Keys in Developing a Compelling Manuscript

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- Conceptual framework
- Hypotheses & tests
- Parallel structure
- Topic sentences
- Quality illustrations and tables

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GOAL?

to advance science for human development

Why Write?

- Writing cultivates
  - discipline
  - clear thinking
  - analytical ability
  - a sense of accomplishment
- Educational gain may be greater for author than reader

But….

Nothing is added to "science" and no benefits are realized unless your writing is published AND understood

《静夜思》

李白

床前明月光
疑是地上霜
举头望明月
低头思故乡

Before you start, think about

- If you have a good story to tell;
- A paper is written for readers, not for yourself;
- Keep it simple stupid (KISS) model;
- Is there any new knowledge or study is unique?
- Who are your audience?
- What's the appropriate journal?
- Who are your coauthor(s)?

Be confident, persistent, and professional!

Definitions for Science and Hypothesis

- Science (from Latin: scientia meaning "**knowledge**") is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.
- Science is a systematic enterprise of human to **understand** or better understand the universe. In this enterprise, organized boy of knowledge is acquired through observation of natural phenomena, and/or through experimentation that tries to simulate natural processes under controlled conditions;
- The **intellectual** and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world, through observation and **experiment** (New Oxford American Dictionary, 2009);
- The study of things which are **unknown**, through the use of systematic and unbiased observation, in order to bolster knowledge through experimentation, thus allowing one, or many, to share meaningful quantitative results with the greater community.

Definitions for Science and Hypothesis

- A hypothesis is a proposition, or set of propositions, set forth as an explanation for the occurrence of some specified group of phenomena, either asserted merely as a provisional conjecture to guide investigation (known as a working hypothesis) or accepted as highly probable in the light of established facts;

- A hypothesis is an educated guess based on observation, i.e., based on your observed phenomenon and established facts, what you think may be the possible answers of your questions. A hypothesis can be proved or disproved;

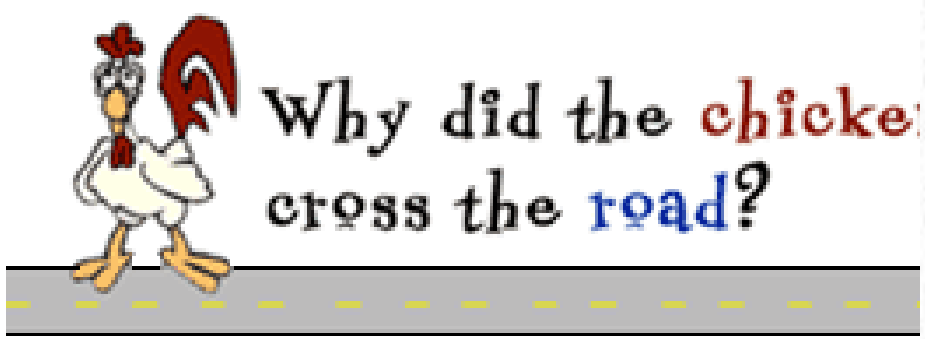
- A supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation experiment (New Oxford American Dictionary, 2009).

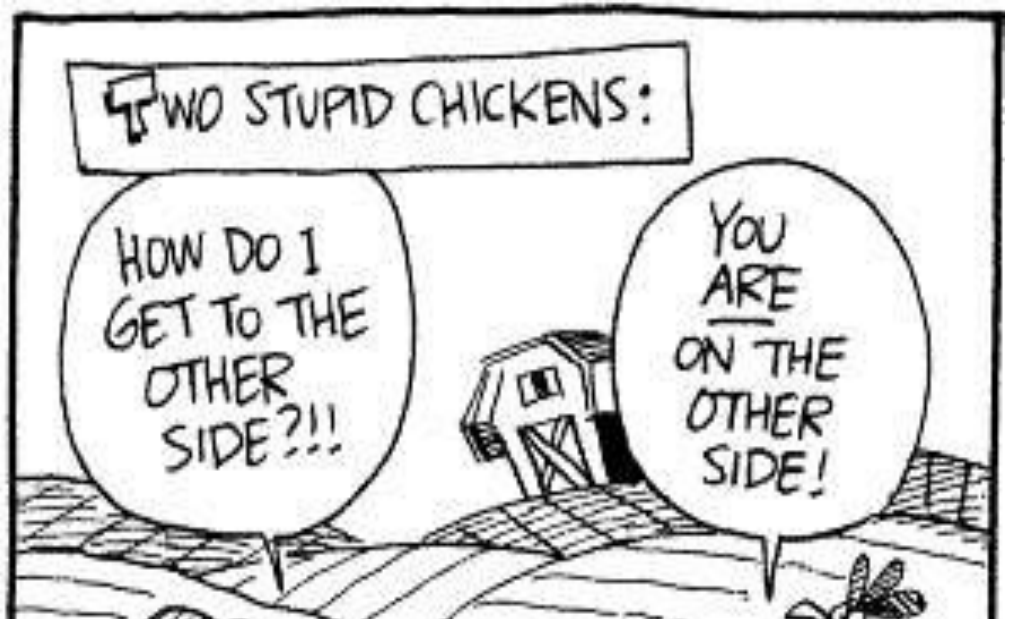
Questions, Hypotheses & Conceptual Frameworks

- Modern science is advan
  hypotheses!
- A hypothesis isn't an edu
  observation, phenomen
  further investigation.
- Hypothesis is often too g
  or a statement of truth!
- Developing testable hyp
  landscape research is pe

Scientists have discovered that the moon is moving away from the earth at a tiny yet measurable distance every year. If you do the math, you can calculate that 85 million years ago the moon was orbiting the earth at a distance of about 35 feet from the earth's surface. This would explain the death of the dinosaurs. The tallest ones, anyway....

There's Science and There's Sound Science...





- ✓ To cross or not to cross, that is the question (Shakespeare)
- ✓ Why would he be one a road, I thought chickens lived in the ocean? (Jessica Simpson)
- ✓ This is not about whether inspectors made sure the chicken crossed the road, it's about the willingness of the chicken to cross the road voluntarily (Colin Powell)
- ✓ It was the logical next step after coming down from the trees (Darwin)
- ✓ The news of its crossing has been greatly exaggerated (Mark Twin)

Example I: Bridgham, S. J. Pastor, and J. Chen. 1997. National Science Foundation

Global Warming and Ecosystem Responses in Peatlands

- Feedback between biotic processes and climate
- Alteration of energy flows through an ecosystem
- Relationship between energy flows & biotic processes

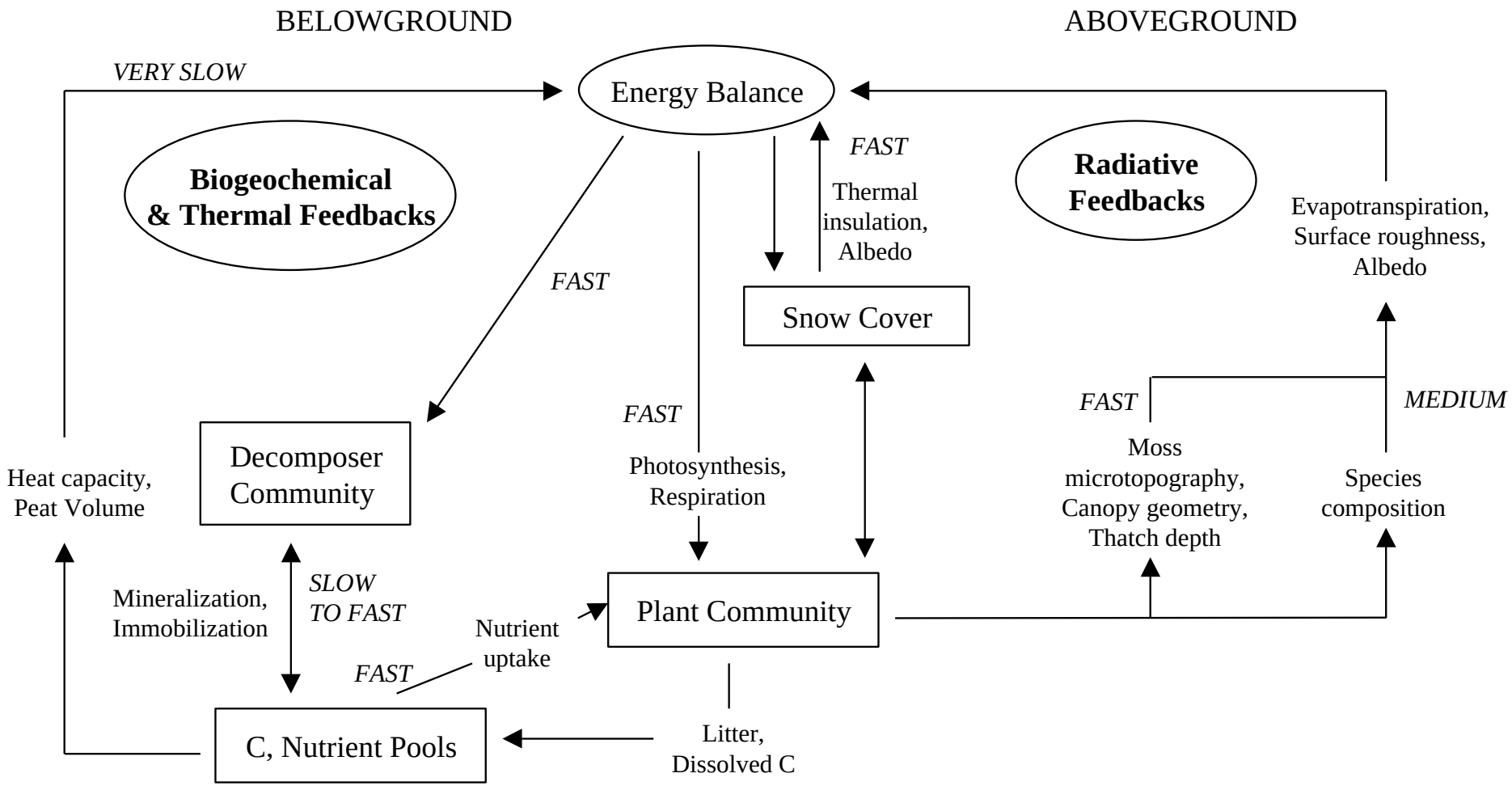
Develop hypotheses

This complex behavior suggests two hypotheses to be tested by our current mesocosms:

- As the water table rises or falls, peat either accumulates or decays, respectively, until it's thickness *H* reaches a new equilibrium with the water table;

- There will be alternative stable states of peat thickness (*H*) and water-table depth (*W).*

A conceptual model of feedbacks among ecosystem energy balance, plant community structure, snow cover and carbon and nutrient pools in peatlands.



HYPOTHESIS

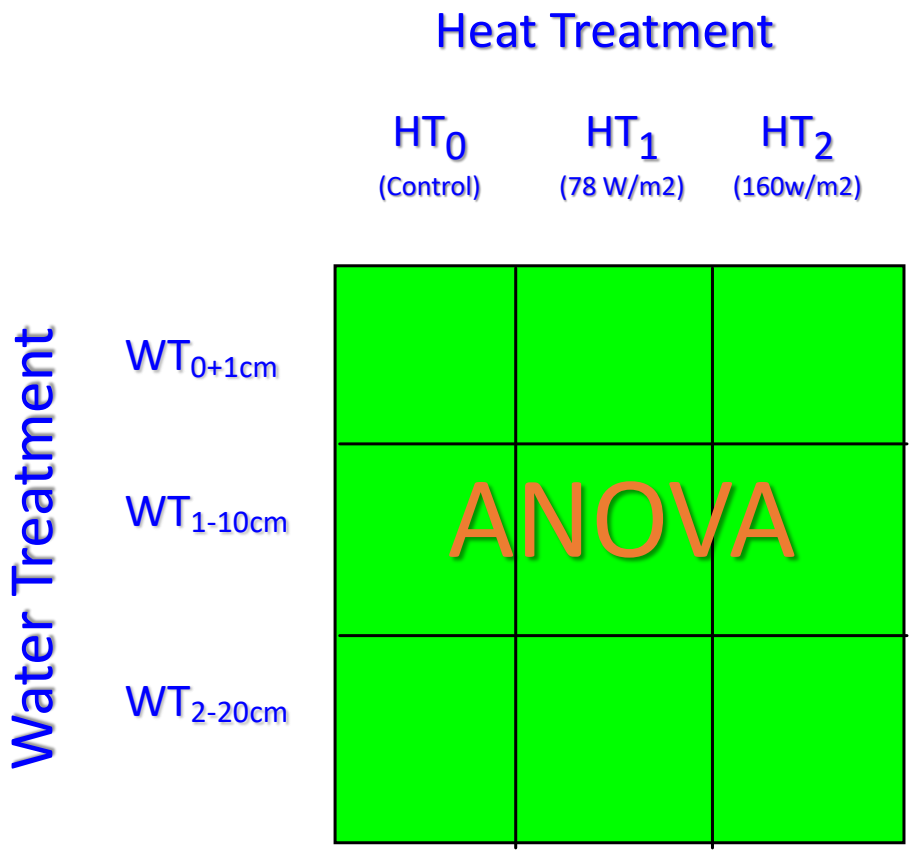
Climate forcing of heat loading and water-table depth determine plant community and ecosystem structure in northern peatlands, which in turn have a feedback effect on the thermal and radiative energy budgets of the system.

Experimental Design

The Mesocosm Facility

54 minimally disturbed soil monoliths of 2.1 m^2 (85 cm in diameter) surface area, 60-cm depth placed in insulated plastic tanks in a large field.

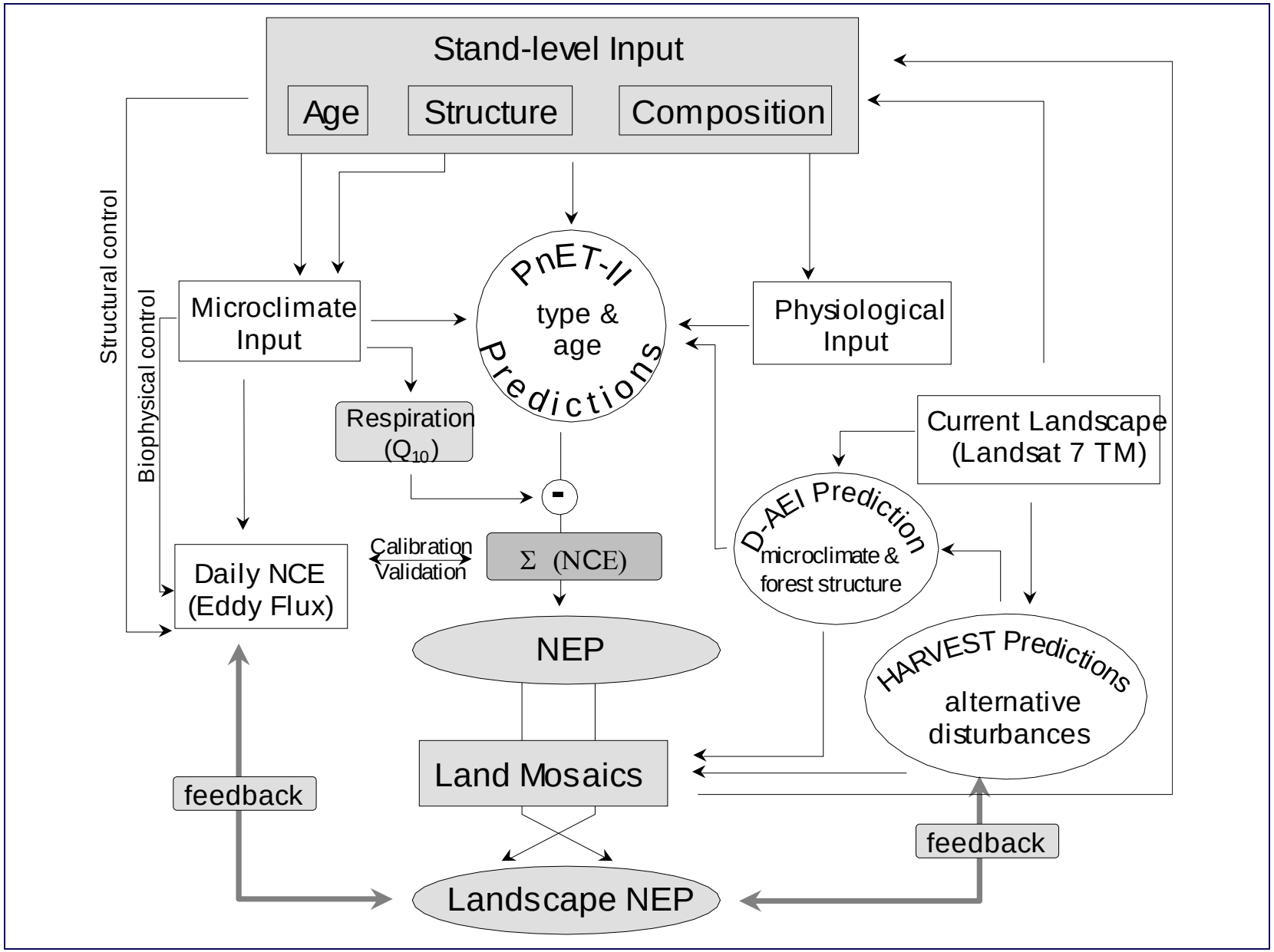
Peatland Types: bog & fen



Example II: Objective

To enhance understanding of landscape-level carbon exchange in disturbed land mosaics, taking into specific consideration of age structure and the area-of-edge-influences (AEI), which can be considerable in many fragmented landscapes. We use a combination of **flux towers, biometric estimation, chamber measurements (P_s & R), RS products and ecosystem modeling.**

Conceptual Framework



Hypothesis

Our central hypothesis is that the cumulative NEP of a landscape is determined by the land mosaic; that is, the various ages and types of ecosystems present, as well as their arrangement.

RESEARCH COMPONENTS

- **Flux Towers:** 2 permanent, 3 mobile (10 ecosystems so far, excluding the JP in UP)
- **Microclimate**: 11 stations
- **Biometric estimation:** overstory, litter, soil, CWD, etc.
- **Landsat TM**: empirical models
- **Modeling (**PnET): soil, vegetation, climate, foliar N, SLW, NDVI/LAI, etc.

Example III: Hypotheses

AEI and AMEI support different functional groups. Their ontributions to the cumulative species pool at the landscape level exceeds their proportional area in the landscape. This can be stated as:

$$\frac{Area_i}{\sum_{i=1}^{n} Area_i} \neq \frac{\sum_{Area_i} (species)}{\sum_{i=1}^{n} \left[\sum_{Area_i} (species) \right]}$$

Chen et al. 2001

Example IV: Coupled Natural and Human Systems (CHN)
NH on Mongolia Plateau

Objective: to examine and model the interactive changes of the *NS* and *HS* at different temporal and spatial scales for use in recommending plans to increase the success of ecosystem and human adaptation to the changing climate and land use on the Mongolian plateau (Fig. 1). Specifically, we aim to understand how global climate and land-use change regulate both biophysical and socioeconomic functions by exploring the major underlying processes and conducting a vulnerability analysis pertaining to IM, MG, and the plateau.

Chen et al. 2008

Example IV: Coupled Natural & Human Systems (CHN) on Mongolia Plateau

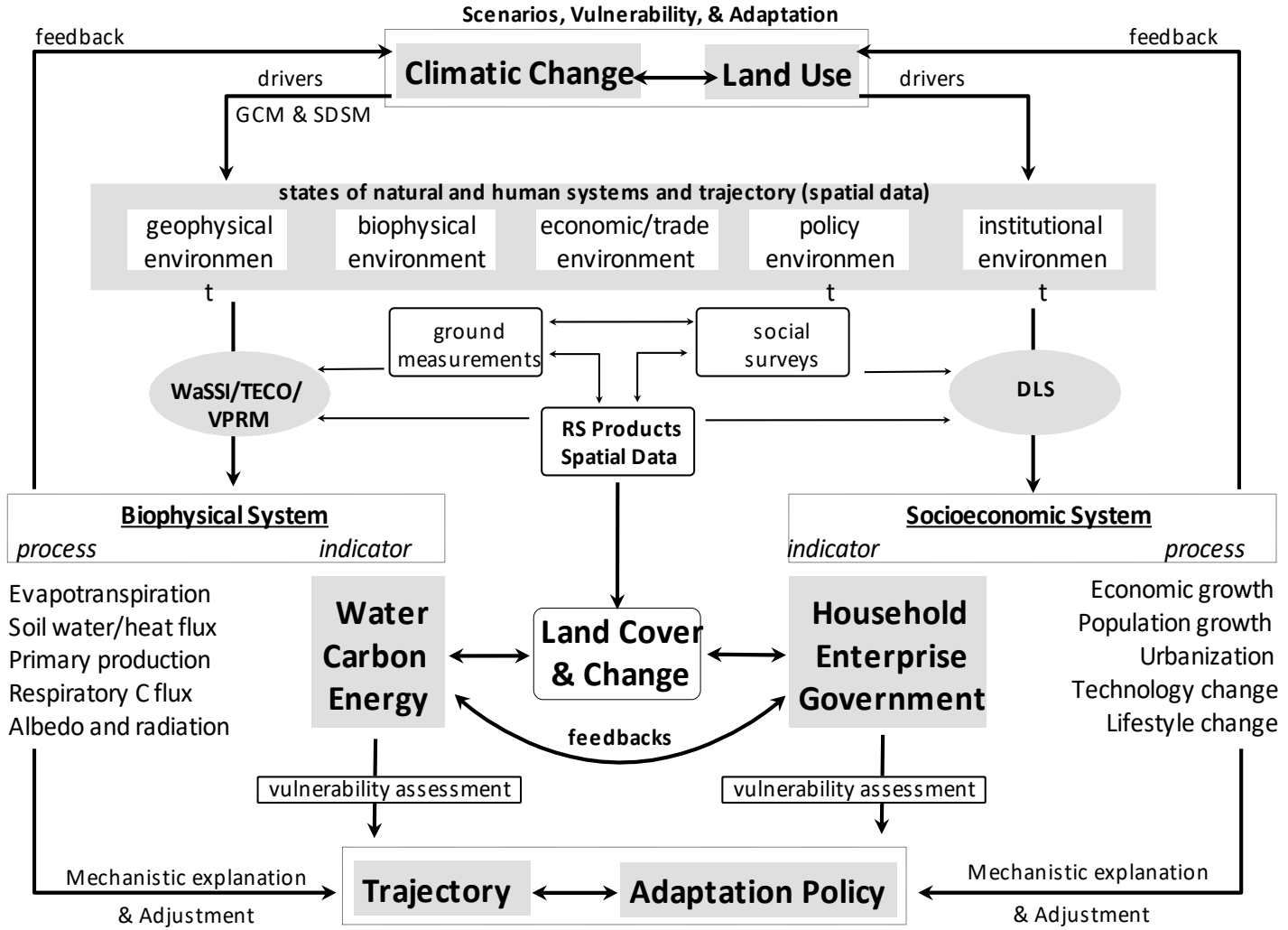


Figure 2. Proposed research components and their linkages for process-based predictions of the ***HS*** and ***NS*** on the Mongolian Plateau using "Land Cover & Change" as the intermediate variable. Five environmental variables through ground/field measurements and/or satellites will be used as the primary input for biophysical (WaSSI/TECO/VPRM) and a socioeconomic (DLS) models to predict system functions. The statistical downscaling modeling (SDSM) will be used to predict future local climate (county level) from GCM predictions. Vulnerability analysis will be performed using Bayesian models for trajectory and developing adaptation plans.

Example IV: CNH on Mongolia Plateau

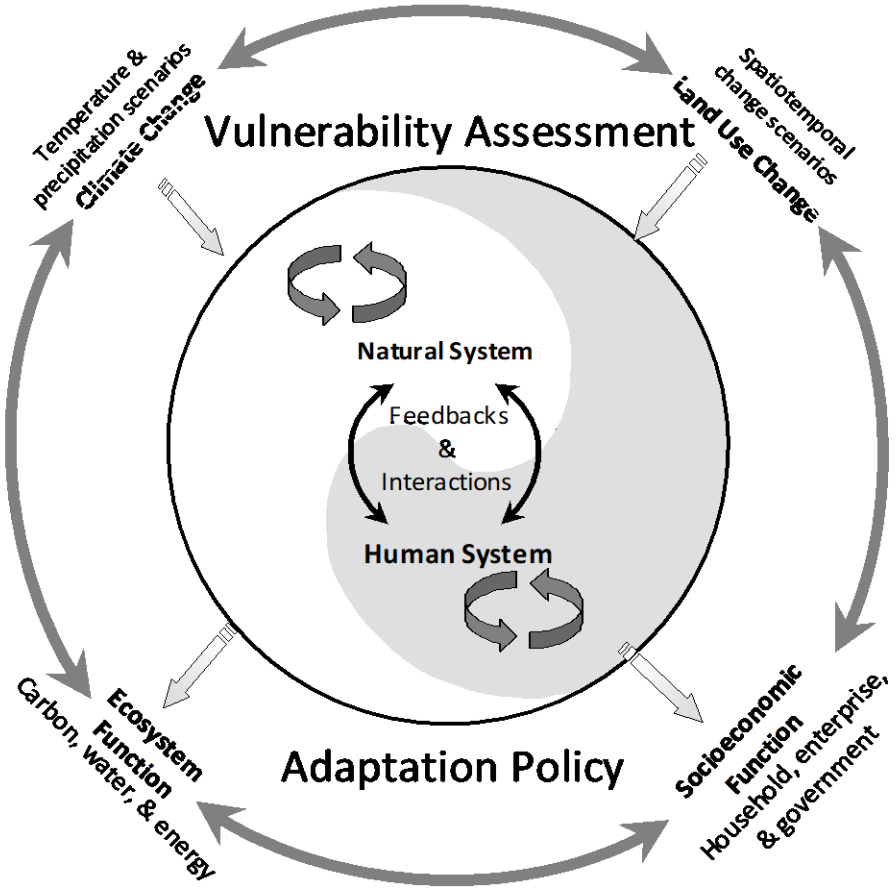
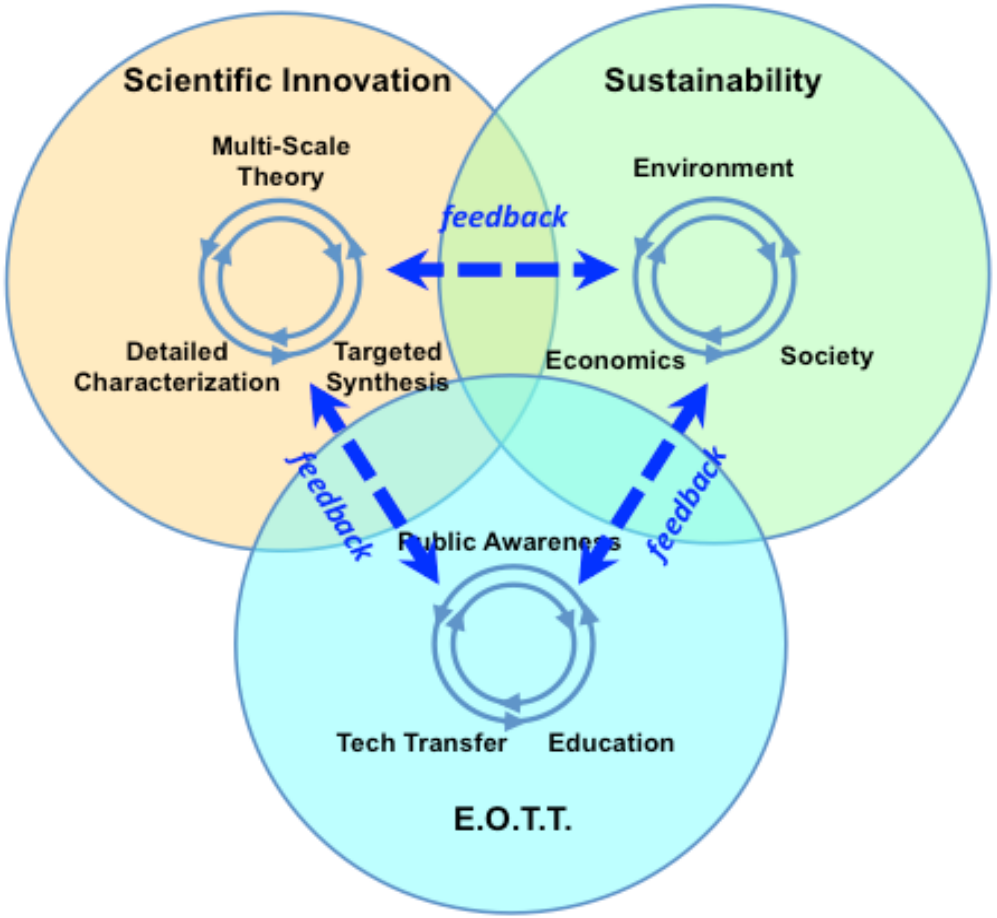


Figure 1. Conceptual framework to examine the coupled effects of climatic change (variability) and socioeconomic shifts on the interactions and feedbacks within and between the ***HS*** and ***NS***.

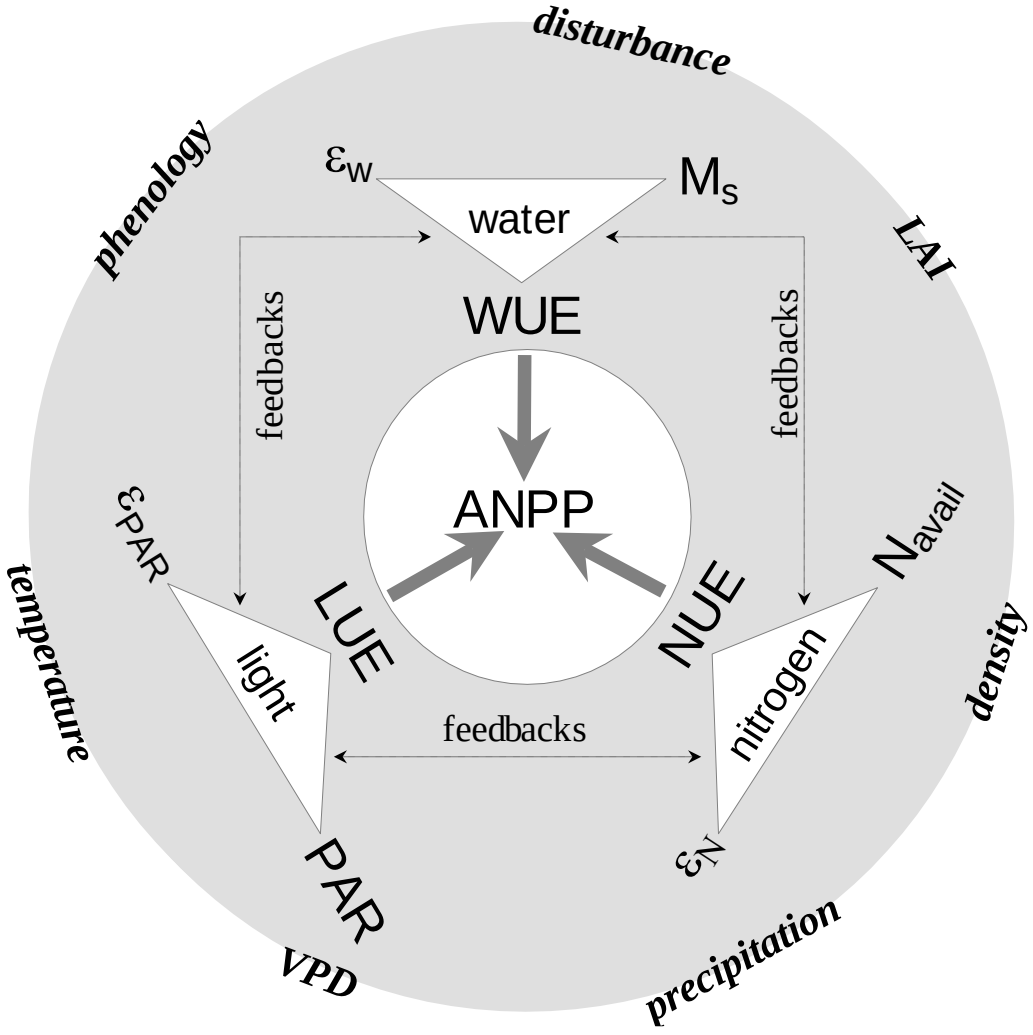
Chen et al. 2008

Example V: The Conceptual Framework for Sustainable PV System

We hypothesize that the trade-offs among the options of sustainable aspects may be off-balance or might appear to compete over short timelines, but could positively correlate over long time scales. This transformative research will assure the development of a truly sustainable PV technology.

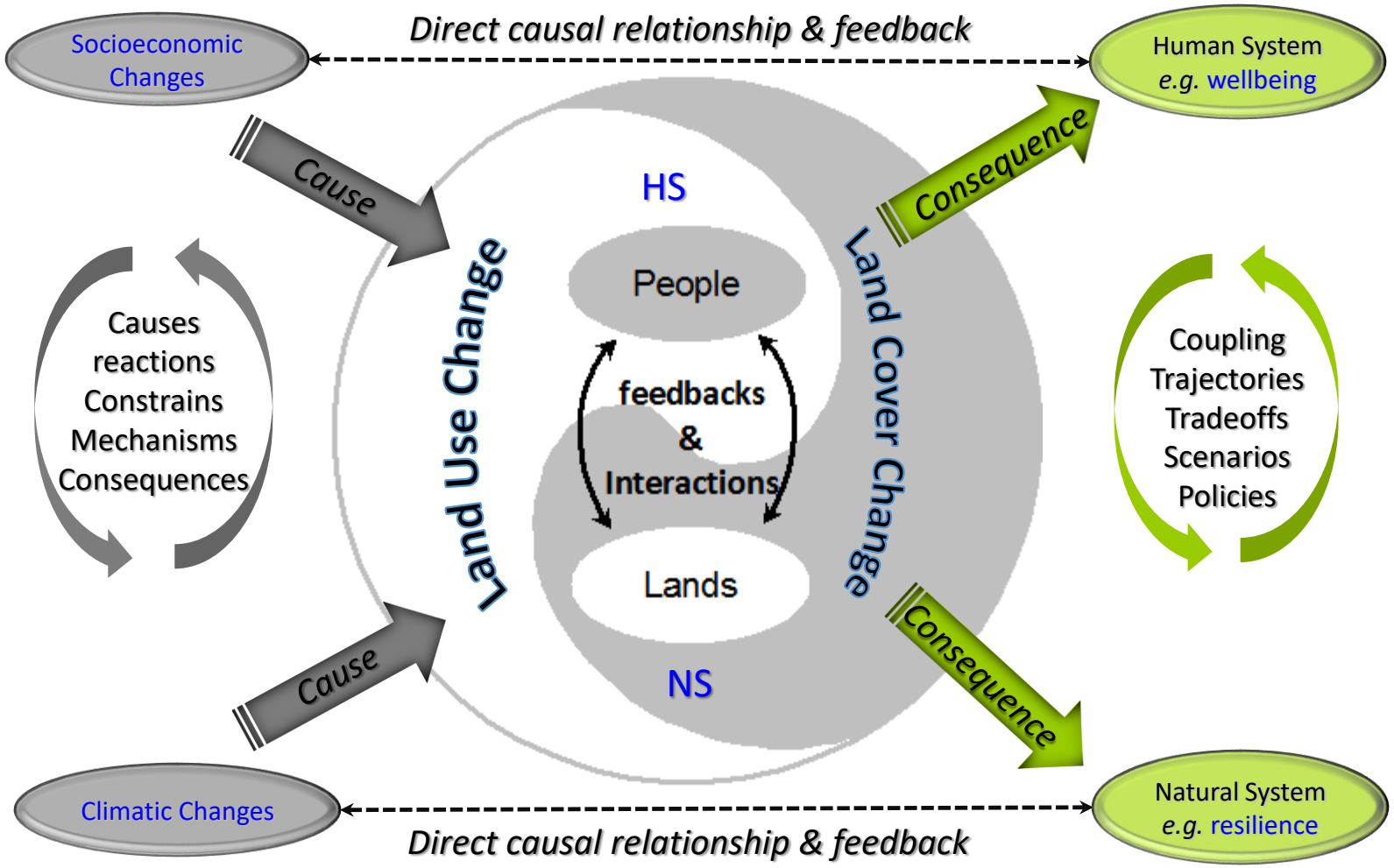


Example VI: Multiple resource use (mRUE) in bioenergy systems

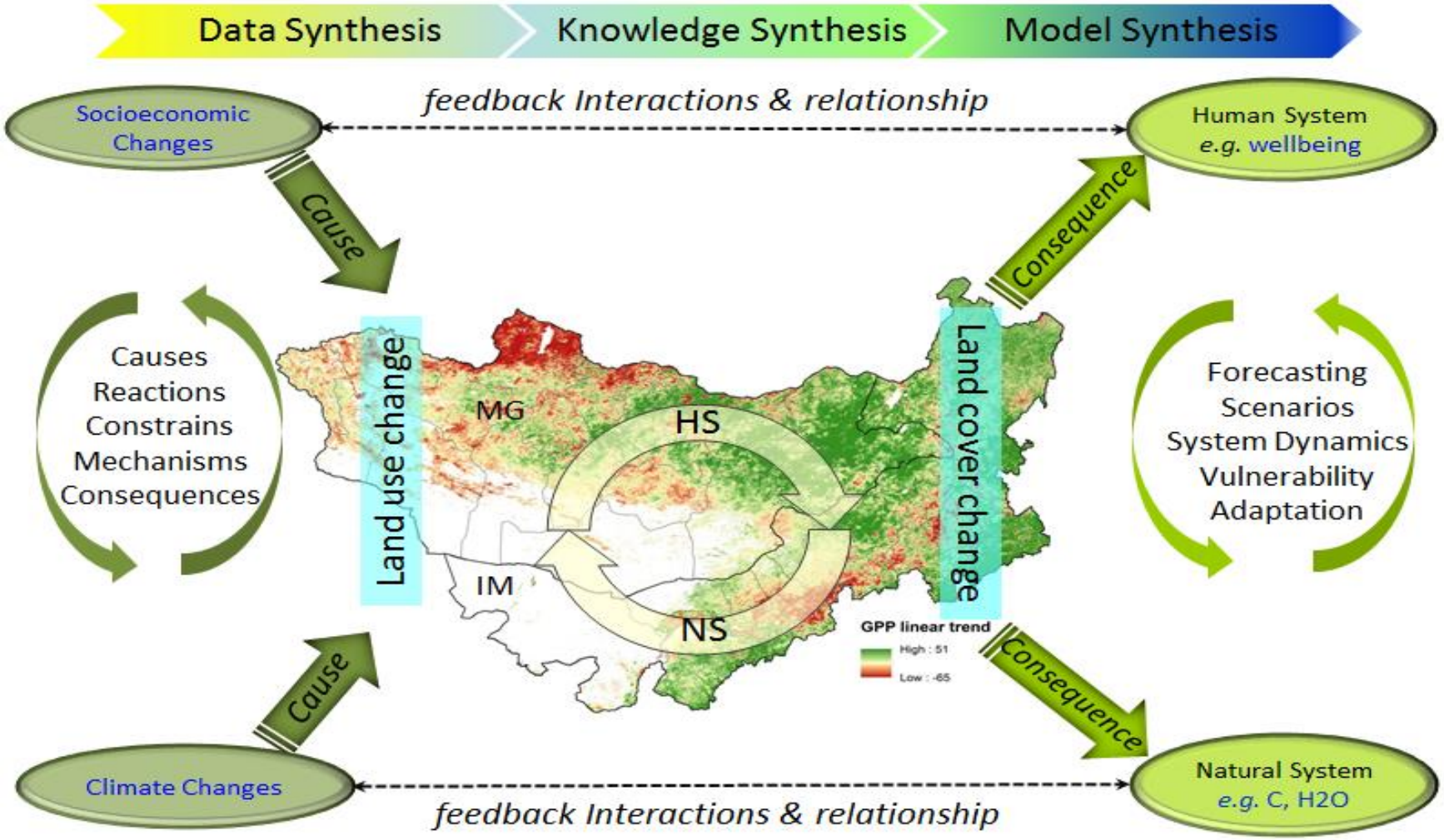


A new concept of resource use and limitation by Chen will be applied. Within the matrix of the biophysical environment (soil, vegetation and microclimate), the resource use matrix of [ε, RUE, R_{avail}] and their complex interactions determine the magnitude and dynamics of production. For each type of resource, there exist complex interactions among [ε, RUE, R_{avail}] at various temporal scales. Alteration of any element of the resource use matrix will trigger changes in other elements. We will examine the feedback among the elements with a focus on water, light and nitrogen (N).

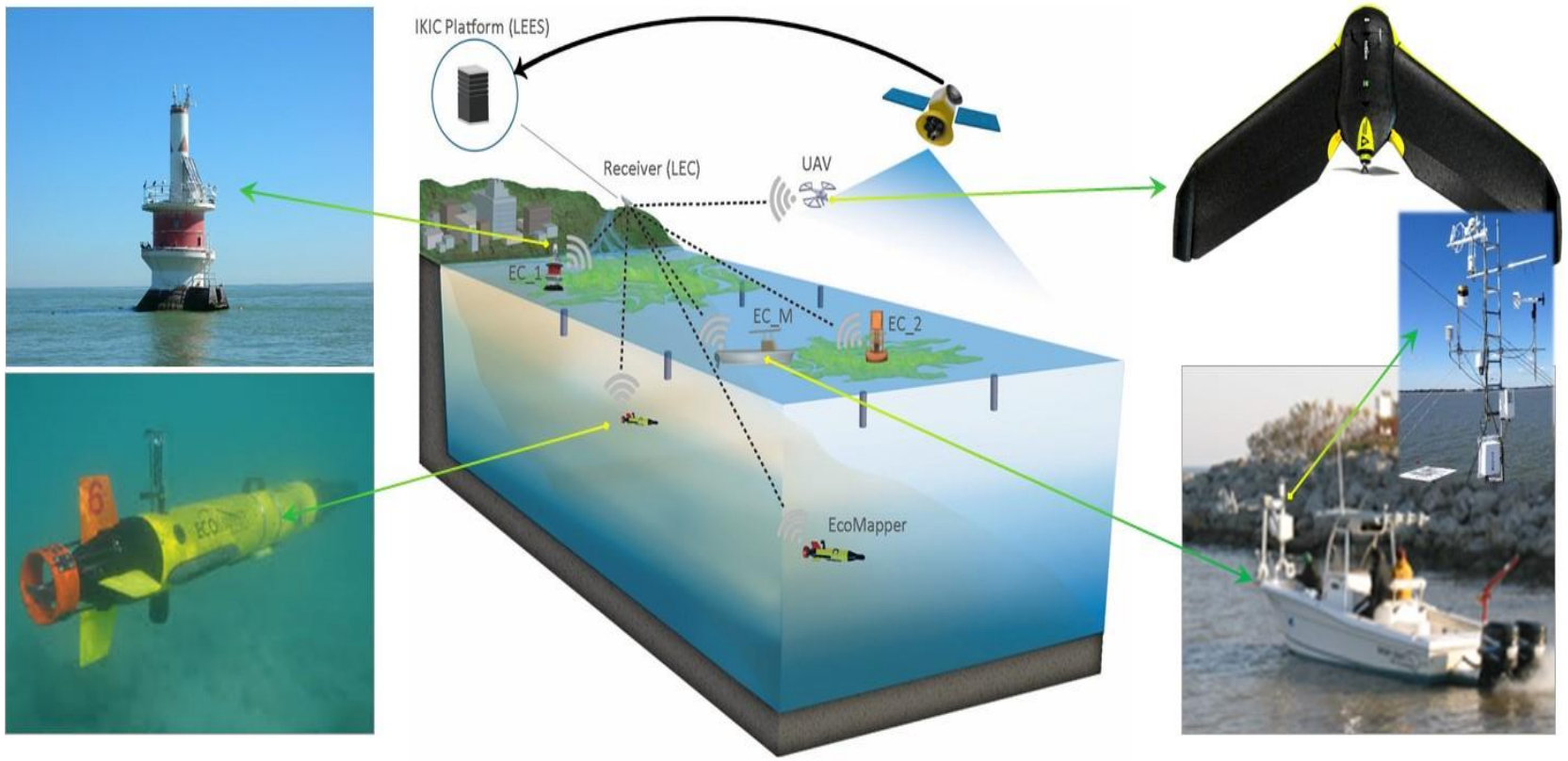
Drivers and Functions as Moving Targets (i.e. focus on the changes)



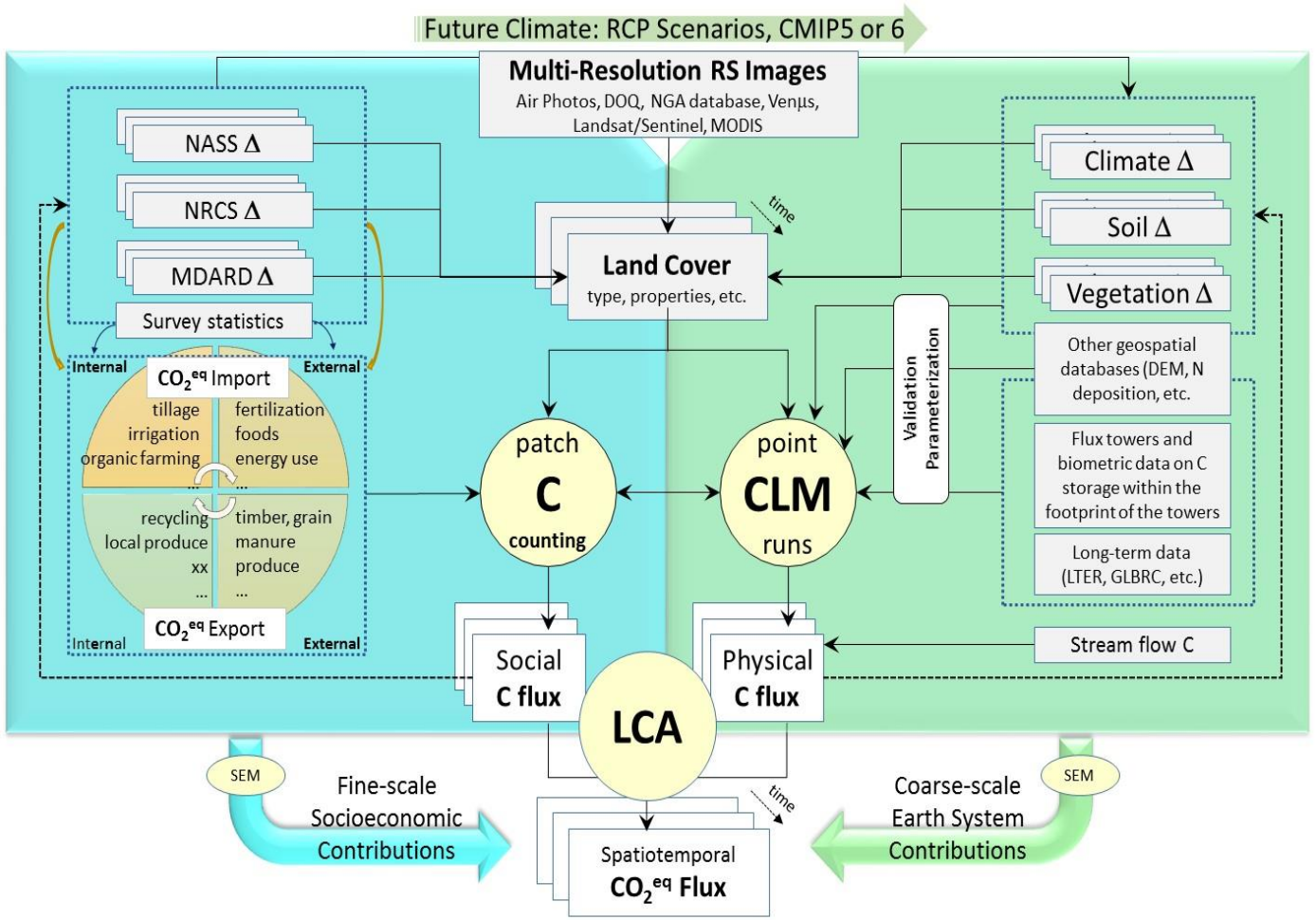
Develop hypotheses: CNH conceptual framework to understand the drivers, mechanisms, and consequences of socioeconomic and physical **changes** on the functional **changes** of the HS and NS on the Plateau. LUC and LCC will be considered as the intermediate variables facilitating the causal.



An integrated water-air sensor network for measuring and modeling the spatiotemporal changes in F_{CO2}, E, H, and the ancillary variables in WLEB will be implemented for this study. This network includes two permanent eddy-covariance (EC) systems (EC_1, EC_2) on fixed infrastructures, a mobile EC vessel (EC_M) mounted on LEC R/V Mayflies, two underwater automated vesicles (EcoMappers) owned by NOAA collaborators, an unmanned aerial vehicle (UAV) for high resolution remote sensing, nine long-term sampling locations for water quality, multiple satellites, and an Information, Knowledge Innovation Cloud (IKIC, Fig. 7).



Proposed research components and their linkages for process-based predictions of the spatiotemporal changes in CO_2^{eq} production that will be quantified by estimating "social C flux", and "physical C flux" at contrasting landscapes (i.e., different land cover compositions) within the Kalamazoo Watershed as well as the entire watershed. Life cycle assessment (LCA) will be employed for major patch types to quantify the C production at different temporal scales. The statistical downscaling modeling will be used to predict future local climate from RCP scenarios. Bayesian structural equation models (SEM) will be constructed to explore the contributions of climate change and human activities.



Chen et al. 2016, In reviewed

More Tips:

- Watch for parallel structure
- Junior writers pay too much attention to their methods, however LOGIC and PHYLOSOPHY are much more important. THINK, THINK, and THINK!
- What are the take-home messages? Remember our goal?
- Use written languages! Always have someone else to read your manuscript, regardless of English as a second language.
- Take reviews, especially the negative reviews positively. NEVER TAKE IT PERSONALLY!
- Be confident. Good luck to all!

ORDER

THE SKELETON: CONSTRUCTING A STABLE FRAMEWORK

Parallelism: structure of an entire document

A good example is a book's table of content (e. g., this book)

ORDER

THE SKELETON: CONSTRUCTING A STABLE FRAMEWORK

Parallelism: structure of the internal parts of a document such as lists and descriptions

The instructions are as follows:

- Turn the power on
- Insert a sheet of paper
- Set the margins and tabs and check the line spacing
- Begin typing

ORDER

THE SKELETON: CONSTRUCTING A STABLE FRAMEWORK

Parallelism: structure within individual sentences

Example:

Seedlings will be planted **to stabilize** stream banks, **to provide** forage for wildlife, and **to improve** aesthetics.

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THE SKELETON: CONSTRUCTING A STABLE FRAMEWORK

Parallelism: structure within individual sentences

Not parallel:

The purpose of this little book is as much to show you the artistry of technical writing as helping you with the underlying mechanics.

Parallel

The purpose of this little book is as much **showing** you the artistry of technical writing as **helping** you with the underlying mechanics.

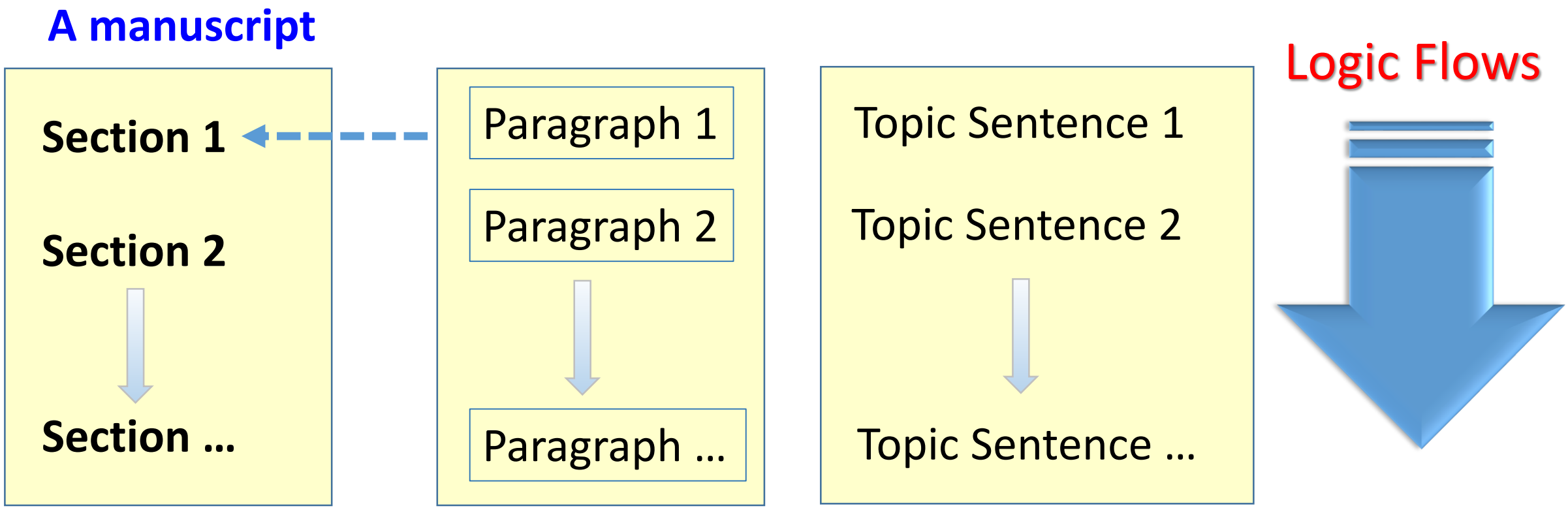
ORDER

THE SKELETON: CONSTRUCTING A STABLE FRAMEWORK

Parallelism: structure within individual sentences

A word phrase operates much like a musical phrase: it has a certain “sounds” to which the reader’s ear becomes attuned. If you change the order of the words, you effectively change the “sound” – which may falsely signal to your reader a change in emphasis or meaning.

Construction of a manuscript through organizing topic sentences



A paragraph: A paragraph is composed of a topic sentence (i.e., the first sentence of a paragraph) and detailed explanations.

1) A synthetic statement
2) Supporting materials
    - Specific details
    - Statistics
    - Examples
    - Arguments
    - Promises & Pitfalls
    - Outlooks

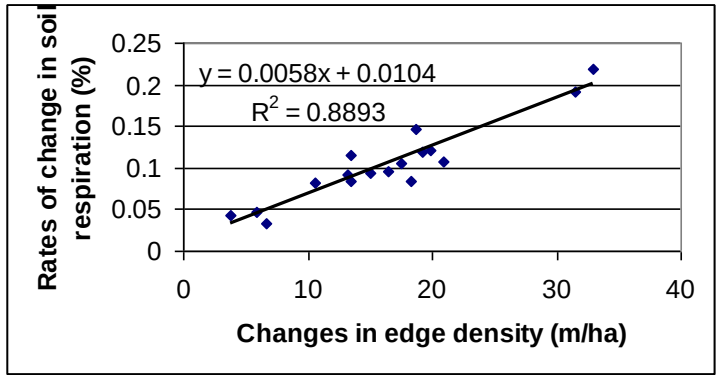
An example:

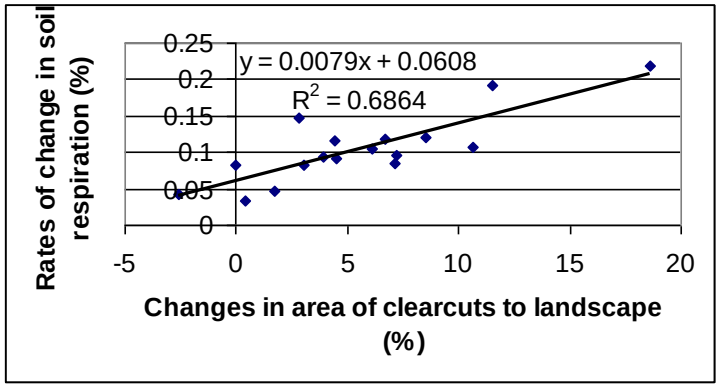
Bayesian models developed in this study performed well in describing the relationships between texture and fluxes (Figs. 7 and 8; Tables 3 and 4). A total of 24 Bayesian models (2 towers * 3 texture features * 2 flux-derived measurements: Footprint%secto and FCsector * 2 day/night measurements) based on the EVI-derived texture features passed the Gelman and Rubin convergence diagnostic statistic test. Despite the unpronounced differences between the models from EVI and NDVI, the EVI textures performed slightly better overall. Therefore, only EVI models are presented in this paper. (Giannico et al. 2018)

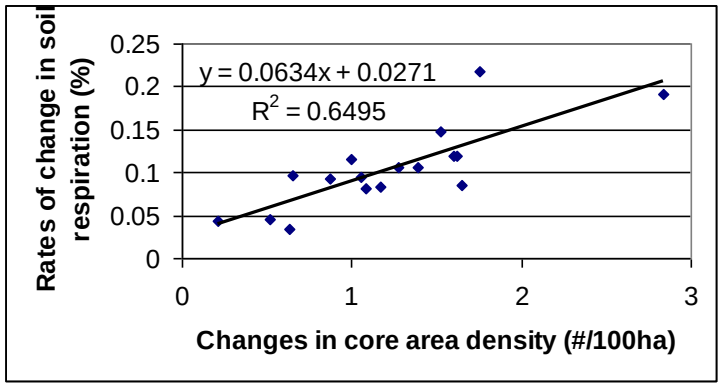
Step 3: develop illustrations (figures, tables, photos, etc.)

- Illustrations should be VERY high quality and follow journal requirements (e.g., units, spacing, lines, labeling). You want to impress the reviewers with quality artworks.
- Remember that MORE is not BETTER. I don't recommend to have more than 15 illustrations.
- All illustrations should be synthetic and easy-to-read.
- Most journals require each illustration be placed on a separate page.
- Eliminate any extra space, duplicated text (see an example).

Draft







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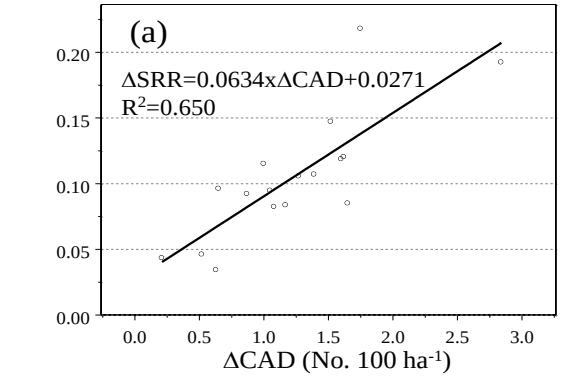
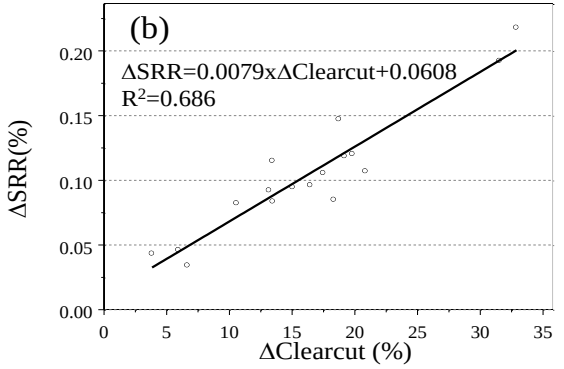




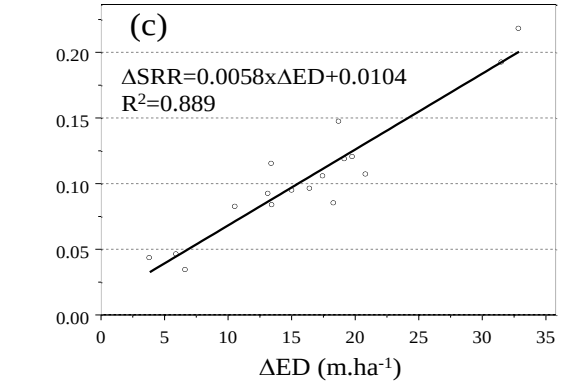


Fig. 3

Step 3: develop illustrations (figures, tables, photos, etc.) -- continue

- Figures should be easy-to-read. For example, do not use too many lines in one figure.
- Do not use color unless it's necessary (cost, copy, etc.)
- Do not duplicate in tables and figures.
- Most importantly, a detailed, self explanatory caption is needed. Many readers are lay and do not have time to read your manuscript carefully. S/he should get the messages by reading your figures and captions. This is the place that you should not worry about duplications (see an example).

ENDING: AFTER WRITING THE LAST

2. **IMPROVING YOUR PROWESS AS AWRITER**

You can read: The more you read, the more you'll absorb and discern about both technique and artistry in writing. Teach yourself to discriminate!

Read broadly!

ENDING: AFTER WRITING THE LAST

2. **IMPROVING YOUR PROWESS AS AWRITER**

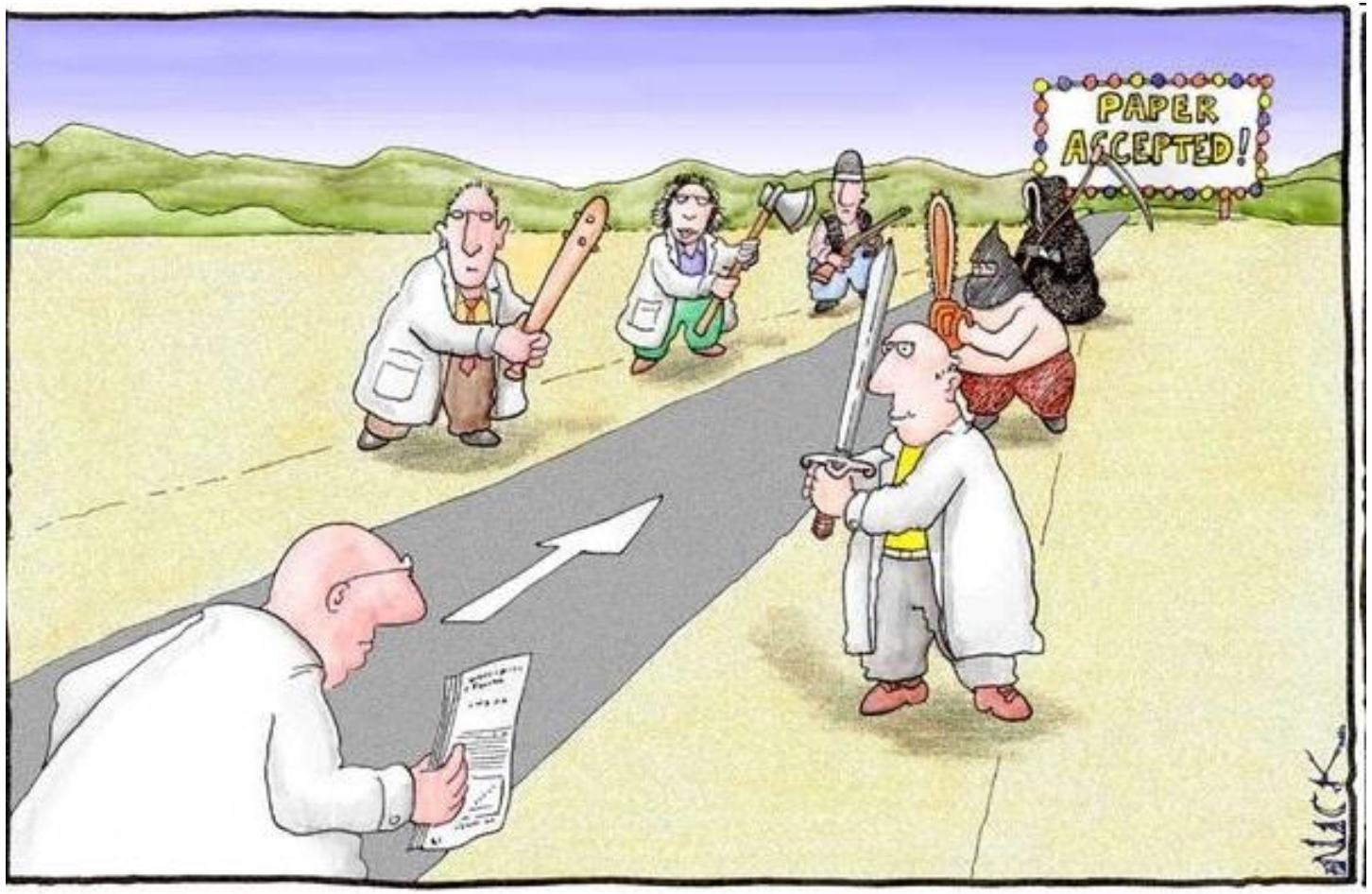
- You can pick up the brains of the writers around you;
- You can bone up through a good reference book or writing workshop;
- You can find a professional editor.

ENDING: AFTER WRITING THE LAST

2. **IMPROVING YOUR PROWESS AS AWRITER**

However, nothing you can do will do more to improve your prowess as a technical writing than to keep on writing!

Because of fierce competitions, one of the assignments is indeed to find a reason to kill your proposal, friendly or not.



Most scientists regarded the new streamlined peer-review process as 'quite an improvement.'

Confidence & Persistence

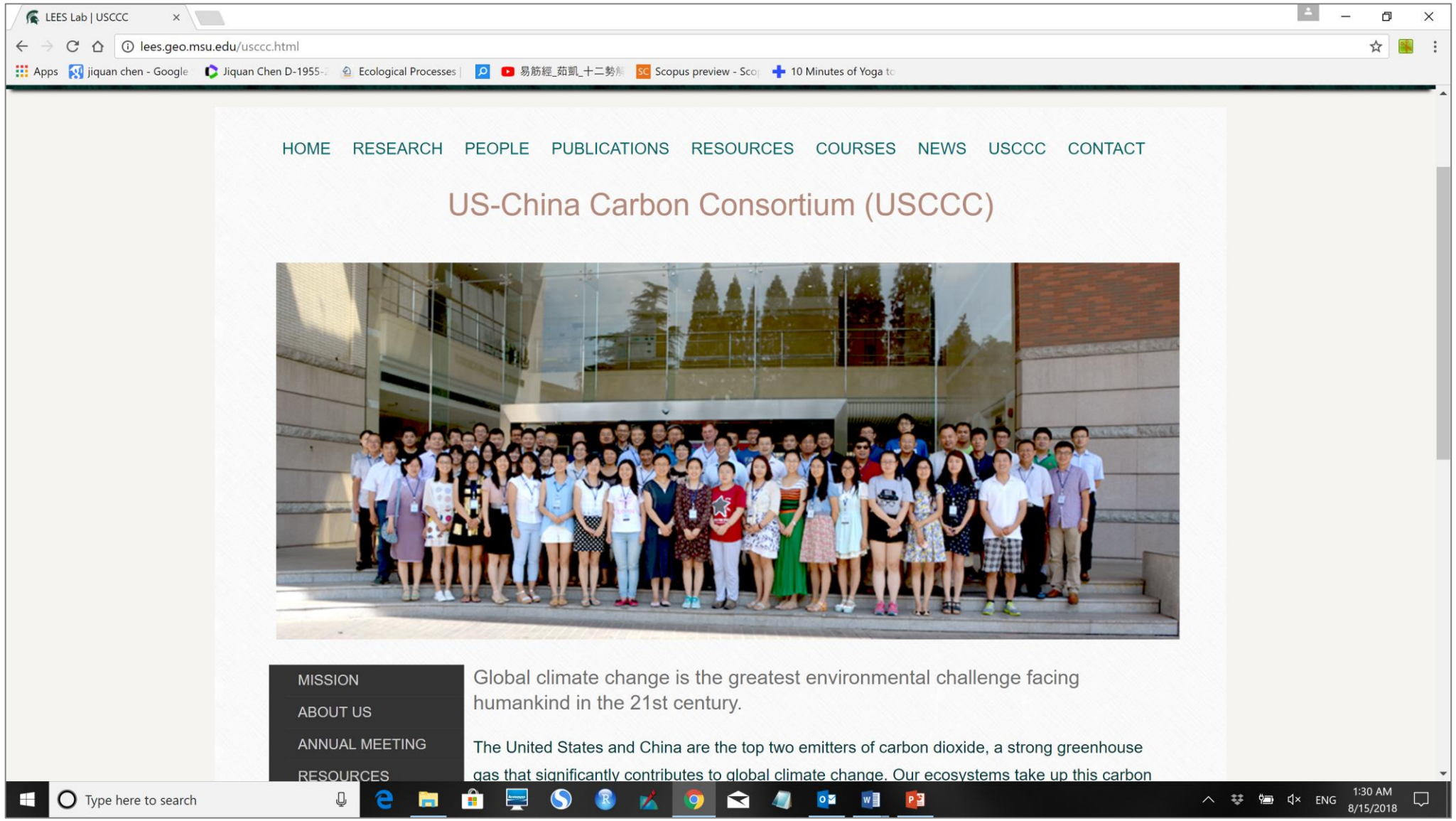
Less Available Funds => Low Success Rate!

Group Exercise: Hypothesis development

- Draft a specific, testable hypothesis that will be used as a foundation of your study or manuscript.

- Your study questions, objectives, experiment, results, and discussion will be developed around this hypothesis

USCCC Collaborative Portal (Password: usccc2018)



MISSION
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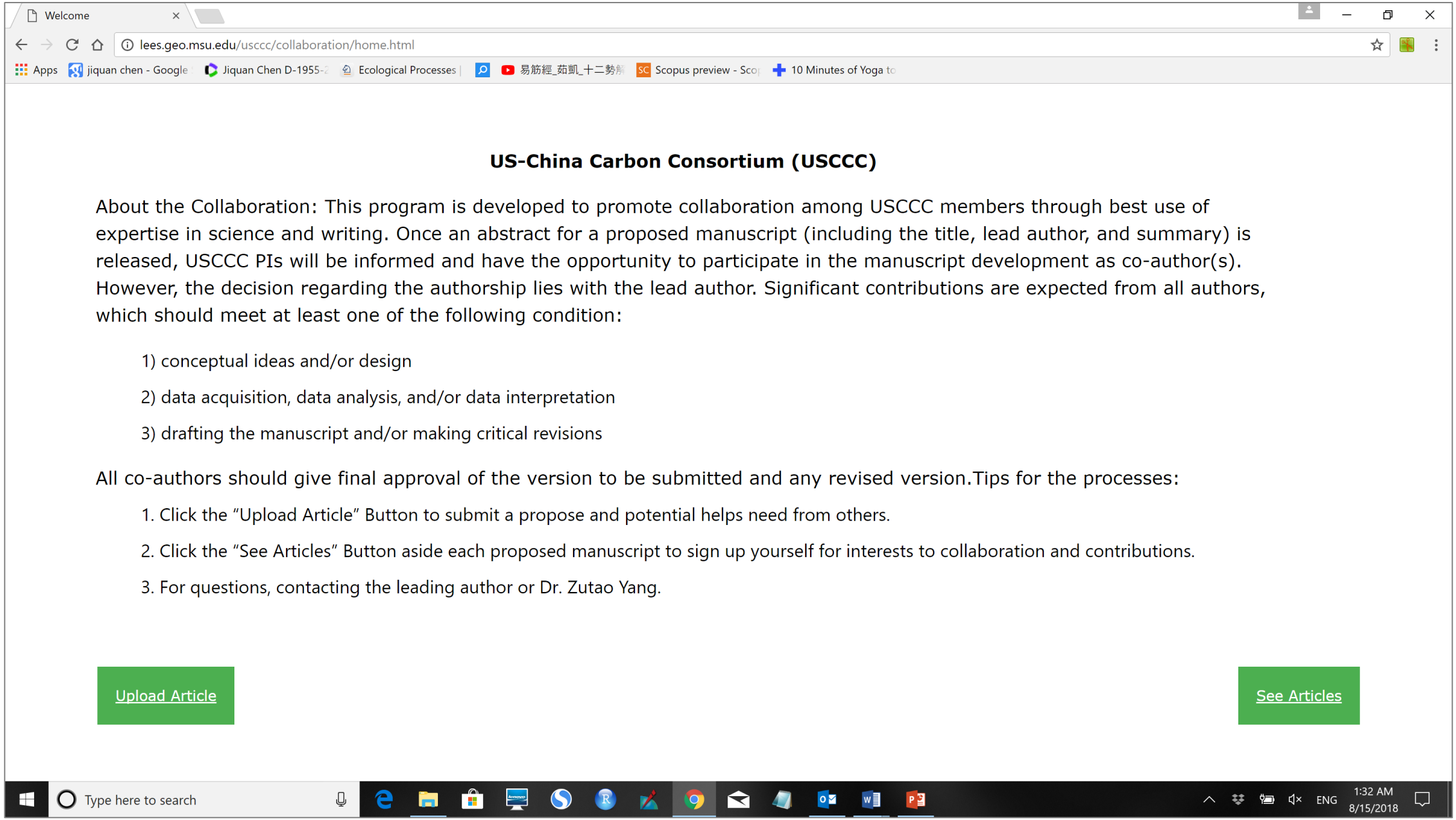
CONTACT

Global climate change is the greatest environmental challenge facing humankind in the 21st century.

The United States and China are the top two emitters of carbon dioxide, a strong greenhouse gas that significantly contributes to global climate change. Our ecosystems take up this carbon dioxide as they grow and are sources of clean water for human use. Therefore, **researching how climate change will impact our ecosystems** is the first step to safely maintaining forests, grasslands, and marshes-- securing our future.

A unique understanding about how ecosystems store carbon and provide water for human use is shared worldwide in order to develop new and improved models for predicting the future impacts of climate change.


Welcome
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Apps
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10 Minutes of Yoga to
US-China Carbon Consortium (USCCC)
About the Collaboration: This program is developed to promote collaboration among USCCC members through best use of expertise in science and writing. Once an abstract for a proposed manuscript (including the title, lead author, and summary) is released, USCCC PIs will be informed and have the opportunity to participate in the manuscript development as co-author(s). However, the decision regarding the authorship lies with the lead author. Significant contributions are expected from all authors, which should meet at least one of the following condition:
1) conceptual ideas and/or design
2) data acquisition, data analysis, and/or data interpretation
3) drafting the manuscript and/or making critical revisions
All co-authors should give final approval of the version to be submitted and any revised version.Tips for the processes:
1. Click the "Upload Article" Button to submit a propose and potential helps need from others.
2. Click the "See Articles" Button aside each proposed manuscript to sign up yourself for interests to collaboration and contributions.
3. For questions, contacting the leading author or Dr. Zutao Yang.
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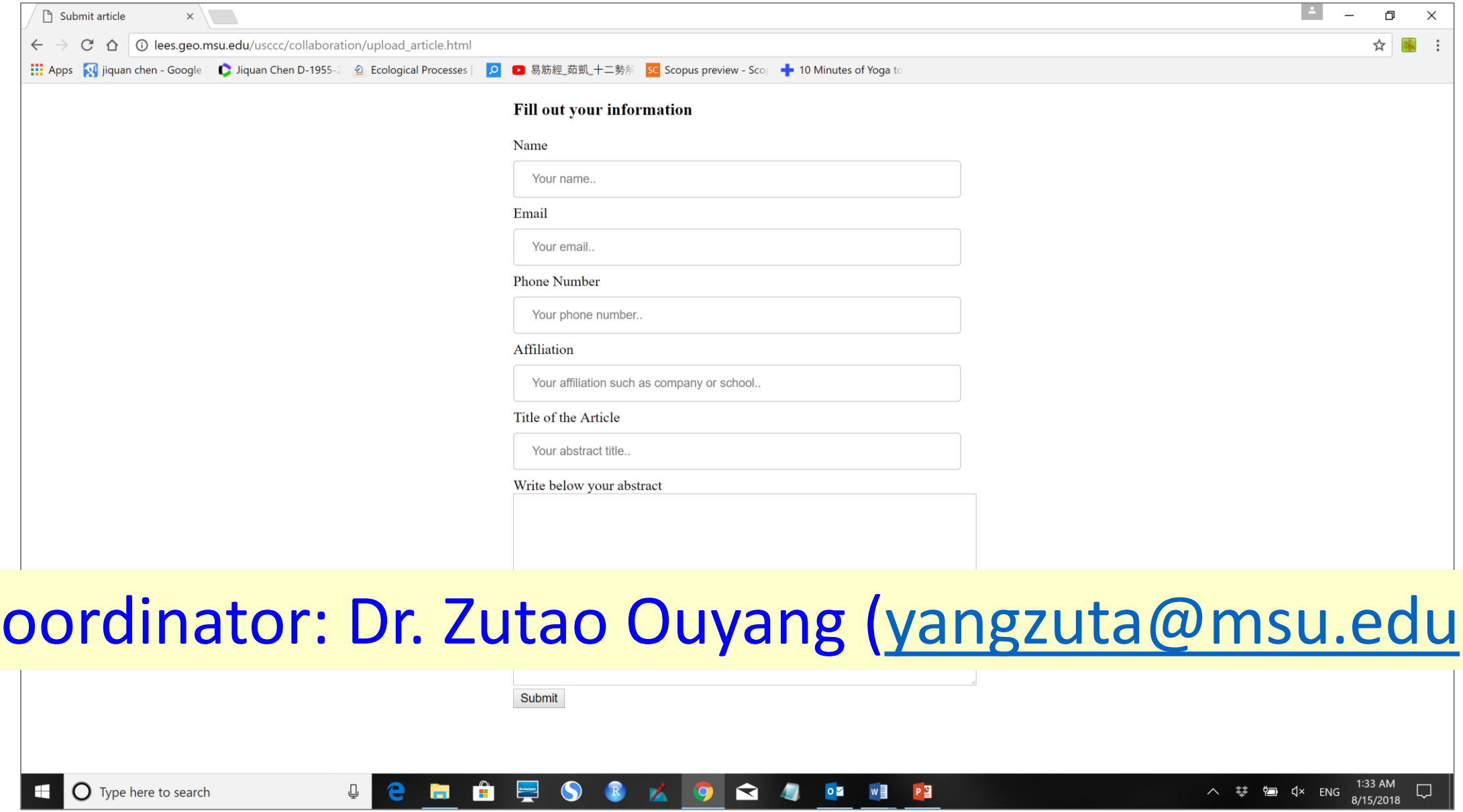
Submission



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