

## 14. Safe anchorage or all at sea?

### Comparing climate adaptation laws, plans, and policies for deeply uncertain port city futures<sup>1</sup>

---

*Alexander Stanley*

#### Introduction

Climate adaptation risk in ports and port cities has emerged as a prominent issue in recent years (Hanson et al., 2011; Hallegatte et al., 2013; Asariotis et al., 2017; Christodoulou et al., 2019; Fernandez-Perez et al., 2024). Many studies explore the impacts of extreme events, such as coastal flooding, heatwaves, and extreme rainfall, through various concepts of risk (Izaguirre et al., 2021; Verschuur et al., 2023a; Verschuur et al., 2023b). One widespread risk concept consists of four interdependent elements: hazard, exposure, vulnerability, and response (Ara Begum et al., 2023). Contingency is inherent in this concept due to the various ways and proportions in which the four elements may combine in any given risk. But these prominent risk studies raise a number of broader contextual questions. In particular, what deeper contingencies lie behind port city climate risks, and what are the implications for port city governance?

Previous port risk studies appear to overlook these deeper contingencies. Several studies produce 'rankings' of relative risk but differ significantly depending on the metric of interest (Hanson et al., 2011; Hallegatte et al., 2013; Izaguirre et al., 2021; Verschuur et al., 2023b). Many studies are global, large-n, and quantitative (Izaguirre et al., 2021; Verschuur et al., 2023a) and rely on sharp political boundaries for comparability (Hallegatte et al., 2013; Roberts et al., 2021). Yet this overlooks the highly contextual, qualitative, and blurred

---

<sup>1</sup> This research was funded by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) under Germany's Excellence Strategy – EXC 2037 'CLICCS – Climate, Climatic Change, and Society' – Project Number: 390683824.

nature of port city relationships in reality (Hein, 2019). Further, studies often focus on the hazard and exposure elements of risk, and ‘hard’ infrastructure responses, rather than on the vulnerability and response elements, and ‘soft’ infrastructure responses such as law and policy (Mutombo et al., 2020; Notteboom et al., 2022: 521). Readily changeable law and governance arrangements could, however, establish enabling conditions for effective climate adaptation (New et al., 2023: 2580–84). Moreover, fragmented port governance arrangements are ripe for reform (van Hooydonk, 2010; Notteboom et al., 2022).

For all these reasons, this chapter identifies three key contingencies in port city governance and explores ‘soft’ infrastructure responses to climate risk. It examines climate adaptation planning in two port city case studies, Hamburg and Cape Town, and adopts a comparative law approach, where enquiry is driven by partial functional equivalents and structural comparison centred on climate adaptation planning (Reitz, 1998; van Hoecke, 2015). Both these port cities exist in systems of multilevel governance, as Germany and South Africa both have new national framework laws for climate adaptation planning, which are compared here for the first time down to the city level. However, each differs significantly in port and city governance arrangements. Despite these differences, there are sufficient structural parallels for fruitful comparison. To that end, comparative legal analysis sheds light on alternative ways of regulating, and this can provide fertile ground for reform (van Hoecke, 2015). Thus, this chapter asks: How do emerging climate adaptation governance frameworks enable and constrain planning for climate risks in port cities? The aim is to illuminate how three critical contingencies in port city governance affect planning professionals’ capacities to plan for different climate futures.

## Contingencies in port city governance

Other chapters in this volume invoke various concepts of contingency in different contexts of urban future-making. This chapter investigates adaptation planning for port city climate futures. Contingency is considered in this context along three dimensions, reflecting three distinct meanings (see Pohl et al., this volume).

First, there is the (obsolete) sense of contiguousness or coming into contact. By definition, ports are spatially contingent places, contiguous with a water body and a hinterland. Ports are both a built structure and a continuing

use of land and waters over time (Taneja, 2013). Ports therefore connect to adjacent physical and human geography, including climates, cities, cultures, and economies (Hein, 2019). Urban and technological development adapt the water-port-hinterland interface, but its essential dynamism remains. On the adaptation front line, port city futures challenge existing *assumptions* about the various spaces interacting at this interface.

Second, there is the sense of conditionality and dependency. Because ports exist to serve societies, complex legal and political orders exist to regulate both port and society. These orders emerge historically, but they are liable to internal reconfigurations at any time. Within a prevailing order, law is an important tool for enabling and constraining human action in different fields. Law's functions are not only to command and control, or to express normative societal values, but also to shape the mental models of those it regulates (Hoff and Walsh, 2021). In other words, law not only expresses the societal intention to control ports and cities, and controls them as such, but law also shapes how planning professionals think. The laws prevailing at any time thereby *shape* the future. Law mediates between what a port city is and what it might become, how it develops, and who is responsible for its development.

Third, there is the aleatoric sense of contingency, relating to accident or chance. This sense is inherent in many climate risks. Law traditionally regulates these risks through disaster laws, which impose requirements both in preparation for and in response to extreme events. However, climate adaptation simultaneously requires adjustments to changing climate boundary conditions while also preparing for and responding to extreme weather events. At the same time, the changing boundary conditions are transforming the likelihood of these events. In a common analogy, the probability of an extreme weather event is compared to rolling dice. As the climate system warms, its properties change and the die is no longer a perfect cube, but rather irregularly deformed. This severely affects the ability to predict extremes and makes planning for climate risks deeply uncertain (Stainforth, 2023: chs. 4, 10). Such dynamic circumstances render rigid rules untenable and severely test traditionally reactive disaster laws. But law can still regulate through proactive, cross-sectoral, and iterative *procedural* rules 'overlaying' other laws (Ruhl and Salzmann, 2013: 1017–19). Here the question becomes: Has the law provided a contingency plan?

Each of these three key contingencies interacts with the others. For example, climate risks have particularly disruptive potential in terms of direct physical impacts on the water-port-hinterland interface, but also indirect impacts

on the legal and political order. This chapter focuses on the second key contingency, prevailing law and governance, because it is arguably easier to change the established legal and political order than it is to move a port or change the climate. The practical effects of these contingencies are explored in the circumstances of two case studies.

## Case studies

Hamburg is Germany's second-largest city, located in the northwest of the country on the River Elbe, flowing into the North Sea. Hamburg is host to one of Europe's biggest ports, owned under a 'landlord' model by the Hamburg Port Authority (HPA), a city-controlled public law body, and run by private terminal operators (Notteboom et al., 2022: 189, parts III–IV). The city owns a controlling majority in the main terminal operator company, the HHLA AG.<sup>2</sup> Under the landlord model, a port authority is typically responsible for land use and basic infrastructure planning, while separate (often private) terminal operators own and operate built infrastructure (Notteboom et al., 2022: 149–50).

Cape Town is South Africa's second-largest city and the capital of Western Cape Province, located in the southwest of the country, overlooking Table Bay. Cape Town hosts South Africa's second-busiest port, owned under a 'landlord' model by Transnet National Ports Authority (Pty) Ltd,<sup>3</sup> and operated by Transnet Port Terminals. Both are controlled by a national state-owned enterprise, Transnet SOC Ltd.

These two port cities will be used to navigate the rough seas of multilevel port city law and governance. As summarized in Table 1 below, the analysis proceeds from the international through to the local levels. Each level is discussed sequentially below.

---

2 Hamburger Hafen und Logistik Aktiengesellschaft.

3 National Ports Act 12 of 2005 ss 1–3 (NPA).

Table 1: Summary of laws and policies analysed in comparative case study analysis.

|                     |        | Hamburg                                                                                                                                                                                                                                                                                                       | Cape Town                                                                                                                                                              |
|---------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International level | Law    | UNCLOS<br>Paris Agreement/UAE Framework<br>EU regulations + directives                                                                                                                                                                                                                                        | UNCLOS<br>Paris Agreement/UAE Framework<br>AU Charter                                                                                                                  |
|                     | Policy | International standards (ISO)<br>World Association for Waterborne<br>Transport Infrastructure (PIANC)<br>Global Covenant of Mayors (GCoM)<br>Sendai Framework                                                                                                                                                 | International standards (ISO)<br>World Association for Waterborne<br>Transport Infrastructure (PIANC)<br>Global Covenant of Mayors (GCoM)<br>Sendai Framework          |
| National level      | Law    | Grundgesetz (GG)<br>Federal Climate Adap-<br>tation Act 2024 (KAnG)                                                                                                                                                                                                                                           | Constitution of South Africa<br>Climate Change Act 2024 (CCA)                                                                                                          |
|                     | Policy | 2009 Critical Infrastructure<br>Strategy (KRITIS-Strategie)<br>2021 Federal Climate Im-<br>pact and Risk Analysis<br>2022 German Strategy for Streng-<br>thening Resilience to Disasters<br>2024 German Climate Adap-<br>tation Strategy (federal PCAS)<br>2024 National Strategy<br>for Sea and Inland Ports | 2011 National Climate Change<br>Response White Paper (NCCRP)<br>2020 National Climate Change<br>Adaptation Strategy (NCCAS)<br>2022 Port Framework<br>Development Plan |
| Subnat. level       | Law    | Hamburg Climate Protec-<br>tion Law (HmbKliSchG)                                                                                                                                                                                                                                                              | (None)                                                                                                                                                                 |
|                     | Policy | 2025 Hamburg Climate Adap-<br>tation Strategy (state PCAS)                                                                                                                                                                                                                                                    | 2023 Western Cape Climate Change<br>Response Strategy (WCCCRS)                                                                                                         |
| Local level         | Policy | Local Adaptation<br>Concepts (pending)                                                                                                                                                                                                                                                                        | 2019 Climate Change Hazard, Vul-<br>nerability and Risk Assessment<br>2021 Climate Change Strategy<br>2021 Climate Change<br>Action Plan (CCAP)                        |

Source: Author.

## International level

Both Germany and South Africa are party to the United Nations Convention on the Law of the Sea.<sup>4</sup> UNCLOS establishes a hierarchy of maritime zones subject to varying national influence, including the ‘territorial sea’ extending 12 nautical miles from the coast.<sup>5</sup> For the purpose of measuring the territorial sea, ports and harbours are part of the coast.<sup>6</sup> In a landmark Advisory Opinion, the International Tribunal for the Law of the Sea said UNCLOS parties must protect, preserve, and restore (if degraded) the ‘marine environment’,<sup>7</sup> which extends beyond maritime zones to coasts and estuaries.<sup>8</sup> Parties must also cooperate on science and information exchange about adaptation measures.<sup>9</sup> ITLOS also said adaptation under the Paris Agreement is ‘compatible’ with adaptation under UNCLOS.<sup>10</sup>

Germany and South Africa are both party to the Paris Agreement as well.<sup>11</sup> It establishes a global goal on adaptation to enhance adaptive capacity, strengthen resilience, and reduce vulnerability to climate change,<sup>12</sup> and it requires parties to engage in adaptation planning.<sup>13</sup> These obligations are further elaborated in the United Arab Emirates (UAE) Framework for Global Climate Resilience.<sup>14</sup> The UAE Framework consists of a four-step iterative

---

4 United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 397 (UNCLOS).

5 Ibid., art. 3.

6 Ibid., art. 11.

7 Ibid., art. 192.

8 ‘Request for an Advisory Opinion submitted by the Commission of Small Island States on Climate Change and International Law’ (Advisory Opinion, 21 May 2024) Case No. 31 (ITLOS Advisory Opinion) paras. 168, 441(4)(b).

9 Ibid., paras. 321, 441(3)(j), (4)(a).

10 Ibid., para. 394.

11 Paris Agreement to the United Nations Framework Convention on Climate Change (adopted 12 December 2015, entered into force 4 November 2016) 2316 UNTS 14 (Paris Agreement).

12 Ibid., art. 7(1).

13 Ibid., art. 7(9).

14 ‘Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) on its fifth session’ (Dubai, 30 November–13 December 2023) (15 March 2024) UN Doc FCCC/PA/CMA/2023/16/Add.1, Decision 2/CMA.5; ‘Report of the CMA on its fourth session’ (Sharm el-Sheikh, 6–20 November 2022) (17 March 2023) UN Doc FCCC/PA/CMA/2022/10/Add.1, Decision 3/CMA.4, paras. 8–10.

adaptive cycle: (1) impact, vulnerability, and risk assessment; (2) planning; (3) implementation; and (4) monitoring, evaluation, and learning.<sup>15</sup> It also anticipates adaptation planning across sectoral 'themes' and 'cross-cutting' considerations.<sup>16</sup> These are the overarching climate adaptation obligations at international law.

More specific obligations arise under other international laws. Germany and South Africa are members of the International Organization for Standardization (ISO). The ISO develops technical standards at the international level that are relevant in professional planning across scales.<sup>17</sup> National laws often transform ISO standards into binding domestic law. German and South African ports are also members of the World Association for Waterborne Transport Infrastructure (PIANC), which issues non-binding technical guidance on climate adaptation planning in ports.<sup>18</sup>

In addition, Germany and South Africa are signatories to the Sendai Framework for Disaster Risk Reduction.<sup>19</sup> This is a non-binding political agreement, which nevertheless aims to integrate and coordinate a risk-based approach to disaster planning and governance across scales. Another 'grey area' arises from both Hamburg's and Cape Town's membership of the Global Covenant of Mayors (GCoM). This is a transnational network operating directly between member cities. Although membership is voluntary, GCoM establishes a 'binding'<sup>20</sup> common reporting framework, including adaptation planning.<sup>21</sup> Member cities must conduct a climate risk and vulnerability assessment

15 'Report of the CMA on its fourth session' (n 63) para. 10(a).

16 *Ibid.*, subparas. 10(b)–(c).

17 E.g. ISO Standard Nos. 9001:2015 (Quality management systems – Requirements); 14001:2015 (Environmental management systems – Requirements); 31000:2018 (Risk Management – Guidelines); 14090:2019 (Adaptation to climate change – Principles, requirements and guidelines).

18 PIANC, 'Climate Change Adaptation Planning for Ports and Inland Waterways', 2020 (WG Report No 178); PIANC, 'Managing Climate Change Uncertainties in Selecting, Designing and Evaluating Options for Resilient Navigation Infrastructure', 20 April 2022 (Technical Note No. 1).

19 'Sendai Framework for Disaster Risk Reduction 2015–2030', Third United Nations World Conference on Disaster Risk Reduction (Sendai 14–18 March 2015) UN Doc A/CONF.224/CRP1.

20 GCoM, 'Global Covenant of Mayors Common Reporting Framework', April 2023 (Version 7.0), p. 8.

21 *Ibid.*, pp. 17–19, 26–28.

spanning at least the city's boundaries within 2 years of joining GCoM.<sup>22</sup> Cities must then prepare adaptation plans, including goals with baselines and targets,<sup>23</sup> within 3 years of joining and update these plans every 2 years.<sup>24</sup>

Finally, Germany and South Africa are Member States in supranational political and economic unions, which further complexify their respective legal orders.

Germany is a member of the European Union (EU). In the EU, there are two main types of legislation: regulations and directives. EU regulations directly bind Member States, whereas EU directives impose binding results, but Member States have latitude to implement them via appropriate national instruments.<sup>25</sup> The EU's Climate Governance Regulation<sup>26</sup> requires Member States to report every 2 years on adaptation goals, plans, and strategies as part of integrated climate progress reports.<sup>27</sup> However, there are few EU laws that apply specifically to climate adaptation in ports. One EU regulation requires consideration of climate adaptation as part of integrated transport planning.<sup>28</sup> An EU directive requires national risk assessments and critical infrastructure planning.<sup>29</sup> Meanwhile, several other EU directives establish integrated legal frameworks regulating the interface between land and territorial waters, and thus apply to ports,<sup>30</sup> but these directives adopt inconsistent spatial definitions. There is no legally binding regime for integrated port planning at the EU level.

---

22 Ibid., pp. 8, 17.

23 Ibid., p. 19.

24 Ibid., p. 28.

25 Consolidated version of the Treaty on the Functioning of the European Union [2012] OJ C326/47 art. 288.

26 Council Regulation (EU) 2018/1999 of 11 December 2018 on the Governance of the Energy Union and Climate Action [2023] OJ L328/1.

27 Ibid., arts. 4(a)(1)(iii), 17(2)(d), 19(1) and pt. I annex VIII.

28 Council Regulation (EU) 2024/1679 on Union guidelines for the development of the trans-European transport network amending Regulations (EU) 2021/1153 and (EU) No. 913/2010 and repealing Regulation (EU) No. 1315/2013 [2024] OJ L2024/1679/1 arts. 23(6)(c), 28(f), 45(j), 46, 54(3)(j).

29 Council Directive 2022/2557 of 14 December 2022 on the resilience of critical entities [2022] OJ L333/164.

30 E.g. Council Directive 2000/60/EC of 23 October 2000 establishing a framework for Community action in the field of water policy [2014] OJ L327/1; Council Directive 2007/60/EC of 23 October 2007 on the assessment and management of flood risks [2007] OJ L288/27.

South Africa is a member of the African Union (AU), an emergent legal order. The AU has an as-yet-inoperative charter for African maritime transport,<sup>31</sup> which South Africa has ratified. This would require state parties to make national port authorities 'sustainable',<sup>32</sup> ensure port efficiency,<sup>33</sup> and encourage port privatizations.<sup>34</sup> It would also require interstate cooperation on marine transport operations,<sup>35</sup> infrastructure,<sup>36</sup> legislation,<sup>37</sup> and marine disaster preparedness.<sup>38</sup> Implementation would be via relatively weak state 'plans of action'.<sup>39</sup> In addition, the AU has a 'Blue Economy' strategy, emphasizing local, robust, and resilient adaptation.<sup>40</sup> However, none of these establish integrated port adaptation planning.

## National level

Germany and South Africa each have a written constitution. These national constitutional orders were recently supplemented by specific climate adaptation laws.

Germany is a federal republic consisting of two levels of government: the federal government (*Bund*) and subnational state governments (*Länder*). Municipal governments (*Kommune*, *Gemeinde*, *Kreise*) are regional subunits of states. Hamburg has dual status as a federal city-state but has no constitutionally recognized subunits (Gern and Brüning, 2019).

The German Basic Law (GG) establishes fundamental rights to life, health, and future generations' essential conditions for life.<sup>41</sup> A landmark decision

31 Revised African Maritime Transport Charter (adopted 26 July 2010, not yet in force) (2010) art. 49(1).

32 Ibid., art. 7(1).

33 Ibid., art. 29(1).

34 Ibid., art. 22(2)(a).

35 Ibid., art. 12.

36 Ibid., arts. 20, 34.

37 Ibid., art. 23.

38 Ibid., art. 28.

39 Ibid., art. 41.

40 African Union Inter-African Bureau for Animal Resources (AU-IBAR), Africa Blue Economy Strategy, October 2019; AU-IBAR, 'Africa Blue Economy Strategy: Implementation Plan 2021–2025', 2020, p. 27.

41 Grundgesetz (GG), arts. 2(2), 20a.

of the Federal Constitutional Court said these rights require federal government adaptation action.<sup>42</sup> Yet any federal action is subject to the GG, which distributes lawmaking powers between federal, state, and municipal governments. Municipal powers are limited to ‘local affairs’,<sup>43</sup> whereas state and federal powers govern over wider issues. Alongside exclusive federal powers,<sup>44</sup> there are concurrent federal-state powers, including spatial planning,<sup>45</sup> fishing and coastal protection,<sup>46</sup> and shipping and navigation.<sup>47</sup> These concurrent powers take two forms: (1) federal pre-emptive or overruling powers, where federal laws prevent any further state law in the field,<sup>48</sup> and (2) divergent federal-state powers, where state laws may deviate from federal laws and, in the case of any conflict, the most recent law prevails.<sup>49</sup> Spatial planning is one such divergent power.<sup>50</sup> In other fields not mentioned in the GG, states retain exclusive lawmaking power.<sup>51</sup> This includes seaports and territorial seas, though the federal level controls inland waterways, including the River Elbe.<sup>52</sup>

The federal government has prepared several plans relevant to port adaptation. The 2024 German Climate Adaptation Strategy is discussed further below. Most relevantly, the 2024 National Strategy for Sea and Inland Ports<sup>53</sup> calls for ‘regular’ risk analyses by port authorities.<sup>54</sup> The strategic goal of climate-resilient ports contemplates individual port adaptation strategies, based on federal climate risk assessments.<sup>55</sup> Elsewhere, the country’s dated critical in-

---

42 Bundesverfassungsgericht (BVerfG), Beschluss des Ersten Senats vom 24 März 2021, 1 BvR 2656/18, Rn. 1–270, paras. 144, 150, 177.

43 GG art. 28(2).

44 Ibid., art. 73(1).

45 Ibid., art. 74(1)(31).

46 Ibid., art. 74(1)(17).

47 Ibid., art. 74(1)(21).

48 Ibid., art. 74(1).

49 Ibid., art. 72(3).

50 Ibid.

51 Ibid., art. 70(1).

52 Ibid., art. 89.

53 Federal Ministry for Digital and Transport (BMDV), National Strategy for Sea and Inland Ports, February 2024.

54 Ibid., p. 16.

55 Ibid., p. 62.

infrastructure strategy<sup>56</sup> and recent resilience strategy<sup>57</sup> provide cross-cutting policies for critical infrastructure protection. The latter reflects a risk-based, all-hazard approach including state and non-state actors.<sup>58</sup> But beyond these policies, there is not (yet) any integrated national legal framework for critical infrastructure in Germany. This follows a recent failed draft law<sup>59</sup> to establish such a national framework and implement both the Sendai Framework and relevant EU directives. In the meantime, disaster management remains both a federal and a state responsibility, also requiring local disaster management plans.<sup>60</sup>

Meanwhile, South Africa is a parliamentary republic consisting of three spheres of government: national, provincial, and municipal.<sup>61</sup> Municipal governments are subcategorized as metropolitan, district, or local.<sup>62</sup> Cape Town is a metropolitan municipality (Category A).

South Africa's Constitution imposes a unique duty of intergovernmental cooperation.<sup>63</sup> All organs of the state must uphold the Bill of Rights, including environmental rights imposing a constitutional duty to respond to climate change (Fuo et al., 2022: 45). National and provincial governments have concurrent legislative competence over the environment, regional planning, and disaster management.<sup>64</sup> However, whereas provinces are responsible for disaster planning,<sup>65</sup> metropolitan municipalities are responsible for managing declared local disasters.<sup>66</sup> Municipalities are self-governing, with broad powers<sup>67</sup> subject to any national and provincial legislation to the contrary.<sup>68</sup> Municipalities are ordinarily responsible for coastal infrastructure and city plan-

56 Bundesministerium des Innern (BMI), Nationale Strategie zum Schutz Kritischer Infrastrukturen (KRITIS-Strategie), 17 June 2009.

57 Federal Ministry of the Interior (BMI), German Strategy for Strengthening Resilience to Disasters, 31 July 2022.

58 Ibid., pp. 62–63.

59 KRITIS-Dachgesetz.

60 GG arts. 35, 73(1)1; Bundes-Zivilschutz-und-Katastrophenhilfegesetz; Hamburgisches Katastrophenschutzgesetz (HmbKatSG).

61 Constitution of the Republic of South Africa 1996 s 40.

62 Ibid., s 155(1)(a)–(c).

63 Ibid., chap. 3.

64 Constitution s 104(1), sch. 4A.

65 Disaster Management Act 57 of 2002 (DMA) ss 28–41.

66 Ibid., ss 42–55.

67 Constitution s 156; schs. 4B, 5B.

68 Ibid., s 151(3).

ning, but not shipping.<sup>69</sup> Ports are a special case: Gazetted port areas are removed from city boundaries,<sup>70</sup> and the Cape Town port area includes the modern harbour and much of Table Bay.<sup>71</sup> Ports are also specifically excluded from coastal management legislation.<sup>72</sup> Instead, one national authority is responsible for all ports, including land use planning, with no detailed planning or monitoring responsibilities.<sup>73</sup> Port plans mention short- (10 year), medium- (10–30 year), and long-term (>30 year) planning horizons but do not mention climate change.<sup>74</sup> A critical infrastructure law also applies to ports,<sup>75</sup> but this legislation is security-based and does not regulate infrastructure planning.

Within these constitutional arrangements, new national framework laws for climate adaptation planning were recently enacted in Germany and South Africa.

In Germany, the Federal Climate Adaptation Act (KAnG)<sup>76</sup> aims to reduce climate impacts, preserve socioecological resilience, and reduce social inequality.<sup>77</sup> The KAnG requires all German public authorities to consider its aims in integrated, multisectoral planning.<sup>78</sup> It also imposes adaptation planning procedures on all levels of governments, at each government level, as described below. Climate mitigation is regulated under a separate Climate Protection Act.<sup>79</sup>

The KAnG envisages a federally coordinated approach. Federal climate risk analyses, including middle- and long-term climate scenarios, must be prepared every 8 years. This analysis must identify especially vulnerable regions and consider how individual risks and action areas interact, with this data publicly available.<sup>80</sup> The risk analysis informs preparation of a 'precautionary

---

69 Ibid., sch. 4B.

70 NPA s 10(3).

71 National Government Gazette No. 32873, 22 January 2010, pp. 28–29.

72 National Environmental Management: Integrated Coastal Management Act 24 of 2008 ss 1, 6(4), 7(2)(a), 13(5), 18(4), 56(5).

73 NPA ss 10(1), 11, 16, 68–69.

74 Transnet National Ports Authority, 'Port Development Framework Plans 2022 Update' (2022) chap 1.2.

75 Critical Infrastructure Protection Act 8 of 2019.

76 Bundes-Klimaanpassungsgesetz (KAnG) vom 22 Dezember 2023 (BGBl 2023 I Nr 393).

77 Ibid., §1.

78 Ibid., §8.

79 Bundes-Klimaschutzgesetz vom 12 Dezember 2019 (BGBl I S 2513), geändert durch Artikel 1 des Gesetzes vom 15 Juli 2024 (BGBl 2024 I Nr 235).

80 KAnG §4.

climate adaptation strategy' (PCAS), to be updated every 4 years.<sup>81</sup> A federal PCAS must identify 'measurable' goals, indicators, and policy measures across seven clusters, including – most relevantly – infrastructure, water, the economy, and regional planning and civil protection.<sup>82</sup> Diverse stakeholders must be consulted in determining these goals, indicators, and measures.<sup>83</sup> A federal PCAS should identify monitoring and evaluation mechanisms, as well as recommend actions to be taken by the states.<sup>84</sup> Federal and state governments must cooperate towards reaching the goals of any PCAS.<sup>85</sup>

The climate adaptation planning envisaged by the KAnG is emerging. The latest federal climate risk assessment was in 2021.<sup>86</sup> In 2024, the first federal PCAS was released.<sup>87</sup> Across seven clusters, the federal PCAS sets out 33 goals and 45 sub-goals, together with indicators and implementation measures. The 'Infrastructure' cluster identifies a goal to optimize transport and logistics on federal waterways during low flows by 2030–40.<sup>88</sup> This includes a sub-goal to advance federal waterway adaptation planning guidelines,<sup>89</sup> and implementation actions relevant to Hamburg's port.<sup>90</sup> Meanwhile, 'Water' cluster goals include strengthening water infrastructure resilience,<sup>91</sup> reducing rain damage,<sup>92</sup> and developing local risk maps.<sup>93</sup> The 'Economy' cluster aims to mainstream climate risks in company decisions<sup>94</sup> by developing national standards

---

81 Ibid., §3(1).

82 Ibid., §3(2).

83 Ibid., §3(4).

84 Ibid., §3(3).

85 Ibid., §9(2).

86 Umweltbundesamt, Klimawirkungs- und Risikoanalyse für Deutschland 2021, Juni 2021.

87 Bundesministerium für Umwelt, Naturschutz, Nukleare Sicherheit und Verbraucherschutz, Deutsche Anpassungsstrategie an den Klimawandel 2024, 11 Dezember 2024.

88 Ibid., I-1.

89 Ibid., I-1.7.

90 Ibid., Annexure 2 – Adaptation Action Plan IV, I-W.14–15, 19, pp. 288–90.

91 Ibid., Wa-2.

92 Ibid., Wa-2.II.

93 Ibid., Wa-2.6 and Wa-2.7.

94 Ibid., Wi-1 and Wi-2.

for adaptation consulting.<sup>95</sup> A cross-cutting goal aims to develop a national adaptation framework for World Heritage areas by 2030.<sup>96</sup>

In South Africa, the new Climate Change Act,<sup>97</sup> when fully commenced,<sup>98</sup> will regulate mitigation and adaptation under one national law. The CCA aims for an 'effective' climate change response aligned with national development goals,<sup>99</sup> but effectiveness is not defined.<sup>100</sup> CCA principles such as integration<sup>101</sup> and best-available science<sup>102</sup> indicate the legislature's intentions,<sup>103</sup> but in contrast, the global goal on adaptation is adopted verbatim, using defined terms.<sup>104</sup> In substance, the CCA requires integrated adaptation planning by municipal,<sup>105</sup> provincial,<sup>106</sup> and national<sup>107</sup> spheres of government. All spheres must consider climate risks across governance and decision-making,<sup>108</sup> as well as regularly consult other spheres<sup>109</sup> and the public.<sup>110</sup>

The CCA envisages a nationally coordinated, cooperative approach. The national sphere must determine: (1) national adaptation objectives, (2) indicators for measuring progress, and (3) a deadline for incorporating objectives into all relevant national plans.<sup>111</sup> The national sphere must also develop adaptation scenarios over the short, medium, and long term.<sup>112</sup> None of these time spans are defined. The scenarios must: (1) be based on best available science, (2) include monitoring and early warning systems, (3) consider potential climate im-

---

95 Ibid., Wi-o.3.

96 Ibid., Ü-4. Hamburg's port is bookended by the Wadden Sea and Speicherstadt World Heritage sites.

97 Climate Change Act 22 of 2024 (CCA).

98 National Government Gazette No. 52319, 17 March 2025, pp. 3–4.

99 CCA Aim.

100 Cf. *ibid.*, Recitals para. 6; s 3(i).

101 Ibid., Recitals paras 3(c), 7; ss 2(a), 3(a), (e), (k).

102 Ibid., (h).

103 Ibid., s 3.

104 Ibid., ss 1,2(b).

105 Ibid., ss 7, 9, chap. 3.

106 Ibid., ss 7–8.

107 Ibid., ss 10–11, 15, chap. 4.

108 Ibid., s 7(1).

109 Ibid., s 31.

110 Ibid., s 32.

111 Ibid., s 19.

112 Ibid., s 20(1).

pacts, and (4) contain available adaptation options.<sup>113</sup> National objectives and scenarios must be updated 'periodically'.<sup>114</sup> Various stakeholders, including the Presidential Climate Commission<sup>115</sup> and interest groups,<sup>116</sup> may advise on the national adaptation response.

Adaptation must be coordinated by a National Adaptation Strategy and Plan (NASP).<sup>117</sup> NASPs are a primary instrument for implementing the CCA and integrate adaptation measures by all government and non-government actors, as relevant.<sup>118</sup> These plans must include vulnerability assessments at various scales and incorporate an implementation plan based on the national objectives and indicators.<sup>119</sup> NASPs must be updated every 5 years, considering: (1) monitoring and evaluation results, (2) technological advances, (3) best available science, and (4) international law.<sup>120</sup> Once any NASP is finalized, sectoral plans must be developed, including for the state-owned port sector,<sup>121</sup> and updated every 5 years.<sup>122</sup>

The CCA sits atop various existing plans and policies. The National Climate Change Response White Paper (NCCRP)<sup>123</sup> called for integration of climate change across all government spheres<sup>124</sup> and continual assessment of harbours and coasts.<sup>125</sup> The NCCRP established three planning horizons: short-term (5 years); medium-term (20 years); and long-term (~40 years). Then came the National Climate Change Adaptation Strategy (NCCAS).<sup>126</sup> It sets out 4 strategic objectives, 12 guiding principles, and 9 strategic interventions linked to 12 strategic outcomes.<sup>127</sup> None are specific to the port sector, nor to relevant

---

113 Ibid., s 20(2).

114 Ibid., ss 19(2), 20(3).

115 Ibid., s 10.

116 Ibid., ss 7(2), 9(4), 10, 11(3), 12(2).

117 Ibid., s 21(1).

118 Ibid., s 21(4).

119 Ibid., s 21(5).

120 Ibid., s 21(3).

121 Ibid., sch. 2.

122 Ibid., s 22.

123 Republic of South Africa Department of Environmental Affairs, 'National Climate Change Response White Paper', 2011.

124 Ibid., pp. 13–15.

125 Ibid., p. 23.

126 Republic of South Africa Department of Forestry, Fisheries and the Environment, 'National Climate Change Adaptation Strategy', 2019.

127 Ibid., pp. 21–24.

state-owned authorities. The NCCAS adopted different planning horizons: short-term (1–3 years), medium-term (4–10 years) and long-term (>10 years). Finally, while other national plans have called for sectoral adaptation strategies since at least 2011,<sup>128</sup> there are still no port adaptation plans.

### Subnational level

The Constitution of the ‘Free and Hanseatic’ City of Hamburg recites how, as a world port city, Hamburg has a special responsibility, bestowed by its history and geography, to the German people.<sup>129</sup> Today this responsibility is outsourced to the HPA and private terminal operators, under city control.

As a city-state, Hamburg has a special dual status, which gives it broad lawmaking power. One law it has enacted is the Climate Protection Law (HmbKliSchG);<sup>130</sup> though mitigation-focused, it also imposes the obligation for all city planning and decision-making processes, including those of the HPA, to consider adaptation and cooperate on adaptation goals.<sup>131</sup> Hamburg’s first standalone climate adaptation strategy<sup>132</sup> implements both the local HmbKliSchG<sup>133</sup> and the federal KAnG.<sup>134</sup>

The federal KAnG requires that states prepare climate risk analyses at appropriate scales.<sup>135</sup> The analyses are used to develop a state’s precautionary climate adaptation strategy. A state PCAS must adopt an interdisciplinary, integrated approach and include public participation.<sup>136</sup> State planning must involve: (1) data collection, (2) climate risk analysis, (3) identification of overarching strategies, (4) development of implementation measures and indicators,

128 Republic of South Africa Department of Environmental Affairs, ‘National Strategy for Sustainable Development and Action Plan’, 2011, pp. 33–34; Republic of South Africa National Planning Commission, ‘National Development Plan 2030: Our Future – Make It Work’, 2011, pp. 53–54.

129 Verfassung der Freien und Hansestadt Hamburg vom 6. Juni 1952 (HmbBL I 100-a), zuletzt geändert durch Gesetz vom 5. März 2025 (HmbGVBl. S. 264) Präambel.

130 Hamburgisches Klimaschutzgesetz (HmbKliSchG) vom 20 Februar 2020 (HmbGVBl. S. 148).

131 Ibid., §§1–2, 5.

132 LT-Drs 22/18165, Strategie zur Anpassung Hamburgs an den Klimawandel, 25.02.2025 (State PCAS).

133 HmbKliSchG §5(1).

134 KAnG §10.

135 Ibid., §§2, 10.

136 Ibid., §10(1)–(2), (4).

and (5) monitoring and reporting mechanisms.<sup>137</sup> A state PCAS must be updated every 5 years,<sup>138</sup> and states must also send reports on their local and state adaptation measures to the federal level, consistent with the EU Climate Governance Regulation.<sup>139</sup>

Hamburg's first state PCAS follows the KAnG procedure. It relies on various climate risk analyses and emphasizes the continual improvement of this data.<sup>140</sup> To that end, Hamburg is developing a new climate information system, including real-time monitoring, across eight fields of action.<sup>141</sup> The state PCAS establishes overarching policies across 11 fields of action, including transport infrastructure, utilities, and disaster protection. On transport, the state PCAS aims to safeguard transport infrastructure during extreme events,<sup>142</sup> identifying two highly relevant port climate risks: storm flood impacts on port railways, and sedimentation causing loss of harbour water depth.<sup>143</sup> The state PCAS proposes various implementation measures, with the HPA responsible for the port railways.<sup>144</sup> On utilities, the state PCAS calls for cooperation to ensure the port's commercial water supplies.<sup>145</sup> On flood protection, the state PCAS acknowledges the many private interests in port land located in front of the dyke line and new laws proposed to reform private flood protection.<sup>146</sup> Finally, on disaster protection, the state PCAS says it is essential to maintain critical infrastructure functionality.<sup>147</sup> Ahead of the critical infrastructure regulations discussed above, the state PCAS calls for private operators to adopt a cross-cutting and all-hazard approach, focused on physical protection.<sup>148</sup>

In contrast, the provincial sphere of government in South Africa is relatively weak compared to national and local spheres (Fuo et al., 2022: 66). The national CCA requires provinces to prepare 'needs and response assessments',

---

137 Ibid., §10(3).

138 Ibid., §10(6).

139 Ibid., §11. See also (n 75).

140 State PCAS (n 181) pp. 21, 23, 27–28.

141 Ibid., pp. 18–19.

142 Ibid., p. 47.

143 Ibid., pp. 47, 50–51.

144 Ibid., p. 50.

145 Ibid., p. 65.

146 Ibid., pp. 69–70.

147 Ibid., pp. 61–62, 74–75.

148 Ibid., p. 61.

with integrated implementation plans, every 5 years.<sup>149</sup> The assessments must: (1) identify response options, (2) analyse relevant regional or local climate risks, (3) identify and spatially map regional or local risks, (4) be based on best available science, and (5) identify measures and mechanisms for implementation.<sup>150</sup> Meanwhile, the implementation plans must: (1) be informed by the needs and response assessment, (2) include measures commensurate with constitutional competencies, and (3) comply with any national requirements or technical standards.<sup>151</sup> These provincial assessments and plans must be integrated with other relevant planning regimes.<sup>152</sup>

Western Cape Province has previously prepared climate risk analyses and a climate policy.<sup>153</sup> Through disaster risk planning and coastal risk assessment,<sup>154</sup> the policy aims to reduce climate risks while increasing resilience.<sup>155</sup> The provincial policy anticipates intergovernmental climate forums,<sup>156</sup> biennial monitoring reports, and harmonization with other relevant reporting protocols,<sup>157</sup> to be established by the national CCA.

## Local level

At local levels, the KAnG requires preparation of ‘climate adaptation concepts’.<sup>158</sup> These concepts follow a similar design pattern to state PCASs, based on localized climate risk data.<sup>159</sup> Hamburg has no constitutionally recognized subunits, so local administrations (*Bezirke*) are not obliged to prepare concepts, yet Hamburg’s state PCAS indicates all are doing so.<sup>160</sup>

The HPA is a public law body under city-state control. As such, it must co-operate towards the goals of the HmbKlimSchG and the state PCAS. Hamburg

149 CCA s 17(1).

150 Ibid., s 17(2).

151 Ibid., s 17(3).

152 Ibid., ss 17(4)–(5).

153 Western Cape Government Department of Environmental Affairs and Development Planning, ‘Western Cape Climate Change Response Strategy: Vision 2050’ (WCCCRS), First revision, March 2023.

154 Ibid., p. 18.

155 Ibid., pp. 16–19.

156 Ibid., pp. 26–27.

157 Ibid., p. 30.

158 KAnG §12(1).

159 Ibid., §12(2)–(6).

160 State PCAS (n 181) pp. 24–25.

has a Port Development Plan 2040, with limited adaptation measures, and the HPA issues biennial sustainability reports. A previous case study even analysed climate adaptation implementation in the port (Koppe et al., 2012). Despite all this, the HPA has no port adaptation plan.

Meanwhile, in the South African system, Cape Town is a powerful, Category A metropolitan municipality. Nevertheless, the CCA imposes the same requirements on municipalities as it does in the provincial sphere to prepare needs and response assessments and integrated implementation plans.<sup>161</sup>

Cape Town conducted a comprehensive climate risk analysis in 2019.<sup>162</sup> The analysis notes there are few studies about climate impacts in South African harbours, but Cape Town's harbour was excluded from its own analysis because of the gazetted port area.<sup>163</sup> The city also has a climate change strategy<sup>164</sup> and a more specific Climate Change Action Plan (CCAP).<sup>165</sup> The CCAP calls for comprehensive risk mapping and more cooperation.<sup>166</sup> It aims to mainstream climate adaptation into city plans<sup>167</sup> and uses multiple planning horizons: existing, short-term (1–2 years), medium-term (3–5 years) and long-term (>5 years).<sup>168</sup> These current adaptation plans could readily be adapted to meet the new CCA requirements for assessments and implementation plans.

However, the CCA also requires that municipal adaptation plans be integrated with other relevant planning regimes.<sup>169</sup> This will be more difficult, with no national port adaptation plan and current city plans pointing to key gaps. For instance, the CCAP identifies climate risks to coastal infrastructure,<sup>170</sup> yet does not mention cooperation on harbour development with Transnet.<sup>171</sup> In contrast, the city's Integrated Development Plan commits to intergovernmental cooperation on port connectivity and suggests the city monitor and assess

---

<sup>161</sup> CCA s 17(1).

<sup>162</sup> OneWorld Sustainable Investment, 'Elaboration of a "Climate Change Hazard, Vulnerability and Risk Assessment" Study to the benefit of the City of Cape Town', 2019.

<sup>163</sup> *Ibid.*, p. 27.

<sup>164</sup> City of Cape Town, 'Climate Change Strategy', 27 May 2021.

<sup>165</sup> City of Cape Town, 'Climate Change Action Plan', 28 September 2021 (CCAP).

<sup>166</sup> *Ibid.*, pp. 45–51.

<sup>167</sup> *Ibid.*, pp. 93–97.

<sup>168</sup> *Ibid.*, p. 134.

<sup>169</sup> *Ibid.*, ss 17(4)–(5).

<sup>170</sup> CCAP (n 214), pp. 17–18.

<sup>171</sup> Cf. cooperation on rail infrastructure: *ibid.*, p. 78.

infrastructure risk.<sup>172</sup> Meanwhile, the city's Disaster Risk Management Plan refers to multiple climate hazards<sup>173</sup> and includes a specific city contingency plan for ship incidents.<sup>174</sup>

### Three contingencies enabling and constraining port city adaptation planning

This section considers the question: How do emerging climate adaptation governance frameworks enable and constrain planning for climate risks in port cities? The discussion proceeds by returning to the three senses of contingency introduced earlier and considering how these contingencies affect planning professionals, at the city level, confronted with uncertain climate futures.

#### Spatial contingency

As a threshold proposition, governance frameworks constrain futures through their underlying assumptions and boundary conditions. These are often exposed to productive critique whenever misalignments are observed between different spatial borders, as often occurs in governance studies (Tocco et al., 2024). This is also observed in both case studies. In Hamburg, the port and territorial sea are state responsibilities, yet the River Elbe is a federal waterway. Meanwhile, in Cape Town, national laws arbitrarily remove the harbour from municipal planning controls. Other misalignments are observed more abstractly. Since 1994, UNCLOS has determined that territorial seas belong to coastal states, building jetties of legal principle that extend the prevailing system of international law, grounded in territorial sovereignty, into the categorically different marine realm. Similarly, the GCoM network between cities lies outside international law, where traditionally only nation-states interact. The systemic implications are profound. Such spatial misalignments invite planning professionals to imagine how entire systems could be different.

---

172 City of Cape Town, 'Five-Year Integrated Development Plan: July 2022–June 2027', 2022, pp. 54, 100.

173 City of Cape Town, 'Municipal Disaster Risk Management Plan', July 2015, p. 38.

174 Ibid., p. 8.

## Conditionalities and dependencies within prevailing legal and political orders

Now looking *within* the prevailing governance systems, the legal hierarchy substantially determines planning professionals' official capacities to shape the future. Once again, Table 1 summarizes the legal and policy hierarchies compared earlier and now discussed here.

In this comparison, it appears Hamburg sits within a generally more integrated legal order than Cape Town. While the effectiveness of these regimes is beyond the scope of this comparison, other literature suggests that there is still more work to do. Despite repeated calls for integrated planning approaches, a significant problem in Hamburg remains sectoral institutional logics, siloed thinking, and budgeting (Hanf et al., 2024: 108). Meanwhile, despite strong intergovernmental cooperation in South Africa, substantial practical challenges remain, including 'ageing municipal infrastructure, inadequate resources, rampant corruption, and limited capacity' (Fuo et al., 2022: 64). These implementation and effectiveness issues could be further investigated in future research, particularly in interviews with stakeholders.

National constitutions substantially determine which levels of government play a role in shaping port city futures. In Germany, states have primary authority over their territorial development, including both cities and ports. Here, Hamburg's dual city-state status is decisive. In South Africa, the municipal sphere has primary authority over most local planning, including coastal infrastructure, except ports, which are controlled by the national sphere. Although South Africa's Constitution has strong intergovernmental cooperation obligations, this is another example of a 'highly fragmented' regulatory framework in that country (Fuo et al., 2022: 69).

Privatization complexifies planning for port city futures. Both case studies involve the same 'landlord' model of port governance, albeit under different ownership structures. In Hamburg, the city controls the landlord and the main private terminal operator. In contrast, Cape Town has no ownership of either the landlord or the terminal operator entity; both are currently held in national ownership. While this persists, intergovernmental cooperation is required, but local influence could be further alienated in future, if port privatization proceeds as envisaged in the AU Charter. Moreover, as a consequence of splitting ownership and operational control, there is a bifurcation of planning focus on climate risks. While the landlord owner looks to the long-term robustness of port infrastructure, the terminal operator looks to short-term commercial im-

pacts on port performance. In short, port privatization has diluted local control in both cases, albeit with more direct control retained in Hamburg than in Cape Town.

Constitutions and ownership are relatively coarse legal controls, while other laws and policies are more granular. Lawmaking is a dynamic process, with new laws and policies emerging all the time. This is demonstrated by the new national framework laws for climate adaptation planning. In both cases, these framework laws impose a similar general requirement: All public authorities must consider climate adaptation in their planning and decision-making. Note that neither law creates more substantive legal rights or obligations, with the legislation overwhelmingly procedural in nature, as anticipated by legal theory (Ruhl and Salzman, 2013: 1017–19). This severely limits the ability of individuals or civil society organizations to bring litigation to enforce the stated goals of climate adaptation. However, other forms of public participation are envisaged, such as in developing overall strategic direction, planning policies, or implementation.

### **Aleatoric contingency of climate risk**

Having critiqued the system and analysed the prevailing order, this part looks to the future and considers the existing system's capacity to meet the exigencies of climate risk.

Across levels of governance, both case studies show the same abstract design pattern for climate risk assessment and adaptation planning. That pattern is an iterative cycle: Assess vulnerability > Strategize at a high level > Identify specific actions > Monitor and evaluate > Reiterate. The pattern recurs across governance levels, from the global goal on adaptation, international standards,<sup>175</sup> and GCoM, to the national adaptation laws and various plans. It now appears systemically entrenched. But even prevailing orders are capable of reconfiguration. Given that neither case study has adopted a port adaptation plan and in light of new impetus<sup>176</sup> to do so, this appears to open up a compelling new opportunity for innovation by planning professionals.

To that end, recent decades have seen the development of 'adaptive port planning' (APP), a promising way of approaching long-term infrastructure

175 E.g. International Organization for Standardization (ISO) Standard No. 31000:2018 (Risk management – Guidelines).

176 2024 German Ports Strategy; CCA s 22.

planning in ports (Taneja, 2013; Notteboom et al., 2022: 511–15). The basic steps in APP dovetail with the established iterative cycle above but further particularize two steps: identifying specific actions, and monitoring and evaluating. At the point of identifying actions, APP calls for even more detailed articulation of different *kinds* of action: whether shaping, mitigating, hedging, or seizing actions. Each of these four types of action represents a different response to changing conditions between iterative cycles of updates to a plan (Taneja, 2013: 97–100). Meanwhile, the monitoring system envisaged in APP is based on ‘signposts’ or triggers, also grouped in four categories: defensive, corrective, capitalizing, and reassessment triggers. The four categories describe how the basic plan must change in light of the trigger being reached, whereupon a corresponding ‘contingency plan’ is also triggered. These more detailed steps in APP could readily be accommodated within the established iterative cycle and new national adaptation laws. Alternatively, emerging critical infrastructure regulations could also offer a basis for the use of APP methods. While some pilot studies of APP in practice exist (Taneja and Vellinga, 2018), more could be conducted under these new and emerging legal frameworks. Future work could then also investigate the practical hurdles to wider uptake of APP in port adaptation governance.

## Conclusion

This chapter contributed a comparative law perspective on climate adaptation planning in port cities. Analysis of the multilevel law and governance frameworks for climate adaptation in two case studies, Hamburg and Cape Town, revealed highly fragmented systems in both cases. This analysis suggests port city adaptation planning remains ‘all at sea’ for now. Although new national laws and recently established design patterns for integrated adaptation planning hold at least the promise of ‘safe anchorages’ in future, more ports need to prepare and implement standalone adaptation plans amid a coming storm of climate impacts.

The multilevel analysis provided a basis for discussion centred on how three contingencies in port city governance enable and constrain planning professionals in shaping port city futures. The ultimate effects of these contingencies can be summarized as follows:

1. Under the currently prevailing legal orders, planning professionals in Hamburg have greater port planning power and agency than their counterparts in Cape Town.
2. In both cases, privatization means that planning professionals must co-operate across institutional barriers and somehow bridge the divergent short- and long-term planning foci of different port management entities.
3. In both cases, new national framework laws for climate adaptation planning require planning professionals to consider national climate adaptation goals in their decision-making. Otherwise, the new national laws are predominately procedural in nature.
4. In practice, planning professionals are bound by more detailed obligations contained in ISO professional standards and are likely to follow relevant technical guidance from bodies like PIANC.
5. Under the currently prevailing legal orders and within broadly established design patterns, planning professionals could experiment with new approaches such as APP.

That said, planning professionals have agency within any prevailing legal and political order. Both case studies demonstrate how the dynamic process of law-making, which exposes discrepancies between new planning policies and the established legal order, opens up new opportunities, where planning professionals can be active agents of change. This is seen in various climate plans and policies that *preceded* the national framework laws, including the GCoM reporting framework and certain national climate policies. For example, GCoM's robust climate adaptation planning and reporting framework emerged in 2019. This was after the Paris Agreement but before the UAE Framework and national adaptation laws. In the meantime, GCoM's reporting framework could be seen as a city-led innovation in the absence of national leadership.

Similar innovations were seen at other levels. Germany's 2021 national climate risk analysis adopted the basic 'cluster' pattern that was subsequently legislated in the KAnG. Likewise, planners made repeated calls for integration and mainstreaming in South Africa's 2011 NCCRP, and in Cape Town's 2019 risk assessment and 2021 CCAP, as subsequently enacted in the CCA. Conversely, some policies remain too far ahead of their time. Germany's 2022 resilience strategy has not achieved a national system of cross-cutting, all-hazard planning for critical infrastructure. Nor has the 2024 port strategy led to individual port adaptation strategies. Likewise, South Africa has not seen the cooperation, particularly on coastal and harbour risk planning, repeatedly called for in

national, provincial, and municipal planning documents. Nevertheless, these discrepancies between law and governance herald opportunities for change, enabling planning professionals to reshape the system towards (or away from) different possible futures.

## References

- Ara Begum, R., R. Lempert, E. Ali, T.A. Benjaminsen, T. Bernauer, W. Cramer, ... and P. Wester (2023) Point of departure and key concepts. In H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegria, ... and B. Rama (eds.), *Climate change 2022: Impacts, adaptation and vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge.
- Asariotis, R., H. Benamara, and V. Mohos-Naray (2017) *Port industry survey on climate change impacts and adaptation* (UNCTAD/SER.RP/2017/18/Rev.1). United Nations Conference on Trade and Development. [https://unctad.org/system/files/official-document/ser-rp-2017d18\\_en.pdf](https://unctad.org/system/files/official-document/ser-rp-2017d18_en.pdf).
- Christodoulou, A., P. Christidis, and H. Demirel (2019) Sea-level rise in ports: A wider focus on impacts. *Maritime Economics & Logistics* 21.4, 482–96.
- Fernandez-Perez, A., I.J. Losada, and J.L. Lara (2024) A framework for climate change adaptation of port infrastructures. *Coastal Engineering* 191, 104538.
- Fuo, O., C. Zengerling, and D. Sotto (2022) A comparative legal analysis of urban climate mitigation and adaptation in the building sector in Brazil, Germany, and South Africa. *Climate Law* 12.1, 32–97.
- Gern, A. and C. Brüning (2019) *Deutsches Kommunalrecht* (4th ed.). Nomos, Baden-Baden.
- Hallegatte, S., C. Green, R.J. Nicholls, and J. Corfee-Morlot (2013) Future flood losses in major coastal cities. *Nature Climate Change* 3.9, 802–06.
- Hanf, F.S., J. Knieling, M. von Szombathely, M. Wickel, J. Oßenbrügge, S. Schlipf, and J. Sillmann (2024) Hamburg, Germany. In A. Engels, J. Marotzke, B. Ratter, E.G. Gresse, A. López-Rivera, A. Pagnone, and J. Wilkens (eds.), *Hamburg climate futures outlook 2024: Conditions for sustainable climate change adaptation*, transcript Verlag, Bielefeld.
- Hanson, S., R. Nicholls, N. Ranger, S. Hallegatte, J. Corfee-Morlot, C. Herweijer, and J. Chateau (2011) A global ranking of port cities with high exposure to climate extremes. *Climatic Change* 104.1, 89–111.

- Hein, C. (2019) The port cityscape: Spatial and institutional approaches to port city relationships. Special issue on Governance in Port City Regions, *POR-TUSplus* 8, 1–8.
- Hoff, K. and J. Walsh (2021) The third function of law: Its power to change cultural categories. In K. Basu and R. Hockett (eds.), *Law, economics, and conflict*, Cornell University Press, Ithaca, NY.
- Izaguirre, C., I.J. Losada, P. Camus, J.L. Vigh, and V. Stenek (2021) Climate change risk to global port operations. *Nature Climate Change* 11.1, 14–20.
- Koppe, B., M. Schmidt, and T. Strotmann (2012) IAPH-report on seaports and climate change and implementation case study for the Port of Hamburg. Paper presented at the Sixth Chinese-German Joint Symposium on Hydraulic and Ocean Engineering (JOINT 2012), National Taiwan Ocean University Keelung, 23–29 September.
- Mutombo, K., A.I. Olçer, and L. Kuroshi (2020) A system inter-dependent approach in addressing climate change in ports: A case study of the Port of Durban, South Africa. In R.C. Brears (ed.), *The Palgrave handbook of climate resilient societies*. Palgrave Macmillan, Cham.
- New, M., D. Reckien, D. Viner, C. Adler, S.-M. Cheong, C. Conde, ... and W. Solecki. (2023) Decision-making options for managing risk. In H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, ... and B. Rama (eds.), *Climate change 2022: Impacts, adaptation and vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge.
- Notteboom, T., A. Pallis, and J.-P. Rodrigue (2022) *Port economics, management and policy*. Routledge, New York.
- Reitz, J.C. (1998) How to do comparative law. *The American Journal of Comparative Law* 46.4, 617–36.
- Roberts, T., I. Williams, and J. Preston (2021) The Southampton system: A new universal standard approach for port-city classification. *Maritime Policy & Management* 48.4, 530–42.
- Ruhl, J.B. and J. Salzman (2013) Climate change meets the law of the horse. *Duke Law Journal* 62.5, 975–1027.
- Stainforth, D. (2023) *Predicting our climate future: What we know, what we don't know, and what we can't know*. Oxford University Press, Oxford.
- Taneja, P. (2013) The flexible port. PhD dissertation, Department of Hydraulic Engineering, TU Delft, Netherlands.

- Taneja, P. and T. Vellinga (2018) Towards sustainable infrastructure with planned adaptation. *Proceedings of the 34th PIANC World Congress*, Panama City, Panama, 7–11 May.
- Tocco, C.L., L. Frehen, A. Forse, G. Ferraro, and P. Failler (2024) Land-sea interactions in European marine governance: State of the art, challenges and recommendations. *Environmental Science & Policy* 158, 103763.
- van Hoecke, M. (2015) Methodology of comparative legal research. *Law and Method*, 1 December. <https://doi.org/10.5553/rem/.000010>.
- van Hooydonk, E. (2010) The law ends where the port area begins: On the anomalies of port law. Maklu, Antwerp.
- Verschuur, J., E.E. Koks, and J.W. Hall (2023a) Systemic risks from climate-related disruptions at ports. *Nature Climate Change* 13.8, 804–06.
- Verschuur, J., E.E. Koks, S. Li, and J.W. Hall (2023b) Multi-hazard risk to global port infrastructure and resulting trade and logistics losses. *Communications Earth & Environment* 4.5.

