A General Overview on Identifying, Selecting, and Prioritizing Climate Change Adaptation (or Preparedness) Strategies
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The following text is an excerpt (slightly modified) from the forthcoming *Planning for Climate Change: A Guidebook for Local, Regional, and State Governments*, which is scheduled to be released in September 2007. ***The text is still in draft and should not be cited until final publication.*** The guidebook is being written by the Climate Impacts Group and King County, Washington, and is being published by ICLEI-Local Governments for Sustainability. The following are covered in this summary:

- Identifying climate change preparedness strategies,
- Selecting and prioritizing strategies, and
- Managing uncertainty and risk.

Please note that the term "community government" is used here to refer to local government (e.g., municipal, township), county government, and state government.

1.1 Identify Climate Change Preparedness Strategies

Once you have selected your priority planning areas (e.g., water supply, public health), look more specifically at what can be done to reduce identified vulnerabilities. In particular, you now need to develop a candidate list of objectives and actions for addressing climate change impacts in your priority sectors. At a general level, your strategies will involve any combination of the following:

- Modifying regulations, policies, practices, and procedures. Existing regulations, policies, operating practices, development plans, and other tools of government may need to be modified to increase resiliency in human and natural systems. In particular, look for the following "red flags":
    - Regulations, policies, practices, and procedures that do not allow regular re-evaluation and adjustment in accordance with changing conditions,
    - Regulations, policies, practices, and procedures that require planning based strictly on the past, or pin certain decisions/triggers to certain periods or seasonal patterns, and

Key Terms

Objectives: the overall methods you will use to accomplish your preparedness planning goals.

Actions: the specific steps that you will take to accomplish the objectives.

Strategies: a term that collectively refers to both objectives and actions.

An objective for the public health sector, for example, may include reducing mortality and morbidity rates associated with extreme heat events. Related actions would include opening additional cooling centers during extreme heat events, improving the use of early warning systems for extreme heat events, and working with local planning departments to increase the use of shade trees to reduce temperatures in urban areas.

- Regulations, policies, practices, and procedures reinforcing trends that increase vulnerability or reduce adaptability (e.g., development along flood plains).

Actions may include improving drought plans, more aggressively controlling invasive species, protecting plant and animal migration corridors, retreating from or abandon vulnerable areas, changing building and zoning codes, adjusting utility prices, or developing contingency plans for low probability but high consequence events, for example. As you look at existing regulations, policies, etc., also consider whether the procedures and guidelines used to formulate new regulations need to be updated so that future regulations are more climate resilient.

- Diversifying options. Diversity may reduce your community's sensitivity to climate change by providing a buffer against climate change impacts. Examples include developing new groundwater sources or wastewater reclamation capacity to diversity your water supply, or diversifying your community's economic base to move away from relying on sources of revenue that may be negatively affected by climate change, e.g., timber production or winter recreation.

- Building new or upgrading existing infrastructure. New infrastructure may need to be developed, or existing infrastructure upgraded, to provide a buffer against or to otherwise accommodate climate change impacts. This may include expanding stormwater collection systems, expanding wastewater treatment capacity, increasing bridge heights, and strengthening flood control levees.

- Improving community awareness and preparedness. Outreach and education may be needed to generate support for specific preparedness strategies. Outreach and education can also be used to effect voluntary change at the individual household level, such as water conservation.

- Partnership building with other communities and agencies. Communities do not govern in isolation and climate change impacts do not follow jurisdictional boundaries. Preparing for climate change will require building new or strengthening existing partnerships other local governments, tribes, federal and state agencies, non-profit organizations and the private sector to address the impacts that occur within a community's jurisdiction as well as those that occur outside the community's jurisdictional boundaries.

Adaptation strategies can also include research and monitoring and data collection. Delaying action may also be an appropriate option if the additional time can be used to gather more information through research or monitoring.

1.2 Select and Prioritize Strategies for Implementation

A key consideration when selecting and prioritizing strategies for preparedness planning is whether the strategy will meet the overall preparedness goals chosen for your preparedness planning effort. The general criteria described below can also help in your selection and prioritization of the specific preparedness actions you will use to accomplish your objectives. Note that strategies will not (and do not need to) meet all of the listed criteria. The more criteria that are met, however, the more likely the strategy

will help reduce your vulnerability to climate change.

As you evaluate the initial list of actions for selection, sort your choices into groups as follows:

- Tier 1 actions are those actions that can and will be implemented in this planning process.
- Tier 2 actions are those actions that could be implemented now or in the future but require additional information, resources, and/or authorities before implementing. Note that you may want to begin exploring these additional information, resource, and authority needs as part of your current planning effort.
- Tier 3 actions are those actions that are not suitable candidates at this time (Tier 3).

Document why certain strategies were or were not selected for the current preparedness planning effort; reasons for ranking strategies in Tier 2 and 3 may change over time, making some of the Tier 2 and 3 strategies more relevant in the next update of the preparedness plan.

Key Criteria

Will the action meet your preparedness objectives? Actions are the means for accomplishing your objectives and, ultimately, your preparedness goals. Consequently, adaptation actions should meet at least one of the objectives established for your planning effort.

Is the action robust under a range of climate change scenarios? Actions should meet their intended purpose under a range of plausible future climate change scenarios. This is particularly true for decisions with a long life span or long-term implications, such as those related to infrastructure and land use changes, since these types of decisions will be affected by a greater range of climate change impacts than projects lasting only a few years. For example, a setback requirement for coastal development based on an estimate of 12 inches of sea level rise is less robust than a requirement that can accommodate a broader range of sea level rise (e.g., 6 inches to 3 feet).

Actions must also be robust to changes in the frequency or severity of specific climate impacts. Some mechanisms used to adapt a sector to past climate and weather stresses could be less suitable for the long-term change that climate change represents. Temporary pumps, for example, may be appropriate for managing flooding that occurs two or three times a year but would not be appropriate if the frequency increased to 100 times a year. Similarly, beach nourishment is a common response to erosion events that may not be economically feasible over the long term in some locations given the potential for climate change to increase erosion in coastal areas. This is not to say that these short-term adaptation actions do not have a role in preparedness planning. It does mean, however, that additional actions for addressing the "big picture" issue may be needed to reduce the need for short-term, crisis-oriented solutions.

Is the action flexible and/or does it increase flexibility in how a system is managed or functions? Regulations, policies, practices, and procedures need to be flexible so they can be adjusted in response to changing conditions (both climate and non-climate). Can the action be easily adjusted as conditions change? Does the action make it easier to modify or reverse decisions once implemented if new information warrants a change? Similarly, some preparedness actions in their own right can create more flexibility.

Do the benefits of the action exceed the costs? In general, the benefits gained from an action should exceed the costs of implementing the action. This includes economic as well as non-economic costs and benefits, which can be difficult to quantify. The benefits/cost calculation will be affected by many criteria, including your planning time horizon, the lifespan of the decision (in the case of infrastructure), and the frequency of specific climate change impacts (e.g., how often a particular flood threshold may be crossed). Consider using your benefit/cost analysis to help identify the "no regrets", "low regrets", or "win-win" scenarios as described in Section 1.3, especially in cases where there is greater uncertainty[1]. Note also that the benefit/cost criteria will take on more significance as you begin looking at specific choices within selected implementation actions, e.g., the cost of enlarging your stormwater collection system by 5% versus 15%.

Can the objective/action be implemented, and in what time frame? Ease of implementation will depend on your planning time frame and the availability of relevant legal and administrative authorities, staff resources, technical resources, and fiscal resources. Can an adaptation action be implemented within your existing operational framework, or are additional authorities and/or resources required? In the later case, who must grant these additional authorities and resources?

Note that choosing adaptation actions is not always about choosing the actions that are easy to implement right away (i.e., the "low hanging fruit"). In some cases, the very fact that an action requires more time or resources to complete will require acting on the action in the near-term. A good example is developing the capacity to treat and distribute "gray water", or water reuse. Because it will take time to secure the additional authorities and resources needed to develop this capacity, you may choose to begin working on this action sooner rather than later.

Additional Factors

Are there unique "windows of opportunity" for implementing a particular action? In some cases, the timing of key decisions being made in other planning arenas can influence the selection and implementation order of a specific adaptation action. For example, your community may be planning a major upgrade of its water main system, creating a timely opportunity to install reclaimed water lines along with the new water mains. In another case, a rare opportunity to purchase development rights in areas vulnerable to sea level rise may lead a community to choose this action for protecting coastal areas over other actions. Other timely windows of opportunity may include periodic license renewals (e.g., Federal Energy Regulatory Commission dam relicensing procedures) and state legislative sessions.

Is the action equitable? Adaptation actions should be equitable, meaning that the strategies should not make impacts worse in other areas or limit the adaptive capacity of other communities or generations. Projected losses in hydropower generating capacity due to declining snowpack should not be replaced with power produced by coal-burning power plants, for example, which would increase greenhouse gas emissions and accelerate climate change.

[1] See Willows and Connell 2003, Luers and Moser, de Loë et al. 2001

Will the action decrease the risk of losing unique environmental or cultural resources? Some adaptation actions may be preferred because of their potential role in protecting unique environmental or cultural resources. These may include important ecosystems, Native American reservation land and burial sites, or historic districts.

Is there stronger scientific confidence associated with the risk the action is trying to reduce compared to others? The confidence the scientific community assigns to specific climate change projections will vary by climate change variable (e.g., temperature, precipitation, wind direction and speed) and by region. In the U.S. Pacific Northwest, for example, there is greater confidence in the range of projected temperature changes than for changes in precipitation. All things being equal, objectives/actions addressing temperature-driven climate change impacts (e.g., changes in streamflow volume and timing in Pacific Northwest rivers) may be ranked higher than objectives/actions addressing precipitation-driven impacts given the uncertainties associated with changes in precipitation amount, intensity, and frequency.

1.3 Managing Uncertainty and Risk

Preparing for climate change is a challenge in part because of the uncertainties that exist around local impacts. Ideally, you would choose preparedness strategies knowing exactly how, when, and where climate change will affect your community. As you know from having to manage other challenges facing your community (e.g., population growth, rising health insurance costs, natural disasters), this level of certainty is not possible. Consequently, when it comes to planning for climate change, you must do as you always do – make decisions in the face of uncertainty.

Risk is another component of climate change preparedness planning that decision makers must manage. All decisions from the personal to the community level involve some informal assessment of risk. When should a homeowner, for example, purchase earthquake insurance for a home? When should a community concerned about bioterrorism purchase smallpox vaccines? The outcome of these decisions will be shaped by personal experience, thresholds for tolerating risk, and new information about risks and probabilities, all of which can change over time and space.

So how can community governments manage uncertainty given that risk and uncertainty will always be a factor in climate change preparedness? One approach is implementing “no regrets”, “low regrets”, or “win-win” strategies for climate change[2]. A “no regrets” adaptation action provides benefits in current and future climate conditions even if no climate change occurs. A water conservation program, for example, provides benefits today by potentially reducing the need for water restrictions during drought and delaying the need to develop new water supplies as population grows, potentially saving the utility and its rate payers millions of dollars in expansion costs. These benefits will accrue regardless of how climate changes in the 21st century but would be even greater with climate change given the potential for climate change to increase the frequency and intensity of drought in many regions of the country.

“Low regrets” adaptation actions provide important benefits at relatively little additional cost or risk. A

[2] See Willows and Connell 2003, Luers and Moser

utility planning stormwater system upgrades may expand the capacity of its stormwater collection system by 10%, for example, in anticipation of more extreme precipitation events if the benefits of the added capacity exceed the marginal cost increase. Similarly, a community concerned about the impacts of sea level rise may increase setback requirements for coastal development by an additional 200 feet as part of a Master Plan development provided the benefits of the additional setback exceed the marginal cost.

"Win-win" actions reduce the impacts of climate change while providing other environmental, social, or economic benefits. For example, preserving riparian wetlands not only provides critical habitat for climate-sensitive species but also provides water quality and flood protection benefits now and under plausible climate change scenarios.

Another approach is quantitative modeling. Modeling integrates different climate change scenarios with our current understanding of how systems respond to changes in temperature and precipitation or other climate-related variables to put boundaries on a range of future conditions. Modeling can also help identify which uncertainties are significant and how specific adaptation strategies may help manage those uncertainties.

Recent advances in downscaling techniques have improved the overall accuracy of smaller-scale climate change impacts assessments used to guide local policies and infrastructure choices. The City of Seattle, for example, sponsored research examining the impacts of climate change on the city's water supply (Wiley 2004). The study found that snowpack in the watersheds contributing to Seattle's water supply could decline by as much as 50% by 2040, reducing the system's current gross yield by 14%. The study also found that while uncertainty was present at each level of the analysis, the uncertainties were no greater than those found in traditional water supply studies that rely on evaluation of historic records and were not "necessarily significant enough to mask the underlying trends or scale of impacts" (ibid, p. 149).

While modeling can be an effective tool for quantifying future impacts, modeling is not required for climate change preparedness nor will it eliminate all of the uncertainties in planning for climate change. Modeling should be viewed as one tool of many that community governments can utilize for global preparedness. Where and when that tool is applied will depend on the community government's vulnerabilities to climate change, financial and technical resources, and the value of the information gained from the modeling effort.

Sources:

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