

## PEER REVIEW OF ADAPTATION GUIDANCE: COASTAL HAZARDS AND CLIMATE CHANGE

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**I was specifically asked to address two questions. The following are the answers to these. Other comments follow these answers.**

*1. Does the material in these sections of the guidance represent current good practice internationally?*

Yes, it does. In fact, I consider that the work in the guidance is pioneering, and is an exemplar of what we in the scientific/policy analysis community are recommending be done by the policymaking community in making decisions in the face of deep uncertainty.

*2. Is it appropriate to provide scenarios of future sea level rise without likelihood assigned to them? (It is our understanding, and that of the authors of the guidance, that assigning likelihoods is not possible. However some stakeholders claim that it is, and think we should include such guidance).*

Yes. Not only is it appropriate to provide scenarios of future sea level rise without likelihoods attached, it is inappropriate (and impossible) to do so. Doing so would give policymakers and the public a false sense of security (that the future is known, and knowable, to some extent). In the case of climate change, this is not true (at least at the present time). Referring to Figure 4-2 (which I was delighted to see in the document), with respect to climate change and its effects, we find ourselves in Level 4 uncertainty – the future context (i.e., scenario) is unknown, the system model is unknown, and the system outcomes are unknown. In this situation, anyone who claims you can assign likelihoods would be misleading you and the public, and any policy analysis based on that assumption could lead to dangerously bad policies. Policies made based on that assumption could force you into a lock-in position; you would have little flexibility to adapt the policy if the assumption were wrong. Dynamic Adaptive Policy Pathways (DAPP), which is the policymaking approach you used, makes it easy and not too costly to change the policy as the future becomes known, without being locked in. I totally agree with what is written in the Preface: “Waiting until uncertainties are reduce before making decisions, or holding back on making decisions under uncertain conditions, is usually not viable or acceptable. . .”

### **Other Comments**

#### **Overall assessment:**

This is an excellent document – clearly written, well structured, and based on sound principles. It should be able to be read and understood by many different types of audiences, including the two major audiences: (1) local government policymakers, and (2) practitioners providing information and services.

#### **References:**

- **s9(2)(a)**. The reference is: Lawrence, J. and M. Haasnoot. “What it took to catalyse uptake of dynamic adaptive pathways planning to address climate change uncertainty,” *Environmental*

- In Sec. 9.3.3, where you state that “the adaptive pathways approach has gained traction and has been used in the Netherlands”, you cite Haasnoot et al., 2013. That is a good reference for the general approach, but a better reference for the Netherlands would be the official Dutch Government document on Adaptive Delta Management: Netherlands Ministry of Infrastructure and Environment, *Delta Programme 2015: Working on the Delta – The decisions to keep the Netherlands livable*. You have included this document in the references, but you have not referred to it in the text.

#### Chapter 4

This chapter provides an excellent foundation for the document, in terms of its discussion of risk and uncertainty. I have only a few minor comments:

- P. 68: In the ‘Guiding principle’ box, second bullet, I suggest you say “sea level will be likely to continue to rise” rather stating authoritatively that it “will continue to rise”.
- P. 69: In the “Guiding principles” box, I suggest that you qualify the final sentence. Yes, scenarios can be used to consider the range of plausible futures, but even the range may be wrong. That is why you need to use DAPP!
- P. 72: In Box 4.2, third bullet: I suggest that you write “greater damages may arrive sooner rather than later.” (Again, be less authoritative.)
- P. 74: In the Summary, fourth bullet: I suggest that you write “Adequately considering uncertainty reduces the potential . . .” (you do not know if it actually produces a minimum)

#### Chapter 7

Overall, this chapter is very good. I do, however, have one major suggestion, and several minor comments. The major suggestion deals with the content of Sec. 7.4 and Table 7-3. This section is titled “Reframing community values as objectives”. Of course, there is a need for this to be done. But, if you are going to implement an adaptive plan, you will need ‘triggers’ and ‘thresholds’, which will be based on measurements. So, there is a need to translate the objectives into measurable quantities (I usually call these “criteria” or “outcome indicators”). This seems to me to be a missing step in the description of the process. It is probably implicit in the process. But, it should be made explicit. (I think it should be easy to add something about this to the text.) The difference between objectives and criteria or outcome indicators is made clear in a paper of mine that I have sent to s9(2)(a) titled “Policy Analysis: A Systematic Approach to Supporting Policymaking in the Public Sector”.

- Table 7-1: Eliminate the word “are” from the title; change “vales” to “values” in the row about Surveys; Change “Access” to “Interviewing” in the row about Key informant interviews.

#### Chapter 8

- Section 8.1: This section is titled “Vulnerability assessment”. It is made clear that vulnerability here is its use in “an engineering/asset context”. But, what is not made clear is that in the literature on ‘deep uncertainty’, we speak of the “vulnerability of a policy” (i.e., how the policy could fail to achieve its objectives). One of the basic concepts within DAPP is that of a ‘tipping point’, which is an indicator that one or more of the objectives is heading toward failure. What is needed in this section (or somewhere in the document) is a definition of vulnerability in the context of DAPP, and its differentiation from vulnerability in the engineering/asset context.

- Sec. 8.1.1: The box titled “Guiding practices: Steps in a vulnerability assessment (VA)” defines ‘sensitivity’ and ‘adaptive capacity’. But, there is no specification as to how these are measured. Sensitivity is merely said to be “the degree to which . . .”; and Adaptive capacity is merely said to be the “ability . . .”. (This is similar to my major suggestion regarding outcome indicators in order to improve Chapter 7.) Later in that box, the analysis of sensitivity asks “What is the impact threshold . . .” and the analysis of adaptive capacity asks “Is the rate of change likely to be beyond . . .” Carrying out these vulnerability assessments will certainly need these limits to be defined more concretely. (A better phrasing of the latter question might be “When does the rate of change go beyond . . .”)

## Chapter 9

This is a key chapter, from my point of view. The process it describes is the basis of DAPP. Overall, the chapter does a fine job of making this process clear (Steps 5 and 6 of the 10-step Decision Cycle). I particularly like Sec. 9.1.1 (“What are we adapting to and why?”) and Sec. 9.2 (“Adaptation decision-making”). Sec. 9.3.1 is the place where you could add a discussion of outcome indicators (so, instead of titling the section “Decide objectives”, title it “Decide objectives and outcome indicators to measure them”. Note that in Box 9.3, the section titled “RPS Chapter B.11 Monitoring and environmental results anticipated” includes both objectives and indicators. (This is a good exemplar; but it’s not followed by any others.)

- Sec. 9.3.2: The 4 bullet points at the top of the page should be called “categories of options” they are not specific options.
- Sec. 9.3.3: The first step in the “adaptive pathways planning approach” should be to ask “what are the objectives?”
- Sec. 9.3.3: In the second current bullet in this section, it should be made clear that this is the vulnerability assessment to determine tipping points (using outcome indicators?). In the deep uncertainty literature this is often called ‘scenario discovery’ (see [https://en.wikipedia.org/wiki/Robust\\_decision-making#Scenario\\_discovery](https://en.wikipedia.org/wiki/Robust_decision-making#Scenario_discovery)).
- Sec. 9.3.3: It should be made clear that the bullets in this section are not sequential steps, but may involve feedback among them.
- Figure 9-2 (this is basically a description of the Scenario Discovery process): (a) in Box 1, objectives for sectors should have associated outcome indicators; (b) to be clear, the outcome from the ‘Pressures’ box should ask “Under which climate conditions (pressures) are objectives not achieved anymore?”
- Text at bottom of page containing Figure 9-3: I suggest that the text read “By exploring different pathways using transient scenarios, an adaptive plan can be designed . . .” Most scenario planning is done using ‘end point’ scenarios (i.e., what will the world look like in the future). A transient scenario includes the dynamics of the changes in the world over time.
- Box 9.4: I suggest that the end of the first paragraph be changed to: “Adaptation is considered a response strategy to anticipate and with the unpredictable impacts of climate change.” And, I suggest that the second paragraph begin: “Climate-resilient pathways include strategies, choices, and actions that reduce the impacts of climate change.”
- Table 9-1 does not contribute anything substantial. Quite the opposite, it is confusing, and diverts the reader from the story you are telling in Sec. 9.4 (a critical section in explaining the approach you used to design your strategy based on DAPP). In fact, the table of “decision support tools” is a mixture of apples and oranges – they are not alternatives to each other. And,

the limited descriptions of each in the table provide little substantive information, and no information about how they were actually used in developing your strategy. I suggest that you eliminate the table (Figure 9-5 gives enough summary information about each of them). If you want to mention them further in the text, list them together with appropriate references to the literature (in case a reader wants additional information) and how you used them. One tool that I find missing is “Exploratory Modeling and Analysis” (EMA), which is a very useful tool for developing dynamic adaptive policy pathways. A reference to EMA in the literature would be: Bankes, Steven, Warren E. Walker, and Jan H. Kwakkel (2013). “Exploratory Modeling and Analysis”, entry (pp. 532-537) in Gass, Saul I. and Michael C. Fu (eds.), *Encyclopedia of Operations Research and Management Science*, 3rd Edition, New York: Springer.

- The “Guiding Practice” box following Table 9-1 is excellent. In the sentence following this box, I suggest you change the word “assessment” to “evaluation”, for consistency with the Decision Cycle terminology.
- Section 9.5: This is an excellent and well written section, with some very important messages.
- Chapter 10: This is another important and well written portion of the document. The discussion of “insurance principles” is very interesting. The text acknowledges that “calculability and fortuity appear . . . to exclude insurance against losses from coastal hazard risk and sea-level rise.” How does New Zealand plan to avoid this problem? The document suggests one way: “This puts the focus back on those with the responsibility to avoid and reduce the hazard risk – local government and property owners.” Another possibility would be to do what the Netherlands does – have the national government insure the public against losses from flooding.
- Figure 10-5 and the text following: The figure shows the top-down nature of the RMA policy and plans; the text following describes a bottom-up process. It might be helpful to use these terms (bottom-up and top-down) to characterize the two processes. Incidentally, I was unable to locate Table 10-1. Is this what can be found much later as Tables 24 and 25?
- Chapter 11: This is an excellent finale to the entire document. It pulls the pieces together and makes some very important points about what is needed for implementation of the plan in order to have it succeed.