Questions & Answers Part 2

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Alex Ruane (alexander.c.ruane@nasa.gov) or Nick Pelaccio (njp2142@columbia.edu)

Question 1: Has CASI done these assessments for non-NASA organizations?
Answer 1: We have not, CASI focuses on increasing NASA resiliency (but open to expanding and collaborating with non nasa orgs) and the fundamental risk theory of identify, develop, assess, evaluate etc. can be applied to a non nasa org as well. The NASA GISS Climate Impacts Group has worked on impacts for a large number of sectors and regions, including the New York City region, ecosystems from the Mesoamerican Reef to Snow Leopards in high mountain Central Asia, and agricultural and food system risks in more than 20 countries around the world.

Question 2: Is there a tutorial on which application I can use for the near real-time (NRT) temperature data and how I can download this temperature data?
Answer 2: There are multiple satellite products openly available. For example, instantaneous hourly land surface temperature (LST) data (from GEOS) available on the Copernicus website.
https://land.copernicus.eu/global/products/lst
There are also MODIS and VIIRS products available for download from LANCE and the NASA Earthdata websites:
https://www.earthdata.nasa.gov/learn/find-data/near-real-time/modis
https://search.earthdata.nasa.gov/search

Question 3: How accurate are downscaled products? What are some methods to do this? Which is the best among them?
Answer 3: We recommend watching the recording for last year's ARSET training on selecting climate projection sets. There is no single best product, but each must be considered for contextual application and we can use the guidance of that ARSET training to examine the strengths and weaknesses of each projection set according to fundamental distinguishing characteristics. Note that higher resolution does not necessarily indicate higher quality. Bias-adjusted products will reproduce target statistics well, but are more limited beyond range of historical observations and will

likely not capture new fine-scale patterns affected by climate change. High elevation regions, they are warming faster than lower elevations, so this could cause

Question 4: Question on the Land Information System (LIS) on slide 41 - I think you said 'revaluation' being in there. So does that mean you combine the satellite data with ground data and some ground truthing to confirm?
Answer 4: The Land Information System includes data assimilation in the historical period (a form of retrospective analysis). This allows us to utilize satellite data, ground data, and other observational datasets to constrain the physical models to reach a physically-consistent simulation setting that closely resembles the combined observations.

Question 5: Proximity to coast increases exposures, but socio-economic limitation and dependencies increases the vulnerability. But why have we classified proximity to vulnerability?
Answer 5: Good question – proximity is likely better classified as a marker of exposure. Vulnerability can be more than socio-economic.

Question 6: How common is it to include hydrological variables like streamflow, overland runoff, groundwater recharge, and evapotranspiration besides the standard variables of precipitation, temperature, solar radiation, wind speed, and wind direction to inform climate zone maps at the county level? Would LIS be used in such cases?
Answer 6: Many operational systems look at more complex hydrological variables to understand water resources, flood risks, and water quality. LIS helps inform many of these systems. This underscores why it is important to have a discussion with decision makers about the key elements to include in climate zone maps – there many many zones depending on who you ask (e.g., ASHRAE zones, plant hardiness zones, agro-ecological zones). A single set of climate zone maps may not be appropriate, but we can design climate zones around the questions we are trying to answer and the decisions we would like to inform.

Question 7: How long does it take to complete an assessment? At the completion of the assessment, when is the assessment implemented or how long does it take to see action?

Answer 7: Depending on the scale of the system that is experiencing challenges the assessment can have multiple timescales. CASI has undertaken this assessment for the last 2 years but is expected to continue into a 5 year plan. One center assessment takes about a year for NREL. There will be a continuing need to reevaluate given that conditions continue to change. The rate of implementation can also have its own time scale determined by politics and funding (among other things).

Question 8: Where can we get Python source code to make similar visualizations (i.e., charts, anomalies map, etc.)?
Answer 8: There are a lot available online, also look to other ARSET trainings, Goddard EIS has jupyter notebooks for some particular hazard risk assessment (eg for fire https://git.mysmce.com/ashiklom/eis-fire-public-dashboards/-/tree/main/dashboards?ref_type=heads). We have not created public facing CASI scripts, the plots we are making are standard data analysis approaches using Python.

Question 9: The vertical land motion looks to be the most significant contributor to rising sea levels. Can you explain more about what vertical land motion is?
Answer 9: In simpler terms, vertical land motion occurs when the coastal land experiences up or down movement due to various factors. These include tectonic activities, groundwater or oil extraction, soil compaction, and ongoing rebound from compressed land masses due to prior glacial ice sheets. Motion is often not the most significant factor but can be in some places. Isostatic glacial rebound is a slowly expanding process and can still be going on today with local and more distant responses.

Question 10: I know NOAA also does a lot of work related to sea level rise. For example, NOAA has a coastal inundation dashboard at https://tidesandcurrents.noaa.gov/inundationdb/. How do you interact with NOAA for sea level rise issues in terms of synchronizing the assessment?
Answer 10: Our webtool for sea level rise (SLR) and coastal flooding is developed by leads that worked on the NOAA interagency report, all the information on the webtool comes from the same scientific assessment in the interagency report. For example, on that NASA website you can see the NOAA SLR scenarios.

Question 11: How do you include cyclones and the intensification of cyclones in the analysis?

Answer 11: We are planning to add more information on hurricane and tropical cyclone impacts at the NASA Centers within the extreme weather events subgroup in the coming year. The IPCC Sixth Assessment Report indicated that a larger fraction of storms are reaching the highest intensity levels, and storms are bringing higher rainfall totals when they do arrive.

Question 12: For climate adaptation, we need monitoring, evaluation and learning. What methodological approaches do you recommend using at a national level? As it is at a national level, we are struggling to actually capture the impacts of implementation adaptation actions. We are working with a methodology that aggregates metrics in efficiency areas, but what do you recommend to capture progress that gathers local information and escalates it to a national level?
Answer 12: This is interesting and important work and we would be interested to learn more about ongoing efforts to evaluate implementations. Inside NASA we are able to look at both a national (Agency) scale as well as the scale of Centers around the country. More work is needed to link projects, understand the differences in scale, and identify risks and impacts at the larger scale (including interactions between the centers).

Question 13: What recommendation do you have for selecting risk guides? For example the traditional use of the 100-year flood; would you recommend the estimation of the 100-year flood for the end of the economic life of the "structure" or facility under consideration?
Answer 13: Scientists cannot make this determination on their own. Including stakeholders is important to target the scientific information that characterizes responses that drive decision making. Ask: how much can that river rise before you run into problems? This could also lead to thresholds based on raw values (e.g., 3 meters flood level) or a return period / statistical quantity (e.g., a 1 in a 20 year flood).

Question 14: How much does it cost to produce the full CASI project and deliverables? Does this include a comprehensive risk assessment report to the NASA facility managers?
Answer 14: Cost, we cannot say now, but in many cases the collaborators are already looking at these measures and are applying science from related projects and applications beyond the Center. Expertise in house at NASA helped this be a more cost effective endeavor.

Question 15: What were the sources of future temperature projections?
Answer 15: The future temperature projections are calculated from NEX GDDP dataset. This dataset contains about 34 global climate models from CMIP6 (which is the latest iteration of climate models). We then subset the dataset to 22 models based on the latest IPCC approaches.

Question 16: Why does California experience high wildfire risk even though most parts of the state are near a water body?
Answer 16: California is very big and has semi-arid climates. Climate dynamics affect the overall drought patterns that in turn are exacerbating fires. Fire weather can be assessed with vapor pressure deficit in general. Salt water would not be a solution in these ecosystems.

Question 17: In slide 39, the 'all models' black line that shows the trend is higher, this is due to some models tend to extrapolate or use extreme scenarios. This means as well that IPCC scenarios are more cautious with their estimations?
Answer 17: Models are based on climate physics represented through fundamental equations and parameters developed from earth observations, but climate models have parameter and structural uncertainties that lead to a spread in future climate projections. The IPCC assessed all of these models and their projections and identified a range of climate sensitivity that is likely given current community understanding and observational constraints. By choosing this subset we utilize an ensemble that is more in tune with the IPCC assessment of climate literature and this ensemble is slightly less sensitive to climate change than the full, unweighted ensemble.

Question 18: How can I access sea level rise data for my study area?
Answer 18: You can check out all of NASA's sea level rise tools to view projections and see what local gauge data are available in your study area https://sealevel.nasa.gov/

Question 19: I am from the south of Mexico, every year the thermal sensation and extreme hot days are concerning, especially during the midday in the hot season. If I want to do research on the possible trends for the future, would you consider it possible to do with public data and are there any NASA resources you would recommend?

Answer 19: NASA has several observational products that provide insights into extreme heat. The NASA NEX GDDP climate projection set used here is a public dataset that includes information about average temperature as well as maximum daily temperature that is more directly associated with the extreme conditions mentioned here. You can access the data here.

Question 20: Once the magnitude of the different CIDs has been calculated, how do you prioritize where to focus actions and strategies? Is it based on cost to implement, cost of BAU, impact on operations etc.?
Answer 20: Implementation can factor in climate information, but it is important to recognize that there are competing motivations for stakeholders such as cost, socio cultural impacts, ecological damage, and synergies/trade-offs with other decision contexts.

Question 21: Would CASI ever consider wider climate change impacts (so not just physical). For example, how different climate scenarios may impact supply chain, access to materials, energy supply, and potential failure of the grid, etc.?
Answer 21: We did talk about these impacts, including worker transportation for example, but have not explicitly examined supply chain vulnerabilities or exposure. In other projects (like AgMIP) we look at systemic risks and the way that shocks can cascade through connected systems.

Question 22: Could the CASI project be potentially implemented on a greater scope? For example, partnerships with international entities.
Answer 22: CASI focuses on increasing NASA resiliency (but we are open to expanding and collaborating with non-NASA organizations and the private sector) and the fundamental risk theory of identify, develop, assess, evaluate etc. can be applied to a non nasa org as well. The NASA GISS Climate Impacts Group has worked on impacts for a large number of sectors and regions, including the New York City region, ecosystems from the Mesoamerican Reef to Snow Leopards in high mountain Central Asia, and agricultural and food system risks in more than 20 countries around the world.

We invite you to please tell us more about your own projects, decision contexts and interests! This training is also a great opportunity to share our work and learn from each other.

Question 23: Is there a manual that describes the procedure to perform the climate risk assessment as developed for the NASA facilities?
Answer 23: We do not have that yet, but a paper is being developed that will describe the CASI approach. The CASI final report will also further describe the methodologies and datasets used.

Question 24: How do you assess risks to your facilities from, for example, failure of larger infrastructures like dams or flood works in a greater area from your facilities? Do you take into the management body of the flood infrastructure assessment or proceed with your own approach?
Answer 24: This is a common topic in the conversation. Large scale dam risk assessment is beyond the CASI scope but we have created spaces to engage stakeholders around this type of risk. We did examine impacts beyond the Center gate including smoke from wildfires in addition to the fire risk, for example.