European Climate Change Adaptation Conference March 18-20 2013 Hamburg, Germany
Session 1b Climate Vulnerability Assessment – Decision Making for Climate Robust Infrastructure

Nienke Maas, TNO	nienke.maas@tno.nl	Sr. Advisor, Strategy & Policy
Yanna Badet, AECOM	yanna.badet@aecom.com	Sr. Environmental Planner, Sustainability & Public Outreach Specialist
Todd Schenk, MIT/CBI	tschenk@mit.edu	PhD Candidate/Associate

Welcome to our session!

We will be presenting three practice-tested approaches for advancing decision making for climate robust infrastructure: The use of multiple scenarios; effective stakeholder engagement; and risk and vulnerability assessment. We will share our experiences testing these tools via a pilot study in California, USA, and role-play simulation exercises in Rotterdam, the Netherlands. We also look forward to hearing about your experiences and encourage you to actively participate.

This session worksheet is designed to assist you in following the discussion, answering questions and capturing comments on the strategies presented so that we can have a lively discussion after the presentation. Thank you for your participation.

We plan to pose the following questions during this session:

1. Which profession do you represent? Do you consider yourself a scientist/researcher? Planner? Practitioner?
2. Are you coming from the private sector? Public sector? A non-governmental organization?
3. Are you working on infrastructure projects? In what area?
4. Do you work on projects that involve vulnerability assessments? Is climate change considered?
5. Is uncertainty a factor in your decision-making processes? Is climate change a significant source of uncertainty?

Discussion: Multi-stakeholder Planning + Decision-Making

6. What experiences do you have with collaborative planning? How has it worked in practice?
   What are the keys (and barriers) to success?
7. Do you use neutral facilitators and process experts? Why or why not?

Discussion: Uncertainty

8. Can single forecasts be sufficient? How can we use them effectively while recognizing their uncertainty?
9. Are scenarios an effective way to deal with uncertainty in practice? Do they enrich or overly complicate decision-making? Is the scenario planning approach workable in practice?
10. Are there alternative ways of reconciling with uncertainty?
11. Is flexibility a viable solution? How do we maintain flexibility in practice?

Discussion: Governance Regimes + Institutions

12. What constraints do existing governance regimes and traditional institutional environments present?
13. Did the presented strategies take them into account adequately? How can they effectively do so?
14. How do we work with or effectively alter institutions, given emerging and dynamic threats like climate change?

Discussion: Adaptive Capacity

15. Is decision-making for climate change really so different, presenting new challenges to existing capacities?
16. How do we assess and strengthen adaptive capacity?
17. What are the primary limitations/needs currently?
18. What did you learn from the strategies presented? Can they help? Are they potentially applicable in your world?

An approach to a vulnerability and risk assessment:

Please mark up as needed

AECOM

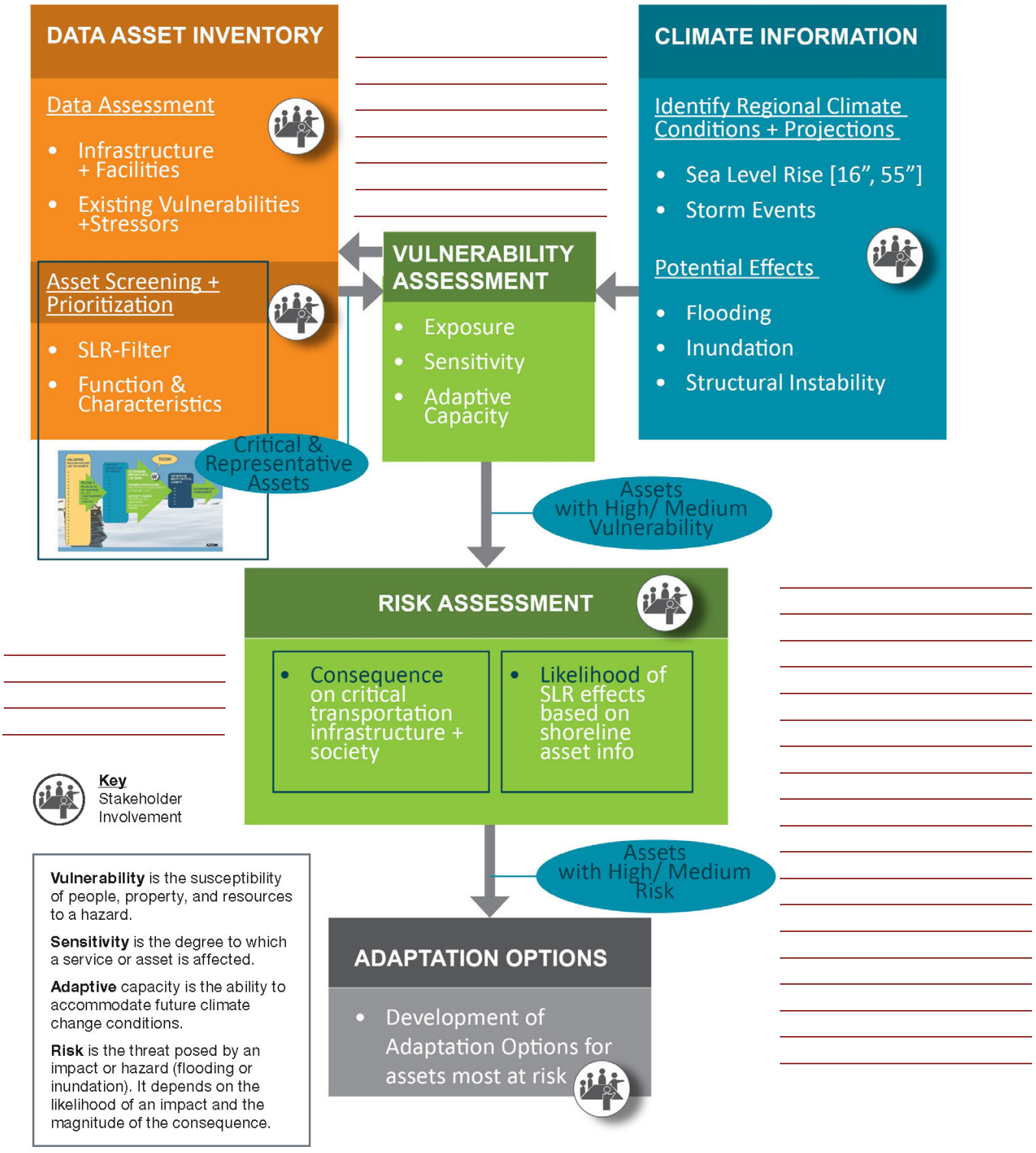
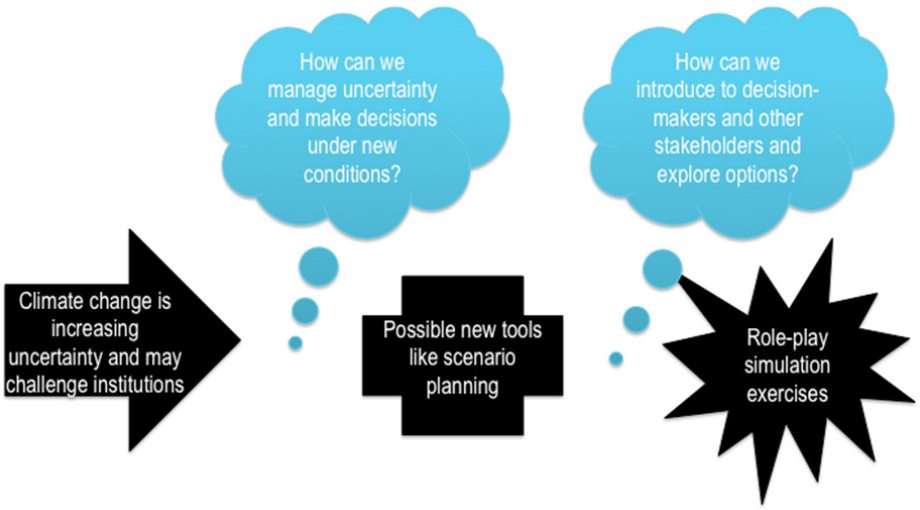


FIGURE 1.2 Adapting to Rising Tides: Transportation Vulnerability and Risk Assessment Pilot Process (this process is adapted from FHWA conceptual risk assessment model which was tested through this pilot process)

Adapting to Rising Tides November 2011, Briefing Book; Page 6. Full copy of the report and more information at http://www.mtc.ca.gov/news/current_topics/10-11/sea_level_rise.htm and http://www.adaptingtorisingtides.org/

Why we use role-play simulation exercises:



Sample infrastructure-related planning scenarios:

Taken from 'Harboring Uncertainty' RPS exercise

Wet and Quiet • Precipitation and/or riverine flooding leads to higher water levels in the near future • Vehicular traffic volume remains constant or declines in the coming years	***Wet and Busy*** • Precipitation and/or riverine flooding leads to higher water levels in the near future • Vehicular traffic increases steadily and substantially in the coming years
Dry and Quiet • Slow or no increase in precipitation and flooding risks • Vehicular traffic volume remains constant or declines in the coming years	***Dry and Busy*** • Slow or no increase in precipitation and flooding risks • Vehicular traffic increases steadily and substantially in the coming years

Steps in the consensus-building approach to decision-making:

Adapted from the Consensus Building Handbook (Susskind et al., Sage, 1999)/Consensus Building Institute, 2008

Adapting to Rising Tides

Climate Impacts Statement

The Adapting to Rising Tides Subregional Working Group and project staff are developing a vulnerability assessment of how climate change may affect the communities, infrastructure, economy and ecosystems along the Alameda County shoreline from Emeryville to Union City. Five impacts associated with changes in storm events and sea level rise define the scope of this assessment. This statement summarizes these impacts and the types of potential effects that will be addressed.

Climate change	Impacts associated with change [i]	Potential effects of these climate impacts on: Society and Equity, Economy, Governance, and Natural Environment [i, ii]
Storm Events	More frequent extreme high sea level events cause ***more frequent flooding events*** in flood-prone areas	• More injuries and loss of life • Overwhelmed flood protection channels and storm drains increase flooding in low-lying areas • Contamination from sewage distribution and treatment systems adversely affects human health • Disruptions to key services (e.g. transportation, water, energy, health care, etc) • Lost wages and lower productivity for the region during recovery periods • Disadvantaged communities bear proportionately high burden of effects • More repeat-loss claims and higher insurance rates due to greater flood risks • Increased need for shoreline communities to plan for and respond to impacts
	With longer duration extreme high sea level events, ***flooding lasts longer***	• Increased cost of repair and maintenance after flood events • Longer duration of disruption of access to goods and services • Longer floods increase shoreline erosion, scouring and release of contaminants • Changes to sediment transport and deposition affect capacity of tidal wetlands to keep up with sea level rise
Sea Level Rise	Higher high tides, shifts in tidal range, and increases in depth and duration of tidal inundation cause ***frequent or permanent inundation*** of areas that are not currently in the daily tidal range	• Inundation of existing private and public infrastructure and critical facilities • Structures, including shoreline protection, that are not adequately protected, elevated or flood-proofed are destroyed or damaged and require replacement, repair and/or more frequent maintenance • Less access to goods and services (e.g. energy, transit, health care, schools, etc) • Low income residents bear proportionately high burden when having to reinforce structures, relocate, purchase more insurance for properties, pay higher goods and services costs or find alternatives • Greater demands on agencies to plan for and manage infrastructure/resources • Building codes and land-use and resource management policies and practices inadequate to address sea level rise impacts • Future flooding of new shoreline development if sea level rise not addressed • Tidal habitats that cannot keep up or migrate inland drown, causing loss of important habitat areas and potentially reducing flood protection benefits of tidal marsh and mudflats to inland communities • Loss of trails, beaches, vistas, other shoreline recreation areas and public access to shoreline over time
	Higher Bay water level causes changes in wave activity in the Bay leading to ***increased shoreline erosion*** and ***waves over-topping shoreline protection***	
	Higher Bay water level leads to ***elevated groundwater levels and salinity***	• Decreased seismic stability • More groundwater intrusion into underground transit infrastructure and other below-grade structures damages infrastructure and requires more pumping • Groundwater intrusion into contaminated sites re/mobilizes contaminants • Higher groundwater salinity reduces fresh water supply from coastal aquifers

Sources: [i] California Natural Resources Agency. (2009) *California Climate Adaptation Strategy.* [ii] City of Chula Vista Climate Change Working Group. (2010) *Climate Adaptation Planning Matrices.*