

# KEY FACTORS FOR SUCCESSFUL CLIMATE ADAPTATION & RESILIENCE PLANNING FOR PORTS



Professor, Adolf K.Y. Ng, Mawuli Afenyo, and Roozbeh Panahi, University of Manitoba, Canada

“Ports sit on the frontlines of global climate change. Many ports are fortunate in having technical and engineering expertise to address these issues head on [however] adaptation to climate change is not the same as preparing for the next major storm. The challenge is to figure out how to proactively address climate adaptations today rather than waiting until they are forced to react in a crisis situation. [Moreover,] a port that is well-positioned to address climate change could still have its operations shut down by failures in other sectors of the supply chain.” - Dr. Geraldine Knatz, Executive Director of Port of Los Angeles, 2006-2014 (Ng et al. 2016)

The importance of ports to conduct climate adaptation and resilience (A&R) planning is well-documented and attempts have been made by port

authority/facility operators to make port critical infrastructure and facilities (CIFs) more resilient while taking care of high priority procedures and services. It is depressing that many modern ports still find this process challenging, as we find many climate A&R plans are established but not (effectively) implemented (see Ng et al., 2016, for illustrative examples). Although sometimes blame lies on the inadequacy of effort, more often it is the lack of a solid foundation that enables climate A&R plans to integrate multiple, diversified interests of port, transport, and supply chain stakeholders, as well as the general public into cohesive strategies. With this in mind, in this article we highlight the major challenges in climate A&R planning for ports and then we propose a framework on how

successful climate A&R planning for ports should be conducted.

## THE MAJOR CHALLENGES OF CLIMATE A&R PLANNING

A key challenge to conduct effective A&R planning is that the risks and vulnerabilities to port CIFs are diversified, regionalized, and even seasonalized. Issues can range from sea level rise (flooding) to hurricanes to extreme temperatures. The question then is how to prioritize diversified risks with limited budgets/funding sources. Moreover, ports face governance and institutional constraints (e.g., jurisdictions, local regulations) where many climate A&R efforts need cooperation from other (non) port stakeholders. This creates a key deficiency, and obstacle, where many established climate A&R plans fail to

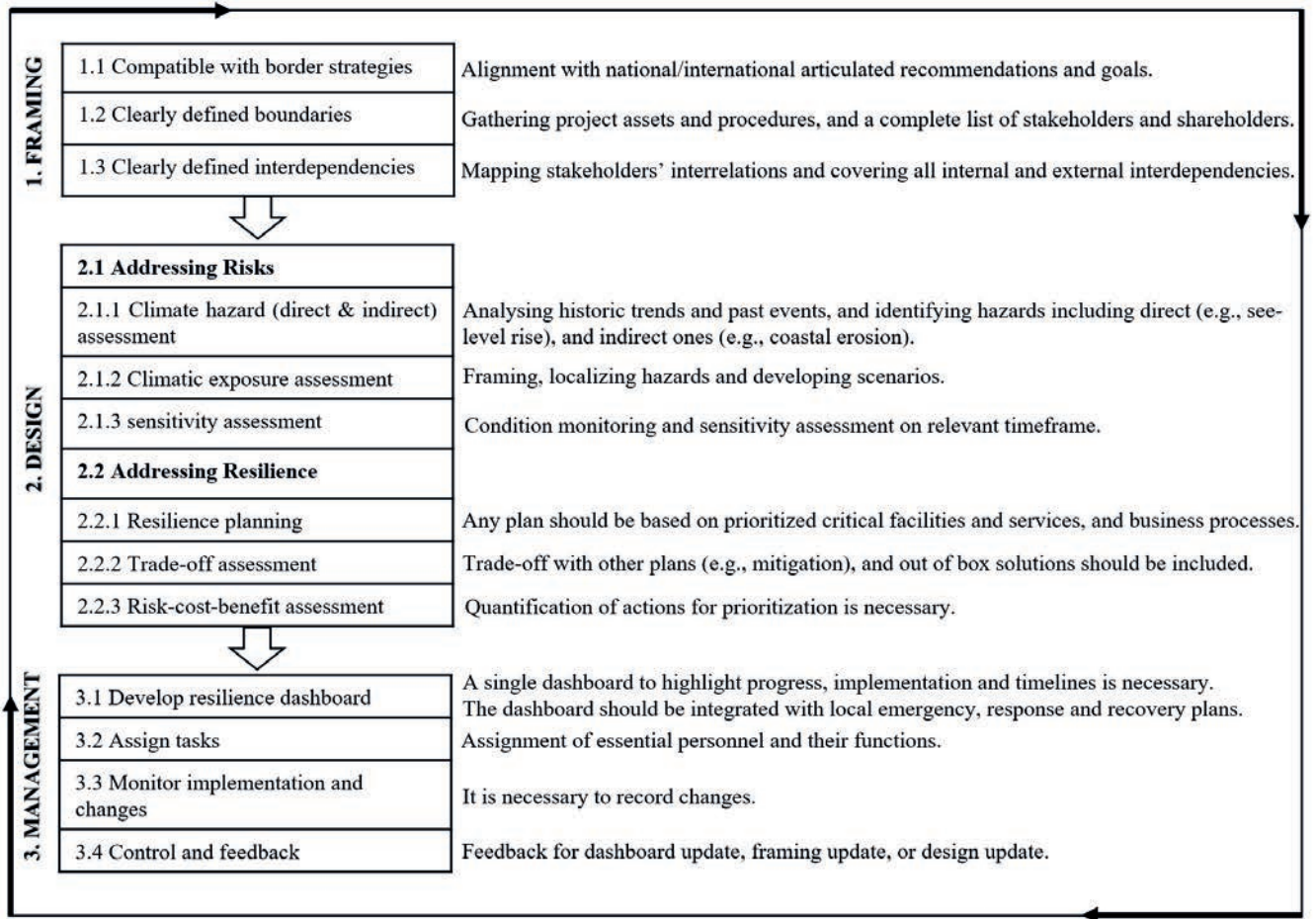


Figure 1. The principles of climate adaptation and resilience planning for ports

recognize ports as inseparable parts of both ‘operational’ and ‘regional’ systems. Put simply, ports are not only components of supply chains and their operations pose both positive and negative impacts to surrounding areas. Planners usually have few problems to address the risks by improving a port’s CIFs, but not many manage to tackle how such improvements affect other components along wider systems, and even fewer consider the impacts of such efforts to cities and regions in general.

The consequence of this is the difficulty in gaining public support for a climate A&R plan. It is even harder for port authority/facility operators to raise funds (e.g., climate bonds) to install new/retrofit CIFs for this purpose as the returns of such commitments 1) cannot be benchmarked easily and 2) are usually much longer than the duration of most port facility operation contracts. Indeed, the perception of stakeholders to climate A&R measures to port CIFs is not always positive (Ng et al., 2018a), it is the same with the attitude of planners (Ng et al., 2018b).

Hence, there are two key questions that port authority/facility operators must urgently tackle if they want to

improve climate A&R planning. First, how to conduct climate A&R planning, keeping in mind that ports are inseparable components of both operational and urban/regional systems? Second, rather than relying on conventional public (e.g., taxpayer money) and private (e.g., private investments, bank loans) funds, how to secure alternative funding sources that allow investments to bear fruits in the longer term rather than immediate results?

**THE FRAMEWORK**

A successful climate A&R plan should:

1. Reflect the concerns and interests of major stakeholders
2. Be realistically implementable
3. Address major risks and benefits
4. Carefully consider trade-offs
5. Be effectively evaluated and monitored

Each of these are key factors in deciding whether alternative funds can be effectively raised. We argue that a successful climate A&R plan would benefit from the ‘network-thinking’ approach (Figure 1) based on three fundamental steps: framing, design, and ongoing management. Planning should therefore be a dynamic procedure as hazard framing

and identification resolution change over time, as well as procedures, stakeholders, and infrastructures.

The design procedure should not take place before establishing framing principles. In this case, combining different sources, such as weather (e.g., sea level rise), geological (e.g., tsunami), technological (e.g., fire), and port-specific (e.g., ship grounding) hazards could contribute to a comprehensive climate A&R plan. The design procedure should be undertaken through regular assessment of CIFs so as to identify potential threats, as well as maintenance and repair reports to give better insight to vulnerability over time. A successful climate A&R plan should clearly identify the hazards, actions, and targets, as well as their interrelations. They should be integrated into a (quantifiable) model that can prioritize actions and progress, control failure modes and responses, thus enhance CIFs’ overall resilience over time.

An illustrative example can be found in Figure 2. It combines how frequently hazards occur (‘likelihood’), how easily one can be detected (‘detection’), and how serious the consequences could be (‘consequence severity’). With a sensitivity

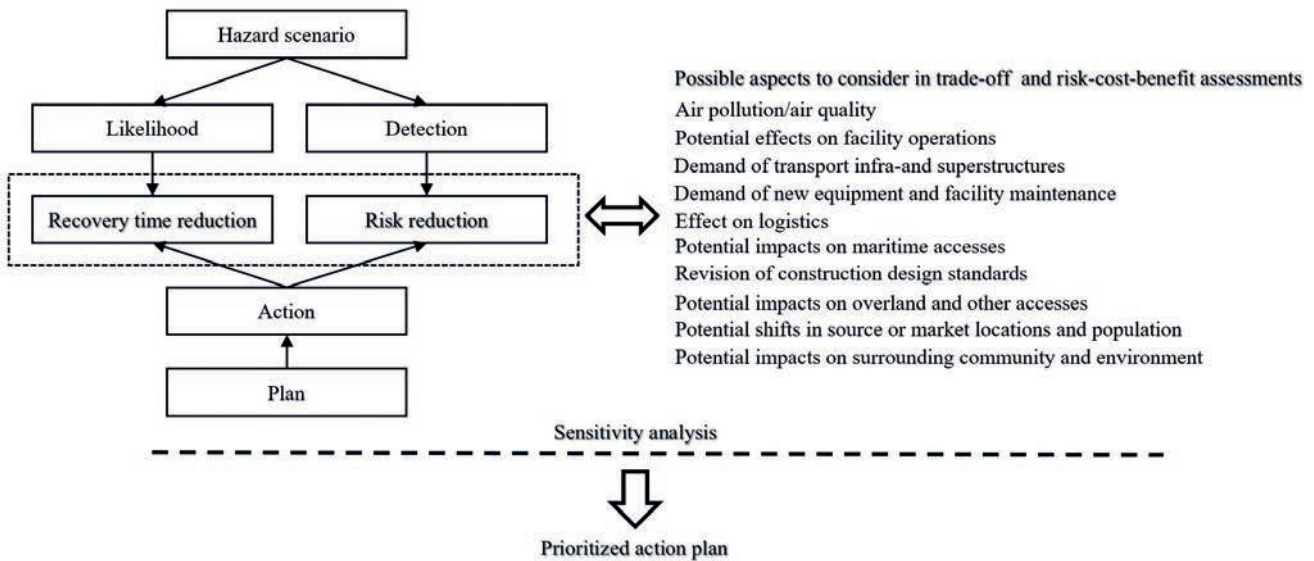


Figure 2. An example of the design procedures for port’s climate adaptation and resilience planning

analysis of actions with respect to trade-offs based on the risk-cost-benefit analysis, this decision-supporting system can propose required information to prioritize actions.

To facilitate the process, we propose a few questions that port authority/facility operators should ask themselves when undertaking climate A&R planning:

- Have you analyzed historic trends and past events? Also, how would more frequent localization of climate change effects and associated risks affect your port’s CIFs?
- Have you defined what an ‘acceptable level’ of climate risk is?
- Have you identified and prioritized your port’s CIFs, including their services and processes?
- Have you established/upgraded a climate A&R plan for your port’s critical infrastructures and facilities, and has it been integrated into local emergency, response, and recovery plans?
- Have you conducted regular climate risk-related assessments of your port’s CIFs?
- Have you considered special climate risk-dedicated insurance for your port’s CIFs?
- Have you considered signing agreements with neighboring ports in case of an emergency?
- Have you considered employing a particular method in assessing climate risks?
- Have you considered an evacuation plan, and if so, its threshold criteria?
- Are you aware of the assistance it may be asked to provide to the community in the event of a climate-related disaster?

- Have you assessed the capacity of port communications assets, including communications with tenants?

**CONCLUDING REMARKS**

We offer a framework to address the key factors that port authority/facility operators should tackle so as to conduct successful climate A&R planning. It will facilitate ports to collaborate with other (non) port stakeholders to develop more cohesive strategies to adapt and become more resilient to climate-related impacts. Also, it increases the chances for them to secure alternative funding sources for such purpose. To successfully develop such a plan, the establishment

of a quality, multidisciplinary team that can effectively initiate, complete, improve and support the model is pivotal. On the other hand, it is always a challenge to raise funds for climate A&R as the returns of climate A&R efforts are often implicit, long term, and not easily quantifiable. To overcome this problem, there is a need to develop a global mechanism that certifies quality climate A&R plans. This gives more confidence to the general public to invest into such initiatives. A good example is the green bond standard and certification scheme by the Climate Bonds Initiative (CBI). A similar initiative can possibly be extended to the port sector.

**ABOUT THE AUTHORS**

Adolf K.Y. Ng is a professor in transport planning and management at the University of Manitoba, Canada, and a founding member of the CCAPPTIA consortium (ccapptia.com). His research in transport excels in climate change, adaptation and resilience planning, sustainability, regional development, and the Arctic.

Mawuli Afenyo is a researcher and instructor at the University of Manitoba. He has worked in engineering and business consulting and is also the author of many articles in reputable scientific journals. He is a founding member of CCAPPTIA. His research focusses on climate change, risk, oil spills, and the Arctic.

Roosbeh Panahi is a researcher at the University of Manitoba, Canada, and a founding member of CCAPPTIA. He has worked in several multidisciplinary projects in the port and shipping industry. Recently, he has become more focused on climate change adaptation and resilience.

**ABOUT THE ORGANIZATION**

The University of Manitoba is a public research university in Manitoba, Canada. Its main campus is located in the Fort Garry neighbourhood of southern Winnipeg with other campuses throughout the city. Founded in 1877, it is Western Canada’s first university.

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