

Climate Change and Maritime Security

By Basil Germond and Antonios D. Mazaris

Abstract: Climate change has been recognised as a major issue for coastal populations. Under this context, the potential socio-economic, environmental and health impacts at local, regional and global scales have received considerable attention by scientists. The knowledge gained feed official strategic documents, which aim to increase awareness but also propose and apply management and mitigation measures towards reducing risks for human beings and the natural environment. Dependencies between human security, social vulnerability of coastal communities and the occurrence of maritime crime have also been studied. There is a consensus on the need to deepen the understanding of the links between climate change effects and threats to maritime security, but it remains to be seen if existing knowledge on the interplay between climate change and maritime security has been translated into policy. This article offers a synthesis on recent evidence and knowledge gained to elaborate the nexus between climate change impacts, social vulnerabilities and the occurrence of maritime criminality. We further explore the extent to which official documents account for the maritime dimension of climate change security. Despite the existence of an embryonic official discourse linking climate change and maritime security, our analysis reveals significant gaps between the concerns raised by the academic community and what is acknowledged in national and regional official strategic documents. Informing decision-makers and stakeholders about the possible dependencies between climate change and maritime security is thus a crucial step towards improving global ocean governance.

Keywords: Global warming; maritime criminality; vulnerability; coastal communities

1. Introduction

Both climate change and, to a lesser extent, maritime security have been recognised as a priority in the cross-sectoral, global policy agenda. The direct and indirect impacts of climate change on marine and coastal ecosystems (Doney et al., 2011; Harley et al., 2006; Hoegh-Guldberg and Bruno, 2010), fisheries (Allison et al., 2009; Cheung et al. 2010), maritime/coastal tourism (Moreno and Amelung, 2009; Moreno and Becken, 2009), maritime transport (Asariotis and Benamara, 2012) and coastal communities (Cinner et al., 2012; Dolan and Walker, 2006) have largely been evidenced in the natural and social sciences literature. Similarly, over the past decades, the research on maritime criminal activities, unlawful acts and violent behaviours (e.g. illegal fishing, piracy and robbery at sea, arms and drug smuggling, human trafficking) has increasingly explored the interactions between economic, social, political and geopolitical factors which alter maritime security, i.e. the absence of security threats at, or from the, sea (Bueger, 2015; Germond, 2015; Suárez-de Vivero and Mateos, 2017).

Both climate change and maritime insecurity can have diverse and severe socio-economic impacts at local, regional and global scale. From a short term, anthropocentric viewpoint, both phenomena challenge population health and welfare; in the longer term, environmental degradations as the cause and output of climate change and criminal activities pose a major obstacle for the sustainable development of next generations (Bueger, 2015; Malcolm, 2017). It therefore becomes apparent that an understanding of the drivers, processes or impacts of climate change and maritime security, includes a variety of contexts (c.f. section 2). Despite interest in both climate change and maritime security, a deeper understanding of the underlying links and dependencies between the two issues requires a synthesis of knowledge and expertise that could trigger new cross-disciplinary research and expertise. This could serve as a critical step towards an improved synthesis of research on risks, vulnerability, adaptation, mitigation and policy options.

Against this background, this article discusses the extent to which there is a case for linking climate change and maritime security. To do so, we answer to the following three questions: a) To what extent is there an academic discourse aiming at analysing those links? b) To what extent is there an official, state-led, discourse linking climate change and maritime security? c) What would be the academic added value of linking climate change and maritime security, and what would be the benefits for maritime stakeholders? We conclude that the process consisting in unravelling the possible links between the multidimensional and synergistic impacts of climate change on natural and human systems and threats to maritime security has only just begun. However, there is clearly a case to be made, since this would contribute to better informing decision-makers and stakeholders, which is a crucial step towards improving global ocean governance.

2. The academic discourse attempting to link climate change and maritime security

The academic discourse linking climate change and maritime security originates in the realisation that climate change “may potentially exacerbate an already difficult situation” (Kaye, 2012: 162). The existence of possible indirect linkages between the effects of climate change on coastal communities and maritime criminality has been recognised by the IPCC in its 5th assessment report (Hoegh-Guldberg et al., 2014: 1706). Cordner (2010) explains that the impacts of climate change on food security and human health as well as specific physical effects, such as erosion, inundation, coastal hazards and flooding put pressure on coastal communities. They are then more likely to engage in forms of maritime criminality. The negative effects of climate change and ocean acidification on coral reefs is likely to impact upon human systems (Cinner et al., 2012; Hoegh-Guldberg et al., 2007). The need or incentive to engage in maritime criminal activities may be increased by the impact climate change has on communities’ economic well-being, since maritime crime becomes a means to compensate for insufficient or decreased revenue (Axbard, 2016; Nordqvist and Krampe, 2018; Storey, 2008) and for a decrease in well-being and poverty in general (Liss, 2013; Rahman, 2012). In addition to poverty and pressures on economic security, climate change is also likely to impact on states’ ability to control their territory and population (Kaye, 2012) and thus on their capacity to prevent, control or limit conflicts and criminality (Jasparro and Taylor, 2008). In other words, vulnerability to climate change and vulnerability to maritime criminality go hand in hand (Cordner, 2017; Jasparro and Taylor, 2008; Kaye, 2012).

In the existing academic literature, fisheries has often been used as a key topic to illustrate those links. Indeed, the complex impacts of climate change upon fishery combine physical, ecological and socio-economic components (Cochrane et al., 2009). Thus, illegal fishing has been anticipated to increase since the exhaustion of fish stocks in some areas could lead local fishermen to explore far away waters (Cordner, 2010; Kaye, 2012) sometimes without much consideration for jurisdictions, quotas and established rules. The movement or shifting of fish species driven by climate change can also increase the risk of (militarized) disputes even between states that enjoy stable diplomatic relationships (Pinsky et al. 2018). A loose control and inefficient management of fisheries could have major costs for societies (Allison & Kelling, 2009) demonstrating the link between the effects of climate change, bad governance, and the possible subsequent development or strengthening of illegal fishing. However, this is also true for other types of maritime crime. For instance, the degradation of fisheries and socio-economic conditions in South-East Asia as a consequence of climate change have also been proposed as factors potentially triggering incentives for piracy (Jasparro and Taylor, 2008) alongside poverty, resource scarcities and conflicts over resources (Liss, 2013; Samatar et al., 2010). Also, climate change impacts on economic and human security can eventually contribute to regional migration by vulnerable populations and human trafficking

(Jasparro and Taylor, 2008; Kaye, 2012). Affected communities, which are not themselves engaged in criminal activities, can nonetheless support local militias engaged in maritime crime such as piracy at the Horn of Africa (Marchal 2011) or at least tolerate their activities (Elmi et al., 2015), although Somali pirates do not always invest in the coastal communities which support them (Percy & Shorland, 2013).

In their seminal study on fisheries and maritime security, Pomeroy et al. (2016) explain that there is also a feedback loop to take into account. Criminal activities at sea can in turn put further pressures on the marine ecosystems stability and functionality through illegal fishing (Agnew et al., 2009; Pomeroy et al., 2016) or on the blue economy and biodiversity conservation efforts through piracy (Mazaris, 2017; Mazaris et al., 2016), which can then in turn generate even further incentives to engage in criminal activities (Fig.1). One of the factors explaining the increase of violence or crime is the additional pressure put by climate change or other criminal activities on the social and ecological resilience of local communities, which are already highly dependent on the sea for their livelihood (Pomeroy et al., 2016). The sustainable development of coastal communities, including maritime security as a precondition for the blue economy, may also be undermined by the illegal activities performed at or from the sea (Bueger, 2015; Womersley, 2005; Malcolm, 2017), feeding back the loop. These various types of pressures act synergistically, which results in a potentially exponential loop of environmental issues and damaged ecosystems, structural pressures on the social, political and economic systems, and maritime criminalities (Mazaris and Germond, 2018).

The feedback loop also extent to other criminal activities in a cumulative or multiplicative way (spill-over effect). For example, illegal fishing has been recognised as a cause of piracy at the Horn of Africa (Samatar et al., 2010), and environmental degradations induced by oil exploitation as a cause of piracy in the Gulf of Guinea (Akinola, 2011). This means that one type of criminal activity could not only in turn further affect natural and human systems, but also reinforce or initiate other forms of criminality that in turn negatively affect communities. The key vectors and structural pressures which are impacted by climate change at the level of natural and human systems feed maritime criminality, which can in turn further affect economic and human security feeding back social vulnerabilities (Fig.1).

This interplay between pressures, processes and structures has led other authors to focus on the concept of vulnerability, which allows grasping the extent to which climate change impacts on the structural elements of social, political and economic stability, and eventually on the occurrence of maritime crime in a given population (Blasiak et al., 2017; Corder, 2017; Spijkers et al., 2018). Scholars agree that the vulnerability of coastal communities to the effects of climate change is a function of three variables: a) their exposure to effects of climate change, b) their sensitivity to these effects, reflected by their dependence on natural capital and the technologies available to them, and c) their potential adaptive capacity, which reflects the ability of a society to anticipate and respond to detected changes and to reduce, cope with, and recover from the consequences of any disaster or change (Allison et al., 2009; Cinner et al., 2012; Blasiak et. al., 2017). This means that vulnerability values would be negligible in the case of communities that are well protected (e.g. good infrastructure), are not sensitive to such changes or have a great capacity to mitigate the negative impacts and adapt to the upcoming changes. According to Blasiak et al. (2017), the degree of vulnerability of a community mainly depends on its capability to adapt. Sensitivity and adaptation to natural hazards and changes strongly depend on a community's socio-economic capacity to face the multidimensional, long term impacts of climate change (Adger et al., 2005).

Climate change-induced vulnerability of fisheries seems to be unevenly distributed, with least developed countries (mainly in Africa and Asia) along with small island states topping the vulnerability index developed by Blasiak et al. (2017). In their discussion of the vulnerability of coastal communities to the effects of climate change, Cinner et al. (2012) do

not explain why communities they use as case studies are all located in ‘developing countries’. However, climate change is also said to play a role in explaining conflicts over resources in ‘developed countries’, as for example in the case of the Northeast Atlantic mackerel dispute (Spijkers and Boonstra, 2017). Still, the ‘developed world’ might be less sensitive to environmental changes and have a higher capacity to adapt to the changing environment, both financially and technologically; indeed, the vulnerability of coastal communities can be understood in an integrated way, i.e. a combination of exposure to the effects of climate change (physical component), capability to adapt, and pre-existing social vulnerabilities (e.g. Dolan and Walker, 2006).

In sum, there is a burgeoning academic discourse linking climate change and maritime security, which can form the basis for further conceptualisations of the dependencies between the two phenomena. The main element put forwards by existing studies is the synergies between the impacts of climate change on natural systems, pre-existing socio-economic vulnerability of communities and the possible occurrence of maritime criminality, offering a solid basis that can feed into mitigation and adaptation plans and strategies (Fig.1).

3. The emerging official narrative linking climate change and maritime security

In parallel with the realisation that the effects of climate change on natural systems also negatively impact societies and human beings, climate change has been securitised in political discourses, that is to say it has growingly been constructed and narratively represented as a security threat by various actors, ranging from international organisations (e.g. Commission of the EU, 2009; UN Security Council, 2007) to national agencies (e.g. US Department of Defence, 2015a). The climate security discourse presents the effects of climate change as a ‘threat multiplier’, i.e. the impacts of climate change are said to reinforce existing threats, possibly to a great extent. However, there is no consensus in the literature on the extent to which climate change has actually been securitized by political actors and on the practical implications of such a discourse in terms of policies and activities (Parsons, 2010; Scott, 2008, 2012; Trombetta, 2008; Von Lucke et al., 2014).

In this context, the dependencies between climate change and maritime security have started to be recognised as a complex and urgent challenge by states and institutions that are leading the current efforts to tackle maritime criminality. Some important features of the above-mentioned synergies can be found in the recently released strategic or policy documents related to maritime security. In this section, we carry out a qualitative textual analysis of such official documents to explore the current position of climate change within the dominant maritime security discourse. We analysed a series of indicative documents that demonstrate enough variation. The documents were selected based on the following criteria: a) Narrative scale: they must have the terms ‘maritime security’ or ‘maritime strategy’ in the title, b) Temporal scale: they must be published since 2001, which is when the concept of maritime security started to be employed with the meaning it has today (Germond, 2015), and c) Administrative scale: they must be released by states or international governmental organisations that possess the discursive power to set up political and security agendas.

The European Union (EU) released its *Maritime Security Strategy* (MSS) in 2014. This document adopted by the Council accounts briefly for the possible links between climate change and maritime security and stresses that it is in the interest of the member states to protect the environment and manage “the impact of climate change in maritime areas and coastal regions, as well as the conservation and sustainable use of biodiversity to avoid future security risks” (Council of the EU, 2014a: 7). Potential risks include the effects of “extreme events and climate change on the maritime transport system and in particular on maritime infrastructure” (p.8). The subsequent *Action Plan* adopted in late 2014 explains that “vulnerability and

adaptation measures” are factors to take into account to assess member states’ and the EU’s capacities to respond to the impacts of climate change on maritime threats as defined in the MSS (Council of the EU, 2014b: 15). The EU thus accounts for both synergies, albeit in passing rather than in details.

In another example, the African Union’s *Integrated Maritime Strategy* (2050 AIM Strategy) adopted in 2014 mentions the fact that climate change adds to the existing overexploitation of marine resources to create instability: “the increasingly intense use of the oceans and seas by various sectors, combined with climate change, has added to the pressure on the marine environment” (African Union, 2012: 8). This may suggest that such pressures might then contribute to the occurrence of maritime crime. Like for the EU, the issue is only mentioned in passing though.

NATO’s *Alliance Maritime Strategy* (2011) mentions climate change but rather to highlight opportunities: “climatic changes pose new opportunities and challenges, which may, inter alia, allow new and economically attractive sea routes, as well as improved access to resources” (2011: para 5). However, the document recognises that new opportunities also means new challenges in terms of freedom of navigation, protection of critical infrastructure and more generally marine environment protection. The paragraph on “crisis management” focuses on military and humanitarian operations (2011, para 11) whereas risks and hazards related to climate change are absent from the text. This could be explained by the fact that NATO is a defence organisation, which thus primary remains focused on ‘hard’ security issues.

Turning to individual state’s narrative, France’s 2015 *National Strategy for Security of Maritime Areas* devotes a specific section to the impact of climate change on maritime security. Climate change is recognised as affecting the availability of natural resources, especially fish (Premier Ministre, 2015: 5) and the relationship between depletion and illegal fishing is highlighted (p.36). Populations and infrastructures are also said to be at risk due to climate change, especially where “capacity for adaptation and resilience are limited” (p.37). Pressures on marine resources are also considered as potential vectors of conflicts, “particularly due to the displacement of fish resources and, consequently, illegal fishing activities” (p.37). The effects can also cause migration, due to increasing risk of “famine or submersion of island States and vulnerable coastlines” (p.37). Finally, this French national strategy highlights the importance of climate change in the Arctic, with the opening of new maritime routes triggering sovereignty claims, disputes and military activities (p.9) as well as pressure on resources (p.37). The question of the opening up of routes in the Arctic with potential maritime security issues has also been put forward by the UK *National Strategy for Maritime Security* (2014: p.26); this is, however, the only mention of climate change in this otherwise comprehensive national document.

In 2013, another European State with a long-established maritime tradition, extended coastline and overseas territories, Spain, released a *National Maritime Security Strategy*. This document also acknowledges that climate change is part of the “risk multipliers [that], although not direct risks and threats to maritime security in themselves, may contribute to their appearance” (Presidency of the Government, 2013: 20). Climate change is listed among other such factors as “poverty, inequality, ideological extremism” that operate beyond and across traditional jurisdictions.

The US *Cooperative Strategy for 21st Century Seapower* (US Navy, 2015) stresses that “climate change-enhanced storms, rising sea levels, and coastal flooding are disproportionately affecting many island nations”. It is then acknowledged that such impacts “may trigger social instability and more frequent humanitarian assistance and disaster response operations” (p.6). So, interestingly, the dependencies between climate change, human security and vulnerability is recognised in this document, but considered within the scope of naval operations rather than maritime security. Climate change is also mentioned in relation to the Arctic, where the melting

of the polar ice cap creates opportunities in terms of resource exploitation and trade routes but also challenges due to “greater maritime activity” and an increase of “the region’s strategic importance” (p.6).

India’s *Ensuring Secure Seas: Indian Maritime Security Strategy* (India Ministry of Defence, 2015) has an entire section devoted to climate change. The impacts on “human and maritime security, with potentially major effects in the future [that] include impact on oceanic living resources due to changes in the levels of salinity and acidity, possible inundation of low-lying coastal areas, and the loss of national territory, which force migration” are recognised. However, the document specifies that “the magnitude of change and consequences may remain largely speculative, their impact may be suddenly experienced, across dispersed areas” (pp.42-43). This exemplifies the need for governments to engage with researchers and the private sector so as to develop a more precise picture of the potential processes at play.

It is important to highlight the fact that important maritime security documents from leading countries do not mention climate change at all, e.g. the US *National Strategy for Maritime Security* (US Department of State, 2005) and *Asia-Pacific Maritime Security Strategy* (US Department of Defense, 2015b). For its part, China’s 2017 *Vision for Maritime Cooperation under the Belt and Road Initiative*, presents climate change as something important to tackle and China will support countries along the so-called Maritime Silk Road, e.g. with technical assistance. However, climate change is not specifically linked to maritime security. Similarly, a comprehensive corpus linguistics analysis of the International Maritime Organization’s (IMO) narrative (Germond and Ha, 2018) has shown that there is no direct discursive link between climate change and maritime security, although indirect links via migration are present, i.e. “migration” is a collocates of both “climate change” and “maritime security” in the IMO’s textual production.

In sum, there is an embryonic official discourse linking climate change and maritime security, but it has definitely not reached the level of a dominant discourse. In national and international strategic documents, the links and dependencies are rather mentioned ‘in passing’ and not yet presented as a focal point that must be central to maritime security strategies, policies and activities. Also, important documents do not even mention climate change. The existing narrative is mainly framed within the broader discourse that links climate change and security, considering the former as a ‘threat multiplier’. Consequently, the narrative revolves mainly around the *type of issues* that may emerge from the maritime domain which is impacted by climate change rather than on the possible *links and dependencies* per se. The outputs of the scientific/academic discourse have thus only superficially been acknowledged at the narrative scale (i.e. few mentions of the issue, limited discussions of the actual or potential dependencies) and at the administrative scale (not all countries have documents even mentioning such links). This illustrates the need to better inform policy makers about existing debates surrounding these synergies.

4. Towards a research agenda for policy planning

Research can inform policy-making by focusing on two important dimensions of the link between climate change and maritime security. Firstly, there may be synergies between the impacts of climate change and the drivers of maritime criminality: climate change in general and its effects on marine and coastal systems in particular affect human security in the form of degraded or diminished access to food, health, adequate revenue and well-being (Allison et al., 2009; Jacques and Smith, 2003). This can generate or rather strengthen incentives to engage in forms of maritime criminality, such as illegal fishing or piracy. Here, an important aspect to consider is the feedback loop dynamics highlighted by Pomeroy et al. (2016), which support that climate change-induced maritime crime can in turn further degrade the environment and

human security of affected communities or generate other forms of crime and violence (Fig.1). The synergies between climate change and maritime security can also be understood in the context of the blue economy. Indeed, whereas climate change poses a threat to the sustainable development of the oceans, maritime security is a precondition for the blue economy to succeed (investments, infrastructure, etc.).

Secondly, there may be synergies between communities' vulnerability to climate change and their vulnerability to maritime criminality (c.f. section 2). Here, three basic principles stand out: a) socio-economic preconditions are central as they directly and indirectly impact on both sensitivity and adaptation to climate change and on incentives to engage in maritime criminality – in other words they determine vulnerability to both climate change and maritime criminality, b) vulnerability to climate change cumulates with other structural and socioeconomic factors explicating the incentive to engage in criminal activities and vice versa: vulnerability to climate change and to maritime criminality reinforce each other in a cumulative or multiplicative way, and c) communities which are vulnerable to one issue (i.e. climate change or maritime crime) are also likely to be vulnerable to the other issue (i.e. maritime crime or climate change).

Still, we acknowledge that there are substantial uncertainties surrounding these various synergies, notably the quantification of the different factors (Mazaris and Germond, 2018). Thus, the magnitude and dimensionality of these synergies could not be taken as granted and further empirical studies are necessary. Climate science can inform on the effects of climate change on natural and human systems, and indicators of risk such as the World Risk Index (Birkmann and Welle, 2016) or the global Ocean Health Index (Halpern et al., 2009) can help forecasting affected places and populations. Now, assessing vulnerability to either climate change or maritime criminality requires using other types of indicators, such as for example the Human Development Index, Corruption Index, etc. Such a framework for analysis combining various such indicators, will offer theoretical grounds on which to base decisions regarding ocean governance, marine spatial planning, the allocation of resources, etc.

5. Conclusion

In the light of our study, the multidimensional, comprehensive attribute of maritime security constitutes a promising framework upon which the magnitude, extent and intensity of climate change impacts on natural and human systems could be addressed. There is a complex interplay between climate change, human security, vulnerability of communities and various other factors explaining the occurrence of maritime crime. To better understand and conceptualise the potential dynamics of, and synergies between, these links and dependencies is a necessary step towards adequately informing the relevant decision-making processes. The idiosyncrasy of local communities, the heterogeneity of the sea and land-scapes, the dynamic political and economic conditions, raise the need for studies at local, regional and global scales towards strengthening our conservation, management and mitigation capacities. Accounting for all the various possible links and dependencies between climate change and maritime security is a difficult but necessary step toward improving global ocean governance. Research on regional dynamics (e.g. the Indian ocean), specific issues (e.g. fisheries), coastal communities' vulnerability, or more generally the interactions between ocean/natural systems and coastal/human systems constitutes the first step towards understanding the drivers, impacts and multicollinearity of this complex task. Still, there is an obvious mismatch between the concerns raised by the academic community and what is acknowledged and presented in official strategic documents, highlighting the need to further inform policy decision-makers.

References

- Adger, W.N., Hughes, T.P., Folke, C., Carpenter, S.R., Rockström, J. (2005) Social-ecological resilience to coastal disasters. *Science* 309, 1036-1039.
- Agnew, D.J., Pearce, J., Pramod, G., Peatman, T., Watson, R., Beddington, J.R., Pitcher, T.J. (2009) Estimating the worldwide extent of illegal fishing. *PLoS ONE* 4, e4570.
- Akinola, A.O. (2011) Niger Delta Crisis: The Nexus between Militants' Insurgency and Security in West Africa. *African Security* 4, 65-80.
- African Union (2012) 2050 Africa's Integrated Maritime Strategy (2050 Aim Strategy). Addis Ababa. 2012 Version, at <https://au.int/en/documents-38>.
- Allison, E.H., Kelling, I., (2009) Fishy crimes: the societal costs of poorly governed marine fisheries, NTS Asia Workshop, Nov, pp. 3-4.
- Allison, E.H., Perry, A.L., Badjeck, M.C., Neil Adger, W., Brown, K., Conway, D., Halls, A.S., Pilling, G.M., Reynolds, J.D., Andrew, N.L. (2009) Vulnerability of national economies to the impacts of climate change on fisheries. *Fish Fish.* 10, 173-196.
- Asariotis, R., Benamara, H. (2012) Maritime transport and the climate change challenge. Routledge.
- Axbard, S. (2016) Income Opportunities and Sea Piracy in Indonesia: Evidence from Satellite Data. *American Economic Journal: Applied Economics* 8(2), 154-94.
- Birkmann, J., & Welle, T. (2016). The WorldRiskIndex 2016: Reveals the necessity for regional cooperation in vulnerability reduction. *Journal of Extreme Events*, 3(02), 1650005
- Blasiak, R., Spijkers, J., Tokunaga, K., Pittman, J., Yagi, N., Österblom, H. (2017) Climate change and marine fisheries: Least developed countries top global index of vulnerability. *PLOS One* 12(6): e0179632.
- Bueger, C. (2015) What is maritime security? *Mar. Policy* 53, 159-164.
- Cinner, J.E., McClanahan, T., Graham, N., Daw, T., Maina, J., Stead, S., Wamukota, A., Brown, K., Cochrane, K., De Young, C., Soto, D., Bahri, T. (2009) Climate change implications for fisheries and aquaculture. *FAO Fisheries and aquaculture technical paper* 530, 212.
- Cordner, L. (2010) Rethinking maritime security in the Indian Ocean Region. *Journal of the Indian Ocean Region* 6, 67-85.
- Cordner, L. (2017) *Maritime Security Risks, Vulnerabilities and Cooperation: Uncertainty in the Indian Ocean*. Palgrave Macmillan.
- Commission of the EU (2009) White Paper: Adapting to climate change: Towards a European framework for action. Brussels, COM(2009) 147/4.
- Council of the European Union (2014a) European Union Maritime Security Strategy. Brussels, 24 June 2014, 11205/14.
- Council of the European Union (2014b) EU Maritime Security Strategy Action Plan. Brussels, 16 December 2014 (OR. en) 17002/14.
- Dolan, A.H., Walker, I. (2006) Understanding vulnerability of coastal communities to climate change related risks. *J. Coast. Res.*, 1316-1323.
- Doney, S.C., Ruckelshaus, M., Duffy, J.E., Barry, J.P., Chan, F., English, C.A., Galindo, H.M., Grebmeier, J.M., Hollowed, A.B., Knowlton, N. (2011) Climate change impacts on marine ecosystems. *Annu. Rev. Mar. Sci.* 4, 11-37.
- Elmi, A.A., Affi, L., Knight, W.A. and Mohamed, S. (2015) Piracy in the Horn of Africa Waters: Definitions, History, and Modern Causes. *African Security*, 8/3, 147-165.
- Germond, B. (2015) The geopolitical dimension of maritime security. *Mar. Policy* 54, 137-142.
- Germond, B. and Ha, F.W. (2018) Climate Change and Maritime Security Narrative: The Case of the International Maritime Organization. *J Environ Stud Sci*, <https://doi.org/10.1007/s13412-018-0509-2>.
- Halpern, B.S., et al. (2012) An index to assess the health and benefits of the global ocean. *Nature* 488.7413 (2012): 615.
- Harley, C.D., Randall Hughes, A., Hultgren, K.M., Miner, B.G., Sorte, C.J., Thornber, C.S., Rodriguez,

Hoegh-Guldberg, O., Bruno, J.F. (2010) The impact of climate change on the world's marine ecosystems. *Science* 328, 1523-1528.

Hoegh-Guldberg, O., R. Cai, E.S. Poloczanska, P.G. Brewer, S. Sundby, K. Hilmi, V.J. Fabry, and S. Jung (2014) The Ocean. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1655-1731.

Hoegh-Guldberg, O., P. J. Mumby, A. J. Hooten, R. S. Steneck, P. Greenfield, E. Gomez, C. D. Harvell, P. F. Sale, A. J. Edwards, K. Caldeira, N. Knowlton, C. M. Eakin, R. Iglesias-Prieto, N. Muthiga, R. H. Bradbury, A. Dubi, M. E. Hatzioios (2007) Coral Reefs Under Rapid Climate Change and Ocean Acidification. *Science* 318/5857, 1737-1742.

HM Government (2014) The UK National Strategy for Maritime Security. Presented to Parliament by the Secretary of State for Defence by Command of Her Majesty, May 2014, Cm 8829. H.M Government: London.

India Ministry of Defence (2015) Ensuring Secure Seas: Indian MARITIME Security Strategy. Indian Navy, Naval Strategic Publication (NSP), at https://www.indiannavy.nic.in/sites/default/files/Indian_Maritime_Security_Strategy_Document_25Jan16.pdf

Jacques, P. and Smith, Z.A. (2003) *Ocean politics and policy: A reference handbook*. ABC-CLIO, Santa Barbara.

Jasparro, C., Taylor, J. (2008) Climate change and regional vulnerability to transnational security threats in Southeast Asia. *Geopolitics* 13, 232-256.

Kaye, S. (2012) Climate change and maritime security, in R. Warner and C. Schofield (eds), *Climate Change and the Ocean*, Edward Elgar Publishing, Cheltenham and Northampton, pp.153-165.

Liss, C. (2013) New actors and the state: addressing maritime security threats in Southeast Asia. *Contemporary Southeast Asia: A Journal of International and Strategic Affairs* 35, 141-162.

Malcolm, J.A., (2017). Sustainability as Maritime Security: A Small Island Developing State Perspective? *Global Policy* 8/2, 237-245.

Marchal, R. (2011) Somali Piracy: The Local Contexts of an International Obsession. *Humanity: An International Journal of Human Rights, Humanitarianism, and Development* 2(1), 31-50.

Mazaris, A.D. (2017) Manifestation of maritime piracy as an additional challenge for global conservation. *Mar. Policy* 77, 171-175.

Mazaris, A.D., Vokou, D., Almpanidou, V., Schofield, G. (2016) Knock-on effects of national risk assessments on the conservation of global biodiversity. *Aquat. Conserv.: Mar. Freshwat. Ecosyst.*

Mazaris, A.D. and Germond, B. (2018) Bridging the Gap between Climate Change and Maritime Security: Towards a Comprehensive Framework for Planning. *Science of the Total Environment*, 635C, 1076-1080.

Moreno, A., Amelung, B. (2009) Climate change and coastal & marine tourism: review and analysis. *J. Coast. Res.*, 1140-1144.

Moreno, A., Becken, S. (2009) A climate change vulnerability assessment methodology for coastal tourism. *J. Sustain. Tourism* 17, 473-488.

National Development and Reform Commission and the State Oceanic Administration (China) (2017), *Vision for Maritime Cooperation under the Belt and Road Initiative*, available at <https://www.yidaiyilu.gov.cn/wcm.files/upload/CMSydy/gw/201706/201706200153032.pdf> [accessed 14.02.2018].

NATO (2011) *Alliance Maritime Strategy*, at https://www.nato.int/cps/en/natohq/official_texts_75615.htm.

Nordqvist, P. and Krampe, F (2018) Climate change and violent conflict: Sparse evidence from South Asia and South East Asia. *SIPRI Insights on Peace and Security*, 4 : 1-9.

Parsons, R.J. (2010) Climate change: the hottest issue in security studies? *Risk, Hazards & Crisis in Public Policy* 1, 87-116.

Percy, S. and Shortland, A. (2013) Contemporary Maritime Piracy: Five Obstacles to Ending Somali Piracy. *Global Policy*, 4/1, 65-72.

Pinsky, M.L., G. Reygondeau, R. Caddell, J. Palacios-Abrantes, J. Spijkers, W.W.L. Cheung (2018) Preparing ocean governance for species on the move. *Science* 360/6394, pp.1189-1191.

Pomeroy, R., Parks, J., Mrakovcich, K.L., LaMonica, C. (2016) Drivers and impacts of fisheries scarcity, competition, and conflict on maritime security. *Mar. Policy* 67, 94-104.

Premier Ministre (2015) National Strategy for Security of Maritime Spaces. Adopted by the inter-ministerial sea committee on 22 October 2015, at https://www.gouvernement.fr/sites/default/files/contenu/piece-jointe/2016/01/strategie_nationale_de_surete_des_espaces_maritimes_en_national_strategy_for_the_security_of_maritime_areas.pdf.

Presidency of the Government (2013) National Maritime Security Strategy, at http://www.lamoncloa.gob.es/documents/20131333estrategiadeseidadmartima_ingls.pdf.

Rahman, C. (2012) The implications of climate change for maritime security. In R. Warner and C. Schofield (eds), *Climate Change and the Ocean*, Edward Elgar Publishing, Cheltenham and Northampton, pp.167-199.

Samatar, A.I., Lindberg, M., Mahayni, B. (2010) The Dialectics of Piracy in Somalia: the rich versus the poor. *Third World Quarterly* 31, 1377-1394.

Scott, S.V. (2008) Securitized climate change: international legal implications and obstacles. *Cambridge Review of International Affairs* 21, 603-619.

Scott, S.V. (2012) The Securitization of Climate Change in World Politics: How close have we come and would full securitization enhance the efficacy of global climate change policy? *Review of European Community & International Environmental Law* 21, 220-230.

Spijkers, J. and Boonstra, W.J. (2017) Environmental change and social conflict: the northeast Atlantic mackerel dispute. *Reg Environ Change* 17: 1835.

Spijkers, J., Morrison, T.H., Blasiak, R., Cumming, G.S., Osborne, M., Watson, J., Österblom, H. (2018) Marine fisheries and future ocean conflict. *Fish Fish* 10, 173.

Storey, I. (2008) Securing Southeast Asia's Sea Lanes: a work in progress. *Asian Policy* 6, 95-128.

Suárez-de Vivero, J.L., Mateos, J.C.R. (2017) Forecasting geopolitical risks: Oceans as source of instability. *Mar. Policy* 75, 19-28.

Trombetta, M.J. (2008) Environmental security and climate change: analysing the discourse. *Cambridge Review of International Affairs* 21, 585-602.

UN Security Council (2007) Security Council Holds First-ever Debate on Impact of Climate Change. SC/9000, 17 April 2007, at: <http://www.un.org/News/Press/docs/2007/sc9000.doc.htm>.

US Department of Defense (2015a) National Security Implication of Climate-Related Risks and a Changing Climate. Submitted in response to a request contained in Senate Report 113-211, accompanying H.R. 4870, the Department of Defense Appropriations Bill, 2015, at <http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery>.

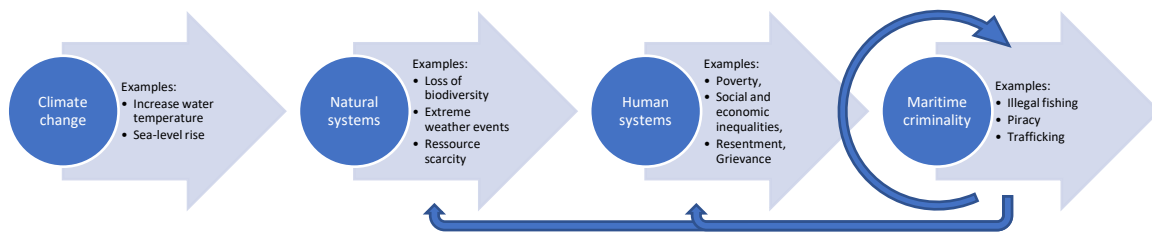
US Department of Defense (2015b) Asia-Pacific Maritime Security Strategy 2015, at https://www.defense.gov/Portals/1/Documents/pubs/NDAA%20A-P_Maritime_Security_Strategy-08142015-1300-FINALFORMAT.PDF.

US Navy, Coast Guard and Marine Corps (2015), *A Cooperative Strategy for 21st Century Seapower: Forward, Engaged, Ready*, available at <http://www.navy.mil/local/maritime/150227-CS21R-Final.pdf>

US Department of State (2005) *The National Strategy for Maritime Security*. Bureau of Political-Military Affairs, at <https://www.state.gov/documents/organization/255380.pdf>.

Von Lucke, F., Wellmann, Z., Diez, T. (2014) What's at stake in securitising climate change? Towards a differentiated approach. *Geopolitics* 19, 857-884.

Figure 1: Synergistic links between climate change impacts and maritime criminality



Climate change affects natural systems, which in turn has negative impacts on human systems, which can engender, or contribute to engender, the occurrence of maritime crimes. The proliferation of one form of maritime crime (e.g. illegal fishing) can contribute to the emergence of another (e.g. piracy). Eventually the occurrence of maritime crime can in turn negatively impact natural and human systems by reinforcing existing issues such as resource scarcities, poverty and grievance.