**Dr. Louis Uccellini - NOAA Environmental Leadership Seminar Questions**

**Q**: Please address NWS plans WRT using containers (Docker or Singularity) in Operation.

**A**: *The NWS currently does not have a plan for the use of containers in operations. This has been identified in agency future planning activities as a concept which needs more exploration and related assessment.*

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**Q:** More generally, what are NWS' plans WRT NOAA cloud computing strategy?

**A**: *The NWS has recently completed a White Paper on its Cloud Computing Strategy. And have recently signed on to the NOAA Cloud Computing Strategy. The White Paper and various ongoing pilot and path-finding cloud projects will inform our next steps in this area and be reflected in the FY21 Annual Operating Plan.*

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**Q:** You didn't speak specifically to how people are receiving weather information, which is something We're studying -- thinking of how to advance technology and therefore reduce vulnerability to severe weather/storms, how can you ensure the most vulnerable populations (who may not have access to advanced technology) receive the information?

**A**: *The NWS delivers watches and warnings through multiple means to ensure the greatest reach to the U.S. population as possible. From NOAA Weather Radio which reaches 96% of the population to utilizing social media to provide information to our partners and the general population before, during and after extreme events and other outreach activities, to alerting individuals with smartphones through Wireless Emergency Alerts (WEA), NWS supports a wide range of technology delivery services.*

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**Q:** Do you envision the NWS ever serving weather information and forecast using a smartphone app (not a widget)?

**A**: *There are no plans in place to field a weather app. Our current policy on support to mobile devices (NWSI 1-1003) focuses support both directly, by making our NWS web presence accessible to all devices, and indirectly, by making NWS data available in industry standard formats to support development of tools throughout the Weather, Water, and Climate Enterprise (e.g., FEMA, private sector). The policy does not prohibit NWS development of apps, but recognizes that a compelling case would need to be made given the resource-intensive maintenance tail associated with apps and the thriving market for private apps currently in existence. We will be working to update this directive based on the current needs of the agency.*

**Q**: If we are building a coastal management plan for local communities in preparation for future extreme weather events, what do you think is essential to include in the plan besides the (maybe) obvious such as local engagement, decision-maker inclusion, stakeholder participation, etc.?

**A**: *I would engage the local NWS Office that serves the community in discussions about what to include in the plan. NWS Office staff could provide information about threats the community should be prepared for and where to access hazardous weather information. In return, their engagement would allow them to serve NWS Core Partners better by understanding the impacts local communities would face as a result of extreme weather events.*

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**Q:** In terms of IDSS, If you have built trust, practiced and practiced, but nothing is working, what would be the next step?

**A**: *If the Core Partner is not satisfied with the IDSS provided, or there remains a disconnect between the IDSS given and the partner response, then I recommend proactive steps be taken to better understand the Core Partner's needs and the best ways to communicate information. Communication tends to be the highest priority element in any trusted relationship. We must recognize that we have diverse communities and cultures that have different cultural attributes that need to be taken into account in order to tailor our messaging to their key decision points and related changing risk preferences as we approach a predicted extreme event. Finally, we must ensure that the line for communication is always open for your Core Partner as individual events may demand unique aspects of IDSS needed to meet their challenges. .*

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**Q**: What efforts NWS has taken to educate the American people about the importance of becoming "weather ready" and what has been the response by the public so far?

**A**: *National Weather Service offices have expressed the importance of being weather-ready with the public through outreach events, office tours, and social media. The NWS has expressed its Vision of becoming a Weather-Ready Nation to core partners and others in the weather enterprise, who in-turn, have educated the public. The response from the public has been positive overall. The NWS continues to see more communities become StormReady and work toward building resilience from extreme weather, water, and climate events. An example of a successful social media safety campaign is the #SafePlaceSelfie Campaign that focuses on how to identify the safe locations from various extreme weather or water threats via Twitter. Last April, over 2,100 people or organizations Tweeted a photo of their safe place from extreme weather or water events with the mention of #SafePlaceSelfie, reaching 92 million people*

*across the Twitter platform. Additionally, the NWS created a Weather-Ready Nation Ambassador initiative in 2014. It is an effort to formally recognize government, non-profits, academia, and private industry entities who are improving the nation's readiness, responsiveness, and overall resilience against extreme weather, water, and climate events. As of March 10th, there are nearly 11,000 Ambassadors nationwide.*

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**Q**: How has citizen science enabled the public to contribute to a weather-ready nation and what might those contributions look like in the future?

**A**: *Citizen science plays an important role in building a Weather-Ready Nation. Those contributing to Citizen Science provide real-time weather observations, alert the NWS about severe weather occurring, and/or contribute to NOAA research. The instruments used by observers may continue to improve with time and the methods in which observations become reported may become more efficient.*

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**Q :** What is the name of the book you read about internalizing change? This concept could really help with other NOAA projects.

**A:** *"Start With Why" by Simon Sinek.*

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**Q:** one of your slides mentioned renewable energy as a "forecast frontier" - can you say more about this?

**A**:*Whether it is solar energy or wind energy, operators have to have very detailed forecasts (solar input, clouds,... and the vertical wind profiles..) in order to properly operate those units (or "farms") at peak efficiency in order to have any hope for a profitable future. Providing those forecasts with enough lead time and providing the situational awareness as the solar or wind farms are operating offer opportunities for the enterprise along with major challenges to provide the tailored information as it is needed.*

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**Q:** How many weather models are used to achieve ensemble weather forecast?

**A**: *The Global Ensemble Forecast System (GEFS) is a weather forecast model made up of 21 separate forecasts (or ensemble members) for every forecast cycle which means we produce 84 forecasts a day out to 16 days in advance.. The NWS National Blend of Models (NBM) consists of 31 different models from various agencies coming together to create the forecast output.*

**Q:** What I believe planners need: I believe a guide is needed that will help planners to best address climate change impacts. Please let me know of study that lays out for planners:

*1. Types of impacts*

*2. Likelihood that a specific impact will occur at a specific location*

*3. Likely severity of impact*

*4. Likely cost to respond (recover, rebuild, increase resilience, relocate, etc.) to impact given no investment in resilience or adaptation*

*5. Types of resilience/adaptation measures that address likely specific impacts.*

*6. Guidelines on putting resilience/adaptation measures in place (e.g., outline specifications), including costs*

*7. Likely impact costs avoided by investing in resilience/adaptation*

*8. How to identify when adaptation/resilience investments are unwise; e.g., when climate change impact will likely overwhelm any adaptation/resilience option*

*9. Case studies of how resilience can help in cases of extreme weather and other climate change events.*

**A: Answers provided by the NOAA Climate Program Office (PMO).**

***1. Types of impacts***

*NOAA has co-led and co-sponsored—and helped to author, review, and edit—some of the world's most authoritative science assessments on the state of the climate system, climate impacts on human and natural systems, and possible response strategies. These resources include:*

- *IPCC Climate Assessment Reports*
- *USGCRP Climate Science Special Report and 4th National Climate Assessment*
- *Arctic Report Card*
- *BAMS annual State of the Climate special issue*
- *BAMS annual Explaining Extreme Events from a Climate Perspective special issue*
- *National Academy of Sciences' America's Climate Choices reports*
- *U.S. Climate Resilience Toolkit*

*Each of those reports and resources are designed to help planners understand and address many different types of climate-related impacts.*

***2. Likelihood that a specific impact will occur at a specific location***

*The U.S. Climate Resilience Toolkit's Climate Explorer offers downscaled climate projections for future decades for every county in the contiguous United States and the boroughs of Alaska (Hawai'i and the U.S. island territories are coming soon). The tool gives users the ability to create maps and graphs of threshold exceedances in a range of decision-relevant variables, including number of days per year above selected temperatures; number of precipitation events above selected thresholds; number of dry days, heating degree days, cooling degree days, and growing degree days; and number of days per year with high-tide flooding at 90 stations along the U.S. coastline. The Climate Explorer helps users consider the likelihood that a climate-related impact will occur at a location, and how that likelihood changes over the 21st century.*

***3. Likely severity of impact***

*Likelihood and severity are the components of "risk," a concept that decision makers are encouraged to consider in detail through the Steps to Resilience. NOAA approaches the likelihood component of risk throughout its portfolio. The NWS mission focuses squarely on planning and preparedness for likely near-term predictions. The climate-focused activities of NOAA archive and provide access to the observational record to evaluate expectations and trends. For example, climate normals, which are updated decadally, provide an indication of recent temperature and rainfall patterns at many scales, from stations to climate divisions to states, and indeed to the nation as a whole. NOAA also provides sub-seasonal to seasonal prediction to guide medium-term planning. Regional and global modeling are increasingly used in this context but also to evaluate possible long-term changes in climate-related hazards.*

*"Severity of impacts" requires that analysts consider not only meteorologically driven phenomena but also non-climate factors such as asset type, location, sensitivity, adaptive capacity, population, impervious surface area and other drainage system characteristics, land cover/land use, and many more factors that are continually changing in parallel with variable and changing climate conditions. These factors are components of vulnerability, addressed within the Steps to Resilience. By combining climate data (related to meteorological hazards) with local community assets (people, buildings, streets, etc.), planners, engineers, and designers can work with climate adaptation experts to develop detailed vulnerability and risk assessments to support actions aimed at building resilience to impacts from specific hazard-asset pairs.*

4. ***Likely cost to respond (recover, rebuild, increase resilience, relocate, etc.) to impact given no investment in resilience or adaptation***

*It is less expensive to anticipate and prepare for impacts than to respond post-facto. According to a recent FEMA report, every $1 invested in proactive adaptation or resilience building measures likely saves $6 in recovery costs. Similar studies by other government agencies (Dept. of Energy, U.S. Army Corps of Engineers, NIST, and others) and investment groups (Goldman Sachs, Zurich Re) support these numbers. A recent white paper authored by the National Environmental Modeling and Analysis Center (NEMAC at UNC-Asheville) estimated a 5.44-to-1 benefits-to-costs ratio (BCR) of proactive resilience building using the U.S. Climate Resilience Toolkit's "Steps to Resilience" framework.*

5. ***Types of resilience/adaptation measures that address likely specific impacts.***

*The U.S. Climate Resilience Toolkit's "Case Studies" section offers a library of over 140 real-world case studies of people taking action to address climate-related hazards all across the U.S.A. These actions fall into two basic categories: 1) loss avoidance and 2) capacity building. Loss avoidance is where communities invest now to better withstand and quickly recover from a disruption from a hazard. Capacity building enables the community (people, businesses, government) to lessen the impacts by building resilience to climate-related stressors (heavy precipitation events, extreme heat, drought, sea level rise) and non-climate stressors (land use change, poverty, unemployment, and other social vulnerability metrics).*

6. ***Guidelines on putting resilience/adaptation measures in place (e.g., outline specifications), including costs.***

*The U.S Climate Resilience Toolkit's "Steps to Resilience" framework helps guide decision makers through a co-production process to help them understand their exposure to climate-related hazards, quantify their vulnerability and risk, identify options for adaptation/resilience, rank and select the best response options, and implement an action plan. The concept of quantification is important if a true cost/benefit analysis will be performed. Investments must pass an "expected value" metric that can prove to elected officials that the proposed resilience solution is both effective and cost efficient. The U.S. Army Corps of Engineers has followed these guidelines for years, and most federal funding to communities also includes the necessity of this metric. The "Steps to Resilience" framework guides a community for first developing the cost of an impact (vulnerability and risk) to a specific neighborhood, and then helps determine the cost of the solution (engineering solution or socioeconomic). By comparing the cost of the solution to the benefits across multiple sectors, the appropriate benefits-to-cost ratio can be calculated.*

7. ***Likely impact costs avoided by investing in resilience/adaptation***

*See response to #4 above.*

8. ***How to identify when adaptation/resilience investments are unwise; e.g., when climate change impact will likely overwhelm any adaptation/resilience option***

   *The U.S Climate Resilience Toolkit's "Steps to Resilience" framework helps guide decision makers through a co-production process to help them understand their exposure to climate hazards, quantify their vulnerability and risk, identify options for adaptation/resilience, rank and select the best response options, and how to make and implement an action plan. The framework encourages decision makers and stakeholders to consider a wide range of options, including doing nothing (i.e., tolerating a given risk) or conducting a managed retreat from the hazard, in addition to possible adaptation / resilience building actions. Some areas may be at such a low risk or such a large risk to continued and accelerating climate impacts (e.g., recurring flooding, high heat events, severe water shortage due to drought) that it does not make economic sense to invest in building resilience. If the latter is the case, then the very difficult choice of retreat must be considered. Some portions of coastal Louisiana are already experiencing this profound impact to their communities and their culture.*

9. ***Case studies of how resilience can help in cases of extreme weather and other climate change events.***

   *The U.S. Climate Resilience Toolkit's "Case Studies" section offers a library of over 140 real-world case studies of people all across the nation and in every sector taking action to reduce exposure, vulnerability, and risk to climate hazards and to build resilience. Planners often learn best from their peers, and these case studies provide excellent examples of how planners and managers of facilities and natural resources are building resilience in the U.S.*