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Climate Change and Water Resources: A crucial consideration in enhancing long-term international and natural security

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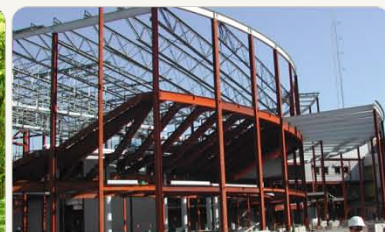
WATER



NATURAL RESOURCES



ENVIRONMENT



INFRASTRUCTURE



ENERGY

Changing nature of military engagement

- Per 2010 Quadrennial Defense Review, 2010 U.S. National Security Strategy, Executive Order 13514
- Climate change poses security and geopolitical challenges for military
- Military requires a holistic, comprehensive and cooperative approach to address today's security challenges

Lessons learned from the Water Sector



- Objective: Focus on water sector to explore potential implications of climate change on military operations and readiness
- Lessons Learned from 3 Tt projects:
 - 1) National Scale Modeling to Evaluate Impacts of Climate Change on Hydrology and Water Quality, United States
 - 2) Natural Disaster Risk Evaluation and Urban Planning, Sana'a, Yemen
 - 3) Sustainable Water Supply and Sanitation Project, Afghanistan

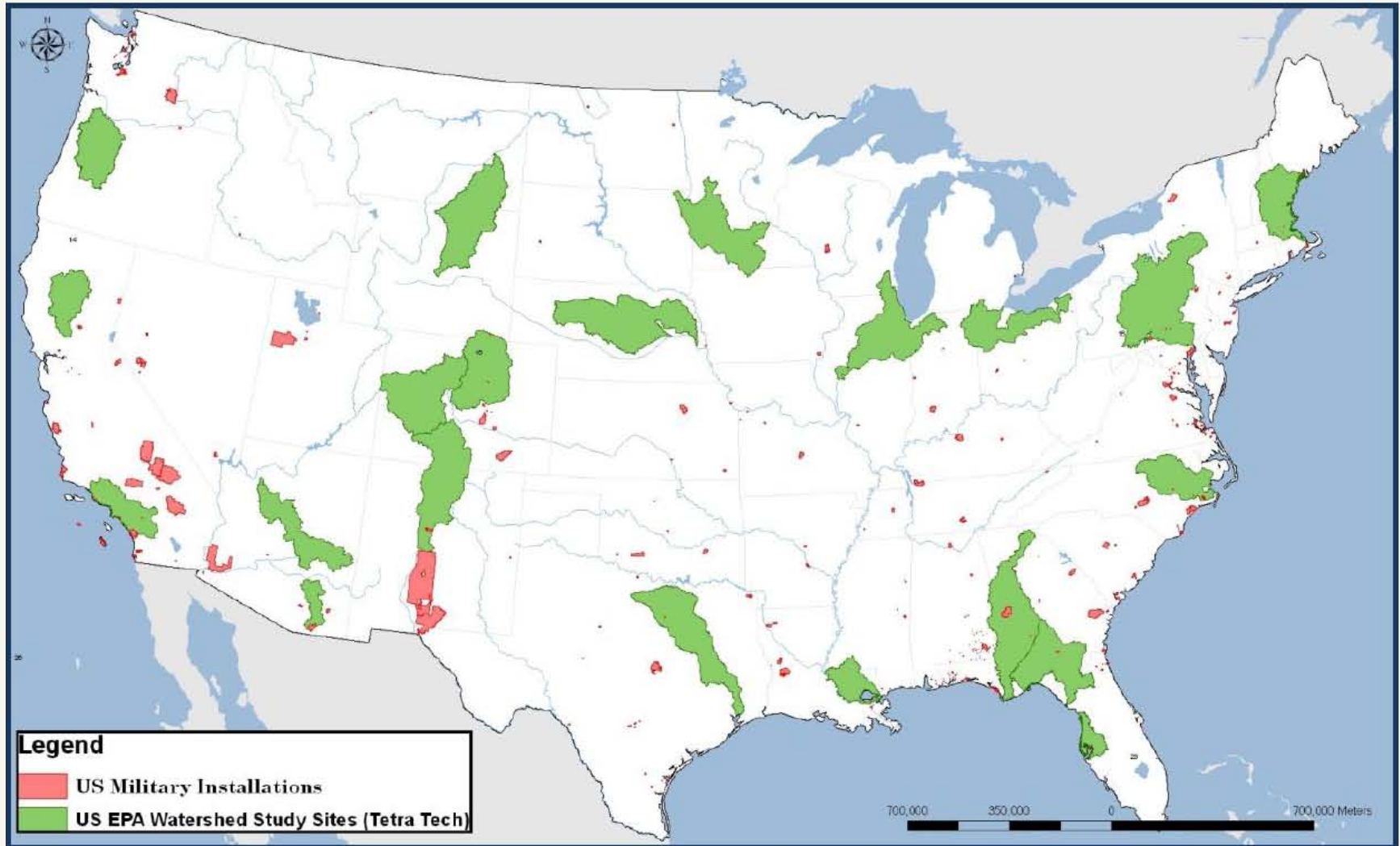
Case Study 1: United States

- National Scale Modeling to Evaluate Impacts of Climate Change on Hydrology and Water Quality, United States, for USEPA/GCRP
- Project Objective: Provide insight into quantifying climate change impacts for EPA, specifically to assist with TMDL analyses
- National scale study – 20 watersheds
- Assess the sensitivity of hydrologic and water quality endpoints under a range of alternative 21st century climate conditions
- Evaluate the effects of different models and methods of downscaling climate change information on the variability of outcomes

Case Study 1: Lessons Learned

- Location plays a major role
- Significant variability across GCMs and downscaling methods
 - No single conclusion
 - Maximum differences at extreme conditions
- Watershed models are sensitive to climate variability and change
 - Significant impacts on flow, particularly for extremes
 - Sediment and nutrient loading impacts, largely controlled by precipitation timing and intensity

Pilot Watersheds and US Military Installations



Relevance to US Military: Assets and Readiness

- Uncertainty of impacts – importance of using an ensemble approach
- Environmental health of military installations could be threatened; negative repercussions for testing and training functions
- For installations located in water scarce areas, there is a potential for greater costs to obtain adequate water resources necessary for personnel and systems (e.g. sewage treatment systems)
- Flooding episodes could damage infrastructure

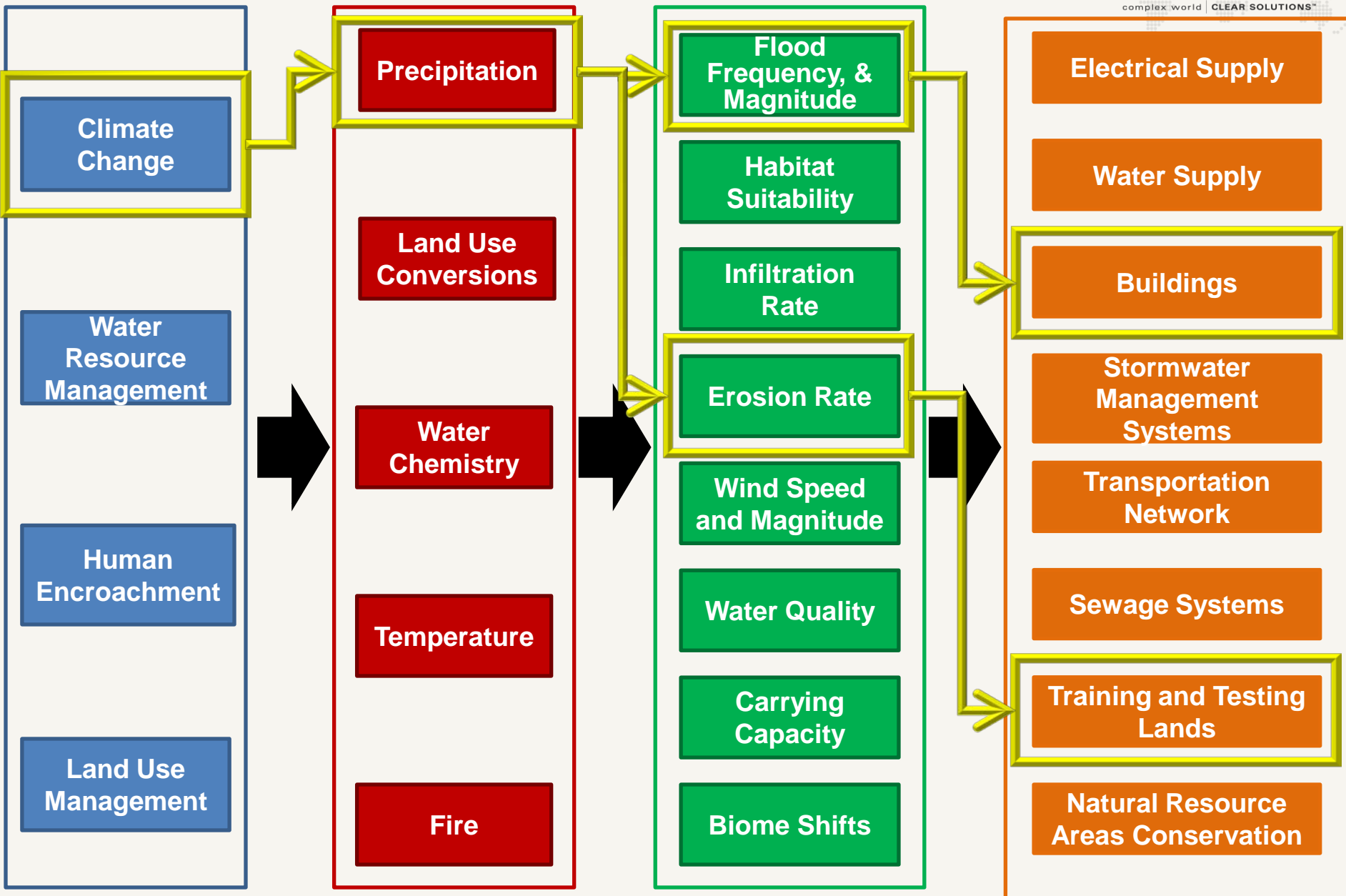
Drivers

Stressors

Endpoints

Mission Assets

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Climate Change

Water Resource Management

Human Encroachment

Land Use Management

Precipitation

Land Use Conversions

Water Chemistry

Temperature

Fire

Flood Frequency, & Magnitude

Habitat Suitability

Infiltration Rate

Erosion Rate

Wind Speed and Magnitude

Water Quality

Carrying Capacity

Biome Shifts

Electrical Supply

Water Supply

Buildings

Stormwater Management Systems

Transportation Network

Sewage Systems

Training and Testing Lands

Natural Resource Areas Conservation

Case Study 2: Sana'a, Yemen

- Natural Disaster Risk Evaluation and Urban Planning, Sana'a, Yemen, for the World Bank
- Objectives:
 - Disaster Risk Assessment
 - Preparation of the Integrated Storm Water Management Plan (ISWMP) and Feasibility Study of a First Stage Drainage Program
 - Integrating Disaster Risk Management into urban planning and municipal management



Case Study 2: Lessons Learned

- Climate change is exacerbating existing stressors
 - Potable water
- Climate change is creating additional stressors
 - Cyclones/Flooding
- USG development efforts counter-productive



Relevance to US Military: Fragile States



- Access to potable water in water scarce areas is crucial to stability; groundwater depletion in Yemen
- Water scarcity could result in environmental migration
- Agriculture accounts for the majority of water usage – depletion has implications for food security and employment
- Potential for U.S. projects to work at cross purposes

Case Study 3: Afghanistan

- Sustainable Water Supply and Sanitation Project, Afghanistan, for USAID
- Objective:
 - Increase access to potable water supply and sanitation services in poor communities
 - Decrease the prevalence of water-related diseases through Community-Led Total Sanitation facilitation process
 - Improve the sustainable management of potable water by training community-appointed hand pump and pipe scheme mechanics to maintain and repair community water systems



Case Study 3: Achievements

RC	Water Supply			Wells Being Contracted	Current Beneficiaries
	Wells Completed	Wells Under Construction	Pipe Schemes Completed and Under Construction		
East	948	1,278	9	565	187,500
West	22	77	0	0	3,850
South	0	25	0	61	0
Southwest	0	112	0	0	0
North	20	16	0	66	3,500
Total	990	1,508	9	692	194,850

Case Study 3: Achievements

RC	Sanitation Achievements					PMP Year Two Targets (by Sept. 30, 2011)	
	New Constructed Safe Latrines	Improved Latrines	Latrines: New and Improved	Under Construction	Beneficiaries from Improved Sanitation Facilities and Practices*	Improved Latrines	Beneficiaries From Improved Sanitation
East	414	2,652	3,066	0	21,462		
West	0	0	0	0	0		
South	0	0	0	0	0		
Southwest	0	0	0	0	0		
North	1,825	3,124	4,949	43	34,643		
Total	2,239	5,776	8,015	43	56,105	23,000	230,000

Case Study 3: Lessons Learned

- Its not enough to build a well or construct a latrine – must involve participatory, holistic approach
- Only small percentage of project nominations are actionable
- Economy of scale important to success
- 3D planning timelines are different and provide different project pressures



Conclusions

- The US military has a strong national and international security interest in assessing and understanding the risks posed by climate change
- Both short-term and long-term planning horizons need to integrate climate change considerations
- More robust decision-support tools are needed
- Better understanding of relationship between climate change and human security
- Integrated staff training on project-level water considerations