CC&E Contributions Towards Analyzing Impacts and Consequences of Global Change:
Impacts on Organisms and Communities

1. What research can we conduct to better address the impacts and consequences of global change?

   a. Better understanding of fluxes and how to represent them

   b. Broad scale observations should be made applicable to all scales

   c. Question of time-space scales using remote sensing. Existing instruments cannot address the smaller scales required.

   d. *Identify relationships between functional groups, communities, species and biogeochemistry. Hybrid functional groups, consider geochemical impact, size, etc.*

   e. Investigations of communities associated with functional types.

   f. Paleo-studies demonstrate occurrence of no analog communities. These investigations need mechanisms to associate.

   g. Role of symbioses in structuring communities and how this effects functionality and biogeochemistry.

h. Need research to bridge gap between predictor variable to assess current situations and types of output we get from climate projections.

i. Make habitat models more process oriented. Are habitat models adequate? Can process be represented adequately? How to make models more mechanistic?

j. Role of disturbance on ecosystem. Characteriziation of interactions between communities and organisms, i.e., continuous vs step-functions.

2. <u>What actions would be most useful to or supportive of future assessments?</u>

a. Process studies that span from organisms to biogeochemistry.

b. Decadal survey might take too long, so recommendation is to make immediate use of existing sensors

c. Immediate scaling studies using existing resources.

d. Increase investment of resources in field campaigns. Define scales explicitly.

e. Make use of multiple platforms with different scales in measurement to address specific questions.

f. Time series and baseline records to determine where large changes are occurring, this will inform future focus.

g. Multiple missions to maintain longterm records.

h. Need for rapid response platforms, AUVs, etc.

i. Support and facilitate international collaborations.

j. Id key ecological questions to use future sensors. ID scale those questions need, and devise sensors to fit scale.

k. Use natural experiments in time series to understand processes.

l. Steady-state models may not be appropriate and should be evaluated carefully. Mine historical records to inform. Changes are specific to scale.

m. More field campaigns are also useful for understanding different scales.

3. **What are the greatest challenges and opportunities** (relevant to the breakout topic)?

a. Organsims properties don't scale linearly with spatial resolution.

b. Prioritization on human need? Or based on global distribution?

c. How well do models incapsulate evolution? Selection will occur with global change, will models see this? Perhaps invasive species can inform this question?

d. Positive & neg feedbacks effect accuracy of projections. Biological component of feedbacks not well understood.

e. This info used to inform mitigation strategies.

f. Adaptation perhaps not addressed in models. Mechanistic models may not capture these changes.

g. Need for centralized database that's flexible and can input all datatypes and across internat'l boundaries

h. How to prioritize research and partition between human need and basic science. Science communities should set priorities and inform decision-makers.

i. Discriminate adaptation and acclimation.

j. Modeling impacts on communities is a challenge because error bars and unknowns are large. Do we have enough good input data to begin to work on 'red arrow' questions?

k. Recognize that broad IPCC questions are scaled differently than our research questions. Use uncertainty in models to help identify future basic research. Simplified models are useful to guide and prioritize.