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Climate Security in the Northern Mediterranean: Threat Scenarios and the Prospects for Resiliency

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Abstract: Climate change is transforming everyday around the world. From how we live our daily lives to how we grow our food, where we can build our homes, and even how we protect ourselves and those we love, climate change is forcing us to reconsider long-held beliefs and habits. In this paper, we map and analyze four sea-level-rise (SLR) scenarios for countries in the Northern Mediterranean to explore numerically and visually increasingly likely climate threats to the region. We argue that climate change generates primary (direct), secondary and even tertiary impacts that indicate that securitization has occurred, even if some policy-makers choose to ignore that reality.

Keywords: climate change, securitization, climate security, SLR scenarios, Northern Mediterranean

Climate change is transforming everyday life in myriad ways in every part of the world. From how we live our daily lives to how we grow our food, where we can build our homes, and even how we protect ourselves and those we love, climate change is forcing us to reconsider long-held beliefs and habits. Recognizing these realities, UN Secretary General Antonio Guterres put it this way in April 2022: dire climate change predictions are "not fiction or exaggeration. It is what science tells us will result from our current energy policies. We are on a pathway to global warming of more than double the 1.5-degree (Celsius, or 2.7-degrees Fahrenheit) limit." He went on to argue that unless countries around the globe reassess energy policies and the way they live and do business more generally, the world will be uninhabitable (United Nations 2022). From heat and wildfires through se-

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vere weather, sea-level rise, impacts on agricultural production and more, the forecasts are indeed grim and developing at an accelerating pace.

These general and more specific climate change impacts have been well-documented in scholarly work on the topic (see for example, Adger, Lorenzoni, and O'Brien 2010; Adger, Arnell, and Tompkins 2005; Boyer, Meinzer, and Bilich 2016; Carmin, Anguelovski, and Roberts 2012; Ciplet, Roberts, and Khan 2013; Ford and Berrang-Ford 2011, and many more) and by the Intergovernmental Panel on Climate Change (IPCC 2021) in its recurrent work, but most recently in its 6th Assessment released in August 2021. These works and many more amply demonstrate that climate change is impacting humanity in unprecedented and accelerating ways.

What is less clear, at least in many policy circles, is the degree to which climate change is forcing a reconceptualization of the nature of security. While it may seem trite to state this given the voluminous scholarship on the topic, security is increasingly defined beyond traditional conceptions that focused primarily on freedom from military attack. In fact, work from and based on the Copenhagen School (see e.g., Buzan, Wæver, and de Wilde 1998; Butler 2019) has shown our field how various issues can be and are "securitized," substantially broadening the concept from long-held realist constructs and arguing for policy action in ways previously considered less urgent in nature. Until recently, however, environmental issues, broadly, and climate change, more specifically, have largely been relegated to "second-order" status as a security threat. This second-order status means that environmental concerns only become security issues if and when they produce conditions that elevate the likelihood of armed conflict. While such work is quite valuable to our understanding of conflict causes and processes and has a long tradition in the international studies field (see for instance, Homer-Dixon 1994, 1999; and Gleditsch 1998, 2012), it focuses less attention on the ways that climate change presents a different type of threat and has become a true first-order security challenge, particularly in recent decades.

To the point of our current analysis, climate change generates primary (direct), secondary and even tertiary impacts that indicate that securitization has occurred, even if some policy-makers choose to ignore that reality. Although we are seeing more attention to primary climate threats in recent years, policy-makers around the globe still remain far from consensus on this notion and are even less united when discussing operational solutions. But what sets climate change apart from some other securitized policy issues are the direct ways that it creates danger, threat and even jeopardizes the survival of both individuals and states more broadly. In this way, climate threats intersect with human security conceptually and operationally. Notably, and depending on the specific sea-level rise scenarios, some countries may cease to exist in the relatively near future. Such scenarios will depend on topography, but even for those countries with higher elevations, coastal settlements will be impacted greatly. As a result, climate change will create climate refugees, which will undoubtedly impact the Global South asymmetrically (see Methmann 2014) both in terms of migration and the relative costs of adaptation. Moreover, these refugee flows will also exacerbate the incidence of statelessness in parts of the Global

South (see Belton 2017). Refugees, statelessness and the disappearance of territory may also produce fertile ground for conflict, as neighbouring countries and the international community more broadly seek to cope with the realities of the loss of homeland and the human impacts such losses produce.

Building on previous work by Boyer and Oculi (2019) that focused on climate security in the Caribbean basin and a more detailed discussion of the constructs of climate change securitization, this analysis expands that work and illustrates climate security realities for most of the countries in the northern Mediterranean region. It is worth noting that climate change as a perceived security threat cross-nationally shows substantial variation in respondent attitudes. In general, polling data shows that 72% of respondents in a small sampling of advanced industrialized countries in North America, Europe and Asia (all not shown in Table 1 below) believe that climate change "will harm you personally" during their lifetime (Pew Research Center 2021). But that perception shows substantial cross-national variation when disaggregated. Table 1 shows some of that variation for a select sample of countries in the region with the US response shown only for comparison (Pew Research Center 2018).[2]

Question wording: "Climate change is a_____to our country."

	Major Threat	Minor Threat	Not a Threat
Greece	90%	6	4
France	83	14	3
Spain	81	13	5
Italy	71	16	8
US	59	23	16
Median of Respondents	68	20	9

Table 1: *Attitudes on Climate Change Threat (% of respondents).* **Source:** Spring 2018 Global Attitudes Survey, Q22d, Pew Research Center.

These data show that respondents in the four countries in the northern Mediterranean involved in this survey have a more acute sense of the threat posed by climate change than do respondents in the US, until recently the world's largest greenhouse gas emitter. This illustrates the perceived urgency of the threat in the Mediterranean and speaks to

2 It is worth noting that even in the United States, long a bastion of climate change resistance, there is a growing sense of urgency on this set of issues. See Yale 2022, https://climatecommunication.yale.edu/about/projects/global-warmings-six-americas/.

the potential for public support for climate policy action in the region.[3] The tendency for the US public to lag behind threat perceptions is manifest in a range of surveys, even if the urgency of climate engagement is also increasing in the US (see Yale 2022). In contrast to the lagging American climate threat perceptions, threat perception in Europe overall remains quite high. For example, a Pew Research Center survey in 2020 found that of the nine European countries surveyed, only Denmark showed a lower climate threat perception than seen in the US, and that difference is quite small (Pew Research Center 2020). The lower Danish perception may also be the result of a progressive national approach to date and a sense of better preparedness on the part of the Danes. Otherwise, European respondents find that climate change poses a major threat to their country. As a result of these heightened climate threat perceptions, it seems prudent to investigate the veracity of the climate threat to lives, livelihood and physical safety by examining mapping data for the northern Mediterranean region.

In this context, this analysis examines data to answer the questions: 1) does climate change pose the existential threat that is often posited in the popular press and conventional wisdom? 2) if so, how seriously does that threat manifest in the northern Mediterranean region as measured by coastal sea-level-rise-induced impacts in the region?[4]

Thinking Through Environmental Securitization[5]

Although the beginning of the intellectual discussion of securitization is often dated to the publication of Richard Ullman's (1983) article "Redefining Security", a broadened definition of security had implicitly been in place for decades before that. But as the Cold War cycled from cold to cool to sometimes quite hot, the military context of security, national and personal, remained the primary policy focus globally. And even today, the war in Ukraine, missile "diplomacy" on the Korean peninsula, and other recent armed conflicts demonstrate the continued relevance of military security as a defining concept for state policy.

That continued relevance of military security threats, however, does not minimize the potential reality that other threats pose to national and personal security. The threat

3 Note that previous work by Boyer (2013) and Boyer, Meinzer, and Bilich (2016) found that one of the obstacles to climate policy action at the regional and local level in the US is that climate threat urgency ranks relatively low on the policy priority ranking for both citizens and policy-makers. Thus, even where climate action is perceived as important, other policy challenges often take precedence before climate action becomes a serious focal point for policy-makers.

4 The reader should note that water-induced climate change impacts are indeed not the only threats generated by climate change locally or globally. For this analysis we focus solely on water-induced threats, but we fully recognize that drought, wildfires, changing agricultural patterns and many more climate impacts are being felt throughout the world and have been documented extensively in southern Europe in 2022 with the record summer heat in the region.

5 Please note that the following section draws extensively on earlier work by Boyer and Oculi (2019).

posed by climate change forces one to recall Davis Bobrow's (1996) presidential address to the International Studies Association focusing on "complex insecurity." In that address, Bobrow noted that security was increasingly changing from enemy-focused threats to "threats without enemies." This change in the focal points for security policy and planning created a new landscape for understanding how best to protect those under a decision-maker's charge. In the current case of climate change, the threat develops from sea-level rise and inundation, storm surge, infrastructure damage, severe weather events, drought and much more. These challenges also demand policy action that confronts a geo-physical threat that is both relentless and unpredictable. It is also a policy problem that forces decision-makers to grapple with the constraints placed on solutions by the existing built-environment. In other words, to cope with the demands of climate security, an optimal planning scenario would allow for the easy movement of people and structures, but that is difficult both politically and physically to accomplish, at least in the short term. Thus, policy planning must account for the built environment and the resistance within society to dramatic changes in current settlement patterns.

It is still worth noting though that until recently securitization has long centred on environmental *conflict* and the ways environmental problems such as famine, land degradation, extreme weather and more lead to conflict over resources, the handling of migration flows and other secondary impacts of environmental problems. These causal chains have led to well-established, even if much debated, research programs, but remain focused on the secondary causality of securitization in the environmental issue area (see Homer-Dixon 1994, 1999; Gleditsch 1998, 2012; Meierding 2013). Hence, in this genre, the "environment" isn't a security issue per se, but only becomes one when it generates political-military conflict among global actors. But as Detraz and Betsill (2009) argue, in the age of attention to climate change, the discourse has shifted away from thinking about climate change as "merely" a cause for conflict and into a realm where climate change is cast directly as a security concern, just as Buzan, Wæver, and de Wilde (1998) argued would be the case in their seminal work on securitization.

Moreover, the social, economic and biophysical problems generated by climate change have been well-documented in the social and biophysical sciences. The most authoritative sources on climate impacts are the recurrent assessments made by the Intergovernmental Panel on Climate Change (IPCC), whose most recent *6th Assessment* was published in 2021. Building on the path-breaking research on climate adaptation laid out in the *2007 4th Assessment*, the *5th and 6th Assessments* tightened the focus on adaptation and vulnerability and helped bring climate change more fully into the security frame. In fact, over the past two decades, culminating in the *4th Assessment,* researchers and policy-makers have moved into a sphere where adapting to climate change has arguably taken the policy foreground away from efforts aimed at greenhouse gas (GHG) mitigation, long the primary focus of the environmental movement as it pertained to climate change. As is well-documented elsewhere, originally the environmental movement was reticent to move away from the primary focus on greenhouse gas (GHG) mitigation for fear of losing sight of the root cause of the problem. Others, however, increasingly saw the focus on

adaptation as both a political strategy and a policy urgency that would ultimately help the policy debate circle back to GHG mitigation (Boyer 2013). As one set of authors put it, the *4th Assessment* and the policy discussions that followed led to a "lifting of the taboo on adaptation" and permitted action on the most urgent climate impacts (Pielke Jr. et al. 2007, 597).

Hence, the securitization of climate change has centred on two forms. The first relies on authoritative scientific declarations about climate change that have largely been put forth globally through the IPCC. As Berling (2011, 392) puts it, "The scientific setting has given scientists a place from where to speak in the security field." Extending that argument further, the work of the IPCC has been pushed into the global political realm through the UN Framework Convention on Climate Change (UNFCCC) process, which relies heavily on IPCC research and documentation. Hence, as Balzacq (2005) argues, pushing the scientific work of the IPCC into the political realm of the UNFCCC is both a pragmatic and strategic practice that changes the audience and those who are listening.

The second important aspect of securitization to note in the climate change context is the switch from a focus on greenhouse gas mitigation to one focusing on adaptation to climate impacts. One can argue that this, too, is grounded in the scientific authority of the *4th, 5th* and *6th Assessments* and that argument would in fact be correct. But this shift in focus also had profound implications for the broader debates in countries around the world, including the United States. This change in focus has also been aided by the reality of severe weather impacts in recent years around the world. These types of severe weather events have increasingly sensitized the average citizen to the fact that something new is indeed happening in our world's climate and weather. Whether it is storm impacts, sunny-day flooding, new demands for storm-water management inland, or changing tactics for agricultural production, such impacts are being felt now and more personally than ever before. That shift forces securitization for the average person as they focus on climate impacts at an individual, familial and local community level. In this way, as Trombetta (2008, 585) suggests generally about environmental securitization, this changed policy is transforming climate "security provisions and practices." We now turn to our analysis of the northern Mediterranean region to answer the research questions above, at least in this particular regional context.

The Study Area

The Mediterranean Region is connected to the Atlantic Ocean by the outlet of the Mediterranean Sea. While the region is connected to Western Asia (Anatolia and Levant), North Africa, and Southern Europe, the focus of this study is confined to seven southern

European countries all with coastline on the northern side of the Mediterranean Sea. The countries included and their geographic locations are shown in Figure 1.[6]

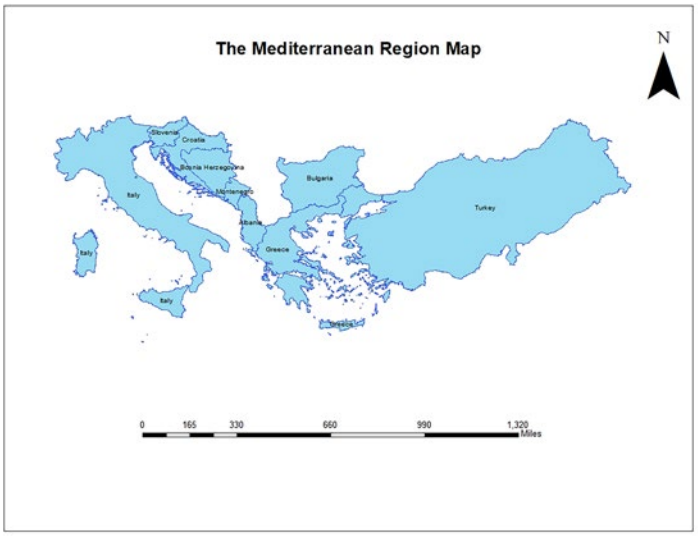

Figure 1: *Map of the Analysis Region*

Data and Methods: ArcGIS Modeling

In this analysis, we employ two major datasets. The geographical data was extracted from the DIVA-GIS database: http://diva-gis.org/gdata. The DIVA-GIS data include administrative unit shapefiles and digital elevation model (DEM) raster images. The second group of data primarily focus on population data for several countries in the region collected by the author team. Also modeled in GIS are the impacts of sea-level rise (SLR) for those countries.[7]

Inundation Scenario Analysis: Scenario studies have become increasingly valuable in both policy and academic analyses. Amer et al. (2013, 23) argue that:

> In the present era characterized by uncertainty, innovation, and change, increasing emphasis is being placed on scenario-planning techniques because of their usefulness in times of uncertainty and complexity … Scenario-plan-

6 The reader should note that several countries in the region were not included in the analysis that follows. This was done partly as a result of data availability and partly for other reasons. For example, Monaco is a city state and for our purposes was included in the French scenarios. San Marino has no coast. Portugal is not on the Mediterranean; and Bosnia, Montenegro and Slovenia have very small coastal exposure. In future work, we plan to include those last three, but not for this analysis.

7 More fine-grained detail on coding and methods can be provided by the authors on request.

ning stimulates strategic thinking and helps overcome thinking limitations by creating multiple futures.

This approach is thus relevant to implementing strategies to cope with climate change. One of the primary aspects of our research is to help formulate policy responses to climate impacts. As a result, we develop four futures or scenarios that allow us to assess the climate threat magnitude.

We additionally argue that the Mediterranean region is susceptible to major hazards that validate our four SLR scenarios. In the region, there has been much research on coastal inundation resulting from tsunamis more than threats from storms (Marriner et al. 2010; Marriner et al. 2017). The Italian Tsunami Effects Database (ITED) has identified 293 tsunamis in the Mediterranean Region and adjacent European Seas (Maramai et al. 2019). Those hazards created various levels of SLR, including those we discuss below. Thus, an argument can be made that tsunamis are not directly correlated to climate change, weakening our climate security claims. Most of those historical tsunami events in the Mediterranean region, however, are in fact storms (Marriner et al. 2017). Hence, our analysis presents four scenarios of possible SLR due to future storm events in the region, and we argue that it is the appropriate methodology for this analysis. These scenarios, accordingly, also present four levels of threat to personal and national security, escalating in intensity and volume as they increase in severity.

In addition, some would argue for the use of the Shared Socioeconomic Pathways (SSPs) approach as a new and robust scenario development framework is better to understand issues of future impacts, vulnerabilities, adaptation, and mitigation (Riahi et al. 2017). The SSPs detailed five possible futures to highlight the need for the strongest mitigation efforts to prevent a worst-case scenario of 5.1C global warming above pre-industrial levels by 2100 (Hausfather 2018). Still, we argue that for our purposes, focusing on regional-scale security threats emerging from SLR exposures is the most appropriate means of assessment because they estimate abrupt events with increased intensity and frequencies.

Results and Analysis

Not surprisingly, our data and analysis indicate that sea-level rise (SLR) poses significant threats to both human and national security in the northern Mediterranean region. The human and geographic impact of climate change-induced SLR is shown in four different scenarios in Table 2. For the seven countries in Table 2, we analyzed four different SLR scenarios, highlighting the total population of the affected area impacted, the total number of people affected, and the percentage of the impacted population. Estimating the impacted population provides clear evidence of human vulnerabilities and insecurities. These vulnerabilities also demonstrate that climate change generates both national and human security threats. Traditionally, national security has been described as the need to protect against territorial and community threats to the state by foreign or domestic actors (Gilman et al. 2011).

Country	Sea Level Rise Scenarios (m)	Population of Impacted Area with any level of SLR	Affected Population	Population (%)
Albania (2011)	1	517,563	153,775	*(see NOTE)
	2	547,156	172,225	*
	3	685,950	191,722	*
	4	707,426	212,527	*
Croatia (2018)	1	638,155	16,852	2.64
	2	698,072	20,418	2.92
	3	776,760	22,878	2.95
	4	789,791	29,115	3.69
France (2017)	1	16,287,777	745,895	4.58
	2	16,486,859	974,648	5.91
	3	16,855,378	1,175,227	6.97
	4	17,088,016	1,349,968	7.90
Greece (2011)	1	4,226,488	118,455	2.80
	2	4,548,766	154,758	3.40
	3	4,734,248	188,302	3.98
	4	4,826,575	215,612	4.47
Italy (2019)	1	51,058,503	2,009,541	3.94
	2	52,222,688	2,399,448	4.60
	3	53,862,279	2,768,213	5.14
	4	55,705,392	3,110,304	5.58
Spain (2019)	1	25,298,101	265,987	1.05
	2	25,298,101	265,987	1.05
	3	25,382,878	332,221	1.31
	4	25,382,878	387,665	1.53
Turkey	1	11,917,416	340,586	2.86
	2	13,815,483	518,608	3.75
	3	16,093,756	696,685	4.33
	4	16,148,850	868,218	5.38

Table 2: *Summary of Inundation Scenarios.* ***NOTE:*** *total population in millions for the countries in Table 2: Albania – 2.8 million; Croatia – 4.04; France – 67.4; Greece – 10.7; Italy – 59.5; Spain – 47.35; Turkey – 84.3; the * in the last column for Albania is because Albania reports the population*

differently than the other countries in this table. Thus, the percentage result is not comparable with the other reported here.

Table 2 shows that any SLR scenarios will significantly impact both territory and people. Naturally, the four-meter scenario yields the most significant threats, but even the one-meter scenario will impact 3.6 million people in the affected areas and touch over 17.5 billion square meters of territory across the countries listed in Table 2. We arrive at those values by summing the inundation area and the communities impacted by the different inundation scenarios highlighted in Table 2. Table 2 highlights the total population of communities with any inundation level in the third column. By extension, the data in Table 2 also provide us with a baseline of the physical threats presented by climate change, both SLR and severe weather, in the region. As you can see, the threats become more intense and impactful as we move from 1M to the 4M scenarios, not surprisingly.

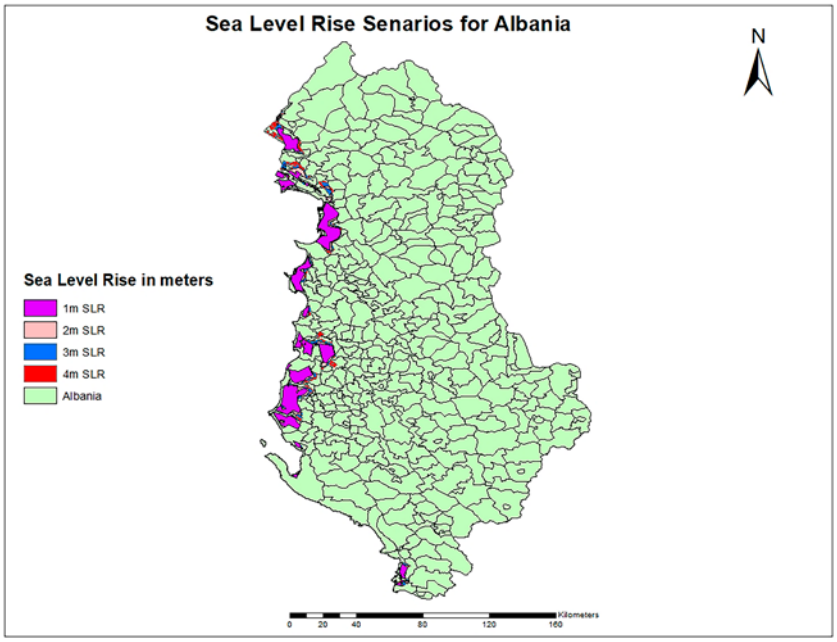

Figure 2: *Albania*

Moving from the aggregate to the specifics of the mapping work, our analysis indicates that Albania (Figure 2) is quite vulnerable to all four SLR scenarios. A one-meter SLR will critically impact many communities in Albania. For example, about 84% of the community of Fushë Kuqe will be inundated. Four-meters of SLR is estimated to flood about 88% of the same community. The same trend is observed in Shënkoll, where one-meter SLR will inundate about 69% of the community, compared to a four-meter SLR, which

will flood over 80% of that community. This further indicates that even the least dramatic scenario (1 meter) poses a serious threat to many communities in Albania. Other communities such as Dermenas, Grabian, Libofshë, Katund i Ri, Levan, Tërbuf, and Topojë will experience over 50% inundation from one-meter SLR. The three most vulnerable cities in Albania are Laç, Durrës, Divjakë, and Sukth. In Lac, there is little difference between the one-meter and four-meter scenarios. One-meter SLR will flood about 55% of that city, while a four-meter will inundate about 61%. A one-meter scenario is expected to inundate 51% of Durrës and about 35% of Divjakë, and Sukth. Of these four cities, more people will be impacted by one-meter inundation scenario in Durrës. About 56,000 people will be affected in Durrës, followed by Laç with over 9,000 people. Please note that reliable community-level population data for Albania was from 2011, so these scenarios have likely worsened in the intervening years.

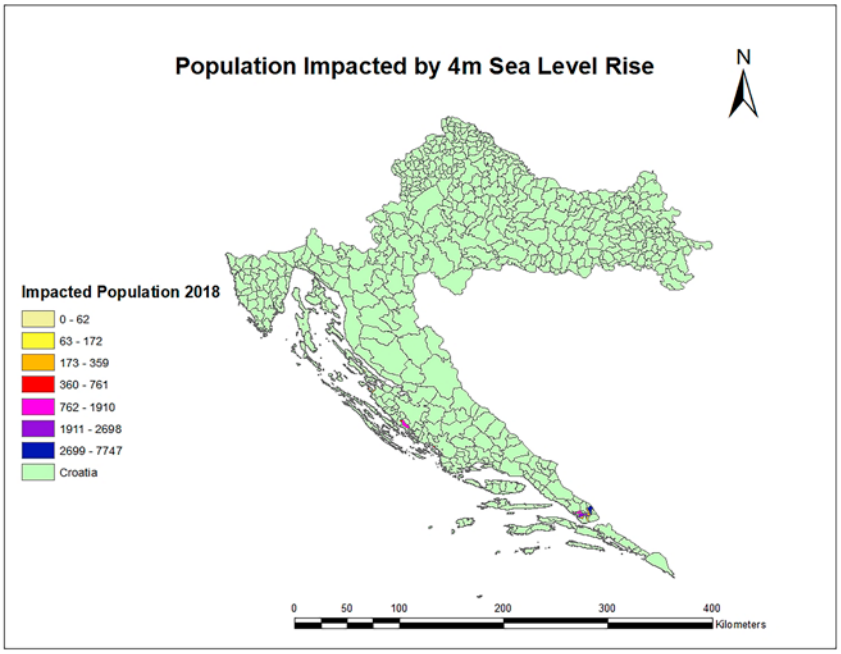

Figure 3: *Croatia*

In Croatia, the two most impacted locations are the city of Opuzen and the town of Metković (Figure 3). As of 2018, in the city of Opuzen, more than 86% of the population will be impacted by one-meter SLR. Our model estimates that out of the 3135 residents of Opuzen, 2712 of them will be impacted by a one-meter SLR. This number jumps to 2698 in the worst-case scenario of a four-meter SLR. One-meter SLR will impact about 6500 residents of the town of Metković. While the absolute numbers may seem small, they would still be catastrophic for a small country like Croatia.

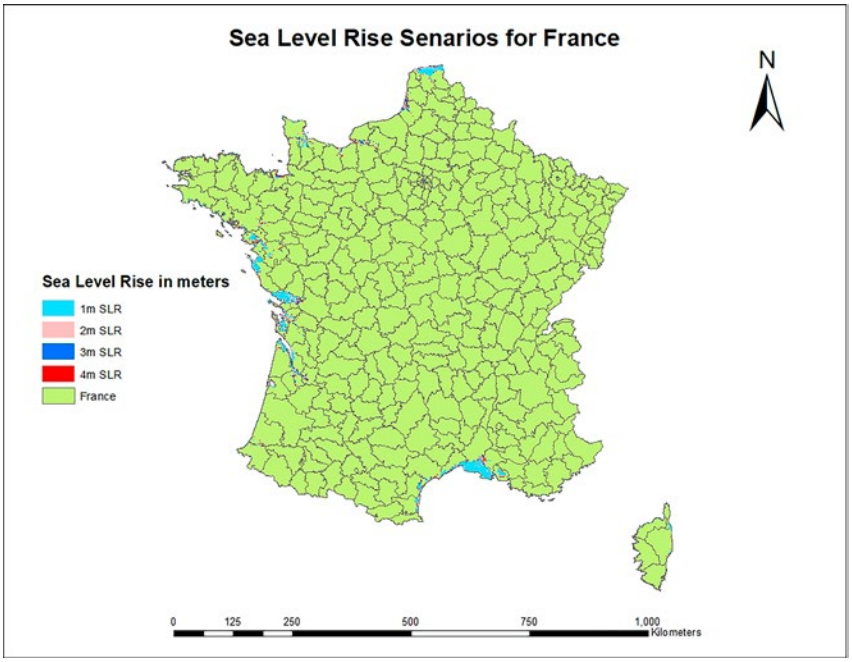

Figure 4: *France*

While it may appear that France is not as vulnerable as many of the countries in the region, our analysis indicates that many important districts in France are susceptible to our various inundation scenarios. As shown in Table 3 below, the district of Montpellier will face the gravest *human* security threat in this sample. Still, in terms of *physical* inundation, the city of Arles is most vulnerable (see Figure 5), with an estimated 45% in the event of a four-meter SLR scenario.

Districts	Total Area (m^2)	Total Population 2017	Affected Population
Montpellier	1410889768	691192	129228
Bordeaux	1520594983	961709	116992
Nantes	2172085770	840239	99426
Istres	758055805.6	327881	99133
La Rochelle	834978841.1	216972	87268
Saint-Nazaire	1776328348	330294	84774
Nîmes	3143335889	556372	83003
Arles	2282875555	172085	77090
Rochefort	1548387460	190481	69678
Calais	319353190.4	157786	62077

Table 3: *Ten Most Impacted Districts in France*

Figure 5: *Arles, France*

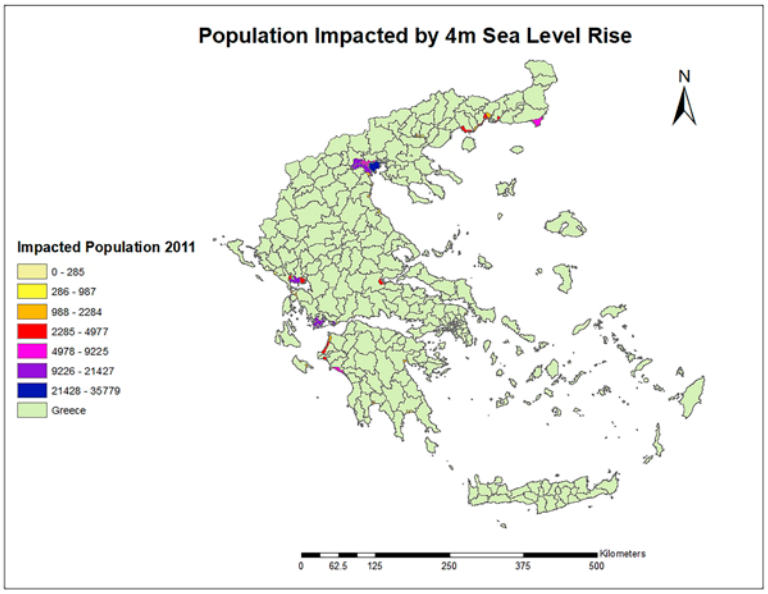

Figure 6: *Greek Population Impacts*

With the longest coastline in Europe, SLR presents an enormous threat to Greece's coastal communities, and it will occur virtually everywhere. About 60% of the population of Greece lives on the coast (Lioutas and Tsimopoulou 2010). While the mainland has many

mountains and forest land, Greece also has thousands of small islands as well. Because of its geographical location, three major water bodies can potentially impact Greece. The Ionian Sea is in the western part of the country; the Aegean Sea on the eastern side; and the Mediterranean Sea as the southern "border." Our analysis indicates that the most potentially impacted region is the Thermaic Gulf towards the east. With this in mind, the municipality of Delta is the most vulnerable to inundation. A one-meter scenario will flood about 56% of the total area in Delta. Such a scenario will affect 25,551 out of the 45,839 residents, based on the 2011 population census. In a worst-case scenario (four-meter SLR), 78% of the area will experience flooding, accounting for 35,779 residents. About 21% of Alexandria will be impacted in a one-meter scenario. That number increases to about 52% in our worst-case scenario, however, making it the largest increase from one meter to four meters. In the northwestern region, the municipality of Missolonghi and the city of Arta are highly vulnerable to all SLR scenarios. A one-meter SLR will inundate about 27% of these two municipalities.

Figure 7: *Greece Inundation Mapping*

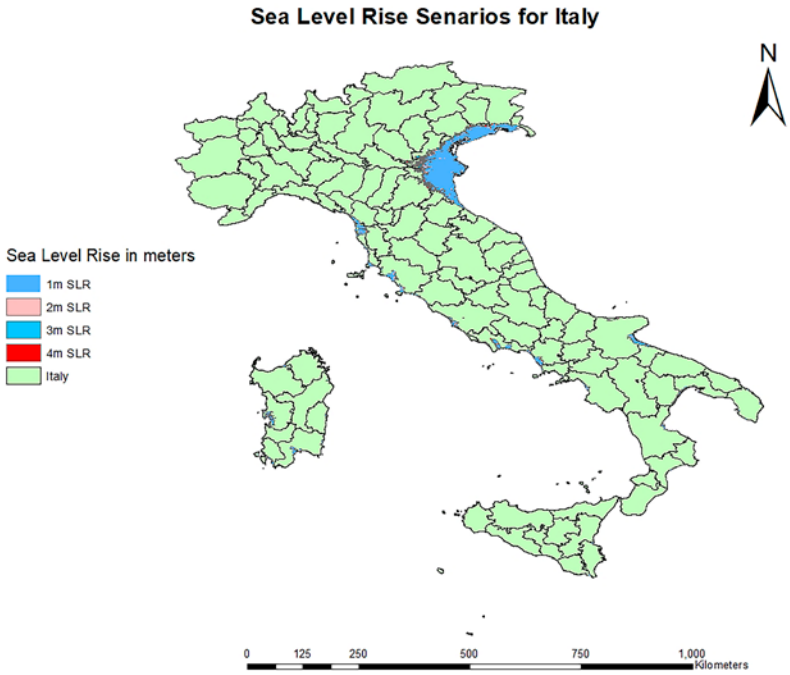

Figure 8: *Italy Inundation Mapping*

Our analysis further indicates that Italy is one of the most significantly impacted countries in this study (see Figures 9, 10, and 11). As shown in Figure 8, one-meter SLR presents significant threats to major provinces and tourism hubs in Italy. For example, more than 70% of the province of Venice will be inundated in a one-meter SLR scenario. Venice's culture, history, art, and architecture draw millions of tourists every year from around the world, making it a significant tourist destination in Europe. Venice's unique physical geography of 118 small islands connected by 400 bridges (Kiprop 2018) makes it one of the world's oldest tourist and cultural centres. Venice is recognized as a UNESCO World Heritage Site and a focal point for humanity, especially from a vantage of historical and cultural preservation. As climate change and SLR persists, however, Venice's one-thousand-year survival is at significant risk, even with the advent of new tidal technologies aimed at stemming SLR in the area. It is also worth noting the increasing incidence of sunny-day flooding in Venice, emphasizing the threat even without inundation.

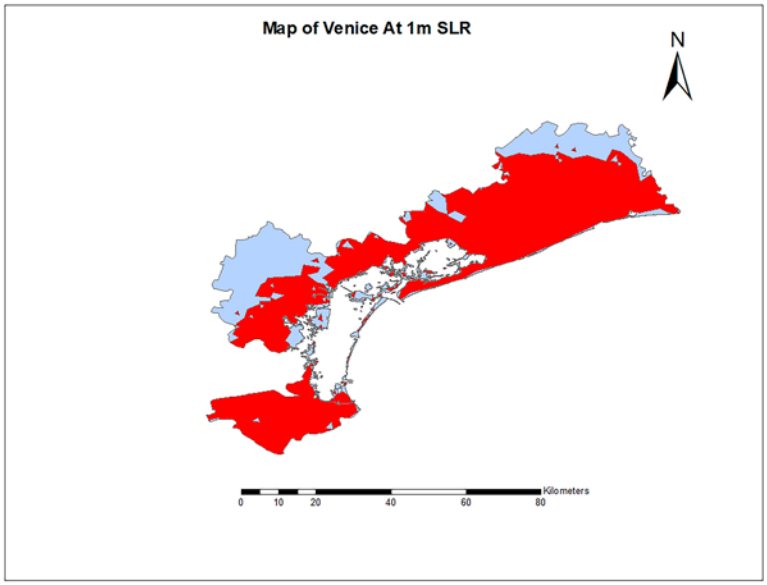

Figure 9: *Venice Inundation Mapping*

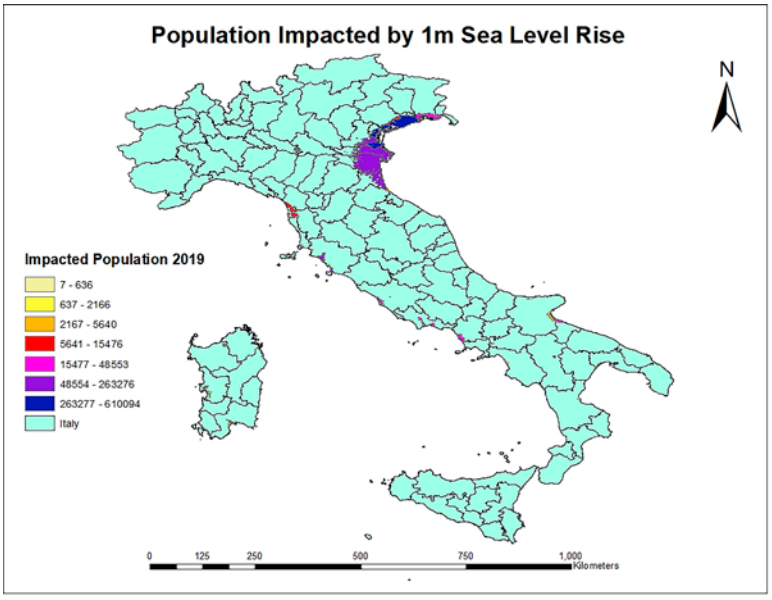

Figure 10: *Italy Population Impacts*

Many other densely populated areas in Italy are also susceptible to the impacts of SLR. Figure 10 and Table 4 illustrate the human consequences of SLR in Italy. The six most impacted populations are listed in Table 4, showing very significant population impacts.

Province	Total Area (m^2)	Total Population 2019	Affected Population
Venezia	2090114178	853338	610094
Ferrara	2623657884	394627	263276
Rovigo	1718106016	387876	230215
Grosseto	4529705204	4999891	196151
Ravenna	1852364620	531891	186262
Padua	2124588923	937908	163031

Table 4: *Six Most Impacted Provinces in Italy*

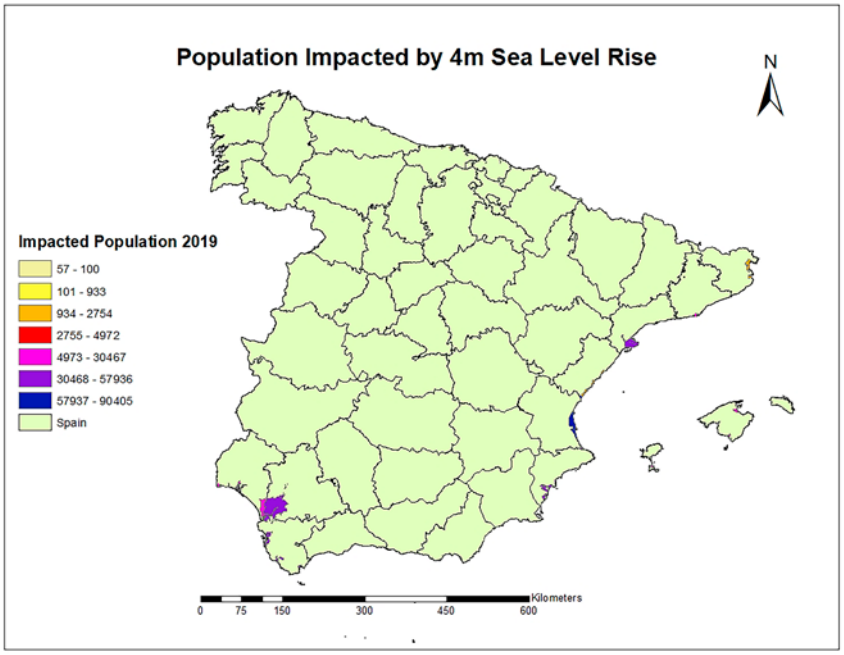

Figure 11: *Spain Population Impacted*

More people living in the Spanish province of Valencia on the southeastern coast of Spain will be impacted by SLR than any other region of the country, as shown in Figures 11 and 12. We estimate that 56944 people will be affected by a one-meter SLR. A four-meter scenario will impact nearly double the number of people predicted for one-meter: 90405 people. The province of Tarragona will also experience major flooding and shows impacts for 36829 people. A four-meter scenario increases to just over 40,000 people, however. This indicates only a slight increase in human impacts in the four-meter SLR scenario, especially as compared to that for Valencia. The province of Alicante, on the other hand, underscores a contrasting set of realities in terms of moving from one-meter to four-meter SLR. One-meter SLR will put 18085 people at risk; while four-meter SLR scenario

shows the estimate more than doubling, placing 57936 residents in the path of flooding. Regardless of the scenario, the human impacts are significant, if not as dramatic as for some of the other countries in this study. These results also show the variability that exists because of the geographical characteristics of a specific locale.

Figure 12: *Spain Four-meter Inundation*

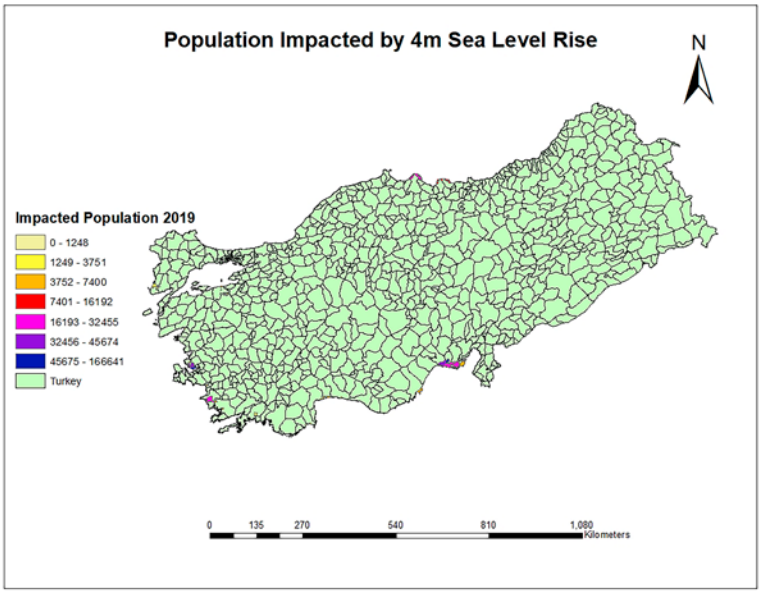

Figure 13: *Turkey Population Impacts*

For Turkey, the last country in the analysis, communities located in Çigli, a metropolitan district of İzmir in the western part of the country, are severely vulnerable. About 59% of Çigli will be flooded in the one-meter SLR scenario. This also means that about 117820 out of 200211 residents will be impacted. This number jumps to over 83%, with 166641 people affected by a four-meter SLR scenario. In Istanbul, the district of Avcilar is expected to experience about 16% inundation if there is one-meter SLR event. This puts 70752 of Avcilar's 448882 residents in harm's way. If Avcilar experiences a four-meter SLR disturbance, 25% of the district will be flooded, translating to 112027 residents. Küçükçekmece, a suburb of Istanbul, is also highly vulnerable, as one-meter SLR would impact 35173 residents.

Figure 14: *Turkey Four-meter Inundation*

Another region severely impacted by possible SLR is the Providence of Adana. The city of Ceyhan, the village of Karataş, the district-municipalities of Seyhan and Yüreğir, and the resort town of Yumurtalık will all be impacted significantly. Seyhan is the most populous district in Adana. About 36% of the residents of Adana Province live in Seyhan. A one-meter SLR will have "minimal" impacts, relative to some of the other locales in our analysis, but still impacting 4351 residents. A two-meter SLR would impact 37593 people, and at the extreme, a four-meter scenario would impact 133576 people.

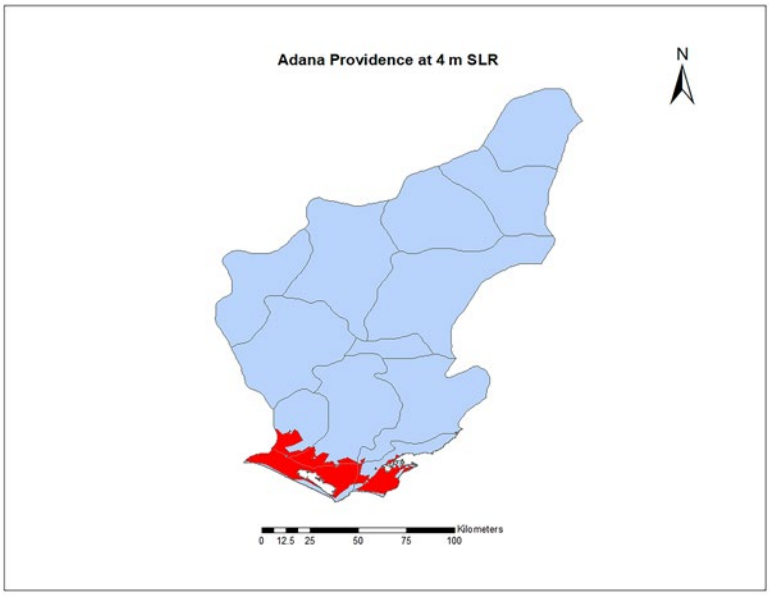

Figure 15: *Adana, Turkey Inundation*

Summary and Closing Thoughts

For those familiar with climate change impacts, the data and analysis in this project are hardly surprising. Rather, they codify what we know to be true: climate change will increasingly impact and threaten humans and human activity in the coming decades. This will happen even in "sunny day scenarios" and will be even more acute when severe weather impacts the region. Moreover, this last statement is especially concerning when one consciously recognizes that human development and humanity's built environment over the past several centuries has often been geographically focused on low-lying areas that are the most vulnerable to climate change. As we know, humans enjoy proximity to water but have rarely planned effectively for their coastal lifestyles. Venice, Italy, is perhaps the most globally notable of such areas, not only because of its coastal geography and inner-city waterways but also because of its extraordinary cultural significance and its place as a tourism icon for people around the globe. But for every well-known global city like Venice, there are countless other lesser-known urban areas that are similarly vulnerable and threatened by climate change, as we have shown above. And many of those vulnerable urban areas are in places least able to cope with climate threats because of a lack of financial resources and technical expertise.

These data, as mapped above, also drive home the reality that climate change is indeed a security challenge of unprecedented severity and potential impact. Granted, governments are correct in preparing for armed conflict as a primary security threat in our very dangerous world. But to ignore the security threats from climate change, we would argue,

is to ignore a threat to human and national security that is more likely to occur than the prospects for armed conflict in most instances. That may be a difficult reality to digest in a region that has been beset with armed conflicts and genocide in the most recent past generation. But ignoring the realities of climate threats has the potential to be more catastrophic in terms of human casualties than any of the recent conflicts in the region. For instance, depending on the estimates, more than 100,000 people perished in the former Yugoslavian conflicts of the 1990s. Going back to the population data in Table 2, however, it shows that the potential for casualties in affected coastal regions has an even greater potential for human death and an even greater potential for displacement and severely disruptive migration flows. As such, it is very difficult to argue that climate change has not become a significant and growing security challenge in this region (and many others).

Hence, climate change has indeed been securitized by rising sea levels, storm surge, tidal variations, and other water impacts from the invasive push of water seeking to fill any void it can. In this context, people's livelihoods (and essential infrastructure) will be reshaped (at best) and demolished (at worst), as well as creating the urgency for migration to more livable places. The ease with which that migration takes place will depend on an array of factors (e.g., availability of housing in new locations; employment capacity; state capacity to plan for such disruptions and migration, etc.) and will almost certainly go more smoothly in some places than others. The relative smoothness of adaptation will also likely be heavily dependent on the availability of financial and technical expertise in local communities and their national governments. As we have argued previously (Boyer and Oculi 2019; Boyer, Meinzer, and Bilich 2017), the relative foot-dragging amongst many policy-makers regarding climate change has left the landscape one where adaptation will likely, and sadly, to be primarily crisis-driven. Hopefully, in places like the northern Mediterranean, policy-makers may be faster and more proactive in planning for the challenges to come than has been the case in climate change laggards like the United States. Regardless, we must again note that much of the capacity to adapt to climate change will depend on the amount of existing government-centric expertise and adequate financing for large-scale projects. This latter requirement will undoubtedly require the large-scale transfer of funds from wealthier countries to those less so. And that will remain an ongoing political struggle, even if one is founded on the inequities engendered by the fact that climate change wouldn't be with us if not for the history of Northern industrialization.

That said, the northern Mediterranean region is likely better positioned to adapt than many countries in the Global South, but only if action is taken soon. That may not be a very cheery conclusion, but it is indeed the reality within which policy-makers must operate. Wealth, planning and expertise will matter and may even provide solutions in time, even if perhaps too little action is too late. As we move forward with this project and examine the realities in other regions of world, it will be worth examining the magnitude of impacts that we see in the Global South, especially in oceanic and coastal venues. Those securitized impacts, we fear, will be much more challenging than those faced in Global North.

References

Adger, Neil W., Irene Lorenzoni, and Karen L. O'Brien, eds. 2010. *Adapting to Climate Change: Thresholds, Values, Governance*. Cambridge: Cambridge University Press.

Adger, Neil W., Nigel W. Arnell, and Emma L. Tompkins. 2005. "Successful adaptation to climate change across scales." *Global Environmental Change* 15 (2): 77–86.

Amer, Muhammad, Tugrul U. Daim, and Antonie Jetter. 2013. "A review of scenario planning." *Futures* 46: 23–40.

Balzacq, Thierry. 2005. "The Three Faces of Securitization: Political Agency, Audience and Context." *European Journal of International Relations* 11 (2): 171–201.

Belton, Kristy A. 2017. *Statelessness in the Caribbean: The Paradox of Belonging in a Postnational World*. Philadelphia: University of Pennsylvania Press.

Berling, Trine Villumsen. 2011. "Science and Securitization: Objectivation, the Authority of the Speaker and Mobilization of Scientific Facts." *Security Dialogue* 45 (4–5): 385–397.

Bobrow, Davis B. 1996. "Complex Insecurity: Implications of a Sobering Metaphors." *International Studies Quarterly* 40 (4): 435–450. https://doi.org/10.2307/2600886.

Boyer, Mark A. 2013. "Global Climate Change and Local Action: Understanding the Connecticut Policy Trajectory." *International Studies Perspectives* 14: 79–107. doi: 10.1111/j.1528-3585.2012.00480.x.

Boyer, Mark A., Melanie Meinzer, and Andy Bilich. 2017. "The Climate Adaptation Imperative: Local Choices Targeting Global Problems?" *Local Environment* 22 (1): 67–85. DOI: 10.1080/13549839.2016.1160372.

Boyer, Mark A. and Neil Oculi. 2019. "Securitizing the Environment: Climate Change as First-Order Threat." In *Securitization Revisited: Contemporary Applications and Insights*, edited by Michael J. Butler, 116–142. London: Routledge.

Butler, Michael J., ed. 2019. *Securitization Revisited: Contemporary Applications and Insights.* London: Routledge.

Buzan, Barry, Ole Wæver, and Jaap de Wilde. 1998. *Security: A New Framework for Analysis*. Boulder: Lynne Reinner Publishers.

Carmin, JoAnn, Isabelle Anguelovski, and Debra Roberts. 2012. "Urban climate adaptation in the Global South planning in an emerging policy domain." *Journal of Planning Education and Research* 32 (1): 18–32.

Ciplet, David, J. Timmons Roberts, and Mizan Khan. 2013. "The Politics of International Climate Adaptation Funding: Justice and Divisions in the Greenhouse." *Global Environmental Politics* 13 (1): 49–68.

Ford, James D., and Lea Berrang-Ford, eds. 2011. *Climate change adaptation in developed nations: from theory to practice* (Vol. 42). Springer Science & Business Media.

Gilman, Nils, Doug Randall, and Peter Schwartz. 2011. "Climate Change and 'Security'." In *Oxford Handbook of Climate Change and Society*, edited by John S. Dryzek, Richard B. Norgaard, and David Schlosberg, 251–266. New York*:* Oxford University Press.

Gleditsch, Nils Petter. 1998. "Armed Conflict and the Environment: A Critique of the Literature." *Journal of Peace Research* 35: 381–400.

Gleditsch, Nils Petter. 2012. "Whither the Weather: Climate Change and Conflict." *Journal of Peace Research* 49: 3–9.

Hausfather, Zeke. 2018. "Explainer: How 'Shared Socioeconomic Pathways' explore future climate change." *CarbonBrief*, April 19. Accessed April 19, 2023. https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change/.

Homer-Dixon, Thomas F. 1994. "Environmental Scarcities and Violent Conflict: Evidence from Cases." *International Security* 19: 5–40.

Homer-Dixon, Thomas F. 1999. *Environment, Security and Violence*. Princeton: Princeton University Press.

Intergovernmental Panel on Climate Change (IPCC). 2021. *Sixth Assessment Report.* https://www.ipcc.ch/assessment-report/ar6/.

Kiprop, Victor. 2018. "How Many Islands Does Venice Have?" *WorldAtlas*, May 17. Accessed May 17, 2023. https://www.worldatlas.com/articles/how-many-islands-does-venice-have.html.

Lioutas, Anestis, and Vana Tsimopoulou. 2010. "A Systematic Approach of Greek Coastal Zone Management." Delft: Delft University of Technology.

Maramai, A., L. Graziani, and B. Brizuela. 2019. *Euro-Mediterranean Tsunami Catalogue (EMTC), version 2.0.* Istituto Nazionale di Geofisica e Vulcanologia (INGV). https://doi.org/10.13127/tsunami/emtc.2.0.

Marriner, Nick, Christophe Morhange, and Stefan Skrimshire. 2010. "Geoscience meets the four horsemen?: Tracking the rise of neocatastrophism." *Global and Planetary Change* 74 (1): 43–48.

Marriner, Nick, David Kaniewski, Christophe Morhange, Clément Flaux, Matthieu Giaime, Matteo Vacchi, and James Goff. 2017. "Tsunamis in the geological record: Making waves with a cautionary tale from the Mediterranean." *Science advances* 3 (10): e1700485.

Meierding, Emily. 2013. "Climate Change and Conflict: Avoiding Small Talk about the Weather." *International Studies Review* 15: 185–203.

Methmann, Chris. 2014. "Visualizing Climate-Refugees: Race, Vulnerability and Resilience in Global Liberal Politics." *International Political Sociology* 8: 416–435.

Pew Research Center. 2018. *Spring 2018 Global Attitudes Survey*. https://www.pewresearch.org/global/2019/02/10/climate-change-still-seen-as-the-top-global-threat-but-cyberattacks-a-rising-concern/.

Pew Research Center. 2020. *Summer 2020 Global Attitudes Survey*. https://www.pewresearch.org/fact-tank/2020/10/16/many-globally-are-as-concerned-about-climate-change-as-about-the-spread-of-infectious-diseases/ft_2020-10-16_climatechange_03/.

Pew Research Center. 2021. "In Response to Climate Change, Citizens in Advanced Economies Are Willing To Alter How They Live and Work." https://www.pewresearch.org/global/2021/09/14/in-response-to-climate-change-citizens-in-advanced-economies-are-willing-to-alter-how-they-live-and-work/.

Pielke Jr., Roger, Gwyn Prins, Steve Rayner, and Daniel Sarewitz. 2007. "Lifting the Taboo on Adaptation." *Nature* 445: 597–598.

Riahi, Keywan, Detlef P. van Vuuren, Elmar Kriegler, Jae Edmonds, Brian C. O'Neill, Shinichiro Fujimori, [...] and Massimo Tavoni. 2017. "The shared socioeconomic pathways and their energy, land use, and greenhouse gas emissions implications: an overview." *Global environmental change* 42: 153–168.

Trombetta, Maria Julia. 2008. "Environmental Security and Climate Change: Analyzing the Discourse." *Cambridge Review of International Affairs* 21 (4): 585–602.

Ullman, Richard. 1983. "Redefining Security." International *Security* 8: 129–53.

United Nations. 2022. "UN climate report: It's 'now or never' to limit global warming to 1.5 degrees." https://news.un.org/en/story/2022/04/1115452.

Yale Program on Climate Change Communication. 2022. *Global Warming's Six Americas*. https://climatecommunication.yale.edu/about/projects/global-warmings-six-americas/.