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Selected aspects of acts of law concerning critical infrastructure protection within the Baltic Sea area

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Abstract

The paper presents the principle aspects of key European Union legislation concerning critical infrastructure protection. Fundamental definitions and assumptions covered by the respective documents, with a special focus on critical infrastructure, its identification and protection, are also included. Basic outcomes of the regulations, reflecting other acts of law concerning the rights and obligations of States within their territorial sea and exclusive economic zone, regarding specific matters related to the Baltic Sea area and EU member states located around it, have also been introduced. Some approaches to the modelling of ECI identification is also given, and analysis of the latest EU activities, associated with the adaptation of critical infrastructure systems to climate change predictions, is introduced. As the vulnerability to the impact of climate change is of key importance for systems operating within the Baltic area, essential findings that apply to them are also covered.

Introduction

The protection of critical infrastructure systems has become, in recent years, a very important part of many public institutions and entrepreneurs' activities. This has arisen out of both an increasing menace of terrorist attacks concentrated on critical infrastructures, and an increasing amount of various elemental disasters having recently taken place that have also caused significant negative impact on critical infrastructure systems (Siergiejczyk & Dziula, 2013). As it is also predicted that future climate change will significantly impact on critical infrastructure assets, intensive work on adapting infrastructures to possible climate fluctuations has also been carried out over the last couple of years.

Activities concerning critical infrastructure protection can, however, be started once they have been accurately identified (Dziula, Kołowrocki & Siergiejczyk, 2014). Documents published by European institutions, mentioned in this article, that relate to critical infrastructure identification, show some issues related to the understanding and interpretation of definitions and recommendations included within, concerning the Baltic sea area's specific features. Consequently, there is a need to process additional works, taking into account the regulations, together with laws related to the rights and obligations of states concerning their territorial sea and exclusive economic zone. Key importance of appropriate critical infrastructure identification can be claimed for countries located on the Baltic Sea, as the region is showing significant concentration of different kinds of systems that, in case of their failure, can lead to a massive negative impact on societies and the natural environment within the area.

There have also been intensive works carried out in recent years related to climate fluctuations. Predictions on near future changes demand special action concerning the adaptation of many different areas of the ways in which societies function. Critical infrastructure systems seem to be particularly sensitive to climate change, which is why

special action regarding their resilience must be started. There is also a possibility, that systems not identified actually as belonging to critical infrastructure, can become part of it because of climate change. There have been several European institutions' activities performed lately, concentrated on adapting infrastructure to climate change. Some of their results directly concern the Baltic Sea area and countries located around it (Dziula, Siergiejczyk & Rosiński, 2015).

European Union legislation concerning critical infrastructure protection

The terrorist outrage that struck Madrid on March 11, 2004, indicated the need to prepare an overall European Union (EU) strategy on critical infrastructure protection. European Commission (European Commission, 2004a), of October 20, issued a Communication on the prevention, preparedness, and response to terrorist attacks. The document points out strategic objectives aimed at directing the Union's fight against terrorism. It identifies a number of priority issues concerning: the prevention and consequential management of terrorist attacks; the protection of critical infrastructure; and the financing of terrorism. There is also a general approach to the prevention, preparedness and response to terrorist attacks in the community sphere included, mentioning community policies, external cooperation, integration of European and national systems, linking-up with the law enforcement community, and security research priorities.

European Commission works related to critical infrastructure protection started with the Communication from the Commission on Critical Infrastructure Protection in the fight against terrorism, published on October 20 (European Commission, 2004b). The publication was a result of the need to prepare an overall strategy to protect critical infrastructure. Its main outcomes are the outlines for a European Program for Critical Infrastructure Protection (EPCIP), aiming to enhance the EU's critical infrastructure protection capabilities, and for a Critical Infrastructure Warning Information Network (CIWIN), bringing together critical infrastructure protection specialists from EU countries. The document encompasses two levels of critical infrastructure: one having a trans-boundary effect (known as European Critical Infrastructure (ECI) in 2008), needed to be protected by European level measures, and the other one, that should be maintained as the sole responsibility of the member states, but under a common framework. There are also guidelines for EPCIP implementation, objectives and progress indicators.

As a result of activities performed after the adoption of the Communication from the Commission on Critical Infrastructure Protection in the fight against terrorism, followed by the Communication from the Commission on prevention, preparedness and response to terrorist attacks, and the EU Solidarity Program on the Consequences of Terrorist Threats and Attacks, the Commission decided to put forward the Green Paper outlining the options for an EPCIP (European Commission, 2005). The document introduces the main purposes and scope of an EPCIP, plus suggestions on key principles to form its basis, as well as the main distinctions and relations concerning ECI, and National Critical Infrastructures (NCI). The Green Paper also defines the roles of owners, operators and users of systems belonging to Critical Infrastructure (CI).

One of the consequences of the adoption of the Green Paper is the Communication from the Commission on EPCIP (European Commission, 2006). This document sets out the principles, processes and instruments proposed to implement an EPCIP. There were three work streams concerning the implementation identified: guidelines for a strategic platform for overall EPCIP coordination and cooperation; indications on protection of ECI, focusing on reducing its vulnerability; and outlines on support concerning national critical infrastructure designed to assist the member states in protection. One of the key elements of an EPCIP was the process of identifying and designating ECIs, and therefore as a further step, the European Council (European Council, 2008) adopted the Directive 2008/114/EC on the identification and designation of ECI and the assessment of the need to improve their protection. The Directive establishes procedures for the identification and designation mentioned, and a common approach to the assessment of their protection improvement. The document also provides definitions and criteria to let each member state identify potential ECIs. There are also indications on Operator security plans – security solutions and their implementation for ECI protection. ECI is defined as: systems and mutually bound functional objects contained therein, including constructions, facilities and installations of key importance for the security of the state and its citizens, as well as serving to ensure efficient functioning of public administration authorities, institutions and enterprises, designated in the systems within the scope of electricity, oil, gas, road, rail and air transport as well as inland waterways transport, ocean and short-sea shipping and ports,

located in member states of the EU the disruption or destruction of which would have a significant impact on at least two member states.

The sectors affected by the directive to be used for the purposes of its implementation are energy and transport. The following subsectors are specified as demanding special activities indicated in the directive:

- Infrastructures and facilities for generation and transmission of electricity in respect of the supply of electricity;
- Oil production, refining, treatment, storage and transmission by pipelines;
- Gas production, refining, treatment, storage and transmission by pipelines, LNG terminals;
- Road transport;
- Rail transport;
- Air transport;
- Inland waterways transport;
- Ocean and short-sea shipping and ports.

On June 22, 2012, the European Commission (European Commission, 2012) published the Commission Staff Working Document on the Review of the EPCIP. The document presents the main preliminary findings of the review of the EPCIP (European Commission, 2006) and in particular the Directive (European Council, 2008). It provides a general analysis of the elements of the critical infrastructure protection program and describes the on-going development of risk assessment methodology in this field.

The latest document found relating to European Critical Infrastructure Protection, is a Commission staff working document (European Commission, 2013c) on a new approach to the EPCIP Making ECI more secure, published on August 28, 2013. The document sets out a revised and more practical implementation of the EPCIP. It also presents a new approach to EPCIP based on a comprehensive review of the European Council (European Council, 2008) Directive, and the European Commission (European Commission, 2006) Communication, conducted in close cooperation with EU Member States and stakeholders.

Basic outcomes of the legislation related to the Baltic Sea area

Identification and protection of critical infrastructure (and especially ECIs) systems within the Baltic Sea area, raises a number of questions related to EU and national law regulations in this field. The questions concern the incorporation of particular systems into ECI assets, related to their location. Further questions regard the protection of critical infrastructure systems in terms of their owners/ operators. There are also various specific aspects about different systems operating within the territorial sea and exclusive economic zone of coastal states.

In terms of critical infrastructure location, the Directive 2008/114/EC adopted by European Council (European Council, 2008) shows two conditions determining a particular system as an asset of ECI: the first one declares that the system is located in one of the member states of the EU, and the other one indicates that potential disruption or destruction of the system can have a significant impact on at least two member states. There are obviously systems within the Baltic Sea area meeting both conditions mentioned, however, a number of systems located outside the territory of member states (outside the territorial sea), can meet the condition regarding potential negative impact on at least two member states, in case of their disruption or destruction.

Basic questions arise then, as to whether, in the case of an ECI assets' identification, both criteria mentioned above should be met. If so, critical infrastructure systems located within the Baltic Sea area can be divided into the following categories:

- ECIs located within the territorial sea of EU member states;
- NCIs located within the territorial sea of coastal states;
- CIs located within exclusive economic zone of coastal states.

The categories mentioned above determine legal regulations concerning critical infrastructure identification and protection. ECIs located within the territorial sea of EU member states are subject to the EU rules, and complementary national regulations. NCIs situated within the territorial sea of coastal states are to be identified and protected according to respective regulations issued by respective countries. The subject of CIs located within the exclusive economic zone of coastal states seems to be a bit unclear. There are no clear indications about the laws that should apply to critical infrastructure identification and protection in such a case. The United Nations (United Nations, 1982) Convention on the Law of the Sea, in respect to the exclusive economic zone, ensures coastal states rights for the purpose of exploring and exploiting, conserving and managing the natural resources. The convention also grants jurisdiction with regard to the establishment and use of artificial islands, installations and structures; marine scientific research; and the protection and preservation of the marine environment. However, there is also

a provision in the convention, stating that the coastal state shall have due regard to the rights and duties of other states. This means that coastal state law regulations do not fully apply to the exclusive economic zone. Regarding critical infrastructure identification and protection, the following provisions of the convention can be quoted, raising further thoughts: all states, whether coastal or land-locked, enjoy the freedoms of navigation and overflight and of the laying of submarine cables and pipelines, and other internationally lawful uses of the sea related to these freedoms, such as those associated with the operation of ships, aircraft and submarine cables and pipelines. The mention of the rights of all states to, inter alia, lay submarine cables and pipelines within the exclusive economic zone of a coastal state, can cause different legislative rules of different states to be applied to the identification and protection of critical infrastructure systems located within the zone.

Assuming, for the purpose of ECI identification, the only criterion met is potential disruption or destruction of the system that can have a significant impact on at least two member states, critical infrastructure assets located within the Baltic Sea area can be divided as follows:

Type 1. ECIs located within the territorial sea of EU member states;
Type 2. ECIs located within the territorial sea of non-EU states;
Type 3. ECIs located within an exclusive economic zone of EU member states;
Type 4. ECIs located within an exclusive economic zone of non-EU states;
Type 5. NCIs located within territorial sea of coastal states;
Type 6. CIs located within exclusive economic zone of coastal states.

The basic difference between the set of categories specified above, and the one submitted previously, is the indication of additional kinds of ECIs – located outside of EU member state territories. Such an interpretation raises further questions concerning these systems. In terms of ECIs located within the territorial sea of non-EU states, basically it can be assumed that the rules of the coastal state apply. However, the question is whether EU regulations could also be taken into account for such systems, considering they can have a negative impact on EU member states in the case of their failure. ECIs located within exclusive economic zones of EU member states, are supposed to be treated according to the EU rules and complementary national regulations, respecting however the previously mentioned issues concerning systems owned and operated by entities from other states. Similarly, ECIs located within an exclusive economic zone of non-EU states, are assumed to be covered by the coastal state law, with the addition of other states' regulations, if owned and operated by the third parties.

Considering all the above issues, the basic question regarding identification of critical infrastructure assets within the Baltic Sea area is related to the interpretation of the ECI definition – whether potential ECIs can only be located within the territorial sea of EU member states, or also outside: within exclusive economic zones of coastal states, and within the territorial sea of non-EU states.

Further problems that should be solved and questions demanding answers concern the protection of critical infrastructure systems. Coastal countries possess certain rights regarding their territorial sea and exclusive economic zones, however regulations also give some rights to other coastal or land-locked states. In terms of the territorial sea, the United Nations (United Nations, 1982) Convention on the Law of the Sea, grants to ships of all states, whether coastal or land-locked, the right of innocent passage through the territorial sea. The convention indicates the coastal state may adopt laws and regulations, relating to innocent passage through the territorial sea, and also states that foreign ships exercising the right of innocent passage through the territorial sea shall comply with all such laws and regulations. However, there is also a provision stating that laws and regulations issued by the coastal state shall not apply to the design, construction, manning or equipment of foreign ships, unless they are following generally accepted international rules or standards. This means that in the case of some ships being identified as critical infrastructure assets, the influence of the coastal state on their design, construction, manning or equipment, associated with their protection, can be restricted.

The rights of other states in respect to the exclusive economic zone of a coastal state are enhanced with, as mentioned earlier, inter alia, the laying of submarine cables and pipelines, and other internationally lawful uses of the sea, such as those associated with the operation of ships, aircraft and submarine cables and pipelines (Janusz-Pawletta, 2006). Regarding laying submarine cables or pipelines, the convention indicates that states shall have due regard to cables or pipelines already in position, in particular, the possibilities of repairing existing cables or pipelines shall not be prejudiced. There is also provision that delineation of the course for

the laying of pipelines is subject to the consent of the coastal state. The consent of the coastal state regarding delineation of the course for the laying of pipelines, seems to be the only influence of the state on works concerning its laying and exploitation. Further statements of the convention indicate every state shall adopt the laws and regulations necessary to provide that, if persons subject to its jurisdiction who are the owners of a submarine cable or pipeline, in laying or repairing that cable or pipeline, cause a break in or injury to another cable or pipeline, they shall bear the cost of the repairs. That means in general that cable and pipeline laying work is regulated by the laws and regulations of the state, and their owners are subject to this jurisdiction. There are no clear indications about laws and regulations that should apply to the exploitation and protection of submarine cables and pipelines, despite the general statement that states shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from, inter alia, pipelines, taking into account internationally agreed rules, standards and recommended practices and procedures. The Helsinki Commission (Helsinki Commission, 1992), on the Convention on the Protection of the Marine Environment of the Baltic Sea Area, also indicates rather general provisions on parties' cooperation relating to the investigation of potential impacts on the marine environment, and taking appropriate measures preventing and eliminating pollution including cumulative deleterious effects. This means that protection of critical infrastructure assets like submarine cables and pipelines, can depend on the policy of the coastal state administrating its exclusive economic zone, and other states subject to the jurisdiction of their owners, if this differs.

Based on the above mentioned facts, considering potential critical infrastructure systems' different locations and different operators / owners, the following categories can be listed which take these aspects into account:

1. Critical infrastructures located within the territorial sea of a coastal state, operated by an entity from the same state;
2. Critical infrastructures located within the territorial sea of a coastal state, operated by an entity from another state;
3. Critical infrastructures located within an exclusive economic zone of a coastal state, operated by an entity from the same state;
4. Critical infrastructures located within an exclusive economic zone of a coastal state, operated by an entity from another state.

Protection of critical infrastructures located within the territorial sea of a coastal state, operated by an entity from the same state, is assumed to be carried out according to the national laws of the coastal state, with the addition of EU regulations, if the state is an EU member. The issue regarding critical infrastructures located within the territorial sea of a coastal state, operated by an entity from another state, is restricted in general to ships performing innocent passage through the territorial sea. In such a case, as mentioned earlier, the impact of the coastal state on the design, construction, manning or equipment of foreign ships, is restricted. The subject of the protection of critical infrastructures located within an exclusive economic zone of a coastal state, and operated by an entity from the same state, in general, seems to be understood as being realised according to the coastal state regulations. However, the provisions of the Convention on the Law of the Sea state that other states can take part in adopting laws and regulations to prevent, reduce and control pollution. That means that other countries can influence the regulations concerning critical infrastructure protection, even in the case of an asset within an exclusive economic zone of the coastal state, operated by an entity from the same state. The impact of other states can be more significant in the case of critical infrastructures located within an exclusive economic zone of a coastal state, and operated by an entity from another state. In some cases operators of such a system would wish to proceed with their activities according to their country's regulations.

A fundamental issue related to protection of critical infrastructure systems located within the Baltic Sea area therefore concerns the cooperation of coastal states regarding the law to be applied. The law must be adopted by close cooperation, harmonizing states' policies at the appropriate regional level, through competent international organizations or diplomatic conference, establishing rules, standards and recommended practices and procedures, as stated in the United Nations (United Nations, 1982) Convention on the Law of the Sea. Additionally, the Helsinki Commission (Helsinki Commission, 1992) on the Convention on the Protection of the Marine Environment of the Baltic Sea Area indicates that parties shall cooperate to ensure that potential impacts on the marine environment of the Baltic Sea area are fully investigated, and shall jointly take appropriate measures in order to prevent and eliminate pollution including cumulative deleterious effects.

An approach to modelling of ECI identification

Based on the European Council (European Council, 2008) Directive 2008/114/EC statements, indicating the ECI is to include systems, the disruption or destruction of which would have a significant negative impact on at least two member states, the operation of a particular ECI sector (or subsector) can be represented by the following three states (Dziula, Kołowrocki & Rosiński, 2015):

1. S_{ECIFA} – State of full ability of an ECI sector;
2. S_{1MSNI} – State of disruption or destruction of an ECI sector, having a significant negative impact on one member state;
3. S_{2MSNI} – State of disruption or destruction of an ECI sector, having a significant negative impact on two or more member states.

The relations appearing between the above mentioned states are shown in Figure 1.

For the transitions presented in Figure 1 the following equations can be derived:

$$\begin{aligned} R_0'(t) &= -\lambda_{02}R_0(t) - \lambda_{01}R_0(t) + \mu_{10}Q_1(t) + \mu_{20}Q_2(t) \\ Q_1'(t) &= \lambda_{01}R_0(t) - \lambda_{12}Q_1(t) - \mu_{10}Q_1(t) \\ Q_2'(t) &= \lambda_{02}R_0(t) + \lambda_{12}Q_1(t) - \mu_{20}Q_2(t) \end{aligned} \tag{1}$$

By assuming initial conditions:

$$\begin{aligned} R_0(0) &= 1 \\ Q_1(0) &= Q_2(0) = 0 \end{aligned} \tag{2}$$

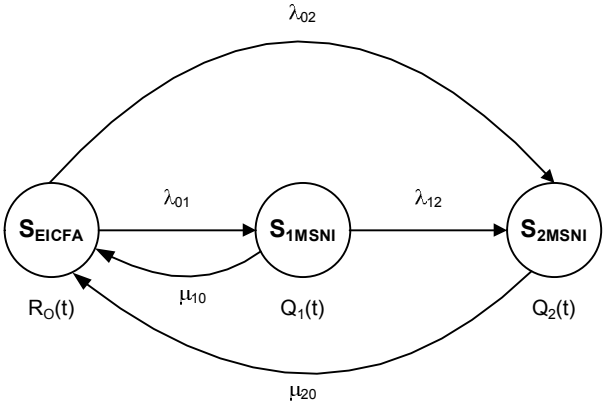

Figure 1. Relations within a critical infrastructure sector. Denotations: $R_O(t)$ – probability function of system stays at state S_{ECIFA}, $Q_1(t)$ – probability function of system stays at state S_{1MSNI}, $Q_2(t)$ – probability function of system stays at state S_{2MSNI}, λ_{01}, λ_{02}, λ_{12} – transition rates from full ability state S_{EICFA} to S_{1MSNI} and S_{2MSNI} states, μ_{10}, μ_{20} – transition rates from S_{1MSNI} and S_{2MSNI} states to full ability state S_{EICFA} (recovery of critical infrastructure)

and, with the use of Laplace transform, the following linear system of equations is obtained (Dziula, Kołowrocki & Rosiński, 2015):

$$\begin{aligned} sR_0^*(s) - 1 &= -\lambda_{02}R_0^*(s) - \lambda_{01}R_0^*(s) + \\ &\quad + \mu_{10}Q_1^*(s) + \mu_{20}Q_2^*(s) \\ sQ_1^*(s) &= \lambda_{01}R_0^*(s) - \lambda_{12}Q_1^*(s) - \mu_{10}Q_1^*(s) \\ sQ_2^*(s) &= \lambda_{02}R_0^*(s) + \lambda_{12}Q_1^*(s) - \mu_{20}Q_2^*(s) \end{aligned} \tag{3}$$

The probabilities of a system staying at particular functional states, in terms of symbolic (Laplace) form, then obtain the following values:

$$\begin{aligned} R_0^*(s) &= \frac{s^2 + s\mu_{20} + s\lambda_{12} + s\mu_{10} + \mu_{20}\lambda_{12} + \mu_{20}\mu_{10}}{s^3 + s^2(\lambda_{02} + \mu_{20} + \lambda_{01} + \lambda_{12} + \mu_{10}) + s(\lambda_{02}\lambda_{12} + \lambda_{02}\mu_{10} + \mu_{20}\lambda_{01} + \mu_{20}\lambda_{12} + \mu_{20}\mu_{10} + \lambda_{01}\lambda_{12})} \\ Q_1^*(s) &= \frac{s\lambda_{01} + \mu_{20}\lambda_{01}}{s^3 + s^2(\lambda_{02} + \mu_{20} + \lambda_{01} + \lambda_{12} + \mu_{10}) + s(\lambda_{02}\lambda_{12} + \lambda_{02}\mu_{10} + \mu_{20}\lambda_{01} + \mu_{20}\lambda_{12} + \mu_{20}\mu_{10} + \lambda_{01}\lambda_{12})} \\ Q_2^*(s) &= \frac{s\lambda_{20} + \lambda_{02}\lambda_{12} + \lambda_{02}\mu_{10} + \lambda_{01}\lambda_{12}}{s^3 + s^2(\lambda_{02} + \mu_{20} + \lambda_{01} + \lambda_{12} + \mu_{10}) + s(\lambda_{02}\lambda_{12} + \lambda_{02}\mu_{10} + \mu_{20}\lambda_{01} + \mu_{20}\lambda_{12} + \mu_{20}\mu_{10} + \lambda_{01}\lambda_{12})} \end{aligned} \tag{4}$$

The relations (4) obtained, allow the probabilities of critical infrastructure sector (or subsector) staying at full ability state S_{ECIFA}, or S_{1MSNI} and S_{2MSNI} states to be determined. By assuming (as initial assumptions) some particular (coming as a result of research) limit values of probabilities of a system staying at the formulated states, analysed critical infrastructure sectors (or subsectors) can be evaluated as to whether they belong to ECI or not. The limit values of probabilities of a system staying at particular states can be modified based on EU (or other entities recommendations concerning ECI identification and protection). The above approach, upon further evaluation, could also be used for the identification of other critical infrastructure assets (other than ECIs) within the Baltic Sea area.

EU works on adapting infrastructure to climate change, and their findings concerning the Baltic Sea area

European Commission activities, associated with critical infrastructure protection, are also reflecting works on adapting to climate change. The base document regarding respective EU strategy is the White Paper – Adapting to climate change: Towards a European framework for action

(European Commission, 2009a). In general, it sets out a framework to reduce the EU's vulnerability to the impact of climate change. The framework indicates four main directions: 1) building a solid knowledge base on the impact and consequences of climate change for the EU; 2) integrating adaptation into EU key policy areas; 3) employing a combination of policy instruments (market-based instruments, guidelines, public-private partnerships) to ensure effective delivery of adaptation; and 4) stepping up international cooperation on adaptation. Activities performed according to the framework mentioned were the grounds for preparing a comprehensive EU adaptation strategy, by publishing the Communication from the Commission on EU Strategy on adaptation to climate change (European Commission, 2013d).

The document launches an adaptation strategy, covering the whole of the EU. The strategy takes account of global climate change impacts, such as disruptions to supply chains or impaired access to raw materials, energy and food supplies, and their repercussions on the EU. The EU's dialogue and cooperation with neighbouring countries and developing countries on adaptation issues is channelled through the Enlargement and European Neighbourhood policies and EU development cooperation policy. The overall aim of the EU Adaptation Strategy is to contribute to a more climate-resilient Europe. This means enhancing the preparedness and capacity to respond to the impacts of climate change at local, regional, national and EU levels, developing a coherent approach and improving coordination.

The communication specifies several actions to be performed within the strategy. One of the actions is ensuring more resilient infrastructure – mapping industry-relevant standards in the area of energy, transport and buildings, identifying standards to be revised for better inclusion of adaptation considerations, and providing guidelines for project developers working on infrastructure and physical assets, with a view to climate-proofing vulnerable investments.

The document accompanies a number of Staff Working Documents (European Commission, 2013a, 2013b) including the following concerning critical infrastructures: SWD(2013)133 – Climate change adaptation, coastal and marine issues, and SWD(2013)137 – Adapting infrastructure to climate change. SWD(2013)133 provides an overview of the main impacts of climate change on coastal zones and marine issues, not only considering its impacts on the environment but also on economic sectors and social systems. Furthermore it points out knowledge gaps and the existing efforts of the EU to best adapt to the impacts of climate change on coastal zones and marine issues. In addition, it also highlights further efforts needed, in particular regarding closing knowledge gaps for better-informed decision-making, as well as better cooperation between member states across borders to make Europe more resilient to climate change. SWD(2013)137 presents the contribution of the EU to climate change adaptation in selected infrastructure sectors. It covers energy and transport infrastructure as well as buildings in the EU – sectors which were given priority for adaptation policy mainstreaming in the White Paper on Climate Change Adaptation. The paper also discusses the instruments and financing provided by the EU to make Europe's infrastructure more climate resilient.

The documents mentioned seem to be of key importance for the Baltic Sea area, concentrating a significant number of assets that can be identified as National and European critical infrastructures. The SWD(2013)133 document highlights the following issues concerning the region: one of the greatest (within Europe) increases in sea surface temperature; a decreasing trend in the Baltic Sea's ice cover; the falling level of the Baltic in the northern shores and rising to the south; increased beach erosion due to increased storminess in the eastern Baltic Sea; and increasing eutrophication problems in coastal waters. The main socio--economic implications indicated by the document concern: the high vulnerability of the southern part of the Baltic coast and the north-western Mediterranean coast to sea level rise flooding, allowing an estimate of between 200,000 and 780,000 people that could be affected by coastal flooding by 2100, with average damage costs of EUR 25 billion annually; the impact on sea-life and therefore on fisheries and aquaculture in warmer, more acidic seawater; "reshaping" the tourism industry impacting on the geographical and seasonal distribution of tourists; increasing risks of inundation and erosion of coastal road transport networks, causing disruptions in the transport of goods and in the mobility of local communities; energy production located in coastal areas, threatened by climate change induced storm surges, sea-level rise and flooding; impacts of climate change on agriculture, resulting in extreme cases, a reduction in suitable areas for cultivation in certain European regions; and erosion and flooding of sensitive coastal ecosystems such as brackish waters and tidal pools.

The SWD(2013)133 document also indicates the following adaptation efforts needed, related to

climate change adaptation: cooperation among member states to address the transboundary hazards, essential for a proper coastal management reaction to increasing climate change impacts; developing guidelines on best adaptation practices in coastal and marine areas in the context of the implementation of integrated coastal management strategies; support to member states, regional and local authorities in implementing climate change proofed policies in coastal and marine areas, in particular by highlighting the benefits of green infrastructure; providing guidance to strengthen the resilience of the fishery sector; and stimulating long-term growth and jobs in the blue economy.

In terms of the Baltic Sea area, the SWD(2013) 137 document points to the following matters: protecting built environments against floods or ensuring water and energy supply during consumption peaks; infrastructure in coastal areas as well as off-shore installations (e.g. transmission lines, wind turbines), affected by sea level rise; increasing frequency and intensity of extreme weather events (e.g. storms, heat waves, flooding) having significant impact on the functioning of transport infrastructure; consequences of climate change for transport infrastructure such as for rail, road, shipping and aviation; increased frequency of extreme weather events or changing water and air temperatures having effects on energy transmission, distribution, generation and demand; and floods, identified as a particular threat to electricity generators and related physical assets.

There are also EU works concentrated on the Baltic Sea area only. The Commission of the European Communities (European Communities, 2009b) published the Communication concerning the European Union Strategy for the Baltic Sea Region. The document in general indicates the need to prepare for more extreme weather events, highlighting 'to mitigate and to adapt to climate change' as one of its priority areas. The following issues have also been pointed to: the necessity of an integrated approach for the sustainable development of the Baltic Sea Region; the key importance of better coordination and a more strategic use of Community programmes, especially at a time of crisis; the need for action to respond to the identified challenges, undertaken by stakeholders in the region, including governments and agencies, municipalities, international and non-governmental organisations; enhancing constructive cooperation with interested third countries in the region; and the necessity to provide an integrated framework that allows the EU and member states to identify needs and match them to the available resources through the coordination of appropriate policies.

Conclusions

The basic assumptions of the EU regulations related to critical infrastructure protection, introduced in the article, were analysed in the case of specific issues concerning the Baltic Sea area. Taking into account indications of other rules concerning the rights and obligations of coastal states, revealed the essential problems and questions demanding further investigation, in terms of the identification and protection of critical infrastructure assets. The identification of potential critical infrastructures located at sea raises queries relating to the interpretation of the ECI definition – whether potential ECIs can only be located within the territorial sea of EU member states, or also outside: within exclusive economic zones of coastal States, and within territorial sea of non-EU states. There is also a necessity to develop models, to be used for ECIs and other critical infrastructure asset identification. Aspects connected to the protection of critical infrastructure, are mainly concerned with the owners/operators of the assets. Systems located at sea can be operated by entities from different countries, resulting with issues regarding the rights and obligations of coastal states, and systems owners/ operators. That means, in terms of critical infrastructure systems protection, the key issue is the cooperation of all states involved with their operation, regarding the laws to be applied. As mentioned previously, the law must be adopted by close cooperation, harmonizing states' policies at the appropriate regional level, through competent international organizations or diplomatic conference, establishing rules, standards and recommended practices and procedures.

Besides activities on the identification and protection of critical infrastructure, EU institutions also perform efforts related to adapting to climate change. As introduced in the article, predicted climate change may affect many critical infrastructure systems. Outcomes of the documents mentioned clearly show the significant importance of the Baltic Sea area, with a high concentration of systems that can be identified as National and European critical infrastructures, and being highly vulnerable to climate change. Thus, many researches on adapting infrastructures to climate change should be carried out. It is worth here quoting the research project "A pan-European framework for strengthening Critical Infrastructure resilience to climate change – EU-CIRCLE" that

started in June 2015 in the scope of Horizon 2020. The project models, methods, procedures and algorithms will be partly based on results closely convergent with the theory of safety and included in the monographs (Kołowrocki, & Soszyńska-Budny, 2011; Kołowrocki, 2014). The proposed approaches to the problems of the safety of complex critical infrastructures are innovative and very important aspects of the project as, in the world of science, comprehensive and general solutions concerned with the safety of critical infrastructures related to their operation processes, determined partly by climate change and their inside and outside dependencies, have not been considered simultaneously.

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