



# **Addendum I**

## ***Using Scenarios to Explore Climate Change: A Handbook for Practitioners***

**Introduction** In 2013, the National Park Service completed a handbook for guidance in using a scenario planning process to help manage into the uncertain future of climate change (National Park Service, 2013). During completion of the handbook, alternative techniques evolved for some of the scenario planning steps introduced in the 2013 guidance. The purpose of this Addendum is to share one of these evolved techniques, the *Incremental* scenario framework, as an alternative to the “2x2 Matrix” and “2x2 Nested Matrix” scenario frameworks presented in the 2013 handbook for building scenarios. The Incremental approach begins with a *Least Change* scenario representing the minimum amount of change expected in the future due to climate change and then builds additional scenarios based on greater levels of projected change.

**Incremental Scenario Framework** Compared to the *Matrix* scenario framework (National Park Service, 2013), building the *Incremental* scenario framework requires less time for participants (1 to 2-day workshop opposed to a 2 to 6-day workshop for the *Matrix* scenario framework) and less facilitation. In the five-step scenario planning process summarized in the 2013 guidance for the *Matrix* technique, Phases 1, 4 and 5 do not change for the *Incremental* technique. It is in Phase 2 (*Exploration*) and Phase 3 (*Synthesis*) where some of the processes are different.

#### Pre-workshop

Upon completion of Phase 1 (*Orient*), as described in the 2013 handbook, Phase 2 (*Exploration*) for the *Incremental* scenario framework starts with the core team preparing a plausible climate scenario that represents the *Least Change* from the current climate conditions based on credible scientific projections (“critical forces” or “critical uncertainties”). Other critical uncertainties are also identified, which are not organized into plausible climate scenarios, including the projected human dimensions of change (e.g., population demographics) and some of the potential impacts. This information is shared with the participants through a series of pre-workshop webinars, allowing for participant input and used in a series of workshop exercises to develop additional scenarios.

#### Workshop

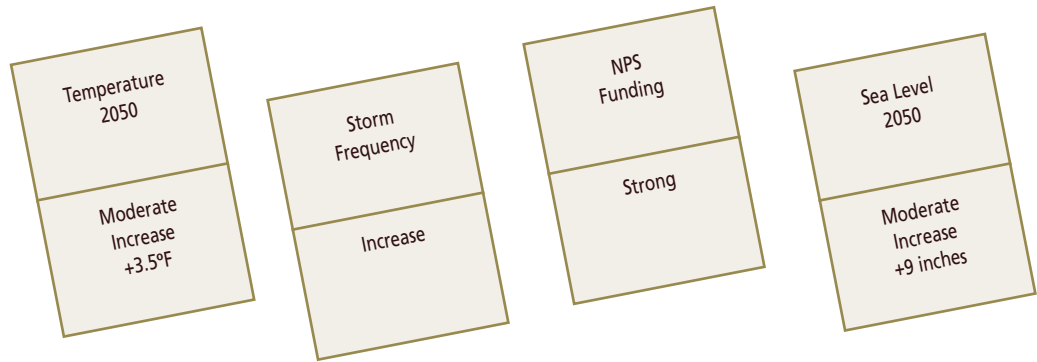
In Phase 3 (*Synthesis*) workshop participants begin by working in smaller groups to independently list the biophysical impacts, along with the human dimensions of change associated with the *Least Change* scenario. The smaller groups return to discuss their respective outcomes, and a Master impacts table is prepared that reflects the discussions of the *Least Change* scenario.

The next steps for developing the *Least Change* scenario are the same as provided in the 2013 handbook for the “2x2 Matrix” technique [Phase 3: *Synthesis*, D. *Describe scenarios in detail and develop narratives*].

In Phase 3 (*Synthesis*), workshop participants next ask, “are there other plausible futures that are relevant and challenging to the park” and participants develop additional (incremental) scenarios, using cards prepared prior to the workshop to quickly facilitate scenario development (Figure 1). Each card represents one critical uncertainty with the endpoints for the range of variability placed on each side of the card. For example, a card for “Temperature (2050)” would have the range of projected increase (endpoints) listed on each side (e.g., 3.5°F and 7.0°F), based on credible modeled projections. Similar to the “Nested 2x2 Matrix” technique, critical uncertainties outside of climate variables (e.g., NPS budget, political support) can also be included in the mix for scenario development, when appropriate.

Figure 1:  
Endpoints on critical  
uncertainties and associated  
cards.

Endpoint	Critical Uncertainty	Endpoint
Moderate increase (+3.5°F)	Temperature (2050)	Large increase (+7.0°F)
Decrease	Storm frequency	Increase
Episodic	Drought	Persistent
No change	Stream flow (spring peak)	Earlier
Moderate increase (+9 inches)	Sea level (2050)	Large increase (+15 inches)
Weak	NPS funding	Strong

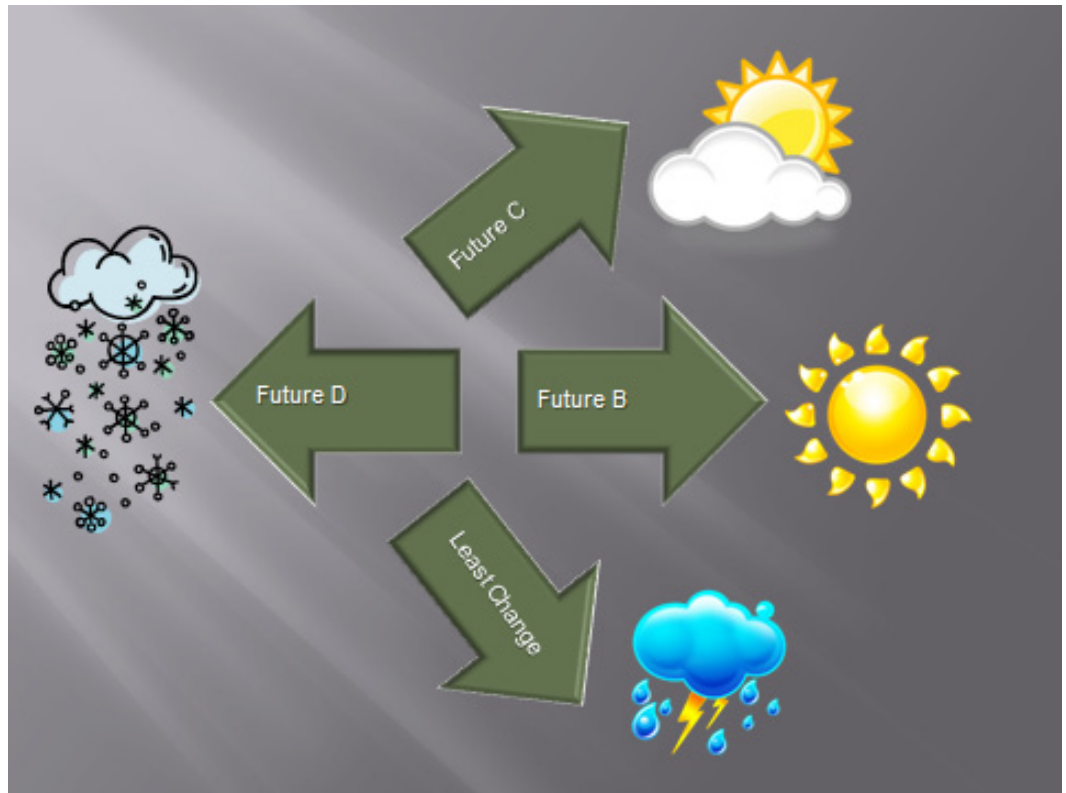


There are a variety of approaches for using the cards to create a range of plausible scenarios that fit the criteria of 1) relevant, 2) challenging and 3) divergent. Using 3 to 5 cards, one approach is for breakout groups to face the cards up to represent the *Least Change* scenario, and then as a group, explore and ultimately select two cards to flip to create a second scenario. Techniques for scenario selection are provided in the 2013 handbook. A third scenario can be created by flipping two more cards to create another plausible future. Another option for creating a third (or fourth) scenario and removing any bias from the selection process is to allow work groups to select two cards for another work group to use.

Once groups have independently created 2 or 3 scenarios, they return as one large group and share the outcomes. As a large group, 2 to 3 scenarios are selected from the several created and included with the *Least Change* scenario, representing a range of plausible futures that are 1) relevant, 2) challenging, and 3) divergent (Figure 2).

The remaining steps in the Incremental scenario process are the same as provided in the 2013 handbook for the “2x2 Matrix” technique [Phase 3: *Synthesis*, C. *Identify scenario impacts*, D. *Describe scenarios in detail and develop narratives*, E. *Reviewing scenarios for plausibility and consistency*; Phase 4: *Application*; and Phase 5: *Monitoring*].

Figure 2: Range of plausible climate change futures that are relevant, challenging and divergent.



**References** National Park Service, 2013. Using Scenarios to Explore Climate Change: A Handbook for Practitioners. National Park Service Climate Change Response Program. Fort Collins, Colorado.

**More Information** NPS Climate Change Planning Intranet Site  
<http://www1.nrintra.nps.gov/climatechange/planning>  
NPS Climate Change public website  
<http://www.nps.gov/subjects/climatechange/index.htm>