

**Blokus-Roszkowska Agnieszka**

**Bogalecka Magda**

**Kołowrocki Krzysztof**

*Maritime University, Gdynia, Poland*

## **General methodology on the Baltic Sea critical infrastructure safety aspects – Dictionary**

### **Keywords**

critical infrastructure, critical infrastructure network, Baltic Sea Region, climate change, safety, resilience

### **Abstract**

The paper presents the terminology and taxonomy of critical infrastructures at the Baltic Sea Region including definitions of general terms and definitions of more detailed notions concerned with selected industrial installations at the Baltic Sea Region. In the paper there are distinguished and listed eight main critical infrastructure networks operating in the Baltic Sea Region. Presented terminology refers to these critical infrastructure networks also in the context of climate change and resilience and vulnerability of the critical infrastructures to climate change. Considering the strategy of critical infrastructures resilience strengthening there are distinguished and defined concepts of robustness, resource fullness, redundancy, response and recovery.

### **1. Introduction**

Considering definitions of main notions from the report [15] concerned with critical infrastructures and their networks, the nature and features of the industrial installations at the Baltic Sea Region, we have distinguished the following 8 main critical infrastructure networks operating in this region [3]:

- port critical infrastructure network [5], [7],
- shipping critical infrastructure network [10]-[11],
- oil rig critical infrastructure network [20],
- wind farm critical infrastructure network [21],
- electric cable critical infrastructure network [8]-[9],
- gas pipeline critical infrastructure network [1]-[2],
- oil pipeline critical infrastructure network [12]-[13],
- ship traffic and port operation information critical infrastructure network [6], [18].

Moreover, we have defined the Global Baltic Network of Critical Infrastructure Networks, described in [14], as the network of all those distinguished 8 networks operating at the Baltic Sea Region. The classification of listed above critical infrastructure networks in the Baltic Sea Region is presented in [3] and they are particularly described in

[1], [7]-[8], [11], [13], [18]-[19]. These papers present the results developed in the scope of the EU-CIRCLE project titled “A pan – European framework for strengthening Critical Infrastructure resilience to climate change” [17] and have been prepared within the Workshop 1 “Baltic Sea Region critical infrastructure networks” of the Summer Safety and Reliability Seminars – SSARS 2016.

To ensure compatibility in the usage of key terms across the work packages of EU-CIRCLE project and papers presenting results developed in the scope of this project, the common “working terminology” has been fixed. The EU-CIRCLE Taxonomy, including the main concepts, elements and definitions that will be used in the project and “the common EU-CIRCLE language” serving as a reference material in all deliverables, are given in the reports [15]-[16]. Taxonomy includes the terminology of critical infrastructure, climate change and resilience organised in several chapters and sections. A similar way of presenting terminology and taxonomy of critical infrastructures at the Baltic Sea Region has been adopted in this paper.

The structure of the paper is as follows. Section 2 includes general terms concerned with critical

infrastructures located and operating within the Baltic Sea and ashore around and definitions of more detailed notions referring to selected critical infrastructure networks operating in this region. Section 3 refers to the climate change with particular regard to definitions associated with climate and weather impacts on these critical infrastructure networks safety. Section 4 presents notions related to resilience of the critical infrastructures and particular concepts of resilience strengthening of selected critical infrastructures in the Baltic Sea Region.

## **2. Critical infrastructure**

*Accident.* The unintended event or injury resulting in victims, loss or destruction of property or environmental damage.

*Accidental loads.* The loads which may occur as a result of pure accident or exceptional circumstances. The worst instances may be collision, breakage, flooding of buoyant parts, fire or explosion. Since the majority of offshore platforms deal with oil, gas, petroleum which are inflammable storage and productions needs to be with umpteen care. Evacuation measures need to be implemented in case of the unwarranted.

*Accidents to personnel.* Accidents which cause harm to any person on board the vessel e.g. crew, passengers, stevedores. which do not arise as a result of one of the other accident categories. Essentially, it refers to accidents to individuals, though this does not preclude multiple human casualties as a result of the same hazard, and typically includes harm caused by the movement of the vessel when underway, slips, trips, falls, electrocution and confined space accidents, food poisoning incidents, etc.

*Accidents to the general public.* Accidents which lead to injury, death or loss of property amongst the population ashore resulting from one of the other ship accident categories.

*Allision.* A violent contact between a vessel and a fixed structure (for the purpose of further elaboration a uniform, independent from energy term for collision has been assumed. contact).

*Array cable(s).* The generic term collectively used for Inter Turbine Cables and Collector Cables. See also Infield Cables.

*Artificial islands.* The man-made islands or other structures surrounded by or floating on water.

*Area to be avoided (ATBA).* A ships' routing measure that comprises an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and should be avoided by all ships or certain classes of ships.

*Aids to Navigation.* A device or system external to vessels that is designed and operated to enhance the

safe and efficient navigation of vessels and/or vessel traffic.

*Authentication.* The process of establishing the legitimacy of a node or user before allowing access to requested information.

*Automatic Identification Systems (AISs).* Systems designed to be capable of providing information about the ship to other ships and to coastal authorities automatically.

*Baltic Oil Rig Critical Infrastructure Network (BORCIN).* The offshore oil rigs network that is composed of 4 oil rigs, 3 of them operating in Polish EEZ and 1 operating in Russia EEZ. The Polish part and the Russian part of the BORCIN work separately and independently. The Polish part of the BORCIN is cooperating with several tankers that are the components of the Baltic Shipping Critical Infrastructure Network (BSCIN) and with 1 gas pipeline that is the component of the Baltic Gas Pipeline Critical Infrastructure Network (BGPCIN). The Russian part of the BORCIN is cooperating with one oil pipeline that is the component of the Baltic Oil Pipeline Critical Infrastructure Network (BORCIN).

*Baltic Port Critical Infrastructure Network (BPCIN).* A complex system located and operating within the 18 core Baltic Sea ports, those significant features are inside-system dependencies and outside-system dependencies, that in the case of its degradation have a significant destructive influence on the health, safety and security, economics and social conditions of large human communities and territory areas.

*Baltic Sea critical infrastructure.* A complex system located and operating within the Baltic Sea and ashore that significant features are inside-system dependencies and outside-system dependencies, that in the case of its degradation have significant destructive influence on the health, safety and security, economics and social conditions of large human communities and territory areas.

*Baltic Sea critical infrastructures global network.* A set of interconnected and interdependent critical infrastructures located within the Baltic Sea and ashore around that function collaboratively using the Critical Infrastructure Operation Process General Model.

*Baltic Sea critical infrastructure network.* A set of interconnected and interdependent critical infrastructures located within the Baltic Sea and ashore, interacting directly and indirectly at various levels of their complexity and operating activity.

*Baltic Sea infrastructure.* An industry and other system (e.g. drilling platforms, gas and oil pipelines, wind farms, telecommunication systems, waterways, maritime transport, ports with their intermodal

connections), performing activities within the Baltic sea area.

*Baltic Sea infrastructure network.* The structure and flow of the inner, outer and cross dependencies of the Baltic Sea infrastructures.

*Baltic Shipping Critical Infrastructure Network (BSCIN).* The dynamic network composed of the subsets of ships operating at the Baltic Sea waters at the fixed moment of time.

*Baltic Wind Farm Critical Infrastructure Network (BWFCIN).* The set of all current (future) energy production wind farms existing (planned).

*Barge.* A non-propelled vessel commonly used to carry cargo or equipment.

*Cable burial.* A submarine power cable is trenched into the seabed and covered with soil providing complete burial of a cable (see: cable trenching).

*Cable grips.* Cable Grips are used to pull or support cables and pipes. They work on the principle of the harder the pull, the tighter the grip.

*Cable trenching.* A submarine cable is lowered beneath the mean seabed level into an open cut trench. The trench is left open and any subsequent cover of the cable is by natural reinstatement of the seabed.

*Capsizing / listing.* A casualty where the ship no longer floats in the right-side-up mode due to: negative initial stability (negative metacentric height), or transversal shift of the centre of gravity, or the impact of external forces (capsizing when the ship is tipped over until disabled; listing when the ship has a permanent heel or angle of loll).

*Casualty event.* Unwanted event in which there was some kind of energy release with impact on people and/or ship including its equipment and its cargo or environment.

*Coincidental demand.* The sum of two or more demands that occur in the same time interval.

*Coincidental peak load.* The sum of two or more peak loads that occur in the same time interval.

*Collision.* A casualty caused by ships striking or being struck by another ship, regardless of whether the ships are underway, anchored or moored. This type of casualty event does not include ships striking underwater wrecks. The collision can be with other ship or with multiple ships or ship not underway.

*Complex system.* A multistate ageing system composed of interacting components and subsystems related to its operation process having significant influence on its safety through changing its structure and its components' safety parameters in the different operation states.

*Complex system outside dependencies.* External dependencies and interactions coming from the complex system operating environment, including changes of the complex system structure and its

components' safety parameters in different operation states and resulting in the complex system safety state changing caused by outside this system operational conditions related to changes of its functionality, location and other objects activity.

*Compliant towers.* The offshore oil platforms that consist of a narrow tower, attached to a foundation on the seafloor and extending up to the platform. This tower is flexible, as opposed to the relatively rigid legs of a fixed platform. The flexibility allows it to operate in much deeper water, as it can absorb much of the pressure exerted on it by the wind and sea. Despite its flexibility, the compliant tower system is strong enough to withstand hurricane conditions.

*Compressor station.* Any permanent combination of facilities which supplies the energy to move gas at increased pressure from fields, in transmission lines, or into storage. The compressor station is a facility located along a natural gas pipeline which house and protect compressors. The compressor is used to compress (or pump) the gas to move it through the system. Compressor station is strategically placed along the pipeline to boost the system pressure to maintain required flow rates.

*Congestion.* A condition that occurs when insufficient transfer capacity is available to implement all of the preferred schedules for electricity transmission simultaneously.

*Construction / installation loads.* The temporary loads that arise during the fabrication or erection of the platform or its components. During fabrication erection lifts of various structural components generate lifting forces, while in installation phase, forces are generated during platform load out, transportation to the site, launching and upending, as well as lifts related to installation.

*Contact.* A casualty caused by ships striking or being struck by an external object. The objects can be: floating object (cargo, ice, other or unknown), or fixed object, but not the sea bottom, or flying object.

*Container ship.* A vessel specially designed to transport containerized cargo.

*Control / operation centre.* A place from which a system is centrally monitored, regulated, and directed, or in which operational devices and controls are housed.

*Critical electricity services to other energy sectors.* Power generators requiring electricity to start generating.

*Critical facilities.* The primary physical structures, technical facilities and systems which are socially, economically or operationally essential to the functioning of a society or community, both in routine circumstances and in the extreme circumstances of an emergency i.e. elements of the

infrastructure that support essential services in a society.

*Critical infrastructure (CI).* A complex system in its operating environment that significant features are inside-system dependencies and outside-system dependencies, that in the case of its degradation have significant destructive influence on the health, safety and security, economics and social conditions of large human communities and territory areas.

*Critical infrastructure community.* The community that includes critical infrastructure owners and operators (those entities responsible for day-to-day operation and investment of a particular critical infrastructure entity), both public and private; departments and agencies; regional entities; governments; and other organizations from the private and non-profit sectors with a role in securing and strengthening the resilience of the Nation's critical infrastructure and/or promoting practices and ideas for doing so.

*Critical infrastructure integrated safety model.* It means modelling complex system operation process including its outside dependencies and operating environment hazards. Modelling complex system safety including inside dependencies between its components and subsystems. Constructing integrated critical infrastructure safety model composed of a complex system operation process model and its safety model including its inside and outside dependences and operating environment hazards.

*Critical infrastructure integrated safety model related to climate-weather change.* A model including modelling the critical infrastructure operation process according to the critical infrastructure operation process general model related to climate-weather change process and modelling the critical infrastructure inside dependencies between its components and subsystems according to the critical infrastructure safety general model.

*Critical infrastructure interconnections.* Critical infrastructures in mutually direct and indirect connections between themselves.

*Critical infrastructure interdependence.* Critical infrastructures in mutually dependant relationships between themselves interacting at various levels of their complexity.

*Critical infrastructure network.* A set of interconnected and interdependent critical infrastructures interacting directly and indirectly at various levels of their complexity and operating activity.

*Critical infrastructure network cascading effect.* Degrading effects occurring within an infrastructure and between infrastructures in their operating environment, including situations in which one

infrastructure causes degradation of another ones, which again causes additional degradation in other infrastructures and in their operating environment.

*Critical infrastructure operation process general model related to climate-weather change.* The critical infrastructure operation process joint model related to operating environment hazards and climate-weather change extreme events linking the critical infrastructure operation process model and the climate-weather change process model.

*Cyber interdependent infrastructures.* Infrastructures the state of which depends on information transmitted through the information infrastructure.

*Cyber security.* The prevention of damage to, unauthorized use of, or exploitation of, and, if needed, the restoration of electronic information and communications systems and the information contained therein to ensure confidentiality, integrity, and availability; includes protection and restoration, when needed, of information networks and wireline, wireless, satellite, public safety answering points, and 112 or similar communications systems and control systems.

*Damage to equipment.* A damage to equipment, system or the ship not covered by any of the other casualty type. Loss of function may also be the result of operating outside the specified performance criteria (e.g. overload, overcapacity).

*Dependency of critical infrastructure.* A linkage or connection between two infrastructures, through which the state of one infrastructure influences or is correlated to the state of the other.

*Distribution.* Dedicated pipelines to power plants and major industrial users general industrial and commercial customers domestic users.

*Distribution (in electric sector).* Passage through grid transformers and substations into and from distribution systems.

*Distribution grids (low-voltage).* Radial networks that carry the electric power from the higher voltage levels to the final users. The number of levels in a distribution grid depends upon the density and magnitude of demand and the terrain.

*Distribution line.* The line used to supply natural gas to the consumer. A distribution line is located in a network of piping located downstream of a natural gas transmission line. As defined in natural gas pipeline safety regulations, a distribution line is a pipeline other than a gathering or transmission line.

*Distribution provider (in electric sector).* Distribution provider provides and operates the wires between the transmission system and the end-use customer. For those end-use customers who are served at transmission voltages, the transmission owner also serves as the distribution provider. Thus, the distribution provider is not defined by a specific

voltage, but rather as performing the distribution function at any voltage.

*Distribution system.* The portion of the transmission and facilities of an electric system that is dedicated to delivering electric energy to an end-user.

*Drill ships.* The ships designed to carry out drilling operations. These boats are specially designed to carry drilling platforms out to deep-sea locations. A typical drill ship will have, in addition to all of the equipment normally found on a large ocean ship, a drilling platform and derrick located on the middle of its deck. In addition, drill ships contain a hole called a "moonpool", extending right through the ship down through the hull, which allows for the drill string to extend through the boat, down into the water. This offshore oil rig can drill in very deep waters. Drill ships use 'dynamic positioning' systems and are equipped with electric motors on the underside of the ship's hull, capable of propelling the ship in any direction. These motors are integrated into the ships computer system, which uses satellite positioning technology, in conjunction with sensors located on the drilling template, to ensure that the ship is directly above the drill site at all times.

*Drilling barges.* The offshore oil rigs that are used mostly for inland, shallow water drilling. This typically takes place in lakes, swamps, rivers, and canals. They are large, floating platforms, which must be towed by tugboat from location to location. Suitable for still, shallow waters, drilling barges are not able to withstand the water movement experienced in large open water situations.

*Dry bulk cargo ship.* A vessel specially designed to transport dry bulk cargo (e.g. ore, grain).

*Dry gas.* It is almost pure methane and occurs in the absence of liquid hydrocarbons or by processing natural gas to remove liquid hydrocarbons and impurities.

*Dynamic threats.* Threats associated with dynamic installations.

*Electric power.* The rate at which electric energy is transferred. Electric power is measured by capacity and is commonly expressed in megawatts (MW).

*Electric power grid.* A system of synchronized power providers and consumers connected by transmission and distribution lines and operated by one or more control centres.

*Electric rate schedule.* A statement of the electric rate and the terms and conditions governing its application, including attendant contract terms and conditions that have been accepted by a regulatory body with appropriate oversight authority.

*Electrical power system.* A critical infrastructure characterized by generation stations, transmission and distribution networks that create and supply electricity to end-users so that end-users achieve and

maintain nominal functionality, including the transportation and storage of fuel essential to that system.

*Electricity.* A form of energy characterized by the presence and motion of elementary charged particles generated by friction, induction, or chemical change.

*Electricity demand.* The rate at which energy is delivered to loads and scheduling points by generation, transmission, and distribution facilities.

*Electricity generation.* The process of producing electric energy or the amount of electric energy produced by transforming other forms of energy, commonly expressed in kilowatt hours (kWh) or megawatt hours (MWh).

*Electricity supply bottleneck.* The power station, substation or other part of transmission and distribution system whose capacity is less than the demand of electricity consumption. A bottleneck (or constraint) in a supply chain means the resource that requires the longest time in operations of the supply chain for certain demand. Usually, phenomena such as increase of inventory before a bottleneck and insufficiency of parts after a bottleneck are often seen. Operationally, usually the asset, machine or resource that takes the longest amount of time is recognized as the bottleneck. Therefore, in a supply chain, a bottleneck governs its throughput, efficiency, productivity and profitability.

*Embedded and intermittent generation.* A small scale power generation linked to the lower voltage distribution network.

*Embodied energy.* The energy used to produce a material substance (such as processed metals or building materials), taking into account energy used at the manufacturing facility (zero order), energy used in producing the materials that are used in the manufacturing facility (first order), and so on.

*End user.* The consumer of gas, in the residential, commercial or industrial sector. The final player in the gas chain.

*Energy efficiency.* The ratio of energy output of a conversion process or of a system to its energy input.

*Energy infrastructure.* The total system of generation, transport, distribution, trade, supply and consumption of energy. This means not only the physical network (e.g. power plants, gas pipes, heat delivery stations), but also the social (economic and institutional) network that manages and controls the physical system. Together, these networks form a socio-technical infrastructure system, where the technological, economic, and institutional domains are strongly interdependent.

*Energy intensity.* The ratio of energy consumption to economic or physical output. At the national level, energy intensity is the ratio of total domestic *primary*

*energy consumption or final energy consumption to Gross Domestic Product or physical output.*

*Energy service.* The application of useful energy to tasks desired by the consumer such as transportation, a warm room, or light.

*Energy supply.* Energy made available for future disposition. Supply can be considered and measured from the point of view of the energy provider or the receiver.

*Energy supply chain.* The global network of systems of generation, transmission and distribution, responsible for energy trade and supply to end customers through an engineered flow of information, physical distribution, and cash.

*Energy supply chain community.* The set of trading partners and nominal trading partners that define a complete energy supply chain.

*Energy trading.* Systems used to trade energy commodities.

*Energy transformation.* The change from one form of energy, such as the energy embodied in *fossil fuels*, to another, such as electricity.

*Environmental Impact Assessment (EIA).* Carried out to evaluate possible impacts of an offshore project on the marine ecology.

*Emergency Towing Vessel (ETV).* A multi purpose boat used by state authorities to tow disabled vessels on high seas in order to prevent dangers to man and environment. The disabled vessel is either towed to a safe haven or kept in place against wind and current until commercial assistance by tug boats has arrived on site or until it has been repaired to the extent of being able to manoeuvre on its own.

*European Critical Infrastructure (ECI).* Critical infrastructure located in the Member States the disruption or destruction of which would have a significant impact on at least two Member States.

*European infrastructure.* The network of interconnected and interdependent infrastructures located in EU member states that function collaboratively in order to ensure a continuous production flow of essentials, goods and services.

*Exchange of gas.* The delivery of gas by one party to another and the delivery of an equivalent quantity by the second party to the first. Such transactions usually involve different points of delivery and may or may not be concurrent.

*Explosion.* An uncontrolled release of energy which causes a pressure discontinuity or blast wave.

*Export cable(s).* The submarine power cables connecting the offshore wind farm transformer station to a landfall connection point.

*External cables (export cables).* Not necessarily need to be a part of the offshore wind farm. The function of the export cables is to transmit the electrical

power from the offshore wind farm to the appropriate cable connection facility at the shoreline or landfall.

*Fatigue.* The degradation of the material caused by cyclic loading.

*Fire.* An uncontrolled ignition of flammable chemicals and other materials on board of a ship (fire is the uncontrolled process of combustion characterised by heat or smoke or flame or any combination of these).

*Fix platform.* The offshore oil platform with the 'legs' constructed of concrete or steel, extending down from the platform, and fixed to the seafloor with piles. With some concrete structures, the weight of the legs and seafloor platform is so great, that they do not have to be physically attached to the seafloor, but instead simply rest on their own mass. There are many possible designs for these fixed, permanent platforms. The main advantages of these types of platforms are their stability; as they are attached to the sea floor, there is limited exposure to movement due to wind and water forces. However, these platforms cannot be used in extremely deep water; it simply is not economical to build legs that long.

*Fixed rigs / platforms.* Rigs that cannot be moved from one place to another.

*Flag state.* The State whose flag each ship is entitled to fly.

*Floating production systems.* The semi-submersible drilling rigs, as discussed above, except that they contain petroleum production equipment, as well as drilling equipment. Ships can also be used as floating production systems. The platforms can be kept in place through large, heavy anchors, or through the dynamic positioning system used by drill ships. With a floating production system, once the drilling has been completed, the wellhead is actually attached to the seafloor, instead of up on the platform. The extracted petroleum is transported via risers from this wellhead to the production facilities on the semi-submersible platform. These production systems can operate in water depths of up to 1800 m.

*Flooding.* The sea water, or water ballast, entering a space, from which it should be excluded, in such a quantity that there is a possibility of loss of stability leading to capsizing or sinking of the vessel.

*Fossil fuel mix.* A fuel such as coal or oil that is obtained from under the ground.

*Foundering.* A casualty event when the ship is taking water on board (foundering will be considered when the vessel has sunk; foundering should only be regarded as the first casualty event if we do not know the details of the flooding which caused the vessel to founder, in the chain of events foundering can be the last casualty event in this case there is the need to add accidental events; flooding refers to a casualty when a vessel takes water on board and can be:

progressive if the water flow is gradual, massive if the water flow is extensive).

*Fuel purchase and supply.* Coal, gas, oil, uranium, renewable and onsite storage capacity.

*Gas and oil production, storage and transportation infrastructure.* The production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, the refining and processing facilities for these fuels and the pipelines, ships, trucks, and rail systems that transport these commodities from their source to systems that are dependent upon gas and oil in one of their useful forms.

*Gas carrier ship.* A vessel specially designed to transport gases.

*Gas pipeline.* All parts of those physical facilities through which gas is moved in transportation, including pipe, valves, and other appurtenances attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders, and fabricated assemblies.

*Gravity Base Structure (GBS).* A support structure held in place by gravity. A common application for a GBS is an offshore oil platform. A GBS intended for use as an offshore oil platform is constructed of steel reinforced concrete, often with tanks or cells which can be used to control the buoyancy of the finished GBS. When completed, a GBS is towed to its intended location and sunk. Prior to deployment, a study of the seabed will have been done in order to ensure it can withstand the vertical load exerted on it by that structure. Gravity-based structures are also used for offshore wind power plants.

*General cargo ship.* Includes general cargo, tween-deck, multipurpose, heavy lift, and other vessels.

*Geographically interdependent infrastructures.* Infrastructures which components can be affected by a local environmental event due to physical proximity.

*Grid.* The layout of a gas distribution system in which pipes are laid in both directions in the streets and frequently connected at intersections. Also, a series of equally spaced parallel bars held together by equally spaced crosspieces; a screen. Alternative name for *network*.

*Grids.* The supply electrical power to a large area, there is used a system of connected wires.

*Grounding / stranding.* Moving navigating ship, either under command, under power, or not under command, drifting, striking the sea bottom, shore or underwater wrecks.

*Hazardous substance accidents.* Emission of toxic flammable substances in the form of gas, vapour or dusts causing impairment of the health and/or functioning of people or damage to the vessel. The following can be the cause of emission: fire,

accidental release, human error, failure of process equipment, loss of containment, or overheating of electrical equipment.

*Hull failure.* A failure affecting the general structural strength of the ship.

*High Voltage Alternating Current (HVAC).* An electric current of high voltage in which the flow of electric charge periodically reverses direction, whereas in direct current the flow of electric charge is only in one direction.

*High Voltage Direct Current (HVDC) technology.* Technology, that uses direct current to transmit power. Direct current facilities are connected to High Voltage Alternating Current (HVAC) systems by means of rectifiers, which convert alternating current to direct current, and inverters, which convert direct current to alternating current.

*Hydrocarbons.* An organic compound containing only carbon and hydrogen and often occurring in nature as petroleum, natural gas, coal and bitumens or in refined products such as gasoline and jet fuel.

*Identification.* The recognizing users on a company's system by using unique names.

*Identification of the Baltic Sea critical infrastructures.* The procedure based on specified local criteria leading to designate system belonging to Baltic Sea infrastructure network as a critical infrastructure system.

*Incident category.* Categorizing the accident in accordance with its character.

*Infield cables or infield array cables.* Submarine power cables connecting two offshore wind turbines or an offshore wind turbine and the offshore substations or the offshore transformer station.

*Information communication technology (ICT).* An electronic information-processing technologies such as computers and the Internet, as well as fixed-line telecommunications, mobile phones and other wireless communications, networks, broadband, and various specialised application devices ranging from barcode scanners and Braille readers to global positioning systems (GPS).

*Initiating event.* The first event in the sequence leading to a hazardous situation or accident.

*Inside dependencies.* Dependencies within an infrastructure (system) itself i.e. relationship between components and subsystems in a system causing degradation of other components and subsystems and in a consequence causing degradation of a system.

*Inter turbine cables.* Submarine power cables connecting two turbines. A series of inter turbine cables form an array cable. Also known as *intra array cables*. The cables which connect the offshore turbines into arrays and also connect the various arrays together. It is normal practice to cable several turbines together in an array, with each cable

providing a link between two adjacent turbines. Each end of the cable is terminated onto the high voltage (HV) switchgear located within the turbine tower. These cables would also connect any offshore substation to the offshore WTG arrays.

*Interconnected critical infrastructures.* Critical infrastructures in mutually direct and indirect connections between themselves.

*Interdependent critical infrastructures.* Critical infrastructures in mutually dependant relationships between themselves interacting at various levels of their complexity.

*Internal cables, grids or inter-turbine array cables.* An integral part of the offshore wind farm.

*International Convention for the Prevention of Pollution from Ships (MARPOL).* The main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The Convention includes regulations aimed at preventing and minimizing pollution from ships both accidental pollution and that from routine operations and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes.

*International Convention for the Safety of Life at Sea (SOLAS).* The convention generally regarded as the most important of all international treaties concerning the safety of merchant ships. The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment and operation of ships, compatible with their safety. Flag States are responsible for ensuring that ships under their flag comply with its requirements, and a number of certificates are prescribed in the Convention as proof that this has been done. Control provisions also allow Contracting Governments to inspect ships of other Contracting States if there are clear grounds for believing that the ship and its equipment do not substantially comply with the requirements of the Convention – this procedure is known as port State control.

*Intra array cables.* A submarine power cables connecting two turbines. A series of intra array cables form an array cable. Also known as Inter Turbine Cables.

*Jack up rigs.* The offshore oil rigs, that are similar to drilling barges, with one difference. Once a jack up rig is towed to the drilling site, three or four 'legs' are lowered until they rest on the sea bottom. This allows the working platform to rest above the surface of the water, as opposed to a floating barge. However, jack up rigs are suitable only for shallower waters, as extending these legs down too deeply would be impractical. This rig type can only operate to 150 m in the depth of water. These rigs are typically safer to

operate than drilling barges, as their working platform is elevated above the water level.

*J-tube.* The J-shaped tube fitted to offshore structures to install submarine cables between the seabed and the structure topsides.

*Land power stations (power plants).* Places where electricity is produced at the land.

*Less serious accidents.* Casualties to ships which do not qualify as very serious casualties or serious casualties and for the purpose of recording useful information also include marine incidents. Which themselves include hazardous incidents and near misses.

*Line pipe.* The pipe that is a part of a line section.

*Line section.* The designated section of a continuous run of pipeline. Line sections may designate sections that run, for example, between adjacent compressor stations or pump stations, between a compressor/pump station and a storage facility, between a compressor/pump station and a block valve, or between adjacent block valves. A line section can also be designated for testing purposes. For example, a line section may be a pipeline segment designated for hydrostatic testing that runs between two main line valves.

*Liquefied natural gas (LNG).* Natural gas that has been converted to a liquid by refrigerating it to -260°F. Liquefying natural gas reduces the fuel's volume by 600 times, enabling it to be shipped economically from distant producing areas to markets.

*Liquefied petroleum gas (LPG).* A gas containing certain specific hydrocarbons which are gaseous under normal atmospheric conditions, but can be liquefied under moderate pressure at normal temperatures. Propane and butane are principal examples.

*Logically interdependent infrastructures.* Infrastructures the state of which depends on the state of the other via a mechanism that is not a physical, cyber, or geographic connection.

*Loss of control.* A total or temporary loss of the ability to operate or manoeuvre the ship, failure of electric power, or to contain on board cargo or other substances: loss of electrical power is the loss of the electrical supply to the ship or facility (loss of propulsion power is the loss of propulsion because of machinery failure; loss of directional control is the loss of the ability to steer the ship; loss of containment is an accidental spill or damage or loss of cargo or other substances carried on board a ship).

*Loss of hull integrity.* The consequence of certain initiating events that result in damage to the external hull, or to internal structure and sub-division, such that any compartment or space within the hull is



opened to the sea or to any other compartment or space.

*Machinery related accidents.* Any failure of equipment, plant and associated systems which prevents, or could prevent if circumstances dictate, the ship from manoeuvring or being propelled or controlling its stability.

*Maintenance.* The process of maintaining property or equipment, including pipelines, to preserve it and prevent it from failure and ensure that it will continue to perform its intended function.

*Marine (liquid) bulk terminal.* A large terminal located on a waterway. Generally, it receives and distributes petroleum via pipeline, barge, or marine tanker from either domestic or import suppliers. Liquid bulk terminals tend to deal with liquid fuels such as petroleum oil and Liquid Natural Gas (LNG).

*Marine casualty.* An event, or a sequence of events, that has resulted in any of the following which has occurred directly in connection with the operations of a ship: 1) the death of, or serious injury to, a person, 2) the loss of a person from a ship, 3) the loss, presumed loss or abandonment of a ship, 4) material damage to a ship (is a damage that significantly affects the structural integrity, performance or operational characteristics of marine infrastructure or a ship, and requires major repair or replacement of a major component or components; or destruction of the marine infrastructure or ship), 5) the stranding or disabling of a ship, or the involvement of a ship in a collision, 6) material damage to marine infrastructure external to a ship, that could, seriously endanger the safety of the ship, another ship or an individual or 7) severe damage to the environment, or the potential for severe damage to the environment, brought about by the damage of a ship or ships.

*Marine Guidance Note (MGN).* A type of Marine Shipping Notice, that give significant advice and guidance relating to the improvement of the safety of shipping and of life at sea, and to prevent or minimise pollution from shipping.

*Marine incident.* An event, or sequence of events, other than a marine casualty, which has occurred directly in connection with the operations of a ship that endangered, or, if not corrected, would endanger the safety of the ship, its occupants or any other person or the environment.

*Marine Information Notices (MIN).* A type of Marine Shipping Notice, that are intended for a more limited audience e.g. training establishments or equipment manufacturers, or contain information which will only be of use for a short period of time.

*Marine operation.* Any activity, including load-out, transportation, offload or installation, which is

subject to the potential hazards of weather, tides, marine equipment and the marine environment.

*Marine power stations.* Places where electricity is produced, at the sea.

*Maritime Mobile Service Identity (MMSI).* A nine digit number used by maritime digital selective calling (DSC), automatic identification systems (AIS) and certain other equipment to uniquely identify a ship or a coast radio station. Maritime Mobile Service Identities are regulated and managed internationally by the International Telecommunications Union.

*Maritime transport.* Shipment of goods (cargo) and people by sea and other waterways.

*Marked energy.* An energy source that is commercially traded. Typically, this energy is sold by a producer, such as a petroleum refiner, through a transmission and distribution network (e.g., pipelines and trucks) to an end-use consumer (e.g., gasoline sold at the pump).

*Mega-node.* It is a single point at which multiple modes intersect. In transportation systems, a mega-node is a place of potential failure or bottleneck, with the potential for wide-ranging disruptions and losses.

*Missing.* A casualty to a ship whose fate is undetermined with no information having been received on the loss and whereabouts after a reasonable period of time.

*Mode.* A specific form or variety of something. In the context of transportation, there are six modes: aviation, maritime, mass transit, highway, freight rail, and pipeline.

*Momentary interruption.* Interruption occurring when power is briefly cut off, lasting from a fraction of a second to as long as a minute.

*Monopile (MP).* Common tubular structure used as foundation for offshore wind turbine generator.

*Moveable offshore drilling rigs.* Rigs that can be moved from one place to another.

*Nacelle.* The part of the wind turbine on top of the tower, where the hub, gearbox, generator and control systems are located.

*National Renewable Energy Action Plan.* A national plan breaking down the target between electricity, heating and cooling, and transport and, within these sectors, for each renewable energy technology.

*Natural gas.* Naturally occurring hydrocarbon gases found in porous rock formations. Its principal component is usually methane. Non hydrocarbon gases such as carbon dioxide and hydrogen sulfide can sometimes be present in natural gas.

*Natural gas liquids (NGLs).* A general term for highly volatile liquid products separated from natural gas in a gas processing plant. NGLs include ethane, propane, butane and condensate.

*Net weight.* The calculated or weighed weight of a structure, with no contingency or weighing allowance.

*Noise.* A continuous distortion of normal voltage.

*Non Destructive Testing (NDT).* Ultrasonic scanning, magnetic particle inspection, eddy current inspection or radiographic imaging or similar. May include visual inspection.

*Not to exceed weight.* A term used to define the maximum possible weight of a particular structure.

*Vessel not under command.* A vessel which due to special circumstances does not have the ability to manoeuvre in accordance with regulations and is not able to move out of the way of another vessel.

*Offshore converter station.* The offshore converter station transforms the collected energy from the offshore transformer stations (several wind parks) to Direct Current in order to send it to a land based converter station.

*Offshore pipeline.* A pipeline located off the coast. Large quantities of natural gas and crude oil are produced from beneath the Baltic Sea floor. Offshore pipelines transport these products from the offshore production areas to onshore processing plants and pipelines.

*Offshore platforms.* Huge steel or concrete structures used for the exploration and extraction of oil and gas from the earth's crust. Offshore oil and gas platforms are generally made of various grades of steel, from mild steel to high-strength steel, although some of the older structures were made of reinforced concrete. Offshore platforms have many uses including oil exploration and production, navigation, ship loading and unloading, and to support bridges and causeways. They are very heavy and are among the tallest manmade structures on the earth. The oil and gas are separated at the platform and transported through pipelines or by tankers to shore.

*Offshore Renewable Energy Installations (OREI).* Offshore installations producing electricity using e.g. waves or marine currents.

*Offshore structures.* Structures designed for installation in the open sea, lakes, gulfs, etc., many kilometres from shorelines. These structures may be made of steel, reinforced concrete or a combination of both.

*Offshore Support Vessels (OSVs).* Vessels that provide support for exploration, development and production activities in the offshore oil and gas industry. Offshore support vessels include specialized multi-purpose vessels and provide support services to offshore drilling (rigs), pipe laying and oil producing assets (production platforms and Floating Production, Storage and Offloading – FPSOs), utilised in exploration and production activities.

*Offshore transformer station.* The offshore transformer station is transforming the collected energy from the wind turbines to a higher voltage.

*Offshore Wind Farm (OWF).* A group of wind turbines arranged in the same seabed location used to produce electricity.

*Offshore wind farm critical infrastructure network.* The term is used when:

- at least two wind farms use a common transformer station or a common cable exporting energy on land,
- two or more offshore wind farms benefit from the *joint operation centre*,
- two or more offshore wind farms have the same operator,
- two or more offshore wind farms use the same connection on land (*onshore substation*).

*Oil rigs critical infrastructure network.* More than one mining platform unconnected technologically, but organizationally linked by the operator, operators association or jurisdiction.

*Operating loads.* The loads that involve the loads subservient under the ongoing operations like loading and unloading, drilling, mooring operations, additional loads generated by cranes and derricks. They take into account impact, momentum, vibration, slosh dynamics, material fatigue etc. Also involves weight of manpower, equipment, storage like the crude oil which has been extracted, life-support systems and so on.

*Operation duration.* The planned duration of the operation from the forecast prior to the Point of No Return to a condition when the operations / structures can safely withstand a seasonal design storm (also termed “safe to safe” duration). This excludes the contingency period.

*Operational reference period.* The operation duration, plus the contingency period.

*Operator.* The entity responsible for managing operations in a field or undeveloped acreage position.

*Outside dependencies.* Dependencies coming from the infrastructure environment (external factors) and relationship between infrastructures. Including degradation of infrastructure's state caused by outside this infrastructure changes e.g. climate changes, changes of infrastructure's functionality, location, government and human decisions (regulations, economic, public policy), also degradation of one infrastructure's state affected or correlated according to the state degradation of other infrastructures (including “loops”).

*Passenger ferrie.* A vessel specially designed to carry passengers.

*Payload related accidents.* Include loss of stability due to cargo shifting and damage to the vessel's structure resulting from the method employed for

loading or discharging the cargo. This category does not include incidents which can be categorized as hazardous substance, fires, explosions, loss of hull integrity, flooding accidents etc.

*Peak demand.* The maximum load during a specified period of time.

*Permanent loads.* The loads that involve the construction loads like the weight of the entire structure, ballast systems, weight of machinery, accommodation and other equipment. For members below the waterline it involves the hydrodynamic forces and also the hydrostatic pressure forces like the buoyancy and pressure loads.

*Petroleum.* A generic name for hydrocarbons, including crude oil, natural gas liquids, natural gas and their products.

*Physically interdependent infrastructures.* Infrastructures the state of which is dependent on the material output(s) of the other infrastructure.

*Pipeline crossing.* A pipeline crossing is a point where two or more pipelines cross without a physical connection existing between the pipelines.

*Pipeline facility.* New and existing pipelines, rights-of-way, and any equipment, facility, or building used in the transportation of gas or in the treatment of gas during the course of transportation.

*Pipeline intersection.* It is a point where a physical connection between two pipelines occurs.

*Platform.* An offshore structure that is permanently fixed to the seabed.

*Point of no return.* The last point in time, or a geographical point along a route, at which an operation could be aborted and returned to a safe condition.

*Pollution from normal operation.* The pollution which results in relatively small quantities of pollutants ending in the sea during long periods, the accidental events result in release of huge quantities of hydrocarbons and pollutants discharged uncontrolled in the sea during relatively short periods.

*Port.* A facility designed to dock, load, and unload marine vessels. Also, *port* term is used the agency (port authority), which administers use of public wharves and port properties.

*Port operations.* All policies, reforms and regulations that influence the infrastructure and operations of port facilities including shipping services.

*Power cables.* Subsea cables which are used to either import or export power capacity. These cables are large diameter cables with similar characteristics and behaviour to the export cables associated with offshore wind farm developments.

*Power disturbances.* Disturbances that affect power delivery or quality. Some may only briefly interfere with the most highly sensitive equipment. Others,

due to extensive damage on an electric delivery system, could result in the total loss of power for days.

*Power outage.* An outage registered whenever the electricity is completely interrupted for a minute or longer.

*Pressure.* Pressure is the force exerted on a given area expressed in pounds per square inch (PSI) or its metric equivalent of kilo Pascals (kPa). Natural gas transported within a pipeline exerts pressure on the pipe wall.

*Primary energy* (also referred to as *energy sources*). The energy embodied in natural resources (e.g., coal, crude oil, natural gas, uranium) that has not undergone any anthropogenic conversion. It is transformed into secondary energy by cleaning (natural gas), refining (oil in oil products) or by conversion into electricity or heat. When the secondary energy is delivered at the end-use facilities it is called final energy (e.g., electricity at the wall outlet), where it becomes *usable energy* (e.g., light). Daily, the sun supplies large quantities of energy as rainfall, winds, radiation, etc. Some share is stored in biomass or rivers that can be harvested by men. Some share is directly usable such as daylight, ventilation or ambient heat.

*Renewable energy.* The energy obtained from the continuing or repetitive currents of energy occurring in the natural environment and includes non-carbon technologies such as solar energy, hydropower, wind, tide and waves and geothermal heat, as well as carbon-neutral technologies such as biomass.

*Reserves.* Estimated remaining quantities of gas anticipated to be economically producible, as of a given date, by application of development projects to known accumulations. In addition, there must exist, or there must be a reasonable expectation that there will exist, the legal right to produce or a revenue interest in production, installed means of delivering gas to market and all permits and financing required to implement the project.

*Rigs.* There are the structures used for the drilling of the wells and platforms are installed in the field for extracting oil / gas operation.

*Roll on / roll of ship (ro/ro ship).* A vessel specially designed to transport vehicles and to load and unload them under their own power.

*Rotor.* Configuration consisting of the complete set of blades, connected to the hub.

*Route Clearance (RC).* The use of grapnels and other methods to clear debris from the planned cable routes. Normally done well in advance of cable operations to allow adequate time to remove debris.

*Sag.* A short duration drop in voltage.

*Scour pit.* The result of scour around a pile, leg etc..

*Shore End.* The section of submarine cable installed between the landfall connection point and the offshore set up position of the Cable Laying Vessel (CLV) or Cable Lay Barge (CLB).

*Sea fastenings.* The system used to attach a structure to a barge or vessel for transportation.

*Seastar platform.* The platform that consists of a floating rig, much like the semi-submersible type discussed above. A lower hull is filled with water when drilling, which increases the stability of the platform against wind and water movement. In addition to this semi-submersible rig, however, Seastar platforms also incorporate the tension leg system employed in larger platforms. Tension legs are long, hollow tendons that extend from the seafloor to the floating platform. These legs are kept under constant tension, and do not allow for any up or down movement of the platform. However, their flexibility does allow for side-to-side motion, which allows the platform to withstand the force of the ocean and wind, without breaking the legs off. Seastar platforms are typically used for smaller deep-water reservoirs, when it is not economical to build a larger platform. They can operate in water depths of up to 1000 m.

*Semi-submersible platforms / rigs.* The offshore oil rigs that have a floating drill unit includes columns and pontoons that, if flooded with water, will cause the pontoons to submerge to a depth that is predetermined. These rigs are the most common type of offshore drilling rigs, combining the advantages of submersible rigs with the ability to drill in deep water. Semi-submersible rigs work on the same principle as submersible rigs; through the “inflating” and “deflating” of its lower hull. The rig is partially submerged, but still floats above the drill site. When drilling, the lower hull, filled with water, provides stability to the rig. Semi-submersible rigs are generally held in place by huge anchors, each weighing upwards of ten tons. These anchors, combined with the submerged portion of the rig, ensure that the platform is stable and safe enough to be used in turbulent offshore waters. They can also be kept in place by the use of dynamic positioning. Semi-submersible rigs can be used to drill in much deeper water than the rigs mentioned above. Now with a leap in technology, depths of up to 1800 m can be achieved safely and easily. This type of rig platform will drill a hole in the seabed and can be quickly moved to new locations.

*Sensitive critical infrastructure protection related information.* Facts about a critical infrastructure, which if disclosed could be used to plan and act with a view to causing disruption or destruction of critical infrastructure installations.

*Serious accidents.* Casualties to ships which do not qualify as very serious casualties and which involve a fire, explosion, collision, grounding, contact, heavy weather damage, ice damage, hull cracking, or suspected hull defect, etc., resulting in: immobilization of main engines, extensive accommodation damage, severe structural damage, such as penetration of the hull under water, etc., rendering the ship unfit to proceed, or pollution (regardless of quantity), and/or a breakdown necessitating towage or shore assistance.

*Severe pollution.* Pollution which, as evaluated by the coastal State(s) affected or the flag Administration, as appropriate, produces a major deleterious effect upon the environment, or which would have produced such an effect without preventive).

*Simultaneous Operations (SIMOPS).* Operations usually involving various parties and vessels requiring co-ordination and definitions of responsibilities.

*Socio-technical infrastructure system.* A complex system. the technological, economic, and institutional domains are strongly interdependent. Those systems used to trade energy commodities are called *energy trading systems*.

*Spar platforms.* The offshore oil platforms among the largest offshore platforms in use. These huge platforms consist of a large cylinder supporting a typical fixed rig platform. The cylinder however does not extend all the way to the seafloor, but instead is tethered to the bottom by a series of cables and lines. The large cylinder serves to stabilize the platform in the water, and allows for movement to absorb the force of potential hurricanes.

*Static threats.* Threats associated with static installations.

*Storage facilities.* There are facilities designed and used for storage of oil or natural gas. Storage facilities vary greatly in size and design based on the product stored and the location and need within the pipeline system. Natural gas storage facilities typically operate so that large volumes of natural gas can be readily available for delivery to customers upon demand. The largest storage facilities are created in underground caverns, such as salt domes, or in porous rock formations.

*Stranding.* The ship becoming fixed on an underwater feature or object such that the vessel cannot readily be moved by lightening, floating off or with assistance from other vessels (e.g. tugs). (For the purpose of further elaboration another term was also assumed – run aground).

*Sub-transmission grids (regional grids).* Radial or locally meshed networks connected to the transmission grid via infeed points. Smaller

generating plants (e.g. wind power stations and gas turbines), and large users are connected to these grids.

*Submarine (underwater) pipeline.* See: offshore pipeline.

*Submersible rigs.* The offshore oil rigs that can be suitable for shallow water, like jack up rigs in that they come in contact with the ocean or lake floor. These rigs consist of platforms with two hulls positioned on top of one another. The upper hull contains the living quarters for the crew, as well as the actual drilling platform. The lower hull works much like the outer hull in a submarine – when the platform is being moved from one place to another, the lower hull is filled with air – making the entire rig buoyant. When the rig is positioned over the drill site, the air is let out of the lower hull, and the rig submerges to the sea or lake floor. This type of rig has the advantage of mobility in the water; however, once again its use is limited to shallow water areas.

*Subsea production systems.* Wells located on the sea floor, as opposed to at the surface. As in a floating production system, the petroleum is extracted at the seafloor, and then can be “tied-back” to an already existing production platform. The well can be drilled by a moveable rig and instead of building a production platform for that well, the extracted oil and natural gas can be transported by a riser or even undersea pipeline to a nearby production platform. This allows one strategically placed production platform to service many wells over a reasonably large area. Subsea systems are typically in use at depths of 2100 m or more, and do not have the ability to drill, only to extract and transport.

*Supply boat.* Includes offshore supply, inshore workboat, Police / Fire boat.

*Surge.* A short-duration increase or spike in voltage lasting as little as a few millionths of a second and varying from a few hundred volts to several thousand volts.

*System safety.* An ability of the system such that during fulfilling its operational objective it does not affect destructively on itself and other objects in its operating environment and does not degrade its natural operating environment.

*System storage.* Storage facilities, or portion of storage facilities, which is used by the pipeline to store gas for its own use, to meet the peak day requirements of its sales customers and to provide flexibility on its system.

*Tank ship.* A vessel specially designed to transport liquid cargo.

*Technological hazard.* It is a range of hazards emanating from the manufacture, transportation, and use of such substances as radioactive materials, chemicals, explosives, flammables, agricultural

pesticides, herbicides and disease agents; oil spills on land, coastal waters or inland water systems; and debris from space.

*Template (jacket) platforms.* The fixed platforms mainly consist of jacket, decks and piles.

*Tension leg platforms.* The offshore oil platform with the long, flexible legs attached to the seafloor, and run up to the platform itself. As with the Seastar platform, these legs allow for significant side to side movement (up to 6 m), with little vertical movement. Tension leg platforms can operate as deep as 2100 m.

*Threat.* An unnatural dangerous event, coming out from human activity and systems or infrastructures operation, that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.

*Threats to the Baltic Sea critical infrastructure or a critical infrastructure network.* The occurrence of an unwanted circumstance or event that may cause damage functioning disruption or service interruption to critical infrastructures located in the Baltic Sea Region.

*Tower.* The tubular element from the top of the flange on the foundation to the bottom of the flange below the nacelle, generally built up of several sections.

*Tracked cable burial machines.* Vehicles usually operated in post laid burial mode to bury subsea cables which have been previously laid on the seabed and are typically used for shorter sections of cable burial.

*Traffic Separation Scheme (TSS).* Traffic Separation Scheme is a method of regulating the flow of vessel traffic moving in different directions. The International Maritime Organization (IMO) defines it as “a scheme which separates traffic proceeding in opposite or nearly opposite directions, by the use of a separation zone or line, traffic lanes, or by other means.” Traffic separation schemes are often part of Vessel Traffic Services, in ports or restricted coastal areas.

*Transition Piece (TP).* A tubular structure on top of a monopile to provide a horizontal foundation for the tower.

*Transmission.* A passage through sub-stations within country and between country interconnectors. It is possible through distribution grids (low-voltage) and sub transmission grids.

*Transmission (in electric sector).* The movement or transfer of electric energy over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers or is delivered to other electric systems. Transmission is considered to end

when the energy is transformed for distribution to the consumer.

*Transmission constraint (in electric sector).* A limitation on one or more transmission elements that may be reached during normal or contingency system operations.

*Transmission grids (high-voltage).* Meshed networks, connecting large generating stations (e.g. hydro power and nuclear power), sub transmission grids, and very large users. Transmission grids enable power trading with other countries and facilitate the optimization of generation within a country.

*Transmission pipeline.* A network of pipelines moving natural gas from a gas processing plant via compressor stations, to storage centres or distribution points.

*Transportation infrastructure.* Physical distribution systems critical to supporting the national security and economic well-being of this nation, including the national airspace systems, airlines, and aircraft, and airports; roads and highways, trucking and personal vehicles; ports and waterways and the vessels operating thereon; mass transit, both rail and bus; pipelines, including natural gas, petroleum, and other hazardous materials; freight and long haul passenger rail; and delivery services.

*Transportation security incident.* A security incident resulting in a significant loss of life, environmental damage, transportation system disruption, or economic disruption in a particular area.

*Tug and towboat.* Includes harbour tugs, line-haul towboats, offshore tugs.

*United Nations Conventions on the Law of the Sea (UNCLOS).* The most comprehensive attempt at creating a unified regime for governance of the rights of nations with respect to the world's oceans. The treaty addresses a number of topics including navigational rights, economic rights, pollution of the seas, conservation of marine life, scientific exploration, piracy, and more. The treaty, comprised of 320 articles and 9 annexes, is representing the codification of customary international law and its progressive development.

*Unmanned platform.* A small platform designed to be operated remotely under normal conditions, only to be visited occasionally for routine maintenance or well work.

*Very serious accidents.* The casualties to ships which involve total loss of the ship, loss of life, or severe pollution.

*Vessel Monitoring Systems (VMS).* A satellite-based monitoring system which at regular intervals provides data to the fisheries authorities on the location, course and speed of vessels.

*Vessel Traffic Management System (VTMS).* A marine traffic monitoring system established by a competent (harbour or port) authority, designed to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment. Vessels Traffic Management Systems are installed in some of the busiest waters in the world. Traffic flow in busy approach routes, access channels, and harbours can be coordinated safely, in the best interest of port and its users. Incidents and emergency situations can be dealt with quickly data from traffic movements can be stored and used as reference information for port administration, port authorities, coastguards and search and rescue services. VTMS systems provide monitoring of shipping lanes and separation schemes, compliance with safety regulations, protection of vessel carrying hazardous cargoes, assistance to coast guard, and other authorities, assistance to search and rescue, and improve port efficiency.

*Vessel Traffic Service (VTS).* A service implemented by a competent authority, designed to improve the safety and efficiency of navigation, safety of life at sea and the protection of the marine environment. VTS is governed by International Convention for the Safety of Life at Sea (SOLAS) together with the Guidelines for Vessel Traffic Services adopted by the International Maritime Organization. International Maritime Organization identifies three types of service that can be provided by a VTS: Information Service (INS), Traffic Organization Service (TOS), Navigational Assistance Service (NAS).

*Waterways.* Navigable waterways capable of carrying marine traffic.

*Wind farm (wind park).* A group of wind turbines arranged in the same land location used to produce electricity.

*Wind Turbine Generator (WTG).* A power generating device that converts the kinetic energy of the wind to electrical energy. There are two main kinds of wind generators, those with a vertical axis, and those with a horizontal axis. Wind turbines can be used to generate large amounts of electricity in wind farms both onshore and offshore.

*Wind turbines.* Used to produce power to make electricity and have a tall structure with blades that are blown round by the wind.

*Working pressure.* Normal operating gauge pressure in a device or system.

### **3. Climate change**

*Absolute sea level trends.* Trends showing how the volume of water is changing, and how these changes relate to other observed or predicted changes in

global systems (e.g., increasing ocean heat content and melting polar ice caps).

*Baltic Sea climate change.* Any changes in climate within the Baltic Sea area over time either due to natural variability or as a result of human activity, while the extreme weather event means the meteorological conditions that are dangerous and happen at a particular place and time and can generate severe hazards.

*Blizzard.* A snowstorm with sustained wind or frequent gusts to 56 km (35 miles) per hour or greater for at least three hours and falling and/or blowing snow reducing visibility frequently to less than 0.4 km (0.25 mile).

*Carbon emissions (carbon dioxide and carbon monoxide).* Usually made by things such as factories or cars that burn carbon and cause pollution. In addition, they replace part of the fossil fuel mix in the electricity generation on the spot markets, gaining from the merit-order effect.

*Climate.* Dynamic interactions of several components including atmosphere, hydrosphere, cryosphere, land surface and biosphere.

*Climate change.* Any changes in climate over time, either due to natural variability or as a result of human activity.

*Climate change scenario.* A coherent and internally-consistent description of the change in climate by a certain time in the future, using a specific modelling technique and under specific assumptions about the growth of greenhouse gas and other emissions and about other factors that may influence climate in the future.

*Climate extreme (extreme weather or climate event).* An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).

*Climate hazards.* Natural phenomena coming out from climate change that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources.

*Climate model.* A numerical representation of the climate system that is based on the physical, chemical, and biological properties of its components, their interactions, and feedback

processes, and that accounts for all or some of its known properties.

*Climate prediction.* The result of an attempt to produce an estimate of the actual evolution of the climate in the future, e.g., at seasonal, inter-annual or long-term time scales.

*Climate projection.* The response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based on simulations by climate models.

*Climate stationarity.* The stationarity of extremes of climate and weather i.e. that the frequencies and intensities of extremes observed in the past adequately represent those that will occur in the future.

*Climate variability.* Variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate at all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

*Climate-weather change process.* The process of the climate-weather states changing considered in time for a fixed area.

*Coastal flooding.* Inundation of normally dry, low-lying coastal land, primarily caused by severe weather events along the coasts, estuaries, and adjoining rivers.

*Cold waves / spells.* Extremely cold days or a succession of frost days with minimum temperatures below 0°C).

*Design temperature (for a unit).* The reference temperature for assessing areas where the unit can be transported, installed and operated. The design temperature is to be lower or equal to the lowest mean daily temperature in air for the relevant areas. For seasonal restricted operations the lowest mean daily temperature in air for the season may be applied. In all cases where the temperature is reduced by localised cryogenic storage or other cooling conditions, such factors shall be taken into account in establishing the service temperatures for considered structural parts.

*Drought.* A period of abnormally dry weather long enough to cause a serious hydrological imbalance. A period with an abnormal precipitation deficit is defined as a meteorological drought. A mega-drought is a very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more.

*Environmental loads.* The loads that may be subdivided into the various categories:

- *Wind loads.* The loads that act on the above portion of the platform by virtue of the blowing winds of varying extremities. For instance during regular sea breeze, this aspect is not to be taken care of but where the situation is graver like in case of gale storms ruffling the seas hither and tither, the consequent aftermath on the structure is a pressing concern. Especially when height to width ratio is more than 5, the cyclic wave loads due to the induced vortex flow has to be taken seriously into account. Structural members have to be designed such that they can withstand longitudinal loads with greater endurance than transverse for higher slenderness ratios. Snowfall or frost heaving which is a phenomenon of abnormal swelling of soil during cold temperature may pose a potential threat to the structure.
  - *Temperature and atmospheric pressure loads.* The loads that cause thermal expansion, contraction and sometimes deformation. Suppose a platform amidst the cold during winters, have to endure high amount of low pressure and temperature vagaries while somewhere else during summer, it may be subjugated to high temperatures, pressures, humidity or warm underwater currents sometimes leading to expansion.
  - *Seismic activities.* The loads that often take place in the underwater oceanic plates where they drift, vibrate, intimate or recede away from each other.
  - *Lateral loads.* The loads from soil, groundwater or seabed may endanger their piling or foundations hence often aggravated by seafloor scour.
  - *Wave loads.* The loads that are the most prominent terror that poses threat to all offshore structures. The waves are basically gravity contact forces energy transfer phenomenon that occurs due to wind pressure on the water surface with a given force or speed, duration and. Waves may be one of the following types: internal, external, normal sea waves, swells, breaking waves.
  - *Marine growth* accumulates on the submerged surfaces, increasing the wave forces through higher drag forces and surface roughness.
- Extreme coastal high water* (also referred to as extreme sea level). Extreme coastal high water depends on average sea level, tides, and regional weather systems. Extreme coastal high water events are usually defined in terms of the higher percentiles (e.g., 90th to 99.9th) of a distribution of hourly values of observed sea level at a station for a given reference period.
- Extreme cold.* What constitutes extreme cold and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered extreme cold. Whenever temperatures drop decidedly

below normal and as wind speed increases, heat can leave your body more rapidly. These weather-related conditions may lead to serious health problems. Extreme cold is a dangerous situation that can bring on health emergencies in susceptible people, such as those without shelter or who are stranded, or who live in a home that is poorly insulated or without heat.

*Extreme heat.* Conditions of extreme heat are defined as summertime temperatures that are substantially hotter and/or more humid than average for location at that time of year. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a “dome” of high atmospheric pressure traps hazy, damp air near the ground. Extremely dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.

*Extreme precipitation.* Expresses large precipitation amounts or intensities, or long-duration dry spells. Even though droughts can be considered as extreme precipitation events, we address here mainly events of increased precipitation intensity. By definition, it rarely occurs in the prevalent climate. The potential damaging effects are implied by the rare occurrence as neither nature nor society are prepared for the conditions. Usually one relates the degree of extremeness to the expected return period of incidents estimated from regular observations.

*Extreme weather event.* Meteorological conditions that are dangerous and happen at a particular place and time and can generate severe hazards.

*Extreme wind.* The wind which is strong enough to be dangerous for people, or cause significant damage to buildings and property, usually faster than 100 km/h (>118 km/h= 12 Beaufort scale, hurricane).

*Fetch.* The distance over which the wind blows.

*Flood.* A general and temporal condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters, unusual or rapid accumulation or runoff of surface waters, or mudslides/mudflows caused by accumulation of water.

*Fog.* The extremely low visibility (that has major impacts on transport).

*Greenhouse gases (GHG).* Gases that causes the greenhouse effect, especially carbon dioxide.

*Gust.* A rapid increase in the strength of the wind relative to the mean strength at the time.

*Hail.* Solid precipitation in the form of balls or pieces of ice (hailstones) with diameters ranging from 5 to 50 mm or even more.

*Hazard.* A natural dangerous event coming out from the natural environment including weather and climate change that that may cause loss of life,



injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.

*Hazard caused by weather change.* An event associated with extreme weather that may cause the loss of life or severe injury, property damage, social and economic disruption or environmental degradation. For instance: a dangerous chemical release (spill) into the sea water as a result of ship accident cause by severe storm.

*Heat wave.* A period of abnormally and uncomfortably hot and unusually humid weather. Typically a heat wave lasts two or more days.

*Heavy rain(fall).* See: *intense rain(fall)*.

*Hydro-meteorological hazard.* The process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

*Hydrological parameters.* The parameters like: seawater temperature, salinity, dissolved gases, current speed and direction, the wave parameters, the ice thickness.

*Ice storm.* A type of storm describing occasions when damaging accumulations of ice are expected during freezing rain situations. Significant ice accumulations are usually accumulations of 6.4 mm or greater of ice on exposed surfaces.

*Intense rain(fall).* A rain characterized by a rainfall rate greater than or equal to 50 mm/h.

*Landslide.* All varieties of slope movement, under the influence of gravity. More strictly it refers to down-slope movement of rock and/or earth masses along one or several slide surfaces.

*Lightning.* A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground or between the ground and a cloud.

*Maintain energy balance.* The energy budget of the climate system, averaged over the globe and over longer time periods, must be in balance. Because the climate system derives all its energy from the Sun, this balance implies that, globally, the amount of incoming *solar radiation* must on average be equal to the sum of the outgoing reflected solar radiation and the outgoing *infrared radiation* emitted by the climate system. A perturbation of this global radiation balance, be it human-induced or natural, is called *radiative forcing*.

*Maritime storm.* An elevation of sea level caused by a combination of change in atmospheric pressure, currents, waves and the topography of the coastal shelf.

*Merit order effect.* The displacement of more expensive marginal cost thermal plant by wind or solar which has zero marginal cost.

*Modes of climate variability.* Natural variability of the climate system, in particular on seasonal and longer time scales, predominantly occurs with preferred spatial patterns and time scales, through the dynamical characteristics of the atmospheric circulation and through interactions with the land and ocean surfaces. Such patterns are often called regimes, modes, or teleconnections.

*Natural disaster.* A violent, sudden and destructive change in the environment without cause from human activity, due to phenomena such as floods, earthquakes, fire and hurricanes with the ability to destroy or incapacitate critical infrastructures.

*Natural hazards.* Severe and extreme weather and climate events that occur naturally in all parts of the world, although some regions are more vulnerable to certain hazards than others.

*Potential impacts.* All impacts that may occur given a projected change in climate, without considering adaptation.

*Rainfall intensity.* The intensity of rain is its rate of fall. "Very light" means that the scattered drops do not completely wet a surface. "Light" means it is greater than a trace and up to 2.5 mm an hour. "Moderate" means the rate of fall is between 2.6 mm to 7.5 mm per hour. "Heavy" means 7 mm per hour or more.

*Relative and absolute sea level trends.* Relative sea level trends show how sea level change and vertical land movement together are likely to affect coastal lands and infrastructure, while absolute sea level trends provide a more comprehensive picture of the volume of water in the world's oceans, how the volume of water is changing, and how these changes relate to other observed or predicted changes in global systems (e.g., increasing ocean heat content and melting polar ice caps).

*Sea-level rise.* An increase in the mean level of the ocean. Eustatic sea-level rise is a change in global average sea level brought about by an increase in the volume of the world ocean. Relative sea-level rise occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence. In areas subject to rapid land-level uplift, relative sea level can fall.

*Short-term climate-weather change prediction.* Climate-weather change prognosis for the nearest future time in the fixed area/environment.

*Significant wave height.* The average height of the highest one-third of the wave heights (trough to peak) from sea and swell occurring in a particular time period.

*Storm surge.* The temporary increase, at a particular locality, in the height of the sea due to extreme meteorological conditions (low atmospheric pressure, strong winds, a high tide).

*Storm tracks.* Regions with a high frequency of storms. The storms tend to have a preference for the north-eastern part of the North Atlantic, but are affected by the NAO.

*Storms.* 1) An atmospheric disturbance involving perturbations of the prevailing pressure and wind fields, on scales ranging from tornadoes (1 km across) to extratropical cyclones (2000-3000 km across). 2) The Wind with a speed between 48 and 55 knots (Beaufort scale wind force 10).

*Thermal expansion.* The increase in volume (and decrease in density) that results from warming water. A warming of the ocean leads to an expansion of the ocean volume and hence an increase in sea level.

*Weather and climate extremes.* The rare events within the statistical reference distribution of particular weather elements at a particular place.

*Weather restricted operation.* A marine operation which can be completed within the limits of an operational reference period with a weather forecast not exceeding the operational criteria. The operational reference period (which includes contingencies) is generally less than 72 hours. The design environmental condition need not reflect the statistical extremes for the area and season.

*Weather unrestricted operation.* An operation with an operational reference period greater than the reliable limits of a weather forecast. The operational reference period (which includes contingencies) is generally more than 72 hours. The design weather conditions must reflect the statistical extremes for the area and season.

#### 4. Resilience

*Accidental Limit States (ALS).* The limit states that ensure that the structure resists accidental loads and maintain integrity and performance of the structure due to local damage or flooding.

*Adequacy (electric).* The ability of the electric system to supply the aggregate electrical demand and energy requirements of the end-use customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements.

*Balancing authority (electric).* The responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a balancing authority area, and supports interconnection frequency in real time.

*Baltic Sea critical infrastructures resilience to climate changes modelling.* Application of:  
– modelling of critical infrastructure safety,

– modelling of climate threats to critical infrastructures diagnostic and detection,  
– modelling of climate change influence on Baltic sea critical infrastructures.

*Burial sleds.* Developed for the burial of the shore end section of cable systems and work in shallow water. As well as being used for open water shore end cable installation, these machines are often used for river crossing and estuary cable work.

*Cable burial.* The primary method for protecting subsea cables. Providing the correct burial machine is selected for the designated burial task, the target depth of burial is likely to be achieved. If a cable is not adequately protected, damage can and will occur. In certain locations, highly specialist cable burial techniques have been developed to suit the exacting requirements of that particular location.

*Cable burial ploughs.* Passive tools towed from a host vessel. The plough share cuts a wedge of soil which is then lifted by the action of the plough cutting through the seabed.

*Climate change adaptation.* Initiatives and measures to reduce the vulnerability or increase the resilience of natural and human systems to actual or expected climate change impacts. There can be distinguished various types of adaptation, such as anticipatory and reactive, private and public, and autonomous and planned.

*Climate-related risk.* The result of interaction of physically defined hazards with the properties of the exposed systems – i.e., their sensitivity or (social) vulnerability.

*Coating.* A metallic, inorganic or organic material applied to steel surfaces for prevention of corrosion.

*Competitive transition charge.* A non-bypassable charge levied on each customer of the distribution utility, including those who are served under contracts with non utility suppliers, for recovery of the utility's stranded costs that develop because of competition.

*Corrosion allowance.* Extra wall thickness added during design to compensate for any anticipated reduction in thickness during the operation.

*Corrosion control.* The control of structural steel for offshore structures comprises:

- coatings and/or cathodic protection,
- use of a corrosion allowance,
- inspection/monitoring of corrosion,
- control of humidity for internal zones (compartments).

*Critical infrastructure owners and operators.* Those entities responsible for day-to-day operation and investment of a particular critical infrastructure entity.

*Critical infrastructure resilience.* An ability of a system and its component parts to anticipate, absorb,

accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

*Critical infrastructure resilience to climate change.* CI capacity being able to absorb and to recover from hazardous events appearing as a result of climate change.

*Critical infrastructure resilience to climate change model.* A framework joining prevention options to minimize CI exposure to hazards, methods of CI protection, methods reducing potential impacts to enhance contingency planning and business continuity and methods of adaptation and mitigation of consequences related to climate hazards.

*Critical infrastructure risk management framework.* A planning and decision-making framework that outlines the process for setting goals and objectives, identifying infrastructure, assessing risks, implementing risk management activities, and measuring effectiveness to inform continuous improvement in critical infrastructure security and resilience.

*Critical infrastructure robustness (in climate change context).* The inherent strength or the ability of infrastructure to withstand external demands coming from climate change without degradation or loss of functionality.

*Critical infrastructure secure / security.* Activities whose objective is to reduce the risk to critical infrastructure by physical means or defensive cyber measures to intrusions, attacks, or the effects of natural or manmade disasters.

*Critical infrastructure vulnerability.* The possibility of a critical infrastructure coming to the safety state subset worse than a critical safety state in time shorter than its fixed value, due to some external factors, causing negative effects on itself, other objects and its operating environment.

*Demand response programs.* Demand response programs are incentive-based programs that encourage electric power customers to temporarily reduce their demand for power at certain times in exchange for a reduction in their electricity bills. Some demand response programs allow electric power system operators to directly reduce load, while in others, customers retain control. Customer-controlled reductions in demand may involve actions such as curtailing load, operating onsite generation, or shifting electricity use to another time period. Demand response programs are one type of demand-side management, which also covers broad, less immediate programs such as the promotion of energy-efficient equipment in residential and commercial sectors.

*Detection of impacts (of climate change for a system or infrastructure).* The identification of a change from a specified baseline. The baseline characterizes behaviour in the absence of climate change and may be stationary or non-stationary.

*Det Norske Veritas (DNV) offshore standards.* Documents which present the principles and technical requirements for design of offshore structures. The standards are offered as DNV's interpretation of engineering practice for general use by the offshore industry for achieving safe structures.

*Electric industry restructuring.* The process of replacing a monopolistic system of electric utility suppliers with competing sellers, allowing individual retail customers to choose their supplier but still receive delivery over the power lines of the local utility. It includes the reconfiguration of vertically-integrated electric utilities.

*Emergency search and rescue facilities.* Facilities equipped to respond to maritime emergencies.

*Energy emergency.* Any significant deviation from a planned or expected course of events that could endanger or adversely affect people, property, or the environment. Energy emergencies encompass, but are not limited to, supply crises caused by international political causes (e.g., embargo), defence mobilization, natural disasters, energy system sabotage, major accidents, and labour strikes or lock outs.

*Energy security.* The uninterrupted availability of energy sources at an affordable price. Energy security has many dimensions: long-term energy security mainly deals with timely investments to supply energy in line with economic developments and sustainable environmental needs. Short-term energy security focuses on the ability of the energy system to react promptly to sudden changes within the supply-demand balance.

*Formal Safety Assessment (FSA).* A rational and systematic process of assessing the risks of an activity that allows to assess the costs and benefits resulting from introducing the option to reduce the given risk.

*Free swimming ROVs (Remotely Operated Vehicles) with cable burial capability.* Use thrusters for propulsion and manoeuvrability and are equipped with a work package or work skid for intervention tasks or cable burial operations.

*Frequency of incidents.* The number of events per unit of time, usually within one year.

*Indirect economic damage.* The damage that may include losses from the fall in the price of the shares of the company after the accident.

*Individual risk.* A direct measure of the frequency of incidents of death for individuals.

*Jetting system.* A system that works by fluidising the seabed using a combination of high-flow, low pressure and low flow high pressure water jets to cut into sands, gravels and low to medium strength clays. Progress in clays is dictated by the available power budget to the tracked cable burial vehicle and the level of cohesion in the clay.

*Limit state.* A state beyond which the structure no longer satisfies the requirements. The following categories of limit states are of relevance for structures:

- *ultimate limit states (ULS)* – corresponding to the ultimate resistance for carrying loads,
- *fatigue limit states (FLS)* – related to the possibility of failure due to the effect of cyclic loading,
- *accidental limit states (ALS)* – corresponding to damage to components due to an accidental event or operational failure,
- *serviceability limit states (SLS)* – corresponding to the criteria applicable to normal use or durability.

*Maintenance.* A process of maintaining property or equipment, including pipelines, to preserve it and prevent it from failure and ensure that it will continue to perform its intended function.

*Marine safety investigation.* An investigation or inquiry into a marine casualty or marine incident, conducted with the objective of preventing marine casualties and marine incidents in the future. The investigation includes the collection and analysis of evidence, the identification of causal factors and the making of safety recommendations as necessary.

*Means of risk control.* Means for control of a single element of risk.

*Mechanical chain excavators.* Excavators typically used in circumstances where the seabed material is beyond the capability of a jetting system or where deeper burial is required.

*Mechanical rock wheel cutters.* Cutters fitted to tracked cable burial vehicles and, as the name suggests, are used to cut narrow trenches into hard or rocky seabed typically operating in the 1.5m trench depth range.

*Mitigation* (of disaster risk and disaster). The lessening of the potential adverse impacts of physical threats, including those that are human-induced, and natural hazards through actions that reduce hazard, exposure, and vulnerability.

*Operating stress.* The stress imposed on a pipe or structural member under operating conditions. This term normally refers to stress resulting from the internal forces due to the pressure of the gas or liquid in the pipeline; however, other forces such as thermal growth, expansion, or contraction may impose stress as well.

*Option of risk control.* Grouping of risk control measures to form a practical recommendation for lowering the risk level.

*Port of refuge.* A port, not on a ship's itinerary, which the ship calls at due to some unforeseen hazard at sea and where the ship may undergo repairs, refuel, or rescue cargo.

*Preparedness.* The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions.

*Prevention:*

- the outright avoidance of adverse impacts of hazards and related disasters,
- those capabilities necessary to avoid, prevent, or stop a threatened or actual act of terrorism,
- the systematic application of recognized principles to reduce incidents, accidents, or the accident potential of a system or organization.

*Protection of critical infrastructure.* Activities whose objective is to ensure functionality, continuous operation and delivery of critical infrastructure services/goods, as well as to prevent natural hazards and other threats to critical infrastructure.

*Rapidity.* The speed with which disruption can be overcome and safety, services, and financial stability restored.

*Recovery.* The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors.

*Recovery in energy sector.* Those actions taken after a facility has been brought to a stable or shutdown condition to return the facility to normal operation. The recovery period will begin when the emergency response to an Operational Emergency is declared terminated. The recovery phase continues until the facility and any affected areas meet predetermined criteria for the resumption of normal operation or use. The types of activities that could be conducted during the recovery phase include (but are not limited to); damage assessment, environmental consequence assessment, long-term protective action determinations, facility and/or environmental restoration, and dissemination of information.

*Recovery organization.* Organization responsible for coordinating all recovery activities. Responsibilities include, but are not limited to, prioritization of activities; protection of worker and general public health and safety; dissemination of information; coordination of site and offsite activities; collection of data and assessment of long-term effects associated with the release of hazardous materials; formulation and implementation of long-term

protective actions for the affected areas; and providing assistance as requested to state and local agencies in formulation of long-term protective actions for affected offsite areas.

*Recovery procedures.* Procedures that include dissemination of information to federal, state, tribal, and local organizations regarding the emergency and possible relaxation of public protective actions; planning for decontamination actions; establishment of a recovery organization; development of reporting requirements; and establishment of criteria for resumption of normal operations.

*Redundancy.* The properties of a critical infrastructure that allow for use alternate options, choices, and substitutions under stress, in order to satisfy functional requirements in threat situations of disruption, degradation, or loss of functionality coming from climate change. It can be measured as the speed with which disruptions coming from climate change can be overcome, in order to contain losses and avoid future disruption, and with which safety, functionality and stability of critical infrastructure can be restored.

*Reliability.* A degree of performance according to imposed standards or expectations.

*Reliability analysis.* Address risk by providing the probability that a consequence measure exceeds a specific threshold.

*Residual impacts.* The impacts of climate change that would occur after adaptation.

*Resilience.* The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.

*Resistance.* The ability of a system to remain unchanged by external events.

*Resourcefulness.* The ability of a critical infrastructure to identify problems, establish priorities, and mobilize needed resources and services when threatened by harmful events coming from the climate change.

*Response.* Reaction (policies and action) during or immediately after a disaster in order to reduce its impacts, to ensure the functioning of basic systems (infrastructures) and to prevent transitions of the system or infrastructure into a crisis situation. It usually includes activities that address the short-term, direct effects of an incident. The response includes immediate actions to save lives, protect property, and meet basic human needs.

*Retrofitting.* A reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards.

*Risk.* The combination of the frequency and severity of the consequences of the event.

*Risk (in energy sector).* The combination of the probability of an incident releasing radioactive and/or hazardous materials and the consequences of the release on the public and the environment which, taken over all events relating to system operation, provides a meaningful picture of the adverse impact of the operation.

*Risk assessment.* The overall process of risk identification risks analysis and risk evaluation.

*Risk management.* The systematic approach and practice of managing uncertainty to minimize potential harm and loss. Risk management comprises risk assessment and analysis, and the implementation of strategies and specific actions to control, reduce and transfer risks. It is widely practiced by organizations to minimize risk in investment decisions and to address operational risks such as those of business disruption, production failure, environmental damage, social impacts and damage from fire and natural hazards. Risk management is a core issue for sectors such as water supply, energy and agriculture whose production is directly affected by extremes of weather and climate.

*Risk management process.* The systematic application of management policies, procedures and practices to the activities of communicating, consulting, establishing the context, and identifying, analysing, evaluating, treating, monitoring and reviewing risk.

*Robustness.* The inherent strength or the ability of infrastructure to withstand external demands coming from climate change without degradation or loss of functionality. Robustness signifies that a system/infrastructure will retain its system structure (function) intact (remains unchanged or nearly unchanged), when exposed to perturbations and can be measured as the probability that a system will not go into the critical state or worse in time shorter than assumed level, due to some external factors.

*Safe operating space.* Safe operating space reflects a corridor for human development where the risks of irreversible and significant damage to global life-sustaining systems seem tolerably low.

*Safety plan from owner / manager of critical infrastructure.* The document indicates a plan that ensures confidentiality, integrity and availability of the organizational, human, material, information-communication and other solutions, as well as permanent and graded security measures necessary for the continuous functioning of critical infrastructure.

*Search and Rescue (SAR).* It is the search for and provision of aid to people who are in distress or imminent danger.

*Social risk.* Indirect measure of the scale of the incident, taking into account the public aversion to major accidents.

*Stability (electric).* The ability of an electric system to maintain a state of equilibrium during normal and abnormal conditions or disturbances.

*Strengthening critical infrastructure resilience.* Efforts, like policies, procedures and actions, taken to prolong the proper and effective functioning of a critical infrastructure and providing its essential services when it is exposed to threats.

*Strengthening critical infrastructure resilience to climate change.* Increasing CI capacity through its components and subsystems parameters improving and its operating environment parameters modification to achieve its characteristics stronger what allow its functioning in its operating environment to be able to absorb and to recover from hazardous events appearing as a result of climate change.

*Supply chain management.* Design, planning, execution, control, and monitoring of energy supply chain activities with the objective of uninterrupted, sustainable, competitive and secure energy supply, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally.

*Sustainable resource management.* Sustainable resource management means both ensuring that consumption does not exceed levels of sustainable supply and that the earth's systems are able to perform their natural functions. It requires monitoring and management at various scales. The aim of sustainable resource management is to ensure the long-term material basis of societies in a way that neither resource extraction and use nor the deposition of waste and emissions will surpass the thresholds of a safe operating space.

*Sustainable supply.* Sustainable supply refers to the amount of resources that can be extracted and used for production and consumption before the threshold of a safe operating space is surpassed.

*System security (in energy sector).* The capability of a power system using its existing resources to maintain power supplies in the face of unexpected shocks and sudden disruptions in real-time, such as the unanticipated loss of key generation or network components or rapid changes in demand.

*Uninterruptible power supply.* A power supply that provides automatic, instantaneous power, without delay or transients, on failure of normal power. It can consist of batteries or full-time operating generators. It can be designated as standby or emergency power depending on the application.

*Vulnerability.* Essential properties of the system, parts of the system, assets, community and the

environment which make them susceptible to adverse effects of natural hazards and other threats.

*Vulnerability in the climate change context.* The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

## 5. Conclusion

In the paper the terminology and methodology on the Baltic Sea Region critical infrastructures has been presented. There have been distinguished following critical infrastructure networks located and operating in the Baltic Sea Region: ports, shipping, oil rigs, wind farms, electric cables, gas pipelines, oil pipelines, ship traffic and port operation information critical infrastructure networks. There have been introduced general definitions concerned with critical infrastructures as well as some notions and terminology specific for these critical infrastructure networks. Moreover, presented terminology refers to the climate-weather change and its impact on critical infrastructures as well as the critical infrastructure resilience and resilience strengthening to climate change.

Definitions provided in this paper are also included in papers devoted to methodology for particular critical infrastructure networks in the Baltic Sea Region and their safety and resilience to climate change analysis [2], [4]-[6], [9]-[10], [12], [20]-[21]. The original references of all definitions are given in these papers' references.

## Acknowledgments



The paper presents the results developed in the scope of the EU-CIRCLE project titled "A pan-European framework for strengthening Critical Infrastructure resilience to climate change" that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 653824. <http://www.eu-circle.eu/>.

## References

- [1] Blokus-Roszkowska, A., Bogalecka M., Dziula, P. et al. (2016). Gas Pipelines Critical Infrastructure Network. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2, 1-6.*

- [2] Blokus-Roszkowska, A., Bogalecka, M., Dziula, P. et al. (2016). Methodology for Gas Pipelines Critical Infrastructure Network safety and resilience to climate change analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 83-91.
- [3] Blokus-Roszkowska, A., Bogalecka, M. & Kołowrocki, K. (2016). Critical Infrastructure networks at Baltic Sea and its seaside. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 7-14.
- [4] Blokus-Roszkowska, A., Bogalecka, M. & Kołowrocki, K. (2016). Methodology for Baltic Sea region critical infrastructures safety and resilience to climate change analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 93-103.
- [5] Blokus-Roszkowska, A., Guze, S., Kołowrocki, K. et al. (2016). Methodology for Port Critical Infrastructure Network Safety and Resilience to Climate Change Analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 139-149.
- [6] Blokus-Roszkowska, A., Guze, S., Kołowrocki, K. et al. (2016). Methodology for Ship Traffic and Port Operation Information Critical Infrastructure Network Safety and Resilience to Climate Change Analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 129-138.
- [7] Blokus-Roszkowska, A., Guze, S., Kołowrocki, K. et al. (2016). Port Critical Infrastructure Network. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 15-28.
- [8] Blokus-Roszkowska, A., Kołowrocki, K. & Soszyńska-Budny, J. (2016). Baltic Electric Cable Critical Infrastructure Network. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 29-36.
- [9] Blokus-Roszkowska, A., Kołowrocki, K. & Soszyńska-Budny, J. (2016). Methodology for Electric Cables Critical Infrastructure Network Safety and Resilience to Climate Change Analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 151-162.
- [10] Bogalecka, M., Kołowrocki, K., Soszyńska-Budny et al. (2016). Methodology for Shipping Critical Infrastructure Network Safety and Resilience to Climate Change Analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 163-171.
- [11] Bogalecka, M., Kołowrocki, K., Soszyńska-Budny J. et al. (2016). Shipping Critical Infrastructure Network. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 1-2*, 43-52.
- [12] Drzazga, M., Kołowrocki, K. & Soszyńska-Budny, J. (2016). Methodology for Oil Pipeline Critical Infrastructure Network Safety and Resilience to Climate Change Analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 173-178.
- [13] Drzazga, M., Kołowrocki, K. & Soszyńska-Budny, J. (2016). Oil Pipeline Critical Infrastructure Network. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 53-60.
- [14] Dziula, P. & Kołowrocki, K. (2016). Global Baltic Network of Critical Infrastructure Networks. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 3*, 15-20.
- [15] EU-CIRCLE Report D1.1 (2015). *EU-CIRCLE Taxonomy*.
- [16] EU-CIRCLE Report D1.2 (2016). *State of the art review and taxonomy of existing knowledge*.
- [17] EU-CIRCLE Report D1.2-GMU1. (2016). *Identification of existing critical infrastructures at the Baltic Sea area and its seaside, their scopes, parameters and accidents in terms of climate change impacts*.
- [18] Guze, S. & Kołowrocki, K. (2016). Joint Network of Port, Shipping and Ship Traffic and Operation Information Critical Infrastructure Networks. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 61-64.
- [19] Guze, S. & Ledóchowski, M. (2016). Ship Traffic and Port Operation Information Critical Infrastructure Network. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 65-72.
- [20] Kołowrocki, K., Kuligowska, E. & Reszko, M. (2016). Methodology for oil rig critical infrastructure network safety and resilience to climate change analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 187-195.
- [21] Kołowrocki, K., Kuligowska, E. & Reszko, M. (2016). Methodology for wind farms critical infrastructure network safety and resilience to climate change analysis. *Journal of Polish Safety and Reliability Association, Summer Safety and Reliability Seminars 7, 2*, 179-186.

