

Climate Change: Global Change and Local Adaptation



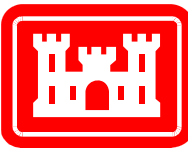


- **Co-Directors**
 - Todd Bridges and Ahmed Abdel Hady
- **Chair**
 - Igor Linkov
- **Organizing Committee Members**
 - Greg Kiker and Abou Ramadan
- **Local Organizers**
 - Inga Jonsdottir



ARW Goals

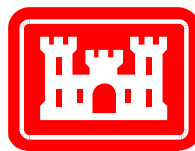
- **Examine the nature of vulnerability and impacts of climate change at local/regional scales**
- **Define the role of risk analysis in managing risks posed by climate change**
- **Define the applicability of adaptive management for climate change**
- **Identify strategies that developing countries can use to manage security risks**
- **Identify specific research needs for improving the value of risk analysis as applied to climate change**





ARW Process

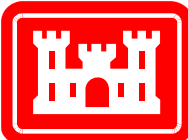
- **Summarize state-of-the-science in areas related to Climate Change Adaptation**
 - Summary presentation during the workshop
 - Summary Chapters after the workshop
 - Book based on the workshop
- **Identify problems and propose solutions/ analytical methods**
 - Focus on Adaptation - Science and Management
 - Risk Analysis
 - Decision Analysis
- **Establish collaborative teams and possible projects (including NATO ARWs)**
- **Have Fun!**





Previous NATO Meetings

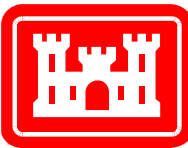
- **1997 – Magnitogorsk, Russia**
 - Air Pollution, Health and ecological impacts
- **1998 – Kiev, Ukraine**
 - Impact of radionuclide and other stressors on forests and natural ecosystems
- **2000 – Lisbon, Portugal**
 - Risk Assessment and Management; Application in developing countries
 - RA methods, RA tools, Environmental Management
- **2002 – Anzio (Rome), Italy**
 - Comparative risk assessment (CRA); Applying CRA to Middle Eastern environmental problems
 - CRA, CRA and Decision making
- **2004 – Eilat, Israel**
 - Environmental Security and Risk Assessment, applications in Middle East
 - Environmental Security, Risk Assessment and Decision Analysis
- **2005 – Thessaloniki, Greece**
 - Environmental security in coastal areas
 - Risk assessment & security; navigation/contaminated sediments; invasive species & coastal restoration
- **2006 - Venice, Italy**
 - Environmental security at ports and harbors
 - Critical Infrastructure, Decision Analysis, Environmental Security
- **2007 - Lisbon, Portugal**
 - Non-chemical Risks
 - Decision Making and Risk Assessment tools and applications to emerging threats
- **2008 – Carvoeiro, Portugal**
 - Nanotechnology Risk Assessment





Overview

- **Why Climate Change Adaptation?**
- **Why Risk Assessment?**
- **Why Decision Analysis?**
- **Why Us and Why Now?**
- **Agenda**

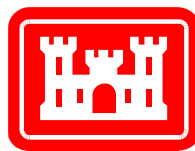




Adaptation

The IPCC defines different types of adaptations (Fluet et al 2009):

- (1) anticipatory (or proactive) adaptation: before the impacts of climate change
- (2) autonomous adaptation: an unconscious response to climatic stimuli, triggered by climate changes
- (3) planned adaptation: resulting from political decisions, and based on an awareness of changing conditions and that actions are necessary to ensure well-being
- (4) private adaptation: initiated by individuals, families or private companies
- (5) public adaptation: initiated and instituted by government at all levels
- (6) reactive adaptation: put in place after the impacts of climate change



Why Adaptation?

Lifting the taboo on adaptation

Renewed attention to policies for adapting to climate change cannot come too soon for Roger Pielke, Jr, Gwyn Prins, Steve Rayner and Daniel Sarewitz.
Nature 2007, 445 p. 597-598

- (1) Timescale mismatch for carbon emissions reductions to impact climate.
- (2) Vulnerability to related impacts is increasing for reasons unrelated to emissions (population growth, development decisions).
- (3) Developing countries focusing on increasing resilience to blunt impact of climate-related events.





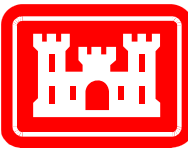
Why Adaptation?

Current approaches:

UNFCCC data base of local coping strategies (cases) and database of funding sources for adaptation.

UNFCCC proposes a risk management approach to adaptation including insurance, economic diversity and innovative technologies.

http://unfccc.int/adaptation/implementing_adaptation/items/2535.php





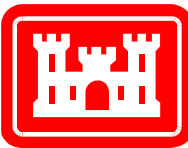
Why Adaptation?

Future needs:

IPCC 4th Assessment, Chapter 17 – Adaptation

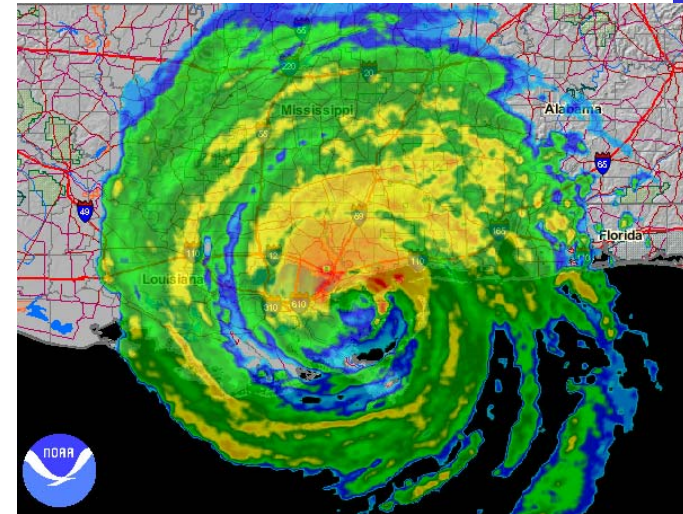
Investments in infrastructure, technologies and behavioral practices.

Barriers to implementing adaptation measures - such as understanding the limits of natural systems as well as social, cultural, cognitive and financial constraints - need to be overcome.



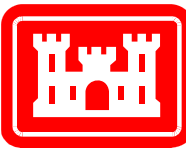
Why Risk Analysis?

- To support risk management decisions that can be justified in terms of quantitative evidence about risk reduction, where:
 - *risk* is the likelihood for all relevant adverse impacts
 - uncertainties are explicitly considered and processes are implemented to manage them
 - the investment is commensurate with the magnitude of the risks



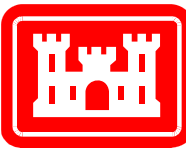
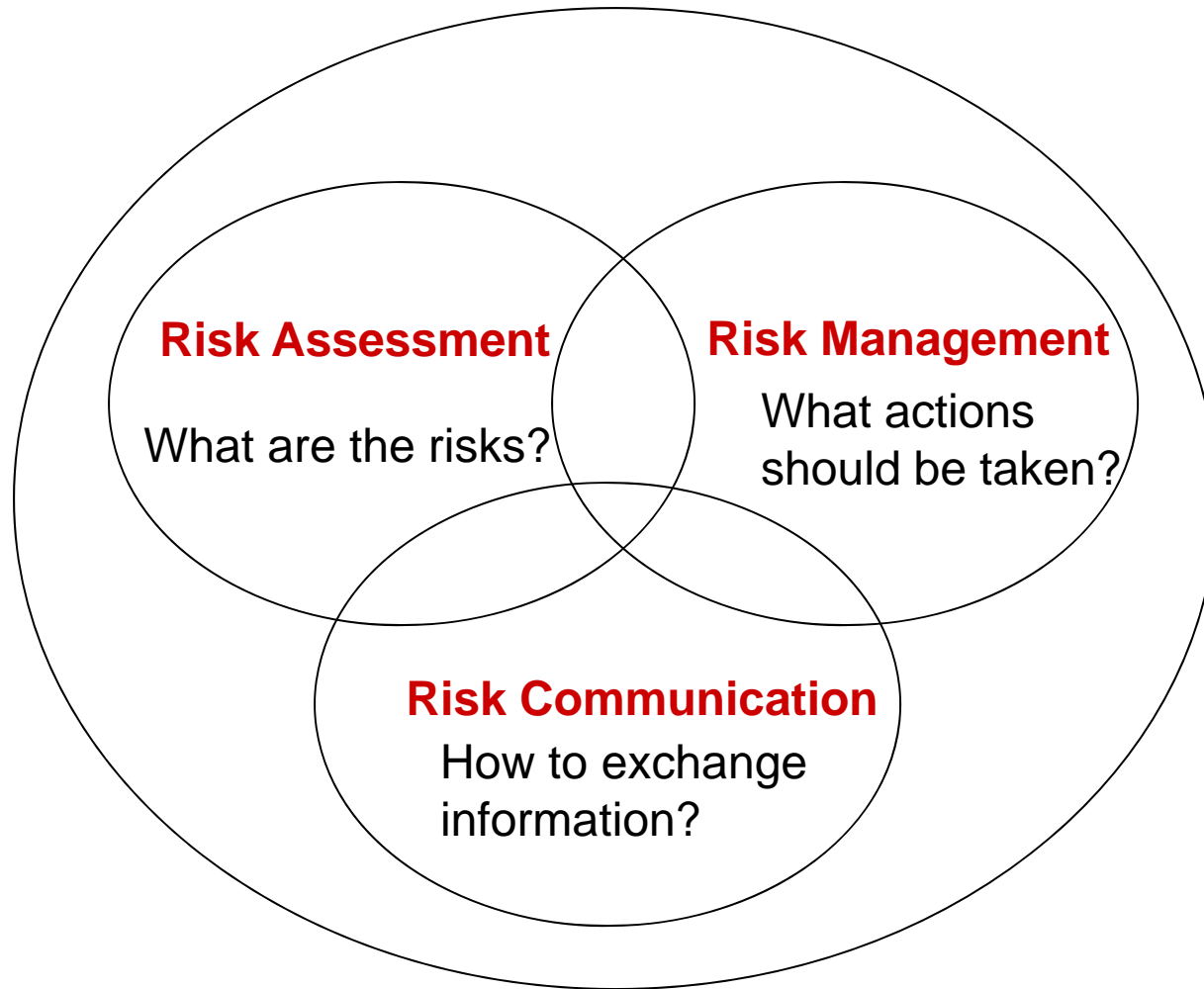
“Transforming Practice to Apply Risk-Informed Decision Making.” T.S. Bridges 2007

“Transforming the Corps into a Risk Managing Organization.” D. Moser, T. Bridges, S. Cone, Y. Haimes, B. Harper, L. Shabman, C. Yoe. 2007

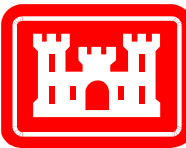




Risk Analysis: The Ideal

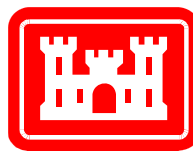


Risk Analysis: Current Practice



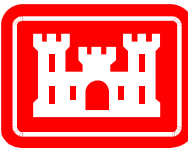
Our Systems

- **We build and operate systems to achieve specific objectives**
 - Navigation system:
 - locks, dams, channels
 - Reservoir system:
 - structures and operating procedures
 - Flood risk management system:
 - Structural, nonstructural, ecosystem features
 - Ecosystem features comprising a restoration project
 - Military operations and infrastructure



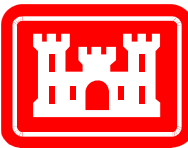
A Risk Hierarchy

- **Risks to a project, a system of projects, a system of systems, e.g.:**
 - How and under what conditions would a levee or an I-wall fail?
 - What future conditions pose risks to the performance of the flood risk management system (structural, non-structural, ecosystem features)?
 - E.g., funding streams, development patterns, climate change
 - How do multiple systems interact to affect risks?
 - Coastal structures in LA and MS
 - The navigation and flood risk management systems
 - The built vs. “natural” systems
- **Process-level understanding of how components and systems “succeed” or “fail”**



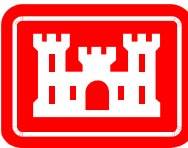
A Starting Place

- **Risk assessment:**
 - What can go wrong?
 - How can it happen?
 - What is the likelihood?
 - What are consequences?
- **Solution-focused risk assessment**
 - Purpose of the assessment is to identify the relative differences among decision alternatives

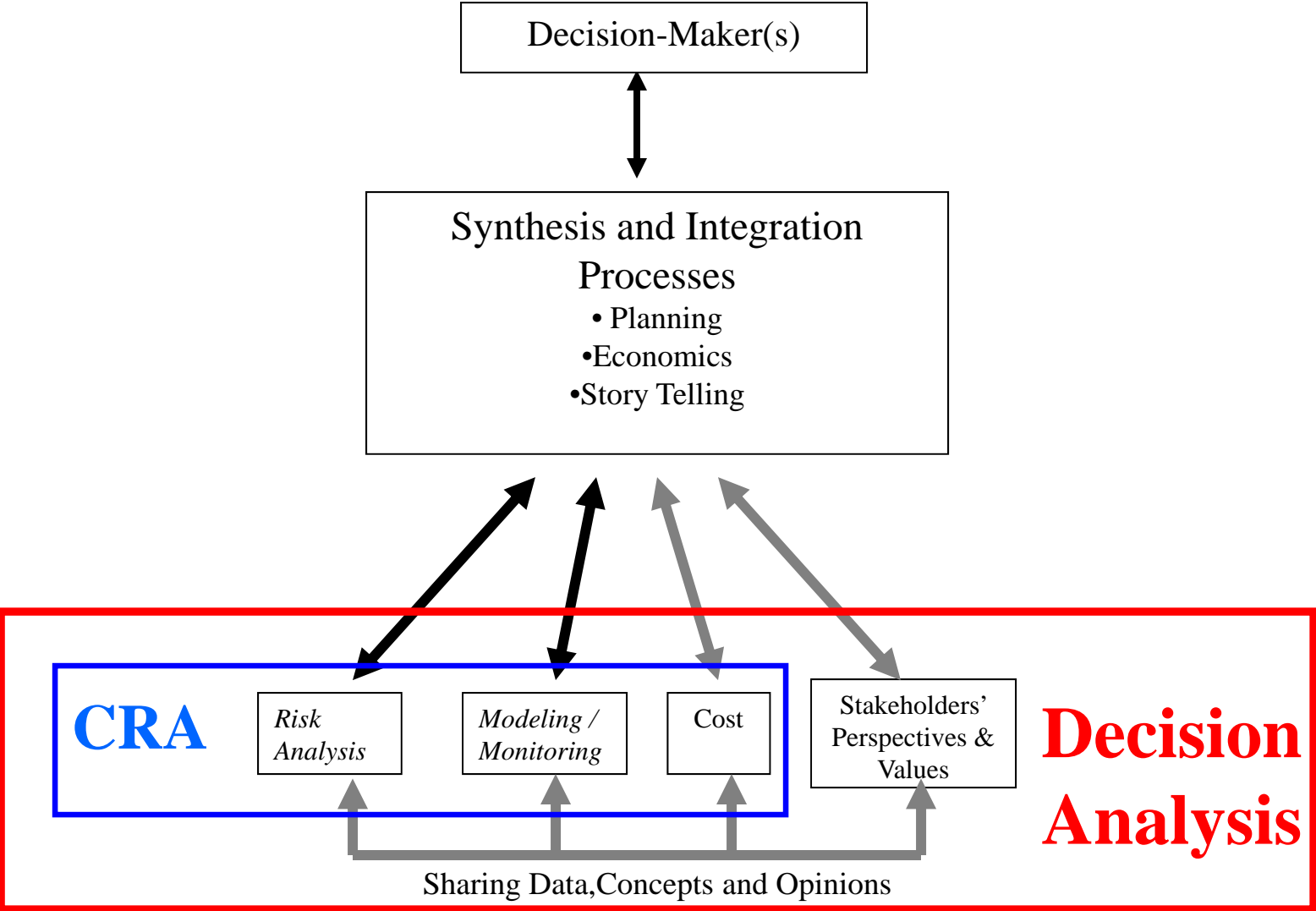


Why Decision Analysis?

- **Decision problems concerning climate change are complex**
 - Long time scales and large and diverse set of uncertainties
- **Means for exploring the implications of uncertainty and the value of reducing it**
- **The ability to distinguish science and engineering inputs to a decision from values associated with objectives**
 - Opportunities to explore trade-offs among diverse objectives
- **Provides a quantitative framework to implement adaptive management**



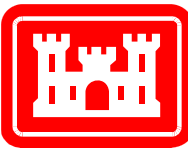
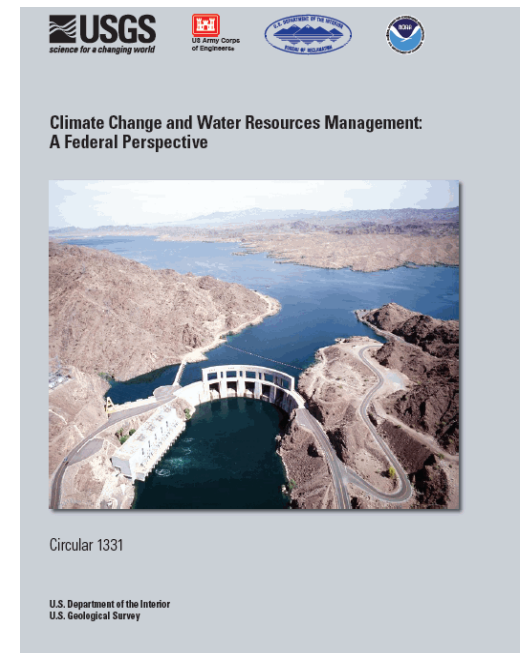
Evolving Decision-Making Processes



Why Now?

Climate Change and Water Resources Management: A Federal Perspective USGS Circular 1331, Feb 2009

"The purpose of this interagency report prepared by the U.S. Geological Survey (USGS), U.S. Army Corps of Engineers (USACE), Bureau of Reclamation (Reclamation), and National Oceanic and Atmospheric Administration (NOAA) is to explore strategies to improve water management by tracking, anticipating, and responding to climate change. This report describes the existing and still needed underpinning science crucial to addressing the many impacts of climate change on water resources management."



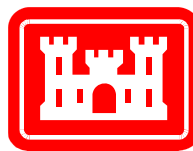


Why Now?

Regulatory Developments

Exec Order 13514 – Oct 2009

Sec. 16. *Agency Roles in Support of Federal Adaptation Strategy...* the agencies shall participate actively in the interagency Climate Change Adaptation Task Force, which is already engaged in developing the domestic and international dimensions of a U.S. strategy for adaptation to climate change, and shall develop approaches through which the policies and practices of the agencies can be made compatible with and reinforce that strategy.



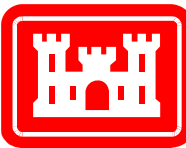


Why Now?

Regulatory Developments

Proposed changes to NEPA, Feb 2010

White House Council on Environmental Quality (CEQ) proposed a guidance document that directs agencies to consider climate change -- both greenhouse gas emission levels and impacts such as rising sea levels or increased droughts -- in their National Environmental Policy Act (NEPA) reviews.

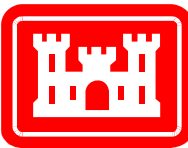




Why Now?

USACE Civil Works circular 1165-2-211 (July 2009):

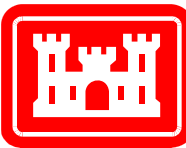
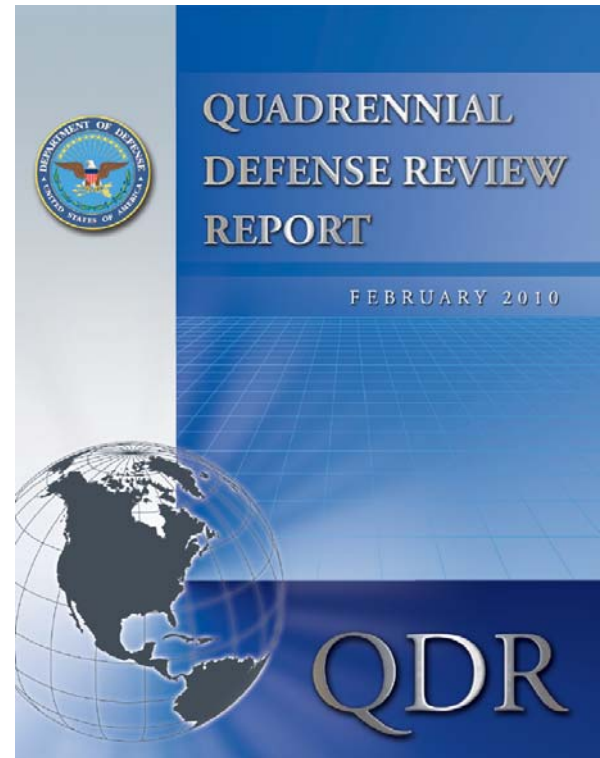
“Recent climate research by the Intergovernmental Panel on Climate Change (IPCC) predicts continued or accelerated global warming for the 21st Century and possibly beyond, which will cause a continued or accelerated rise in global mean sea-level. Impacts to coastal and estuarine zones caused by sea-level change must be considered in all phases of Civil Works programs.”



Why Now?

QDR February 2010 report:

- Identified the need to advance knowledge of risks to sustaining coastal military installation assets and mission capabilities.
- Called for the development of climate change assessment tools.
- Resulted in the formation of a joint DoD and DOE research effort through the Strategic Environmental Research and Development Program: SERDP SI-1701 Project.



Agenda - Sunday

13:30-14:00 Opening Address:

Ólafur Ragnar Grímsson (President of Iceland): The Challenge of Climate Change
Q & A

Opening Session (main hall)

1. Workshop Introduction and Goals

- 14:00** **Linkov, Jonsdottir & Bridges:** Scientific Background, Goals and Overview
- 14:30** **Mortsch:** IPCC: Vulnerability and Adaptation
- 14:50** **Hillel:** Climate Change Adaptation: Developing World Perspectives
- 15:10** **Hady:** Climate change: Global, Regional and National dimensions

15:30 Coffee Break (Upstairs).

2. Climate Change Impacts and Adaptation: Work Group Overviews

- 16:00** **Kiker and Ranger:** WG1 Coastal Systems
- 16:20** **Lambert and Troccoli:** WG2 Inland Systems
- 16:40** **Russo and McBride:** WG3 Military Installations and Operations

17:00 Keynote Lecture

Stockton (Chief Engineer, USACE): US Army Corps of Engineers: Responding to Climate Change

Holland (Chief Scientist, USACE): Water-Climate Interface - Impacts and Adaptation Research

19:00 Reception and Dinner (Hotel Rangá, main hall)

Agenda – Monday AM

3. *Global Climate Change (main hall)*

- 8:00** **Lewis:** Seamless weather and climate for security planning
- 8:20** **Björnsson:** Climate Change and Iceland
- 8:40** **Geiss:** Energy Security in a Global Context

4. *Regional Aspects of Adaptation: Panel Discussion (main hall)*

- 9:00** **5min presentations and open Discussion**

White: USA

Troccoli: Europe/Australia

Sterin: Russia

Bromberg: Israel

El Raie: Egypt

Discussion

5 *CC Adaptation: Methods (main hall)*

- 10:30** **Zhu:** Integrated modeling for national greenhouse gas flux assessment in support of policy applications
- 10:50** **Hallegatte:** Adaptation to climate change: Economic analysis and Decision-making under uncertainty
- 11:10** **Linkov, Bridges, Scarlett:** Adaptive Management Needs and Solutions
- 11:30** **Munoz-Carpena:** Climate Change Modeling and Global Uncertainty Analysis

Agenda – Monday PM

6. Work Group Meetings #1 13:00 – 15:00 (*three meeting rooms, two upstairs, one downstairs*)

15:30 *Coffee Break (upstairs)*

7. Climate Change and Iceland 16:00 – 17:00

16:00 **Á. Höskuldsson:** The Eyjafjallajökull eruption in 2010

16:20 **F. Höskuldsson:** The role of the ICG regarding natural hazards.

16:40 **Jóhannesdóttir:** Hazards in Iceland, local adaptation.

8. 17:00 **Poster Social (pool room)**

Thorne and Butte: An Expert Model of Influences of Climate Change on USACE Environmental Risk Management

Salama: Mapping Sea Level From Space: Precision Orbit Determination And Satellite Altimetry

El-Raey: Climate Changes Impacts on Egypt and the Arab Countries

Linkov and Kiker: Use Of Multi-scale Models, Data and Scenario Projections To Reduce Risk Of Climate Change Effects On Birds at Florida Military Installations

Bennett: Climate Change and Sustainable Energy

Tkachuk: Integrated Threat, Vulnerability and Consequence Model: Application to Energy and Climate

Barlettani: Big sized photovoltaic plants in Italy: strategic solution for power generation from renewable sources

Yumagulova: Resilient by design: adapting cities to climate change

White: US Water Resources Management Climate Change Adaptation Methods

White: US Army Corps of Engineers Climate Change Decision-Making

White: Linking Adaptation and Mitigation Measures at USACE Water Resource Projects

White: Mapping and Analyzing Regional Climate Effects to Support Decision-Making in Watersheds

Rögnvaldsson: SAR Weather forecast

Jónsdóttir: Real time monitoring of natural hazards

Linkov: Professor W.R. Schell - a tribute to an outstanding environmental scientist

Lambert: Adaptation to Climate Change and Emergent Conditions Influencing Erosion in Alaska Communities

Lambert: Energy Security Alternatives for Installations: Addressing Regulatory Needs and Uncertain Future

Finnsson: Geometry, mass balance and climate change response of Langjökull ice cap, Iceland

Pórhallsdóttir: Early flowering as an indicator of global warming: a nationwide local community monitoring project.

19:00 **DINNER (Hotel Ranga) “Gala” dinner in main hall.**

Agenda - Tuesday

8.00 **Bridges and Ramadan: Brief Review of Day 1 Discussions & Working Group Activities**
5min Summaries by WG Co-Chairs (main hall)

9. *CC Adaptation: Examples (main hall)*

8:30 **McBride:** U.S. Navy's Climate Change & Energy Initiatives

8:50 **Ranger:** Revisiting the generation and interpretation of climate models
experiments for adaptation decision-making

9:10 **Klein:** Adaptation to climate change in coastal areas: more than technology

9:30 **Bowman:** Adaptation Challenges for Water, Power, and Waste Management: Examples
from China and USA

10. *Cognitive and Social Aspects of Risk Assessment and Vulnerability (main hall)*

10:30 **Brklacich:** Climate Change, Human Vulnerability and Security

10:50 **Nyer:** Climate Change-Cost of impacts and lines of adaptation in France

11:10 **Palma:** Risk Perception and Communication

11:30 **Discussion**

13:00 **Keynote Lecture**

Lynn Scarlett (former Deputy Secretary, US Department of Interior):
Climate Adaptation: The Nexus of Science, Collaboration and Decision Making

11. *Work Group Meetings #2 14:00 – 16:00 (three meeting rooms)*

16:15 *Bus Tour*

Dr. Ármann Höskuldsson will be the guide to Gígjökull, Seljalandsfoss and Seljavellir around Eyjafjallajökull to study environmental changes during the eruption and impacts on local community.

Agenda - Wednesday

8.00 Jonsdottir & Bridges: Brief Review of Day 2 (main hall)
5min overviews by WG Chairs

12. *Environmental Security Under Climate Change (main hall)*

8:30 Jones: Downscaling from Global to Local: Implications for Vulnerability Research

8:50 Merad: Sustainable Development and Climate Change

13. *Work Group Meetings #3 9:10 – 10:00 (three meeting rooms)*

14. *Work Group Meetings #4 10:30 – 12:00 (three meeting rooms)*

12.00 – 13:00 Lunch (main hall then coffee upstairs)

15. *Work Group Reports (main hall)*

13:30 WG#1 Representative

14:00 WG#2 Representative

14:30 WG#3 Representative

15. *Plenary Summary of Workshop & Next Steps*

15:00 Bridges: Summary of Key Results and Research Needs (Discussion)

15:30 Linkov & Hady: Schedule for Publication of Proceedings & Next Steps for Workshop

16:30 Conference Tour and Relocation to Reykjavík and Keflavík.

Tour to Gullfoss, Geysir and Þingvellir.

20:00 Conference Dinner at Nesjavellir

Working Groups

Coastal

Barlettani
Bromberg
El-Raey
Hallegatte
Hawkins
Holland
Jonsdottir
Kiker
Mortsch
Nyer
Ranger
Rögnvaldsson
Scarlett
Stockton
Thorne
Valdimarsson
Viggósson
Kiker
Þórhallsdóttir
Björnsson

Inland

Björnsson
Bowman
Bridges
Hady
Hillel
Jones
Karl
Klein
Lambert
Munoz-Carpena
Palma
Reynisson
Sterin
Troccoli
White
Yumagulova
Zhu
Ogilvie
Jóhannesdóttir
Höskuldsson, Á
Jóhannesson
Nawri

Military

Bennett
Brklacich
Butte
Geiss
Höskuldsson, F
Lewis
Linkov
McBride
Merad
Russo
Salama
Tkachuk
Þorsteinsdóttir

Tribute to Bill Schell

