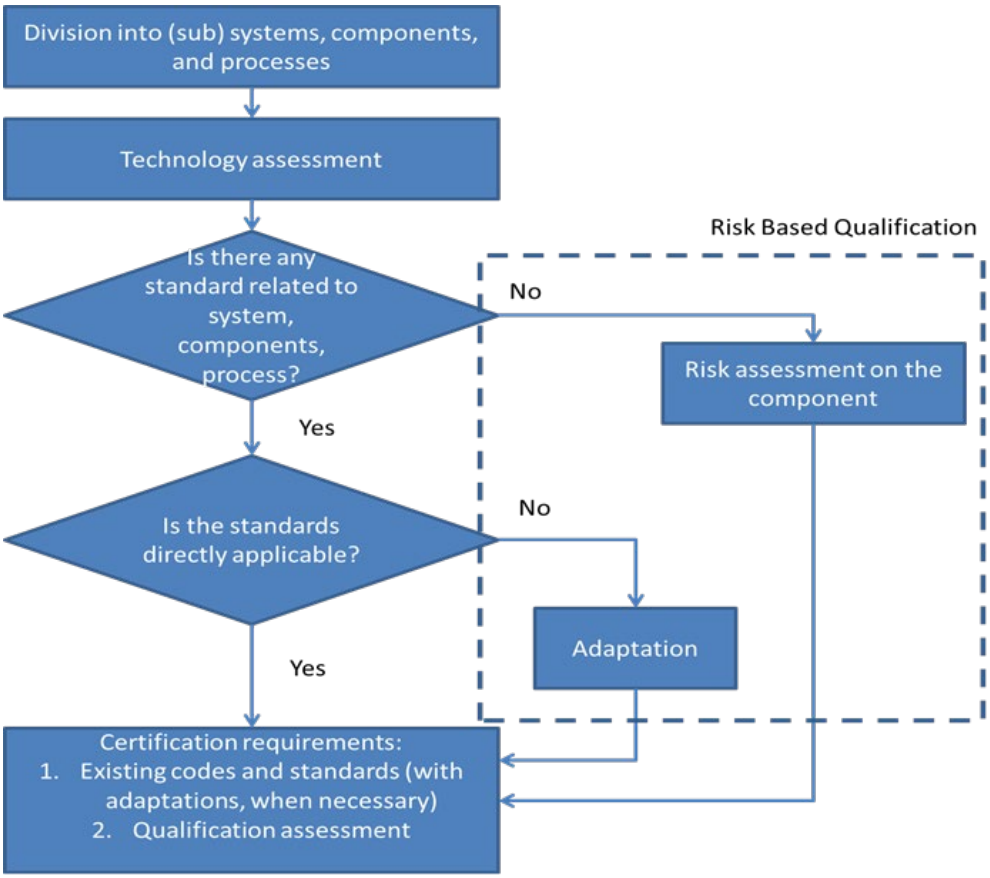

Figure 1. Flowchart for risk-based methodology

The flowchart demonstrates a methodology to build upon the existing codes and standards for offshore applications. However, Space@Sea comprises new technology and operations and therefore requires an independent assessment for the development of adequate codes and standards. At first existing codes and standards will be collected after which the gaps will be identified. In the gap identification assessment additions to existing standards will be recommended, as well as the initiation of complete new codes and standards to assure HSE risk is managed to ALARP level.

2. Inventory of regulations, standards and guidelines

2.1 Preconditions for Inventory

It was foreseen that inventories of regulations, standards and guidelines for multi-use platforms would already have been tackled extensively in former European research projects, such as MERMAID, TROPOS and MARIBE, or current projects (i.e. MUSES). No products were found that covered all issues considered relevant to the floating modules that are part of study of the current Space@Sea project. However, some of the deliverables from the above mentioned projects contained relevant information, and are referred to in following inventory.

Therefore, a main part of this inventory is based on earlier work as performed by the partners in this Work package, and additional searches on the internet.

A list of regulations, standards and guidelines is provided in the form of a table as presented in Annex 1. The list includes the title, version, and a short description. Furthermore, it indicates the relevance to several aspects of the Space@Sea project, including work packages for various applications, the type of (HS or E) regulation, and different phases of the deployment of floating structures. These aspects are briefly introduced in the following sections.

2.2 Applications

The standardised and cost efficient modular island that is being developed within the Space@Sea project can serve different applications. These applications can be combined into multi-use floating platforms. Within the current project four different applications are considered, and a selection of promising combinations will be studied for feasibility of their integration. Each application will be further developed in different Work packages of the Space@Sea project. For each application the main potential risks will be identified in a risk register, by making use of a Hazard Identification (HAZID) procedure. Regulations intent to control and minimize these risks. Therefore, we identify which relevant regulations, standards and guidelines link to the following applications:

- Energyhub at sea (WP6)
- Living at sea (WP7)
- Farming at sea (WP8)
- Transport and Logistics at sea (WP9).

These applications are briefly described in the following sections.

2.2.1 WP6: Energyhub at Sea

The Energyhub at Sea concept is one of the four research areas of the Space@Sea project. The major goal is to develop a cost-effective and energy self-sufficient maintenance platform where different energy carriers such as wind, wave and solar are converted, stored and consumed together in a synergistic way promoting clean and sustainable renewable energy distribution to the shore. Regarding this, a standardized modular substructure for floating island for multiple use will be developed. One use will be an operation and maintenance (O&M) hub for offshore wind maintenance as a base for service and logistic. In order to be energy self-sustain, a smart energy storage and smart off-grid in combination on-grid will be developed promising emergency power supply. The primary energy source of the hub will be a

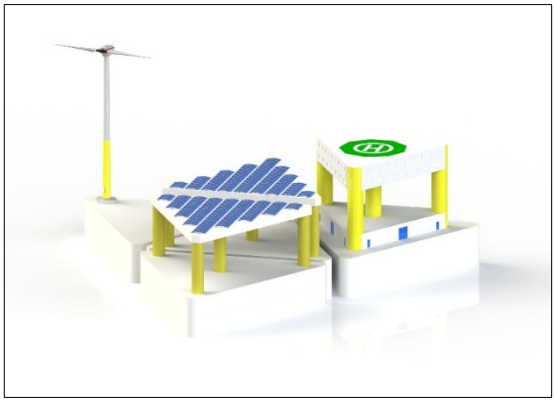

Figure 2. Perspective view of Energyhub at Sea

medium sized wind turbine (rotor diameter of 30 m) coupled with photovoltaic (PV) system and another source will be wave energy converters. However, the main energy supply is expected from the wind turbine and PV.

The first configuration of the floater which is made of precast concrete is a triangle shape which has been previously proved in model scale by MARIN and shows the highest flexibility for combination with other modules in comparison to other shapes. However, recent research has shown that a square shape represents the optimum in combination with the other modules as the use of deck space for a square floater is more efficient. A perspective view of the Energyhub is demonstrated in Figure 2.

The Gulf of Fos located in the Mediterranean Sea close to southern France coastline has been chosen as a site of interest for the energy hub. The preliminary location for Energyhub@Sea is envisioned approximately 60 km off the southern France coastline at a water depth of 60 to 200 m. The final design is intended to be applicable for any location with harsh offshore conditions e.g. in the North Sea, maximum wave height and other environmental conditions are assumed as those of the North Sea in this design phase.

In future, offshore based O&M facilities will become more attractive reducing unplanned downtime. The hub comprises four modules with different functions, whereby two modules are occupied with photovoltaic system, one for wind energy turbine and the remaining one is an O&M hub with accommodation facilities.

It is assumed that approximately 36 service staffs are sufficient to man such an O&M hub that will be designed in that manner that staff can survive at least 14 days without any outside support. Like a self-sufficient artificial island, the hub will be equipped with fresh and wastewater infrastructures, accommodation building with offices, workshops, apartments and kitchen, a hospital with required first aid facilities, a storage and maintenance building as well as a helicopter deck which functions as evacuation and emergency transport. The basic design specification representing selected parameters are listed in Table 1.

Table 1. Hub basic design specification

Floater Basic Design	
Edge length of floater	50 m
Height of floater	10 m
Wall thickness	0.2 ~ 0.4 m
Total weight	3000 t
Load capacity	8000 t
Draught	2.5 m
Application Module Design	
Height of accommodation building	6 m
Height of storage hall	4 m
Topside weight of O&M hub	2000 t
Wall thickness	0.2 ~ 0.4 m

In addition to the wind turbine, solar energy will play as another potential energy carrier of the hub. Under first assumption, photovoltaic modules are positioned on two floaters and will share cables with the wind turbine. Moreover, a smart energy storage system which is coupled with both wind turbine and PV system will be developed to store surplus energy and ensure an uninterrupted power supply during downtime. Further, wave energy generators between the floaters are provided producing energy on base of wave motions.

Furthermore, it is intended to support services and maintenance of about 100 wind turbines in future. Siemens 8 MW wind turbine is taken as a reference wind turbine design and scaled up to 10 MW under assumption of its drivetrain being gearless.

Components for O&M heavier than 2 tons will not be stored in the O&M hub for instance rotor blades and generators. The largest spare part will therefore be azimuth. Spare parts can be categorized into gear oil, coolant, wear parts, repair and exchange parts. Wear parts refers to components like brake parts, rechargeable battery packs, hydraulic hoses, filters, bearing grease. Repair and exchange parts are drive units, converters or other electronic units, lubrication systems, hydraulic systems.

Energyhub at Sea includes a range of assemblies, systems and components that incorporate occupational health and safety and environmental aspects. First and foremost, this certainly applies to the following floating modules:

- O&M hub with accommodation and storage building, spare parts, helicopter deck
- PV hub with power storage system
- WTG hub with power storage system
- Wave energy converters between the floating islands

HSE Regulations listed in the inventory table are to be applied to occupational health and safety and environmental protection when working on these floating islands in a marine environment. These include statutory health and safety regulations, accident prevention regulations and regulations for the handling of resources and waste as well as their disposal and regulations for the protection of the environment.

2.2.2 WP7: Living at Sea

It is the philosophy of Space@Sea that the demand for living space in coastal areas, industry or farming at sea will attract people to live at sea too. The demand is already visible for the maintenance crew of offshore renewable energy. It is too costly to transport the crew for each task separately creating a demand for living space at sea. This concept will start from housing for workers in the near future but expand through housing for the families to larger building complexes gradually evolving into cities to be placed on the blocks.

Housing off offshore personnel is commonly done on a fixed platform either as part of the work platform or placed next to it. Housing is temporary and not for family members. Living@Sea will accommodate offshore workers on an attached component where a small community is built also suitable for family members of the workers. With larger amounts of people living offshore, the necessity for shops and recreation grows. In the long run the Space@Sea results can contribute to building offshore communities and cities.

The staff of Floating offshore constructions as those developed under Living@Sea is confronted with daily work in their accommodation that poses a security risk. HSE-relevant rules and regulations must be applied in order to keep occupational safety and health at a tolerable level too.

Requirements for safe and comfortable living in case of longer or even permanent stay on the floating structures, will be elaborated in more detail in WP7 (Task 7.3).

2.2.3 WP8: Farming at Sea

Farming at sea involves the culturing of marine species by making use of the benefits and facilities of floating islands. Furthermore, the presence of other applications may enable services that are also required by aquaculture, such as energy supply, transport, storage, accommodation for workers performing maintenance operations and so on. The focus is on the culturing of microalgae, seaweeds, mussel (shellfish) and fish species. Several types of culture systems can be used in relation to the floating modules, and their feasibility is part of study. Options involve culturing on top of the floating modules, under, in between, inside, and adjacent to the modules. In addition, culture systems can be separately moored where the floating modules may function as a service island. The culture systems can be build up from tanks, enclosure, cages, nets, ropes, and other devices.

Since aquaculture is a maritime activity, HSE aspects for floating islands may not be very different from current practices of aquaculture. However, most of current aquaculture is taking place in coastal areas, whereas floating island may help to expand it to offshore areas where environmental conditions (both abiotic and biotic) are different. These conditions, such as waves and wind, may affect the behavior of the floating modules, and any equipment placed on top of it. As an example, fish in tanks may experience unfavorable water movements, and workers may experience movements influencing their wellbeing, too. Considering environmental aspects, aquaculture may impose impacts on the environment, and this depends on both the species cultured, and the type of culture-system used. In the other way, the environment may affect the quality of the aquaculture products, including their use as seafood.

2.2.4 WP9: Transport & Logistics at Sea

With growing transport quantities, ports will require more space. Rotterdam has solved this problem for now by expanding into sea using land reclamation. This solution is rather costly and may not be applicable for all harbours. For city ports which have limited space to extend, an offshore hub will be the only possibility for growth. For other ports a logistic hub offshore will provide the possibility to extend the port activities without the necessity of many large ships navigating narrow rivers. The Transport & Logistics@Sea component will cater for such possibilities.

Expansion of ports and logistic hubs is currently done by expanding land inwards or creating new land just offshore. Transport and Logistics@Sea will provide space for port expansion or the creation of an offshore hub, reducing the costs while increasing flexibility. The floating port can furthermore become a logistic hub for a sea basin from where smaller feeders or inland vessels call to the ports.

Here, accident prevention regulations as HSE regulations also just apply to the newly created floating modules acting as harbour for the loading and unloading of ships, including the preparation and handling work as well as the associated handling, transport, provisioning and storage work on land. The contractor is required to set up operating instructions in case of harbour work which requires special knowledge in order to avoid accidents or health risks. The contractor must disclose the operating instructions to the insured and make them available for inspection at a suitable location for the insured persons.

2.2.5 Health & Safety and Environment

An indication is made whether the regulations, standards and guidelines to health and safety issues and/or to environmental aspects. We briefly define HSE as follows: Health relates to people and the control of injuries or health problems; Safety considers the control of any accidents or damage to equipment and infrastructure; Environment relates to the control of impacts on the ecosystem.

2.2.6 Design guideline

Various HSE regulations also influence the design of plants / assemblies, systems, sub-systems and components. In a broader sense, they also function as Design guidelines.

As example, DIN EN 547-1 Safety of machinery - Human body measurements - Part 1: Principles for determining the dimensions required for openings for whole body access into machinery , DIN EN 547-2 Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings, DIN EN 547-3 Safety of machinery - Human body measurements - Part 3: Anthropometric data - can be mentioned. This standard specifies the requirements of the new EC Machinery Directive 2006/42/EG.

This type B standard specifies and defines the dimensions of openings for access to machine workplaces and passage openings like man holes and ducts. This European Standard has been developed primarily for stationary machine workstations, and mobile machines may have additional requirements.

Another example of acting of HSE rules as design guidelines is the advice-giving function of several regulations to the concept of accommodation & storage compartments of O&M hub of WP 6. The following examples can be listed from HSE point of view, e.g.

- For fire protection, two opposite columns must be designed as staircases.
- One column should have a goods elevator to accommodate a rescue stretcher.
- Doors should be chosen so wide that passage by a rescue stretcher is possible.
- From an occupational medical perspective, a ceiling height of 2.5 meters is recommended.
- For the leakage monitoring, communication, fire alarm system, an extra control room should be considered.
- In addition to a power generator, a motor-driven extinguishing water pump (extra space) should be considered.

All relevant HSE regulations that could act as a design guide line were marked in the inventory table.

2.3 Project Phases

2.3.1 Construction

Construction of floating multi-use platform is a highly complex process, that in addition to the offshore construction and commissioning activities, relies on the supply chain and logistics functions to deliver components. Progress of offshore activities will be affected by weather, as well as other potential factors such as seabed conditions and equipment performance, so the project construction plan should be reviewed to determine sensitivity to such events, and appropriate contingency measures identified in advance, so that these can be thoroughly assessed prior to being needed. The start of the construction phase represents a step change in the level of activity and risk exposure; the effectiveness of the preparations undertaken in the earlier phases of the project will be revealed.

The construction phase involves:

- Preparation of support sites for the construction and subsequent phases; this may involve major construction work to provide the necessary facilities in ports;
- Logistical operations relating to the equipment to be installed, including:
  - Receipt from manufacturing locations;
  - Storage and marshalling in / near port;
  - Load-out onto vessels and transportation to construction site;
- Personnel logistics, including:
  - Movements and support facilities in ports;
  - Offshore transfer, tracking and accommodation;
- Construction activities, including:
  - Foundations or moorings;
  - Devices;
  - Substation and array / grid connection cables; and
- Initial inspections of safety equipment, after it has been installed, and before being put into use for other activities later in the construction or subsequent phases.

Many of these activities involve movement of heavy, awkward and relatively fragile loads, in a challenging environment, and often in close proximity to people; any error or failure could endanger people and vessels. This applies both to major lifts, such as nacelles and tower sections or parts of platforms to be still constructed on site, and to smaller “routine” lifts of lighter components and equipment; the full range of operations needs to be managed safely.

During commissioning, checks are carried out to confirm correct assembly and construction, after which systems can be powered up, and operation can commence. The nature of the commissioning activities will vary, depending on the devices being commissioned; a prototype or early production device is likely to be subject to an extended programme of testing to confirm that it is functioning as intended, whereas series-manufactured devices should only require basic checks before commencing normal operation, albeit with greater monitoring during initial operation than might be undertaken once performance has been demonstrated. While it is usually intended that commissioning will follow almost immediately after construction, this may not always occur, particularly if cabling or substation works are not completed in time for the devices to commence operation.

Commissioning is a key stage, as it prepares the multi-use platforms for operation; thorough checking of mechanical and electrical completion. The operation of safety-related systems will minimise the risk to people in subsequent activities. The handover of information from construction and commissioning to operations and maintenance is also vital to enabling safe and effective working in subsequent phases.

The construction phase can involve several activities and hazards from HSE point of view as follows:

- Large numbers of people working offshore;
- Numerous lifting operations, some of which involve very heavy and awkward loads being lifted at height
- Intensive operation of a wide range of vessels;
- Executing weather-sensitive tasks within the available weather windows; and

The risk from these physical hazards can be increased by the financial pressure that delays in offshore operations may create, and the need to achieve a pre-determined schedule.

There are also some health and safety critical interfaces and communications which involves:

Inputs from earlier phases:

- Construction Phase Plan (CPP), which defines the safety management arrangements;
- Project team, with competent contractors and personnel appointed in all necessary roles;
- Site information to enable activities to be planned in a manner that is suitable for the seabed and metocean conditions at the location.

Construction and commissioning phase activities:

- Marine co-ordination and management of large numbers of simultaneous operations, and tracking the locations of all personnel offshore;
- Multi-contractor operations – clear project team structure, under the control of the Construction manager;
- Safety-related systems, such as those for lifting, handling and work at height, need to be fully tested and commissioned prior to use, so initial inspections will be required during the Construction phase;

Phase outputs:

- Phase also provides information to the O&M phase:
    - Ensuring that this information is accurate and accessible will help O&M activities to be established safely; it is not simply a matter of handing over the completed project health and safety file.

Contractors working on the project are required to integrate their safety management systems with those defined in the CPP, to ensure that a common approach is adopted for all activities on the site. Auditing should be undertaken while work is in progress, both to monitor compliance with the CPP, and also the sufficiency of the measures defined in it.

The quality of work completed during design, manufacture and Construction will determine the level of follow-up "snagging" work that is required after commissioning; in critical areas, this may delay handover to operation. Where a phased approach is being taken to construction and commissioning, effective feedback of issues experienced during commissioning of the earliest areas of the floating modules to be handed over, can allow these to be addressed in subsequent areas, thereby reducing the need for rework at a later stage.

2.3.2 Installation

The installation phase is crucial in the deployment of the floating island. Space@Sea partners believe that two phases of installation hold; "installation of the floating island" and "installation of the 'function' on the island". The installation of such large structures is not straightforward. The whole installation comprises of many operations including but not limited to platform towage and deployment, mooring installation, power cable installation, interconnecting of the floating island and heavy lift operations of various components. Once the offshore work has been completed installation activities on the platform and around the platform can commence. For all these operations standards have been developed for both the offshore wind industry as well as oil and gas practices.

- Phase I: "installation of the floating island". This phase comprises all activities required to install the island at the site of interest. This phase is generic and only dependent on the selected site and the associated

conditions. HSE guidelines will closely be reflected by current standards in installation of large structures. A breakdown of high level operations for the installation are identified and have a strong relationship with the identified standards:

- Port and towage of structures to sea. The island modules will be prepared and towed to the site of interest. Many standards have been created for safe towing operations of e.g. FPSOs, floating wind turbines and GBS structures.
- Interconnection between the various modules. Interconnections are to be made between the modules. Safety standards are to be developed for this matter.
- Mooring installations. Mooring installations will follow the guidelines lessons learnt and standards of offshore industry for this matter.
- Cable laying for power supply. Reference is made to the installation of umbilicals and cables in the (floating) offshore wind industry.

- Phase II: "installation of the 'function' on the island". This phase comprises all activities required to install the "function" on the island. The functions as per Space@Sea scope are living at sea, Energyhub@sea, Farming@Sea and Transport and Logistics @sea. For each function different types of assets are to be installed. For example the installation of high rise structures on the island will require lift operations at high altitude on a moving platform complicating and limiting the operational window for safe execution of the work. For example Energyhub@sea only low rise structures are foreseen on the island opening up the window to perform safe operations at sea. Each asset to be installed has its own set of HSE standards. Hence a good overview is required of those assets and the installation requirements thereof to adequately develop the HSE standards. The following operations have been identified for Phase II installations:
  - Construction of assets (e.g. collapse of structures, exposure to building dusts, electricity). The regulations for the construction of the assets are developed for onshore constructions. Many of those regulations will hold although the offshore environment will make those operations more complex while assuring adequate safety standards.
  - Lifts and operation of lifting equipment; Lifts and the operation of lifting equipment on the platform will be in line with heavy lift operations at sea. DNV GL standards prescribe the sound methods for safe lifting in an offshore environment.
  - Work at height; In case of high rise working at height is inevitable. With induced motions due to the offshore environment standards should be updated to assure safe working environment.
  - Side-by-side transfers (offloading of assets). Side-by-Side operations will be performed to offload equipment to the island for installation. Regulations for the offloading in an offshore environment are available and could be a basis for the SBS for these particular installation operations.

Where Phase I is generic and applicable for all functions Phase II clearly shows deviations in operations required for the final commissioning of the "function". Therefore dedicated HAZIDs are needed for WP6 through WP9 to assure standards and gaps are identified.

2.3.3 Operation & Maintenance

The O&M phase will have the longest duration of any phase of the multi-use platforms. The offshore O&M activities can relate to the devices, structures, moorings, cables, and substations; support facilities such as ports, vessels and work equipment also require appropriate maintenance. In all areas, the overriding aim should be to ensure that deterioration of assets does not jeopardise their continued availability and safe operation. An optimised maintenance strategy achieves these aims, while avoiding unnecessary interventions; not only do these expose people to health and safety risks, but they also have the potential to introduce faults to equipment that was previously operating reliably.

A variety of maintenance philosophies can be applied to different elements of a floating module, including reactive, condition-based and scheduled maintenance; the most appropriate strategy for multi-use platform is likely to

involve a combination of these different approaches. The approach may also change over the operating lifetime, with the device manufacturers leading maintenance while the devices are under warranty, then the operator or another contractor taking over after the warranty period has expired. The O&M phase activities will occur offshore:

- Remote monitoring techniques will be used to monitor device performance and component condition;
- Certain items of equipment offshore are subject to a time-based schedule of statutory inspections and reporting, these include:
  - Lifting equipment;
  - Lifts;
  - Work at height equipment and anchor points; and
  - Emergency equipment, such as rescue and evacuation equipment, fire detection and suppression, emergency lighting and first aid equipment;
- Offshore maintenance activities all involve people working at the offshore locations (e.g. O&M hub of Energyhub), so offshore access is key to enabling maintenance work to take place; in some locations, and especially where major maintenance campaigns are planned, O&M hub will be used to reduce the daily transfer distances and durations.

A challenge for maintenance of any renewable energy converter (e.g. wave energy converter of Energyhub) is the fact that as its energy source is wind, waves or tides, it may not be possible to undertake a test run immediately after completing maintenance activities. Achieving high rates of successful repairs in a single visit depends on having sufficiently clear understanding of faults on the basis of remote monitoring data, combined with good diagnostic work by technicians, in order to make best use of limited offshore working time.

During maintenance activities, people will be working in areas of the wind turbine of Energyhub that are normally unattended, in particular inside devices. In general, this will only occur with the devices having been handed over to the local control of the technician, and then isolated from sources of energy in accordance with the safe system of work that is being operated at the location. Residual risks remain, even after the application of these measures:

- Maintenance activities often involve transitions between equipment states, such as removal of rotor lock or restoration of motive power:
  - It is important to ensure that the equipment will behave in a predictable manner during such transitions;
  - The risk assessment should also consider whether safety relies on people not making mistakes, or if there are additional safeguards, for example, to ensure that WTG blades are pitched to stall before releasing the rotor brake to rotate the hub, in order to ensure that an uncontrolled over speed cannot be initiated;
- Even with good remote diagnostic systems, there will be occasions where, after starting work on the device, it becomes clear that different, or additional work has to be undertaken. The safe systems of work need to be capable of managing such situations without undue delay, and without compromising the safety of the technicians involved.

Work inside devices also presents a range of ergonomic and welfare risks:

- Tasks may involve awkward working positions or work at height, and while the frequency of the task may be low on any given device, technicians are likely to repeat the task on many similar devices, giving repeated exposure;
  - The direct ergonomic risks combined with the effects of weather and offshore transfers;
- Technicians are likely to spend full working days inside individual devices, so need to have access to appropriate welfare facilities.

Some maintenance activities, such as those that relate to subsea structures, cables and corrosion protection, will involve subsea inspection and intervention; safe methods for this should be identified in order to minimise the use of divers.

There are also some health and safety critical interfaces and communications which involves:

Inputs from earlier phases:

- The design of equipment will determine the scope, ease and safety of subsequent maintenance activities; and
- The effectiveness of monitoring and diagnostic systems will determine the ability to identify problems before downtime occurs.

O&M phase activities:

- Maintenance activities will involve both daily minor work and periodic major maintenance campaigns, with each category requiring different management approaches;
- Various parties may be directly involved in maintenance activities, such as the operator, device manufacturer, balance of plant and other contractors;
- Other parties will perform supporting roles, such as marine co-ordination, vessel provision and emergency response;

Outputs:

- As the end of the useful life of equipment is approached, the maintenance effort is likely to be reduced, however sufficient attention should still be given to ensure that the multi-use platforms remain safe to decommission;

O&M activities need to take place within a safety management system that covers all of the areas of work that will be necessary. These include:

- Establishing and operating safe systems of work, such as the respective Safety Rules or other permit to work systems;
- Ensuring that all personnel involved have the necessary training, competence and supervision to fulfil their roles and enable safe working;
- Monitoring and controlling the location and status of all vessels and personnel working offshore; these responsibilities are usually fulfilled by the Marine Co-ordination function, and are essential to being prepared for any emergency situations that may arise.

2.3.4 Decommissioning

As a condition of consent for an offshore construction, a decommissioning plan is generally required to be submitted to, and approved by, the authorities before construction starts. This enables the government to ensure that its obligations under international treaties to ensure the safety of navigation (under UNCLOS) and protection of the marine environment (under the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic) are fulfilled. UNCLOS refers to IMO standards; in general, the aim of decommissioning activities is to restore the location of the multi-use platforms to its condition prior to the development having been installed.

Decisions made during the design phase, and subsequent modifications and upgrades, will determine the hazards that have to be addressed during decommissioning.

The general requirement in decommissioning is that the platforms should be completely removed; however in the case of items such as anchor piles driven deep into the seabed, or buried cables, this may not be appropriate, in which case the Best Practicable Environmental Option (BPEO) is likely to be partial removal, as long as this can ensure that there is no hazard to future safe navigation or other sea uses such as fishing. Such partial removal is likely to entail cutting piles below the level of the seabed, removing any exposed sections of cable, and committing to a programme of monitoring to ensure that the buried components are not subsequently exposed due to seabed movement.

There are some key health and safety risks to be considered:

The same operation may be more hazardous in reverse than during original assembly: for example, in the apparently simple case of a bolted joint:

- During initial assembly:
  - Components are lifted in accordance with manufacturer's instructions, often under the supervision of the manufacturer's own specialist personnel, using lifting points of known strength, and are then lowered into place (sometimes with the assistance of bumpers and guides), the holes aligned, the bolts inserted and tightened to the specified torque;
- During disassembly:
  - Integrity of lifting points may have deteriorated:
    - Condition will need to be assessed prior to lifting, and if the lifting points are no longer suitable, alternative safe means of attachment will be necessary;
    - The initial design and location of lifting points will affect the probability that they will still be serviceable when required for decommissioning;

Other joining systems also present challenges; for example, grouted connections cannot be disassembled, so structures will have to be cut, usually at a location away from the grouted areas.

While piled foundations can be driven into the seabed without any subsea work being undertaken, cutting of anchor piles beneath the sea floor involves intricate subsea work, followed by lifting of the cut section of the pile. While the anchor pile is being cut, it will need to be supported, usually by attachment to a crane, as it may no longer be able to withstand wave loading from the sea;

The design of structures, and selection of materials during the design phase should therefore consider how the floating modules will eventually be decommissioned, in order to minimise the hazards that will be involved in this work.

In the event of a device or structure being damaged during its operating life, decommissioning may be more hazardous; for example, the centre of gravity of a broken blade of the WTG of Energyhub will be different to that of a complete blade, affecting lifting operations, while access inside a fire-damaged structure will not be able to rely on the lift or ladder being in safe condition to use. In such cases, additional task-specific planning and risk assessment will be necessary, prior to starting decommissioning activities.

There are also some health and safety critical interfaces and communications which involves:

Inputs from earlier phases:

- The risks that decommissioning will present should first be considered during project definition and detailed design phases.
  - Under Construction (Design and management) regulations, the Designer's responsibilities include considering "the health and safety of those who will maintain, repair, clean, refurbish and eventually remove or demolish all or part of a structure." The Designer must therefore consider how to reduce risk during decommissioning; this could include, for example, designing subsea structures that will be suitable for the use of Remotely Operated Vehicles (ROVs) during the expected decommissioning operations, thereby avoiding the need to deploy divers;
  - Under the Machinery Directive, the Essential Health and Safety Requirements aim to „eliminate any risk throughout the foreseeable lifetime of the machinery including the phases of transport, assembly, dismantling, disabling and scrapping". Where the manufacturer can take measures that contribute to this aim, such as avoiding the use of construction techniques or materials that increase hazards during dismantling or scrapping, then they should do so.

Decommissioning phase activities:

- Partially-dismantled structures can pose a greater navigational hazard than complete structures which will not be visible above the surface, or on radar, yet is within the draft of many ships. Navigational safety measures such as buoyage, guard vessels and Notices to Mariners should be determined by risk assessment;

- In many cases, decommissioning of parts of a floating offshore construction will take place while other parts are still in normal production. In order for such phased activity to be managed safely. Clear boundaries and protocols will need to be established to avoid the risk of interference between parts of the site that are operational and those that are being decommissioned;

Outputs:

- On completion of decommissioning, the site should be restored to its original state, before the floating module was developed, and should not present any additional risks to navigation or the environment;

3. HSE Regulations, Standards and Guidelines

3.1 General

Health and Safety and Environment (HSE) is a discipline and specialty that studies and implements practical aspects of environmental protection and safety at work. In simple terms it is what organizations must do to make sure that their activities do not cause harm to anyone.

Regulatory requirements play an important role in HSE discipline and HSE managers must identify and understand relevant HSE regulations, the implications of which must be communicated to executive management so the company can implement suitable measures.

From a health and safety standpoint, it involves creating organized efforts and procedures for identifying workplace hazards and reducing accidents and exposure to harmful situations and substances. It also includes training of personnel in accident prevention, accident response, emergency preparedness, and use of protective clothing and equipment.

From an environmental standpoint, it involves creating a systematic approach to complying with environmental regulations, such as managing waste or hazardous substances all the way to helping site's reduce the company's carbon footprint.

In Europe, since the late 1980s, the European Commission has issued guidelines defining minimum standards in Europe. Member states must transpose these directives into national (occupational health and safety) law within certain deadlines, but must not fall short of the minimum requirements.

The relevant Directive is Framework Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health protection of workers at work, in conjunction with Directive 2007/30/EC of the European Parliament and of the Council of 20 June 2007 amending Council Directive 89/391/EEC and its specific directives.

Worldwide, health and safety regulations are gradually converging. Above all, globally operating companies that can be certified in accordance with ISO 45001 are adapting their occupational safety standards to international standards. Currently, the Commonwealth countries and North America have the highest requirements due to their criminal and civil law legislation.

The following HSE Regulations could be applied to occupational health and safety and environmental protection when working on multi-use platforms in a marine environment. There are statutory health and safety regulations, accident prevention regulations, technical standards, laws, standards and guidelines for maritime safety, regulations for the handling of resources and waste as well as their disposal and regulations for the protection of the environment, but rules for risk management, too.

3.2 Standards

3.2.1 EN ISO standards

ISO standards or the European standards EN are internationally developed standards. A national standard is a voluntary standard drawn up by a working committee in the national Institute for Standardization, in which material and immaterial objects are standardized.

DIN EN ISO means e.g. a German takeover of a standard produced under the leadership of ISO or CEN, which was then published by both organizations.

A typical Health, Safety and Environment related standard is EN ISO 12100 - Safety of Machinery Basic concepts, general principles for design. This basic standard provides general principles of design as well as definitions and describes in detail the method of risk assessment. Safety of machinery in this context means that machines can

perform their intended functions in the respective phase of life and the risk has been sufficiently reduced. Ensuring the safety of machinery is an iterative task of design department.

3.2.2 EN standards

For EN standards, in principle, the same applies as under section 3.2.1.

DIN EN means e.g. a German adoption of a European Standard (EN). European standards, when adopted, must be adopted unchanged by the members of CEN and CENELEC.

A typical HSE related standard is DIN EN 795 - Personal fall protection equipment - Anchor devices. This European Standard specifies requirements for performance and associated test methods for single-user anchor devices which are intended to be removable from the structure. These anchor devices incorporate stationary or travelling (mobile) anchor points designed for the attachment of components of a personal fall protection system in accordance with EN 363. This European Standard also gives requirements for marking and instructions for use, and guidance on installation. This standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of the EU Directives.

3.2.3 ISO standards

For ISO standards, in principle, the same applies as under section 3.2.1.

DIN ISO means e.g. an unchanged German adoption of an ISO standard.

A typical HSE related standard here is DIN ISO 31000 - Risk management/ Guidelines. According to this standard, risk management is a management task in which the risks of an organization are identified, analyzed and evaluated. To this end, the overarching objectives, strategies and policies of the organization must be defined for risk management. Specifically, this includes establishing criteria to classify and assess risks, methods of risk identification, risk decision making responsibilities, provision of risk mitigation resources, internal and external communication of identified risks, and staff qualifications for the risk management.

3.3 National Law

In principle, the territorial principle applies to National legislation, that is, they apply only to the territory of the dedicated EU country. This also applies to the Occupational Health and Safety Act and other important health and safety laws. The scope may also include the Exclusive Economic Zone (EEZ).

However, this legislation is mainly based on the implementation of EC directives on occupational health and safety, which have provided information on certifications, time limits for inspections, qualification of personnel, etc. since 1989, so that comparable provisions can be expected in all EU countries. However, in individual cases, the EU member states may also go beyond the minimum protection measures provided for in these EC Directives, e.g. when setting national limit values. Thus, an employer is obliged to always familiarize himself with the legal requirements of the respective country.

As an example, Occupational health and safety plays an important role in Germany and is implemented accordingly stringently, because billions can only be saved by appropriate preventive measures. In addition, employees also feel far more comfortable at work. In the companies there are high standards and there are also appropriate control bodies, which keep the companies in mind and evaluate them. So it is no wonder that there are corresponding differences between the individual countries and these include, among others:

- Fixed controls by government agencies in Germany
- Regulations for employees at the workplace
- Personal Protective Equipment, which must be made available in Germany
- Special courses and seminars such as driving a forklift

- Prevention through information
- Monitoring at the workplace

Young people and young adults are already being sensitized to occupational safety at vocational schools, and this knowledge is also part of the exams in some sectors. Countries such as Germany, the United States and Sweden attach great importance to occupational safety.

At national level (for example in Germany) there are a number of important public health and safety guide lines.

One of the most important laws here is the Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work.

This Occupational Health and Safety Act/ Arbeitsschutzgesetz (German abbreviation: ArbSchG) is a German law for the implementation of EU directives on health and safety at work. The aim of the law is to safeguard and improve the health of all employees - including the public sector - through occupational safety and health measures.

The main innovation in the introduction of the law was the risk assessment. It is an "assessment of working conditions" and not an assessment of the resilience of the individual employee. In addition to classical hazard types such as "physical, chemical and biological effects", hazards arising from "the design of work and production processes, work processes and their interaction" and "insufficient qualification and instruction of employees" must also be assessed.

The effectiveness of the preventive measures resulting from the risk assessment of working conditions should be reviewed. Focusing the Occupational Safety and Health Act on working conditions and not on individual employees means that prevention measures have to be tackled at their source and that individual protection measures are secondary to other measures.

In addition, the employer must ensure that his staff are regularly briefed or can delegate tasks and duties to suitable staff, but in any case remains obliged to control the performance of the tasks assigned. Employees, for their part, must observe the instructions of the employer and ensure that their activities do not jeopardize other persons. They are also obliged to report identified deficiencies that may affect safety and health to the employer.

3.4 Accident prevention regulations

The accident prevention regulations represent the obligatory occupational safety and health protection at work for each company and every insured person of the Statutory accident insurance.

In Germany e.g., Employers' Liability Insurance Associations, as trade associations and as holders of Statutory accident insurance, issue the statutory accident insurance regulations (DGUV regulations), which must be approved by the Federal Ministry of Labor and Social Affairs as specialist supervision.

The accident insurance institutions issue as an independent right accident prevention regulations e.g. about

1. Facilities, arrangements and measures to be taken by operators for the prevention of accidents at work, occupational diseases and work-related health hazards, and the way in which those tasks are transferred to other persons,
2. The behavior of insured persons for the prevention of occupational accidents, occupational diseases and work-related health risks,

A representative example is the DGUV Regulation 36 - Harbour work. These regulation regulates the occupational safety and health protection e.g. for the following topics:

- Transhipment, transport, provision and storage of dangerous goods and similar goods
- Use of transhipment devices
- Use of load handling devices on lifting equipment
- Use of equipment for the lifting of persons
- Port work in the land area

- Harbour work in the ship's area
- Administrative offences

Accident prevention regulations are also applicable abroad for employees insured in Germany. Here is the so-called posting effect. Since the Employers' Liability Insurance Association has to settle or compensate for accidents of persons insured in Germany, at least the German accident prevention regulations always apply to employees working abroad, unless the health and safety regulations in the respective country are of higher quality.

3.5 Rules, information and principles of Trade associations

In addition to section 3.4, e.g. German employers' liability insurance associations issue rules, information and principles.

These are designated as:

- DGUV rules (formerly BGR / GUVR)
- DGUV information (formerly BGI / GUVI)
- DGUV principles (formerly BGG / GUVG)

The DGUV rules and DGUV information are not in the rank of a regulation, but belong to the state of the art. They concretize the protection goals defined in the accident prevention regulations and give hints on how they can be achieved. They can be used in the risk assessment as a basis for decision (margin of the employer).

Following sets of DGUV information are e.g. representative of the above-mentioned regulations:

1. BG RCI T 008 (now DGUV Information 213-054) - Machines / Safety concepts and protective devices

This regulation supports the employer in the risk assessment for machines according to § 3 of the Industrial Safety Ordinance (BetrSichV). This rule contains checklists that can be used to check safety concepts and protective devices on machines. The leaflet and the checklists substantiate the rules A 016 / A 017 of the BG RCI on the risk assessment. The requirements described in this regulation are based on the Machinery Directive (2006/42/EC) and the harmonized European standards.

2. BG RCI A 017 (previously BGI 571) - Risk assessment / hazard catalogue

This document assists in the systematic recording and assessment of hazards and load factors in the context of the risk assessment without any claim to completeness. An adjustment to the operating conditions may be required.

This basic hazard catalogue A 017 enables the systematic recording of significant hazards and loads. It is supplemented by special catalogues.

The hazard catalogue contains:

- Hazards factors and load factors
- Examples of protective measures
- Applicable regulations and technical rules

Where possible, specific examples of action have been given specific legal bases. The examples of protective measures are particularly detailed if there are no or only general measures in regulations and technical regulations.

This document will serve as a tool for the risk assessment (HAZID) of Health, safety and environmental risks related to harm to persons or environment due to the activities associated with the multiple-use platforms in Working package 6 to 9 at all stages of the process from manufacturing through to installation, operation and decommissioning.

3.6 Technical Rules

In addition to section 3.5, there are technical rules for the specification and completion of legally binding claims, so-called German sub-regulatory framework.

Common to the rules and regulations is that they are not legally binding, but provide guidance for design solutions. The application of the rules gives rise to presumption of conformity.

Some Technical Rules are illustrated in Table 2 as follows:

Table 2. Listing of Technical Rules

Technical Rule	Description	(German) Legal basis
TRBS	TR for operational safety	BetrSichV
TRGS	TR for hazardous substances	GefStoffV
TRBA	TR for biological agents	BioStoffV
ASR	TR for work places	ArbStättV

A typical representative of these rules is the TRGS 400 - Hazard assessment for activities involving hazardous substances.

Within the range of its scope, the TRGS 400 specifies requirements of the Hazardous Substances Ordinance (GefStoffV). The TRGS 400 describes procedures for information gathering and risk assessment according to GefStoffV. It incorporates the requirements of the GefStoffV into the framework prescribed by the Occupational Health and Safety Act (ArbSchG).

3.7 Relevant guideline documents for new offshore operations

For operations at sea several guidelines have been developed, which relate to various operations for new offshore technology. In recent years offshore wind technology has expanded significantly with the development of dedicated guidelines. In general marine operations will be designed, planned and operationally controlled as appropriate to the scale, complexity and risk level. The most known and relevant guidelines for Space@Sea operations related to HSE are:

- DNV-OS-H101 Marine Operations
- 0001/ND General Guidelines for Marine Projects
- 0035/ND Guidelines for Offshore Wind Farm Infrastructure Installation
- ISO 29400 Offshore wind energy – Port and marine operations

Many guidance documents have been developed for various operations. The majority of these documents have been originated for use in the offshore Oil & Gas industry. Currently many of these guidelines are adapted for the offshore wind industry. A similar approach is required for Space@Sea project. The following general operations have been defined for which current guidelines have been developed

- Towage operation at sea
- It is expected that many lifting operations are required in both the installation as well as the operation of the platform. Lifting operations are generally defined within offshore legal framework as set out in the EU Machinery Directive and Use of Work Equipment Directive which in turn is implemented by national

legislation in EU member states. There are a number of recognised guidance documents and codes of practice. Most significant issues currently noted in the industry is related to the correct classification of a lift and application of the appropriate process. For Space@Sea project lifting operations are to be defined to understand the relevance of the codes and standards.

- Floating installations and operations require the use of DP vessels for Space@Sea applications. Currently there is a lack of clarity in the industry when determining the appropriate class of DP vessel. This is particularly the case when operating within the safety zones of Oil & Gas installations. Recently new standards have been released as found in DNVGL-ST-0111.
- Space@Sea project requires many transfer operations offshore both for installation as well as O&M operations. In offshore wind an increasing number of personnel transfers in the offshore wind industry are executed. Collision hazards exist. Compare to Oil & Gas the hazards show less severe consequences compared to collision in Oil & Gas. Current industry guidance relating to personnel transfers in the wind industry includes:
  - IMCA SEL 025 / M 202 – Guidance on the transfer of personnel to and from offshore structures;
  - G9 Good Practice Guideline for the safe management of small service vessels used in the offshore; wind industry
  - DNV GL Gangway Access to Offshore Facilities – Walk-to-Work (W2W) Industry Guidance

3.8 Environmental issues

Environmental issues concern the impacts that activities may have on the quality of the ecosystems. Several policies and regulations are in place in order to avoid or minimize the impacts, summarized below. The environment itself, and therefore also discharges from human activities, may impact the quality of seafood, either from wild catch/harvest or resulting from aquaculture. For aquaculture both the relevant regulations on the environment and food quality will be considered.

3.8.1 General Environmental regulations

Any activity at sea will be subject to (a set of) environmental regulations. Also guidelines may apply to ensure mitigation of impacts, or to minimize the environmental food print of activities related to the construction, operation and decommissioning of constructions and their application(s) as considered in the Space@Sea project.

The seas of the European Union are subject to several environmental legislations that need to be integrated and implemented in National laws by each member state. Furthermore, international conventions apply that provide additional instruments. Here, we focus on relevant European policies and international conventions that apply to environmental issues.

Every proposed activity with likely significant effects on the environment should be subject to an Environmental Impact Assessment. The EIA is mandatory in Europe according to the EIA Directive 2011/92/EU. The relevance and applicability of EIA and other legislation for future offshore installations has been described as part of the TROPOS project: “The EIA Directive established procedures to assess environmental impacts, and it applies to different public and private projects which are defined in the Annexes I and II of the directive. Projects listed in Annex I are considered to have significant environmental effects and require an impact assessment (mandatory EIA) prior to them being granted consent by local and/or national authorities. Projects listed in Annex I are mostly large-scale projects, such as motorways, power stations, chemical works, oil refineries, etc. For projects listed in Annex II of the directive (e.g. related to energy industry, food and textile industry, development of tourism and leisure facilities, etc.), the national authorities have to decide whether an EIA is needed. This is done by the "screening procedure", which determines the effects of projects on the basis of thresholds/criteria or a case by case examination. However, the national authorities must take into account the criteria laid down in Annex III of the Directive (e.g. characteristics of the project, location, etc.).” The deployment of floating modules at sea as those

being developed within the Space@Sea project can be considered a large-scale project for which an EIA procedure will apply.

Deliverable 6.2 of the TROPOS project is dedicated to an overview of European and national Legislation and Policies, and international commitments and conventions. In addition, relevant legislation was identified in this document for different applications of multi-use platforms that are also relevant to the Space@Sea project. Identified documents, including those reported by TROPOS, are listed in the table and are briefly described hereunder.

The most important general European environmental regulations with regard to the protection of the marine environment are the Marine Strategy Framework Directive (or Marine Directive), the Water Framework Directive (only inland and coastal waters), the Habitats Directive, and the Bird Directive. These provide a framework for the environmental quality aspects that should not be significantly impacted by human activities, such as those arising from floating modules at sea.

Aside from regulations, International Commitments and Conventions apply, such as the UN Convention of the Law of the Sea (UNCLOS), and Regional Sea Conventions (OSPAR Convention for the North-East Atlantic Ocean, HELCOM Convention for the Baltic Sea, Barcelona Convention for the Mediterranean Sea and Bucharest Convention for the Black Sea). Originally, these conventions had a focus on the protection of the environment to sources of pollution, but they have broadened their scope to the protection of the marine environment from several sources of impact that arise from land- and sea-based human activities. Although the agreements and actions from these conventions have no legal force, contracting parties have obliged themselves to support in the achievement of their goals and measures.

Many of the concepts and approaches laid down in European Directives originate from other international conventions. The United Nations Convention on the Law of the Sea (UNCLOS) provides the legal framework for contemporary principles of protection of the marine environment, including the ecosystem based approach, the precautionary approach and sustainable development. The Convention on Biological Diversity (CBD) aims to halt biodiversity loss, ensuring the conservation and sustainable use of marine biodiversity, and to create a global network of marine protected areas (MPAs). The Regional Seas Conventions (RSC) are cooperation structures set up to protect the marine environment of a specific marine region.

Aside from formal regulations, the environmental performance of activities, processes and products can be assessed by means of a Life Cycle Assessment (LCA). LCA is a technique to assess environmental impacts associated with all the stages of a product's life, by assessing the environmental impacts caused by inputs (e.g. raw materials, energy), processing (construction), application (operation and maintenance, products and other outputs) and decommissioning (disposal and recycling). The procedures of life cycle assessment (LCA) are part of the ISO 14000 environmental management standards: in ISO 14040:2006 and 14044:2006. (ISO 14044 replaced earlier versions of ISO 14041 to ISO 14043.) There is no specific standard on the methodology for performing an LCA of floating offshore constructions as those developed within Space@Sea, but ISO 14040 would be the most relevant and commonly used reference for these (TROPOS D5.4).

3.8.2 Aquaculture and Seafood

Several EU regulations apply to aquaculture, with regard to the environment, the health and welfare (of cultured animals), and trade of products, consumer information (e.g. labelling) and product certification[1]. In this section, the focus is on regulations concerning the potential impacts of aquaculture on the environment, and regulations for the (food) quality of aquaculture products.

[1] www.ec.europe.eu/fisheries/cfp/aquaculture/policy-areas_en

3.8.2.1 Environmental impacts

In the "Future brief: Sustainable Aquaculture" a view is provided on sustainable aquaculture in the future, taking consideration of environmental problems with current aquaculture practices and EU policies. Considering the regulations as presented in section 2.7.1, several environmental issues have been identified relevant to aquaculture. The main issues are pollution caused by aquaculture and ecological interactions.

Pollution refers to organic waste and nutrients that may be released to the environment, the use of pharmaceuticals and pesticides (antibiotics, anti-parasitics), and antifoulants (applied to equipment such as nets or cages). The required water quality is regulated in the Water Framework Directive and Marine Framework Strategy Directive, and additionally the Bathing Water Directive and Urban Waste Water Directive may apply.

Major concerns on the ecological interactions of aquaculture are about the escape of species, more precise the consequences of escapees for wild populations, and the introduction of (invasive) alien species. Also diseases occurring in cultured species may be spread to wild populations, such as sea lice (parasites). Furthermore, the feed of many larger fish species consists partly of wild catch fish, thereby requiring fishery activities that potentially may negatively affect the natural ecosystem. The same applies to the culturing of mussels that require the fishing or collection of juvenile mussels (spat, seed) to stock culture systems. The fishing of mussel seed may impact the seafloor, while seed collected with mussel seed capture installations may compete with other filter feeders in the ecosystem, such as other bivalve species and zooplankton. Comparably, cultured seaweeds may compete for nutrients and sunlight with naturally present primary producers, such as other seaweed species, phytoplankton, and eelgrass.

3.8.2.2 Quality of aquaculture production and products

For the culturing of marine species and its application for food and feed, many regulations and different types of certification are applicable for the way of culturing and the final food or feed products. Here, we briefly describe the following: Food and feed safety regulations; Labelling; Sustainability certification. Also other, more general types of regulations and guidelines may apply that have a broader and more general agricultural scope.

The basic set of principles for the requirements of food and feed is laid down in the General Food Law (Regulation (EC) 178/2002). It covers general requirements, the primary responsibility of producers (Food and Feed Business Operators) for quality and safety, the founding of the European Food Safety Authority (EFSA) and of the Rapid Alert System Food and Feed (RASFF). The requirements for specific areas, including hygiene, trade and labelling, additives and undesirable substances, are laid down in additional regulations (see Annex 1), and additional Commission Decisions[2] The organization of official controls for monitoring any infringement of the regulations is laid down in Regulation (EC) 882/2004 (European Commission, 2004).

In addition to the above mentioned public standards, also private standards apply to ensure safe procedures and products throughout the supply chain involved in aquaculture and food production in general. ISO22000:2005 (EN) is a standard for the Food Safety Management System, The organizations involved in the food chain need to ensure that food is safe at the time of human consumption. The traceability of food and feed products is described in ISO22000:2007.

For the labelling of products, general marketing and use of feed regulations apply for feed (EC 767/2009) and food (EU 1169/2011). The qualification of organic production and labelling is laid down in Regulation (EC) 834/2007, and the rules on its implementation in Regulation (EC) 889/2008. In general, organic standards are designed to allow the use of naturally occurring substances while prohibiting or strictly limiting synthetic substances.

Sustainability certification of aquaculture products may be obtained on a voluntary basis, by the Aquaculture Stewardship Council (ASC) and the Marine Stewardship Council (MSC). The Aquaculture Stewardship Council is an independent, international non-profit organization that manages the world's leading certification and labelling program for responsible aquaculture. The ASC Standard cover the following areas of aquaculture: a. Legal compliance (obeying the law, the legal right to be there); b. Preservation of the natural environment and

[2] https://ec.europa.eu/food/animals/animalproducts/aquaculture_en

biodiversity; c. Preservation of water resources and water quality; d. Preservation of diversity of species and wild populations (e.g., preventing escapes which could pose a threat to wild fish); e. Responsible sourcing and use of animal feed and other resources; f. Good animal health and husbandry (no unnecessary use of antibiotics and chemicals); g. Social responsibility (e.g. no child labour, health and safety of workers, freedom of assembly, community relations).

3.9 Marine Spatial Planning

When planning any activities at sea, other established and planned activities should be considered as well. For this purpose, the EU has developed a Directive on Maritime Spatial Planning (MSP). MSP is part of the overarching Integrated Maritime Policy of the EU. The MSP Directive provides 'a process by which the relevant Member State's authorities analyse and organise human activities in marine areas to achieve ecological, economic and social objectives', according to the European Commission's Directive on Maritime Spatial Planning'. The main aim of the Directive is to reduce (potential) conflicts between the various sectors active at sea and to stimulate to find synergies between activities[3]. It also encourages investments by creating predictability, transparency and clearer rules. Furthermore it should increase cross-border cooperation between EU countries to develop energy grids, shipping lanes, pipelines, submarine cables and other activities, but also to develop coherent networks of protected areas. Protection and preservation of the environment could also be improved through early identification of impact and by seeking opportunities for multiple use of space.

The multi-use platforms developed within Space@Sea intent to contribute to the aims of the MSP Directive by providing multiple use of space for maritime activities. However, it is up to the authorities of the Member States to assess if, how and where these platforms could be integrated within their spatial management.

[3] https://www.msp-platform.eu/msp-eu/introduction-msp

4. Discussion and Conclusions

In this deliverable D2.1 we report on the inventory of regulatory framework for operations at sea and specific requirements for health, safety and environmental (HSE) issues. An inventory was made on the relevant regulations, standards and guidelines that apply to the development and application of the standardised floating modules that are being studied in the Space@Sea project. The overview is not exhaustive but aims to identify the main risks related to the HSE aspects that need to be considered and controlled. The identification and evaluation of risks will be considered in the next phase of work package 2 of Space@Sea.

Health and safety hazards and environmental risks need to be considered for all steps of the multi-use platform life cycle with a special focus on manufacturing, installation, operation and decommissioning. Following on from the previous analysis of technology options a full HAZID study will be developed reviewing potential hazards and risks in a range of different deployment scenarios for the proposed substructures, being developed in WP 6, 7, 8 and 9. A HAZID means a hazard identification (HI) and hazard characterization (HC) step of a risk assessment (RA), being followed by an Exposure Assessment and Risk characterization.

Hazard Analyses are an integral part of a Safety Program for construction projects. In industry it is standard procedure to carry out an identification of hazards in relation to the various activities to be carried out and to make an assessment of the risks for personnel, equipment, material and environment for the technology to be developed. The Space@Sea project team will carry out a Hazards Identification (HAZID) during which for each hazard a criticality factor will be established.

The results of these risk assessment studies will be presented in the HAZID Report. HAZID is an integral part for the project management. Both regulatory requirements and standards within the industry require that the HAZID be undertaken as part of the Risk Assessment System. However, if hazards cannot be identified Space@Sea could switch to other methods of removing or mitigating risks such as HAZOP.

The methodology basis, often referred to as the Coarse Analysis or Preliminary Hazard Analysis, is based on an identification of credible hazards, for a Qualified Risk Assessment (QRA). The HAZID is a necessary step in any risk analysis, it is often a requirement. On the other hand, the HAZID alone will often give very valuable results, in the identification of hazards and the suggestions for risk reducing measures. Accidents causing pollution, personal injuries or non-productive time. The cost of HAZID is a fraction of the potential savings.

Space@Sea consortium considers it good practice to perform a full HAZID study prior to final concept design. The primary reason for this approach lies in the fact that problems found by HAZID studies will be easier incorporated into the concept. And the earlier a potential hazard is detected the more time can be applied toward finding an optimal solution.

A full analysis of HSE issues will be reviewed for construction, deployment and operation of the proposed substructures, taking into account the work of task 6.6 at Working package 6. The HAZID will be carried out as a workshop, involving a panel of experts covering the necessary fields of competence and experience. There are several issues which need to be considered in terms of serial manufacture and fabrication of key structural items, potential hazardous risks with port facilities for substructure deployment and a number of potential issues with deployment and specialised shipping.

Operations and maintenance will have several potential hazardous scenarios due to the non-static nature of the floating platforms leading to potential access problems. In addition to this, several offshore environmental scenarios for deployment will be reviewed. Furthermore, the potential food and feed safety hazards, including the characterization thereof, which may result from multi-use platforms would be elucidated in foods such as seaweed. Accessibility in terms of specialised equipment for vessel transfer and safe working practices on the floating platform will be key considerations which need to be reviewed in detail.

Under consideration of task 6.6, a methodology for risk assessment of Energyhub@Sea will be developed. Methods for hazard identification, risk estimation, risk evaluation and risk treatment will be described. For risk estimation, various categories of probability and severity will be defined. The acceptable risk will be defined by constructing a

risk matrix showing acceptable / unacceptable combinations of the probability and severity categories. For risk evaluation, requirements for risk treatment will be given for each risk level.

A HSE risk register and Technology risk register for storage of information from the individual subtasks for each identified hazard or failure mode will be developed for WP6. The results are also included in D6.5: Risk Assessment report.

Further work will also include definition of preconditions for the actual design of the floating island constructions based on an analysis of legal requirements. Preconditions will be specified that need to be taken into account for the specific business cases within Space@Sea as further defined in WP1, and to be elaborated in the dedicated WP6 through WP9. Relevant issues on health aspects includes the impact of spending time at sea, medical care, quality of aquaculture products. For safety aspects, many regulations have been developed, and relevant topics need to be identified for constructions and operations as defined within Space@Sea. Interactions with the environment includes both the impact of operations on the marine ecosystem, as the environmental provisions (e.g. nutrients for seaweed culture) and impacts of the marine environment on structures (e.g. salinity, fouling organisms).

As a result of a risk based approach, the most important aspects on HSE (to take account of by developing applications for the multi-use platforms) would enable an assessment whether current rules and regulations are sufficiently covered by existing ones, or no. Particular aspects related to the construction, deployment and applications of multi-used platforms may require adjustments to current regulations, or the development of specific new ones. This will be one of the outcomes of the HAZID study and the development of the HSE guideline for the (multi-use) applications.

A HSE guideline, and a list considerations for environmental aspects will be delivered as final product.

Annex 1: **Inventory table of rules and regulations for health, safety and environmental issues**

#	Short title of HSE Rules & Regulations	Title of HSE Rules & Regulations	Current version	Short description of content	WP6: Energyhub at Sea	WP7: Living at Sea	WP8: Farming at Sea	WP9: Trans&Log at Sea	Health & Safety	Environmental	Design guideline	Project phase				
												Construction	Installation	Operation	Maintenance	Decommissioning
1	Framework Directive 89/391/EEC	Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work	1989-06-12	The aim of this Directive is to introduce measures to encourage improvements in the safety and health of workers at work. It applies to all sectors of activity, both public and private, except for specific public service activities, such as the armed forces, the police or certain civil protection services. It is of fundamental importance as it the basic safety and health legal act which lays down general principles concerning the prevention and protection of workers against occupational accidents and diseases. It contains principles concerning the prevention of risks, the protection of safety and health, the assessment of risks, the elimination of risks and accident factors, the informing, consultation and balanced participation and training of workers and their representatives.	X	X	X	X	X			X	X	X	X	X

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												Construction	Installation	Operation	Maintenance	Decommissioning
2	Directive 2007/30/EC	Directive 2007/30/EC of the European Parliament and of the Council of 20 June 2007 amending Council Directive 89/391/EEC, its individual Directives and Council Directives 83/477/EEC, 91/383/EEC, 92/29/EEC and 94/33/EC	2007-06-20	The aim of this directive is to simplifying and rationalising the reports on practical implementation.	X	X	X	X	X			X	X	X	X	X
3	Directive 2006/42/EC	Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC	2006-05-17	Its main intent is to ensure a common safety level in machinery placed on the market or put in service in all member states and to ensure freedom of movement within the European Union by stating that "member states shall not prohibit, restrict or impede the placing on the market and/or putting into service in their territory of machinery which complies with Directive".	X	X	X	X	X			X	X	X	X	X

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4	DIN EN ISO 9001	Qualitätsmanagementsysteme (Quality Management Standard)	2015-11	This standard describes what requirements a company's management system must meet in order to meet a certain standard in the implementation of quality management. It can be informative for the implementation within a company as well as for the proof of certain standards towards third parties. Evidence is provided by a certification process with subsequent issuance of a time-limited certificate by independent certification bodies. The standard deals with the fundamentals of quality management systems, including the seven quality management principles upon which the family of standards is based.	X	X	X	X		X		X	X	X	X	X

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5	DIN EN ISO 14001	Umweltmanagementsysteme (Environmental Management Standard)	2016-03	This standard sets globally recognized requirements for an environmental management system and is part of a family of standards. This family of standards includes numerous other standards covering various areas of environmental management, including life cycle assessments, environmental indicators and environmental performance assessment. It can be applied to both manufacturing and service companies. This standard places emphasis on a continuous improvement process as a means of achieving the defined environmental performance goals of an organization (company, service provider, authority, etc.). The continuous improvement process is based on the Plan-Do-Check-Act (PDCA) method.	X	X	X	X		X		X	X	X	X	X

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6	DIN ISO 45001 (ex OHSAS 18001)	Managementsysteme für Sicherheit und Gesundheit bei der Arbeit (Work Safety Management Standard, ex OHSAS-System)	2018-06	The well-being and also the health of the employees can be negatively influenced by various hazards on working place. Often, employee misbehaviour or deficiencies in the organization are sources of potential hazards. Employers can minimize the risks by introducing an OHSAS 18001 health and safety management system. In the medium term, this system will reduce accidents and, as a result, reduce downtime. The previously used OHSAS 18001 will now be replaced by its successor, the ISO 45001.	X	X	X	X	X			X	X	X	X	X
7	DIN ISO 31000	Risikomanagement - Leitlinien (Risk management - principles and guidelines)	2018-05	According to this standard, risk management is a management task in which the risks of an organization are identified, analyzed and evaluated. To this end, the overarching objectives, strategies and policies of the organization must be defined for risk management. Specifically, this includes establishing criteria to classify and assess risks, methods of risk identification, risk decision making responsibilities, provision of risk mitigation resources, internal and external communication of identified risks, and staff qualifications for the risk management.	X	X	X	X	X	X		X	X	X	X	X

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8	DIN EN ISO 12100	Sicherheit von Maschinen - Allgemeine Gestaltungsleitsätze - Risikobeurteilung und Risikominderung (Safety of machinery)	2011-03	This basic standard provides general principles of design as well as definitions and describes in detail the method of risk assessment. Safety of machinery in this context means that machines can perform their intended functions in the respective phase of life and the risk has been sufficiently reduced. Ensuring the safety of machinery is an iterative task of design department.	X	X	X	X	X		X	X	X			
9	DIN EN ISO 14122-1	Sicherheit von Maschinen (Safety of machinery) - Ortsfeste Zugänge zu maschinellen Anlagen - Teil 1: Wahl eines ortsfesten Zugangs und allgemeine Anforderungen	2016-10	Permanent means of access to machinery - Part 1: Choice of fixed means of access between two levels	X	X	X	X	X		X	X	X			
10	DIN EN ISO 14122-2	Sicherheit von Maschinen (Safety of machinery) - Ortsfeste Zugänge zu maschinellen Anlagen - Teil 2: Arbeitsbühnen und Laufstege	2016-10	Permanent means of access to machinery- Part 2: Working platforms and walkways	X	X	X	X	X		X	X	X			
11	DIN EN ISO 14122-3	Sicherheit von Maschinen (Safety of machinery) - Ortsfeste Zugänge zu maschinellen Anlagen - Teil 3: Treppen, Treppenleitern und Geländer	2016-10	Permanent means of access to machinery- Part 3: Stairs, stepladders and guardrails	X	X	X	X	X		X	X	X			
12	DIN EN ISO 14122-4	Sicherheit von Maschinen (Safety of machinery) - Ortsfeste Zugänge zu maschinellen Anlagen - Teil 4: Ortsfeste Steigleitern	2016-10	Permanent means of access to machinery- Part 4: Fixed ladders	X	X	X	X	X		X	X	X			

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												Construction	Installation	Operation	Maintenance	Decommissioning
13	DIN EN 547-1	Sicherheit von Maschinen (Safety of machinery) - Körpermaße des Menschen - Teil 1: Grundlagen zur Bestimmung von Abmessungen für Ganzkörper-Zugänge an Maschinenarbeitsplätzen	2009-01	Human body measurements- Part 1: Principles for determining the dimensions required for openings for whole body access into machinery	X	X	X	X	X		X	X	X			
14	DIN EN ISO 13857	Sicherheit von Maschinen (Safety of machinery) - Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen	2018-01	Safety distances to prevent hazard zones being reached by upper and lower limbs	X	X	X	X	X		X	X	X			
15	DIN EN 547-3	Sicherheit von Maschinen (Safety of machinery) - Körpermaße des Menschen - Teil 3: Körpermaßdaten	2009-01	Human body measurements- Part 3: Anthropometric data	X	X	X	X	X		X	X	X			
16	DIN EN 795	Persönliche Absturz-schutzausrüstung - Anschlageinrichtungen (Personal fall protection equipment)	2012-10	Personal fall protection equipment - Anchor devices	X		X	X	X			X	X	X	X	X
17	DIN EN ISO 13857	Sicherheit von Maschinen (Safety of machinery) - Sicherheitsabstände gegen das Erreichen von Gefährdungsbereichen mit den oberen und unteren Gliedmaßen	2018-01	Safety distances to prevent hazard zones being reached by upper and lower limbs	X		X	X	X			X	X			
18	GOST EN 953	Sicherheit von Maschinen (Safety of machinery)	2014	Guards- General requirements for the design and construction of fixed and movable guard	X	X	X	X	X		X	X	X			X

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												Construction	Installation	Operation	Maintenance	Decommissioning
19	DIN EN 349	Sicherheit von Maschinen - Mindestabstände zur Vermeidung des Quetschens von Körperteilen (Safety of machinery)	2008-09	Minimum gaps to avoid crushing of parts of the human body	X		X	X	X			X	X			X
20	DIN EN 60204-1	Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen (Safety of machinery)	2014-10	Electrical equipment of machines- Part 1: General requirements	X	X	X	X	X		X	X	X	X X	X	X
21	DIN EN 60204-11	Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 11: Anforderungen an Hochspannungsausrüstung für Spannungen über 1000 V Wechselspannung oder 1500 V Gleichspannung, aber nicht über 36 kV (IEC 44/756/CD:2016) (Safety of machinery)	2016-08	Electrical equipment of machines- Part 11: Requirements for HV equipment for voltages above 1000 V AC or 1500 V DC and not exceeding 36 kV	X				X		X	X	X	X X	X	X
22	DIN EN 981	Sicherheit von Maschinen - System akustischer und optischer Gefahrensignale und Informationssignale (Safety of machinery)	2009-01	Telecommunications bonding networks for buildings and other structures	X	X	X	X	X		X	X	X	X X		X
23	DIN EN 1838	Angewandte Lichttechnik - Notbeleuchtung (Lighting application)	2013-10	Protection against lightning- Part 3: Physical damage to structures and life hazard	X	X	X	X	X		X	X	X	X X		X
24	DIN EN 50172	Sicherheitsbeleuchtungsanlagen (Emergency escape lighting)	2005-01	Protection against lightning- Part 4: Electrical and electronic systems within structures	X	X	X	X	X		X	X	X	X X		X
25	DIN EN 50310	Telekommunikationstechnische Potentialausgleichsanlagen für Gebäude und andere Strukturen (Telecommunications bonding networks)	2017-02	System of auditory and visual danger and information signals	X	X	X	X	X		X	X	X			X

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26	DIN EN 62305-3	Blitzschutz - Teil 3: Schutz von baulichen Anlagen und Personen (IEC 81/476/CD:2) (Protection against lightning)	2016-04	Lighting application- Emergency lighting	X		X	X	X		X	X	X			X
27	DIN EN 62305-4	Blitzschutz - Teil 4: Elektrische und elektronische Systeme in baulichen Anlagen (IEC 81/478/CD:2015) (Protection against lightning)	2016-04	Emergency escape lighting systems	X		X	X	X		X	X	X			X
28	ISO 3864-1	Graphische Symbole - Sicherheitsfarben und Sicherheitszeichen - Teil 1: Gestaltungsgrundlagen für Sicherheitszeichen und Sicherheitsmarkierungen (Graphical symbols)	2011-04	Telecommunications bonding networks for buildings and other structures	X	X	X	X	X		X	X	X			X
29	ISO 3864-2	Graphische Symbole - Sicherheitsfarben und Sicherheitszeichen - Teil 2: Gestaltungsgrundlagen für Sicherheitsschilder zur Anwendung auf Produkten (Graphical symbols)	2016-12	Protection against lightning- Part 3: Physical damage to structures and life hazard	X	X	X	X	X		X	X	X			X
30	DIN EN ISO 7010	Graphische Symbole - Sicherheitsfarben und Sicherheitszeichen - Registrierte Sicherheitszeichen (Graphical symbols)	2012-10	Protection against lightning- Part 4: Electrical and electronic systems within structures	X	X	X	X	X		X	X	X			X
31	SeeUmwVerhV	Verordnung über das umweltgerechte Verhalten in der Seeschifffahrt (Regulation on environmentally compatible behaviour in the maritime traffic)	2014-08-13	- Oil logbook - Pumping at sea - Oil residues - Cargo logbook - Discharging of ship wastewater - Garbage logbook	X		X	X		X				X	X	X

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												Construction	Installation	Operation	Maintenance	Decommissioning
32	ArbMedVV	Verordnung zur arbeitsmedizinischen Vorsorge (Ordinance on Occupational Health Care)	2008-12-18	- Obligations on the employer - Mandatory health care - Optional health care - Elective health care - Measures following preventive occupational health care	X		X	X	X			X	X	X		X

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												Construction	Installation	Operation	Maintenance	Decommissioning
33	SeeArbG	Seearbeitsgesetz (Maritime Labour Act)	2013-04-20	- Crew members - Minimum age of the crew member - Requirement of medical fitness for sea service - Certificate of medical fitness for sea service - Ships' manning levels - Crew list - Principles for the arrangement of working time - Hours of work at sea - Rest breaks and hours of rest - Extension of hours of work - Maximum hours of work and minimum hours of rest - Records of hours of work - Right to accommodation - Access to communication facilities - Visits, accompanying partners - Entitlement to medical care - §107 Medical spaces and medical equipment - Safety representative - Order on board	X		X	X	X		X	X	X	X	X	X
34	MariMedV	Verordnung über maritime medizinische Anforderungen auf Kauffahrteischiffen (Regulations on Maritime Medicine Requirements on Merchant Vessels - Maritime Medicine Regulations)	2014-08-14	- Certificate of fitness for service at sea	X	X	X	X	X		X	X	X			X

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35	SchSG	Schiffssicherheitsgesetz (Ship Safety Act)	1998-09-09	- Supplementary duties - Structural condition and equipment	X		X	X	X			X	X	X	X	X
36	SchSV	Schiffssicherheitsverordnung (Ordinance for the Safety of Seagoing Ships)	1998-09-18	- Responsibility - Cooperation and maritime security partnership - International safety standard - §5 Steam boiler, steam generator - $6 Wastewater retention plant - Ship's certificate - Conduct obligations - Logbooks - Life saving equipment - Special vehicles, work boats, offshore service vehicles - fire extinguisher pump - type and number of fire extinguisher depending on kind of room	X		X	X	X		X	X	X	X	X	X
37	SeeUnterkunftsV	Verordnung über die Unterkünfte und Freizeiteinrichtungen der Besatzungsmitglieder an Bord von Kauffahrteischiffen (Ordinance on Accomodation and Recreational Facilities for Crew Members on Board of Merchant Vessels)	2013-07-25	- Walls, ceilings, floors, insulation - Protection devices against vermin, lightning - Systems concerning ventilation and air conditioning, Heating system - Noise and vibrations - Berths, Sanitary facilities - Galleys, refrigeration compartments, mess rooms - Medical spaces, offices	X	X			X			X	X			X

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38	SchBesV	Schiffsbesetzungsverordnung (Safe Manning Ordinance)	2013-07-18	- Minimum safe manning	X	X		X	X			X	X	X		X
39	BaustellV	Verordnung über Sicherheit und Gesundheitsschutz auf Baustellen (Directive on Health and Safety on Construction Sites)	1998-06-10	- Duties, coordination, responsibility	X	X	X	X	X			X	X	X	X	X
40	SeeAnlV	Verordnung über Anlagen seewärts der Begrenzung des deutschen Küstenmeeres (Regulation on installations seaward of the boundary of the German territorial sea)	1997-01-23	- Security zone - Duties, supervision	X	X	X	X	X					X		X
41	GGVSee	Verordnung über die Beförderung gefährlicher Güter mit Seeschiffen (Regulation on the transport of dangerous goods by seagoing vessels)	2017-12-07	- Duties, supervision, instruction - Loading of dangerous goods	X	X		X		X	X	X		X		
42	SeeSchStrO	Seeschifffahrtsstraßen-Ordnung (German Traffic Regulations for Navigable Maritime Waterways)	1998-10-22	- Navigation signs, visual signs, sound signals - Anchoring, mooring, transhipment	X			X	X			X		X		
43	SeeAufgG	Gesetz über die Aufgaben des Bundes auf dem Gebiet der Seeschifffahrt (Law on the tasks of the Federation in the field of maritime shipping)	2016-06-17	- competences of the German maritime authorities - tasks in the field of ship safety - edict of legal ordinances				X	X					X		
44	Offshore-ArbZV	Verordnung über die Arbeitszeit bei Offshore-Tätigkeiten (Ordinance on Working Time in relation to Offshore Work)	2013-07-05	- Working time, rest brakes	X	X	X	X	X			X	X	X X	X	X

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45	HoheSeeEinbrG	Gesetz über das Verbot der Einbringung von Abfällen und anderen Stoffen und Gegenständen in die Hohe See (Law banning the discharge of waste and other substances and articles into the High seas)	1998-08-25	- Prohibition on the discharge and burning of garbage	X	X	X	X		X		X	X	X X	X	X
46	HoheSeeEinbrV	Verordnung zur Durchführung des Gesetzes zu den Übereinkommen vom 15. Februar 1972 und 29. Dezember 1972 zur Verhütung der Meeresverschmutzung durch das Einbringen von Abfällen durch Schiffe und Luftfahrzeuge (Regulation implementing the Law of 15 February 1972 and 29 December 1972 on the prevention of marine pollution by discharge of waste by ships and aircrafts)	1977-12-07	- Burden of proof of garbage	X	X	X	X		X		X	X	X	X	X
47	SeeFSichV	Verordnung über die Sicherung der Seefahrt (Regulation on Securing Shipping)	1993-07-27	- Sea rescue	X	X		X	X					X	X	X
48	SeeEigensichV	Verordnung zur Eigensicherung von Seeschiffen zur Abwehr äußerer Gefahren (Regulation on self-protection of seagoing ships to defence of external hazards)	2005-09-19	- Creation of hazard prevention plan - Representative - Training, exercise	X	X	X	X	X		X	X	X	X	X	X
49	ArbZG	Arbeitszeitgesetz (Working Hours Act)	2016-11-11	- General regulations - Working hours and non-working hours - Sunday and holiday rest - Exceptions in special cases -Implementation of the law -Penalty and fine regulations	X	X	X	X	X			X	X	X	X	X

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50	OffshoreBergV	Bergverordnung für das Gebiet der Küstengewässer und des Festlandsockels (Mining Ordinance for the Territory of the Coastal Waters and the Continental Shelf)	2016-08-03	- §14; §53 helideck - §22 cabins/ sanitation - §27 staging area/ deposit station - §57 lifesaving appliances - §58 emergency drill	X	X			X		X	X	X			X
51	ArbSchG	Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit (Act on the Implementation of Measures of Occupational Safety and Health to Encourage Improvements in the Safety and Health Protection of Workers at Work)	1996-08-07	- General provisions - Obligations on employers - Obligations on the workers - Rights of the workers - Authorisations to issue statutory instruments - Joint German Occupational Safety and Health Strategy - Concluding provisions	X	X	X	X	X			X	X	X	X	X
52	PSA-BV	Verordnung über Sicherheit und Gesundheitsschutz bei der Benutzung persönlicher Schutzausrüstungen bei der Arbeit (Regulation on health and safety at use of personal protective equipment at work)	1996-12-04	- Scope of application - Provision and use - Instruction												
53	LasthandhabV	Verordnung über Sicherheit und Gesundheitsschutz bei der manuellen Handhabung von Lasten bei der Arbeit (Ordinance on Health and Safety Requirements for the Manual Handling of Loads at Work)	2017-10-18	- Scope of application - Measures - Delegation of tasks - Instruction	X	X	X	X	X			X	X	X	X	X

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54	LärmVibrationsArbSchV	Verordnung zum Schutz der Beschäftigten vor Gefährdungen durch Lärm und Vibrationen (Ordinance for the protection of workers from the hazards of noise and vibration)	2017-10-18	- Scope of application - Identification and assessment of hazards; Measurements, - Action values and protective measures for noise, - Exposure limit values and release values, - Protective measures for vibrations, - Instruction of employees, - Exceptions, offenses and misdemeanours, transitional provisions	X		X		X	X	X	X	X		X	X
55	BetrSichV	Verordnung über Sicherheit und Gesundheitsschutz bei der Verwendung von Arbeitsmitteln (Regulation on health and safety at use of work equipment)	2015-02-03	- Duties, risk assessment, protective measures	X	X	X	X	X			X	X	X	X	X
56	ArbStättV	Verordnung über Arbeitsstätten (Ordinance on Workplaces)	2004-08-12	- Duties, risk assessment, protective measures	X	X	X	X	X		X	X	X	X	X	X
57	BioStoffV	Verordnung über Sicherheit und Gesundheitsschutz bei Tätigkeiten mit Biologischen Arbeitsstoffen (Ordinance on Safety and Health Protection at Workplaces Involving Biological Agents)	2013-07-15	- Risk assessment - Protective measures	X		X		X	X	X	X	X	X	X	X
58	GefStoffV	Verordnung zum Schutz vor Gefahrstoffen (Regulation on the protection against hazardous substances)	2010-11-26	- Obligations, duties, protective measures - Breakdowns, accidents, emergencies	X	X	X	X	X	X	X	X	X	X	X	X

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59	NAV	Verordnung über Allgemeine Bedingungen für den Netzanschluss und dessen Nutzung für die Elektrizitätsversorgung in Niederspannung (Ordinance on general conditions for grid connection and its use for electricity supply in low voltage)	2006-11-01	- Security of supply - emergency power	X	X			X			X	X	X		X
60	ProdSG	Gesetz über die Bereitstellung von Produkten auf dem Markt (Act on making products available on the market)	2015-08-31	- Prerequisites for making products available on the market and for the exhibition of products - Regulations governing the authorising authority - Notification of conformity assessment bodies - GS mark - Market surveillance - Information and notification obligations - Special provisions - Installations subject to mandatory inspection - Provisions on penalties and regulatory fines - Design of the GS mark			X	X	X			X	X	X		
61	WindSeeG	Gesetz zur Entwicklung und Förderung der Windenergie auf See (Offshore Wind Energy Act)	2016-10-13	- Security zone	X				X			X	X	X		X

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62	IfSG	Gesetz zur Verhütung und Bekämpfung von Infektionskrankheiten beim Menschen (Law on the prevention and control of infectious diseases in humans)	2000-07-20	- Kitchen staff §42 - Quarantine - Duty of report	X	X			X		X	X	X	X		X
63	LMHV	Verordnung über Anforderungen an die Hygiene beim Herstellen, Behandeln und Inverkehrbringen von Lebensmitteln (Regulation on hygiene requirements in the manufacture, treatment and placing on the market of foodstuffs)	2016-06-21	- Storage, production, handling		X	X		X			X	X	X		
64	TrinkwV	Verordnung über die Qualität von Wasser für den menschlichen Gebrauch (Regulation on the quality of water for human consumption)	2016-03-10	- Requirement and test conditions	X	X	X		X			X	X	X		X
65	Lebensmittelhygiene-Leitfaden (BGV)	Leitfaden für die Lebensmittelhygiene an Bord von Schiffen unter deutscher Flagge (Guideline to food hygiene on board ships under the German flag)	2013-01-01	- Food handling	X	X		X	X		X	X	X	X		X
66	Medizinischen Anforderungen in der Seeschifffahrt (BSH)	Vierte Bekanntmachung des Standes der medizinischen Anforderungen in der Seeschifffahrt (Fourth notice of the state of medical requirements in the maritime sector)	2018-01-17	- Basic equipment medicines	X	X		X	X		X	X	X	X		X
67	TRGS 400	Gefährdungsbeurteilung für Tätigkeiten mit Gefahrstoffen (Risk assessment for activities involving hazardous substances)	2017-07-01	- TRGS: Technical rules for hazardous substances - Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X

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68	TRGS 401	Gefährdung durch Hautkontakt - Ermittlung, Beurteilung, Maßnahmen (Skin contact hazard - identification, assessment, measures)	2008-06-01	- Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X
69	TRGS 500	Schutzmaßnahmen (Protective measures)	2008-01-01	- Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X
70	TRGS 509	Lagern von flüssigen und festen Gefahrstoffen in ortsfesten Behältern sowie Füll- und Entleerstellen für ortsbewegliche Behälter (Storage of liquid and solid hazardous substances in stationary containers as well as filling and emptying points for portable containers)	2017-04-06	- Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X
71	TRGS 510	Lagerung von Gefahrstoffen in ortsbeweglichen Behältern (Storage of hazardous substances in portable containers	2015-11-30	- Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X
72	TRGS 520	Errichtung und Betrieb von Sammelstellen und Zwischenlagern für Kleinmengen gefährlicher Abfälle (Installation and operation of collection points and interim storage facilities for small quantities of hazardous waste)	2012-01-01	- Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X
73	TRGS 522	Raumdesinfektionen mit Formaldehyd (Room disinfection with formaldehyde)	2013-01-01	- Risk assessment - Protective measures	X	X	X	X	X		X	X	X	X		X
74	TRGS 525	Gefahrstoffe in Einrichtungen der medizinischen Versorgung (Hazardous substances in health care facilities)	2014-09-01	- Risk assessment - Protective measures	X	X		X	X		X	X	X	X		X

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75	TRGS 526	Laboratorien (Laboratories)	2008-02-01	- Risk assessment - Protective measures			X		X		X	X	X	X		
76	TRGS 528	Schweißtechnische Arbeiten (Welding works)	2009-02-01	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
77	TRGS 554	Abgase von Dieselmotoren (Exhaust gases from diesel engines)	2008-10-01	- Risk assessment - Protective measures	X	X		X	X	X	X	X	X	X		X
78	TRGS 555	Betriebsanweisung und Information der Beschäftigten (Operating instructions and information of employees)	2017-02-01	- Information obligation	X	X	X	X	X			X	X	X	X	X
79	TRGS 800	Brandschutzmaßnahmen (Fire protection measures)	2010-12-01	- Risk assessment - Protective measures	X	X	X	X	X		X	X	X	X	X	X
80	TRLV Lärm Teil 3	Lärmschutzmaßnahmen (Noise protection measures)	2017-08-01	- TRLV - Technical rules for Noise and Vibration Industrial Safety Ordinance - Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X
81	TRBA 100	Schutzmaßnahmen für Tätigkeiten mit biologischen Arbeitsstoffen in Laboratorien (Protective measures for activities involving biological agents in laboratories)	2013-10-01	- TRBA - Technical rules for Biological agents - Risk assessment - Protective measures			X		X		X	X	X	X	X	
82	TRBA 213	Abfallsammlung: Schutzmaßnahmen (Waste collection: protective measures)	2005-05-01	- Risk assessment - Protective measures	X	X	X	X	X	X	X	X	X	X	X	X

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83	TRBA 500	Grundlegende Maßnahmen bei Tätigkeiten mit biologischen Arbeitsstoffen (Basic measures for activities involving biological agents)	2012-04-25	- Risk assessment - Protective measures			X		X	X	X	X	X	X		
84	TRBS 1112	Instandhaltung (Maintenance)	2010-10-14	- TRBS - Technical rule for operational safety - Risk assessment - Protective measures	X	X	X	X	X							X
85	BekBS 1113	Beschaffung von Arbeitsmitteln (Procurement of work equipment)	2015-03-01	- BekBS - Notices on operational safety - Basics of the procurement of work equipment	X	X	X	X	X			X	X	X	X	X
86	TRBS 1151	Gefährdungen an der Schnittstelle Mensch - Arbeitsmittel – Ergonomische und menschliche Faktoren, Arbeitssystem – (Hazards at the Interface - Human - Work Equipment - Ergonomic and Human Factors, Work System –	2015-03-01	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
87	TRBS 1201	Prüfungen von Arbeitsmitteln und überwachungsbedürftigen Anlagen (Tests of work equipment and systems requiring monitoring)	2012-08-01	- Protective measures	X	X	X	X	X			X	X	X	X	X
88	TRBS 1201 Teil 2	Prüfungen bei Gefährdungen durch Dampf und Druck (Tests for hazards due to steam and pressure)	2014-07-01	- Identification and determination of required tests	X	X	X		X			X	X	X	X	X

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89	TRBS 1201 Teil 3	Instandsetzung an Geräten, Schutzsystemen, Sicherheits-, Kontroll- und Regelvorrichtungen im Sinne der Richtlinie 2014/34/EU (Repair works to equipment, protective systems, safety, control and regulating devices as defined in Directive 2014/34 / EU)	2018-01-01	- Requirements for the repair work	X	X	X	X	X							X
90	TRBS 1201 Teil 5	Prüfung von Lageranlagen, Füllstellen, Tankstellen und Flugfeldbetankungsanlagen, soweit entzündliche, leichtentzündliche oder hochentzündliche Flüssigkeiten gelagert oder abgefüllt werden, hinsichtlich Gefährdungen durch Brand und Explosion (Testing of storage facilities, filling stations, petrol stations and airfield refueling systems, as far as flammable, highly inflammable or extremely flammable liquids are stored or filled, with respect to hazards due to fire and explosion)	2010-05-12	- Inspection period	X	X		X	X					X	x	X
91	TRBS 1203	Befähigte Personen (Qualified persons)	2010-03-01	- General and additional requirement	X	X	X	X	X			X	X	X	X	X
92	TRBS 2111	Mechanische Gefährdungen – Allgemeine Anforderungen (Mechanical hazards - General requirements)	2014-03-01	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
93	TRBS 2111 Teil 1	Mechanische Gefährdungen – Maßnahmen zum Schutz vor Gefährdungen beim Verwenden von mobilen Arbeitsmitteln (Mechanical hazards - Measures to protect against hazards when using mobile work equipment)	2015-04-01	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X

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94	TRBS 2121	Gefährdung von Personen durch Absturz - Allgemeine Anforderungen (Hazards to persons due to falling - General requirements)	2017-03-23	- Risk assessment - Protective measures	X	X		X	X			X	X	X	X	X
95	TRBS 2121 Teil 1	Gefährdungen von Personen durch Absturz - Bereitstellung und Benutzung von Gerüsten (Hazards of persons due to falling - provision and use of scaffolding)	2009-09-21	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
96	TRBS 2121 Teil 2	Gefährdungen von Personen durch Absturz – Bereitstellung und Benutzung von Leitern (Hazards of persons due to falling - provision and use of ladders)	2010-03-16	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
97	TRBS 2121 Teil 3	Gefährdungen von Personen durch Absturz – Bereitstellung und Benutzung von Zugangs- und Positionierungsverfahren unter Zuhilfenahme von Seilen (Hazards of persons due to falling - Provision and use of access and positioning procedures using ropes)	2009-09-21	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
98	TRBS 2121 Teil 4	Gefährdungen von Personen durch Absturz – Heben von Personen mit hierfür nicht vorgesehenen Arbeitsmitteln (Hazards to persons due to falling - Lifting of persons with work equipment not intended for this purpose)	2010-01-01	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
99	TRBS 2141	Gefährdungen durch Dampf und Druck - Allgemeine Anforderungen (Hazards due to vapor and pressure - General requirements)	2007-03-23	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X

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100	TRBS 2141 Teil 1	Versagen der drucktragenden Wandung durch Abweichen von zulässigen Betriebsparametern (Failure of the pressure-bearing wall by deviating from permissible operating parameters)	2008-03-06	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
101	TRBS 2141 Teil 2	Gefährdung durch Dampf und Druck - Schädigung der drucktragenden Wandung (Hazard due to steam and pressure - Damage to the pressure-bearing wall)	2009-08-04	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
102	TRBS 2141 Teil 3	Gefährdungen durch Dampf und Druck bei Freisetzung von Medien (Hazards due to vapor and pressure on release of media)	2009-09-21	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
103	TRBS 2181	Schutz vor Gefährdungen beim Eingeschlossensein in Personenaufnahmemitteln (Protection against hazards when trapped in lifting devices for passenger transport)	2007-03-23	- Risk assessment - Protective measures	X	X		X	X			X	X	X	X	X
104	TRBS 3145 TRGS 745	Ortsbewegliche Druckgasbehälter – Füllen, Bereithalten, innerbetriebliche Beförderung, Entleeren (Transportable compressed gas cylinders - Filling, holding, in-house transport, emptying)	2016-03-31	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
105	TRBS 3146 TRGS 746	Ortsfeste Druckanlagen für Gase (Stationary pressure equipment for gases)	2016-10-20	- Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
106	ASR A1.2	Raumabmessungen und Bewegungsflächen (Room dimensions and movement areas)	2013-09-01	- ASR - Technical Rules for workplaces - Base areas - Clear height	X	X	X	X	X		X	X	X	X	X	X

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107	ASR A1.3	Sicherheits- und Gesundheitsschutzkennzeichnung (Safety and health protection marking)	2013-02-01	- Identification - Escape / rescue plan	X	X	X	X	X		X	X	X	X	X	X
108	ASR A1.5/1,2	Fußböden (floors)	2013-02-01	- Protective measures against stumbling and slipping	X	X	X	X	X		X	X	X	X		X
109	ASR A1.6	Fenster, Oberlichter, lichtdurchlässige Wände (Windows, skylights, translucent walls)	2012-01-01	- Requirements during planning and choosing	X	X		X	X		X	X				X
110	ASR A1.7	Türen und Tore (Doors and gates)	2009-11-01	- Planning and selection - Safety	X	X		X	X		X	X				X
111	ASR A1.8	Verkehrswege (traffic routes)	2012-11-01	- Equipment, operation, maintenance	X	X	X	X	X		X	X	X	X		X
112	ASR A2.1	Schutz vor Absturz und herabfallenden Gegenständen, Betreten von Gefahrenbereichen (Protection against falling and falling objects, entering of danger areas)	2012-11-01	- Risk assessment - Protective measures	X	X		X	X			X	X	X	X	X
113	ASR A2.2	Maßnahmen gegen Brände (Measures against fires)	2018-05-01	- Facilities - Fire extinguishers and extinguishing agents	X	X	X	X	X		X	X	X	X	X	X
114	ASR A2.3	Fluchtwege und Notausgänge, Flucht- und Rettungsplan (Escape routes and emergency exits, escape and rescue plan)	2007-08-01	- Identification - Escape / rescue plan	X	X	X	X	X		X	X	X	X	X	X
115	ASR A3.4	Beleuchtung (lighting)	2011-04-01	- Lighting for work, controls, accommodations - Operation, maintenance	X	X	X	X	X		X	X	X	X		X

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116	ASR A3.4/7	Sicherheitsbeleuchtung, optische Sicherheitsleitsysteme (Safety lighting, optical safety guidance systems)	2009-05-01	- Safety lighting, optical safety guidance systems	X	X		X	X		X	X	X	X		X
117	ASR A3.5	Raumtemperatur (room temperature)	2010-06-01	- room temperature	X	X			X			X	X	X		X
118	ASR A3.6	Lüftung (ventilation)	2012-01-01	- Air quality - Air conditioning systems	X	X	X	X	X		X	X	X	X		X
119	ASR A3.7	Lärm (noise)	2018-05-01	- Risk assessment - Protective measures	X	X	X	X	X		X	X	X	X		X
120	ASR A4.1	Sanitärräume (sanitary facilities)	2013-09-01	- Toilets, washrooms, changing rooms	X	X		X	X		X	X	X	X		X
121	ASR A4.2	Pausen- und Bereitschaftsräume (Recreation rooms and Standby rooms)	2012-08-01	- Recreation rooms, Standby rooms	X	X		X	X		X	X	X	X		X
122	ASR A4.3	Erste-Hilfe-Räume, Mittel und Einrichtungen zur Ersten Hilfe (First Aid Rooms, Means and First Aid Facilities)	2010-12-01	- First Aid Facilities	X	X	X	X	X		X	X	X	X	X	X
123	ASR A4.4	Unterkünfte (accommodation possibilities)	2010-06-01	- Furnishing of accommodation	X	X		X	X		X	X	X	X	X	X
124	BG RCI T 032	Laborabzüge (laboratory extraction fans)	2008-08-01	- BG RCI - German Trade Association/ Raw materials and chemical industry - Room climate, ventilation, extraction fans		X	X		X		X	X	X	X		
125	BG RCI T 034	Gefährdungsbeurteilung im Labor (Risk assessment in the laboratory)	2009-09-01	- Working places in the laboratory		X	X		X		X	X	X	X		

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126	BG R 237	Hydraulik-Schlauchleitungen – Regeln für den sicheren Einsatz	2008-02-01	- BG Rule - German Trade Association Rule - DGUV publication - German statutory accident insurance publication - Selection, handling, operation - Checklists, deadlines	X	X	X	X	X	X		X	X	X		X
127	BG R 500	Betreiben von Arbeitsmitteln (Operating of work equipment)	2008-04-01	- Various machines and protective devices	X	X	X	X	X		X	X	X	X	X	X
128	DGUV guide line	Erste Hilfe in Offshore-Windparks (First aid in offshore wind farms)	2016-12-12	- Organisation of First Aid	X	X			X			X	X	X	X	X
129	DGUV Regulation 84 - UVV See	Unfallverhütungsvorsschriften für Unternehmen der Seefahrt (Accident Prevention Regulations for Shipping Enterprises)	2018-04-01	- Basic duties, work and accommodation areas, traffic routes - Dangerous work on sea going vessels, ship movement - periodical tests	X			X	X			X	X	X	X	X
130	BG RCI T 008 DGUV I 213-054	Maschinen - Sicherheitskonzepte und Schutzeinrichtungen (Machines - Safety concepts and protective devices)	2016-09-01	- Protection concepts - Emergency stop	X	X	X	X	X		X	X	X	X	X	X
131	DGUV R 112-190	Benutzung von Atemschutzgeräten (Use of breathing apparatuses)	2011-12-01	- DGUV rules - German statutory accident insurance rules - Risk assessment - Protective measures	X	X	X	X	X			X	X	X	X	X
132	DGUV R 113-004	Behälter, Silos und enge Räume (Containers, silos and narrow spaces)	2008-09-01	- Risk assessment - Protective measures	X	X	X	X	X		X	X	X	X	X	X

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133	DGUV Regulation 36	Hafenarbeit (Habour work)	1995-10-01	- General provisions - Transhipment, transport, provision and storage of dangerous goods and similar goods - Use of transhipment devices - Use of load handling devices on lifting equipment - Use of equipment for the lifting of persons - Port work in the land area - Harbour work in the ship's area - Administrative offences				X	X			X	X	X		
134	BBK guide line	Leitfaden für die Planung, Einrichtung und den Betrieb einer Notstromversorgung in Unternehmen und Behörden (Guideline to the planning, installation and operation of emergency power supply in companies and public authorities)	2005-12-01	- BBK - Federal Office for Citizen Protection and Disaster Support - cumulative energy balance - design emergency power supply - emergency plan/ maintenance	X	X			X		X	X	X	X		X

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135	Marine Strategy Framework Directive 2008/56/EC	Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy		The aim of the MSFD is to protect more effectively the marine environment across Europe in order to achieve a Good Environmental Status (GES). The main objective is that biodiversity is maintained by 2020 and that the resource base upon which marine-related economic and social activities depend is protected. The GES consists of "descriptors" of ecosystem components that are coupled to pressures that result from human activities. Human activities should thus consider their impacts on the environmental targets.	X	X	X	X		X			X	X	X	X
136	Habitats Directive 92/43/EEC	Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora		It is one of European nature's policies that establishes one organised network—Natura 2000, which intends to protect nature and wildlife. It sets limits to any activities that may affect the quality objectives of the protected area.	X	X	X	X		X			X	X	X	X
137	Birds Directive 2009/147/EC	Council Directive 2009/147/EC on the conservation of wild birds		It aims to protect all European wild birds and the habitats of listed species and also adds to the Natura 2000 network. It sets limits to any activities that may affect the quality objectives of the protected area.	X	X	X	X					X	X	X	X

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138	Water Framework Directive 2000/60/EC	Water Framework Directive 2000/60/EC		The aim is to achieve good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile from shore) by 2015. It is relevant for any activities taking place in the coastal zone.	X	X	X	X		X			X	X	X	X
139	Common Fisheries Policy	The core principles and objectives that the CFP is based on are set out in the Basic Regulation of the CFP (Council Regulation No 1380/2013), adopted in December 2013.		It sets out a collaborative approach to manage fisheries in EU's seas. Rules are aiming to ensure that fishing and aquaculture activities are environmentally sustainable in the long-term and contribute to the achievement of a Good Environmental Status. The EU Common Fisheries Policy regulates all aspects of fishing within the EU, from the sea to the consumer. The overall objective of the CFP is to ensure economically, environmentally and socially sustainable use of fisheries resources. The CFP is a complex policy consisting of many rules, principles and concepts, e.g. community waters, third country fishing and licenses, access to waters, relative stability, community vessel, fishing license, fishing permit, fishing effort 'days at sea', vessels capacity 'GT', kW etc.			X		X	X			X	X	X	

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140	Bathing Water Directive	Bathing Water Directive		Its main objectives are to safeguard public health and protect the aquatic environment in coastal and inland areas from pollution. Bathing waters can be coastal waters or inland waters (rivers, lakes).	X	X	X	X		X				X		X
141	Urban Waste Water Directive	Council Directive 91/271/EEC concerning waste water treatment		Its objective is to protect the environment from the adverse effects of urban waste water discharges and discharges from certain industrial sectors	X	X	X	X		X				X		X
142	General Food and Feed Law	Regulation (EC) 178/2002		Laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety			X		X					X		
143	Feed Hygiene	Regulation (EC) 183/2005		Laying down requirements for feed hygiene			X		X					X		
144	Hygiene of foodstuffs	Regulation (EC) 852/2004		On the hygiene of foodstuffs			X		X					X		
145	Microbial criteria foodstuff	Regulation (EC) 2073/2005		On microbial criteria for foodstuffs			X		X					X		
146	Undesirable substances in animal feed	Directive 2002/32/EC		On undesirable substances in animal feed (e.g. heavy metals and other pollutants)			X		X					X		

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147	MRLs in food	Maximum Residual Levels (MRLs) in food		Laying down provisions for the management of expenditure relating to the food chain, animal health and animal welfare, and relating to plant health and plant reproductive material. It includes the regulation of residue levels of pesticides			X		X					X		
148	MRLs in food	Regulation (EU) 212/2013	Replace-ment of Regulation (EC) 396/ 2005 Annex 1	Regards additions and modifications with respect to the products covered			X							X		
149	Contaminants in food	Regulation (EC) 1881/2006		Setting maximum levels for certain contaminants in foodstuffs			X							X		
150	Placing on the market and use of feed	Regulation (EC) 767/2009		Labelling considering marketing and use of feed			X							X		
151	Provision of food information to consumers	Regulation (EU) 1169/2011		Labelling of food and nutrition			X							X		
152	Organic production and labelling	Regulation (EC) 834/2007		Labelling for organic production and products			X							X		

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153	Rules on the implementation of Regulation (EC) 834/2007	Regulation (EC) 889/2008		Laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control			X		X					X		
154	Additives for use in animal nutrition	Regulation (EC) 1831/2003		On additives for use in animal nutrition			X		X					X		
155	Food additives	Regulation (EC) 1333/2008		Establishing a common authorisation procedure for food additives, food enzymes and food flavourings			X		X					X		
156	Rules on organic aquaculture	Regulation (EC) 710/2009		Laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007, as regards laying down detailed rules on organic aquaculture animal and seaweed production			X							X		
157	Official controls	Regulation (EC) 882/2004	(current)	On official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules			X							X		
158	Official controls	Regulation (EC) 2017/625	(from 14 Dec. 2019)	On official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules			X							X		

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159	Food Safety Management System	ISO 22000:2005		Specifies requirements for a food safety management system where an organization in the food chain needs to demonstrate its ability to control food safety hazards in order to ensure that food is safe at the time of human consumption			X		X					X		
160	Traceability	ISO 22000:2007		The ability to trace and follow a food, feed, food-producing animal or substance intended to be incorporated into a food or feed, through all stages of production, processing and distribution			X		X					X		
161	Maritime Spatial planning	Directive 2014/89/EU		Information on the environment for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public.	X	X	X	X								X