MultiSector Dynamics (MSD) in Complex Adaptive Systems: Community Collaboration

Antonia Hadjimichael, Erwan Monier,
Richard Moss, Patrick Reed

Tuesday Session on Working Groups

MSD Working Groups--Accelerating Collaboration

Today

Short recap of MSD community project

- Purposes, near-term goals, long-term aspirations

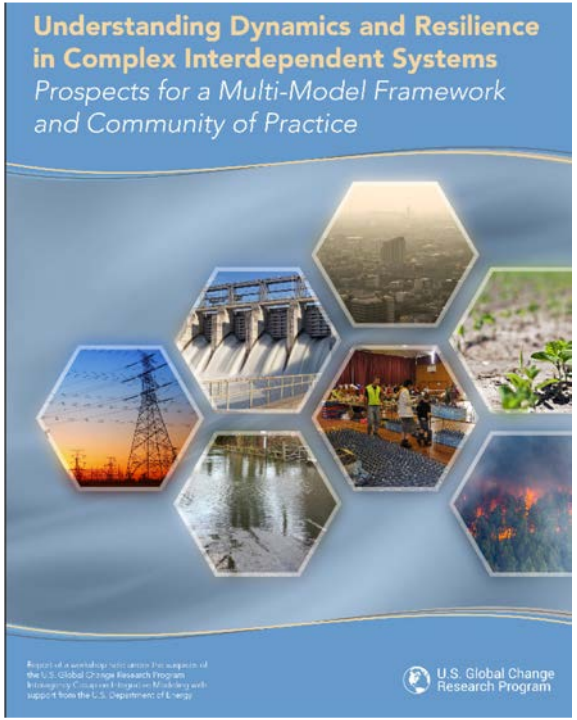
Mostly focus on MSD community working groups

- Working group process
- Possible working group topics
- Preview of relationship to broader community structures

Friday discussion with PIs and sponsors will focus on broader issues in anticipation of circulating full plan to entire community

MSD Community Project

- Help create a community of practice of MSD researchers
- Advance scientific understanding of the complex interdependencies and co-evolutionary pathways of human and natural systems
- Create a framework to develop a system of models, data, analysis & decision support capabilities (extends work of 2016 workshop)
- Four team members (Hadjimichael, Monier, Moss, Reed)
- Goal to launch core elements in October 2019



Near-term Priorities

Systemized, community-wide communication

Within the MSD community—both interim as well as long-term options

Technical/professional coordinating body

Governing charter, organizing structure, working groups, and engagement protocols

Community Plan

Identifies and organizes around priority topics (domain-specific and methodological), broad-based collaborative interests, outreach to other communities, and timelines

White paper and framework publication

Facilitate the emergence of MSD as a field, clarify its value and role in interdisciplinary science (including use case examples), major research questions at its center, diverse capabilities that exist or will be required

Elements of Community Plan

- Snowmass 2019
  - Discuss possible working groups (Tuesday) and broader issues (Friday w/ PIs)
- August/September 2019
  - MSD community input to charter, WGs, communications, webinar series, etc.
- October 2019
  - Launch charter, working groups, management structure, internal website, listservs & webinar series
- April 2020
  - AGU MSD session proposal, community white paper draft, MSD special issue proposal
- October 2020
  - Strategy for launch of the broader MSD community
- December 2020
  - Official launch of broader MSD community at AGU
- 2021
  - MSD annual meeting? MSD journal discussion?

MSD Working Groups

- Advance MSD scientific priorities – both topical and methodological
- Broad purposes
  - Share information across projects
  - Strengthen and expand coordination and collaboration on selected topics
    - Across teams
    - With other research communities
  - Serve additional substantive, professional growth, and community-building objectives

Terms of Reference for WGs

Purposes:

- Develop: shared scientific agenda, coordinated model experiments, shared data, joint DMA framework, publications;
- Communicate research opportunities and needs

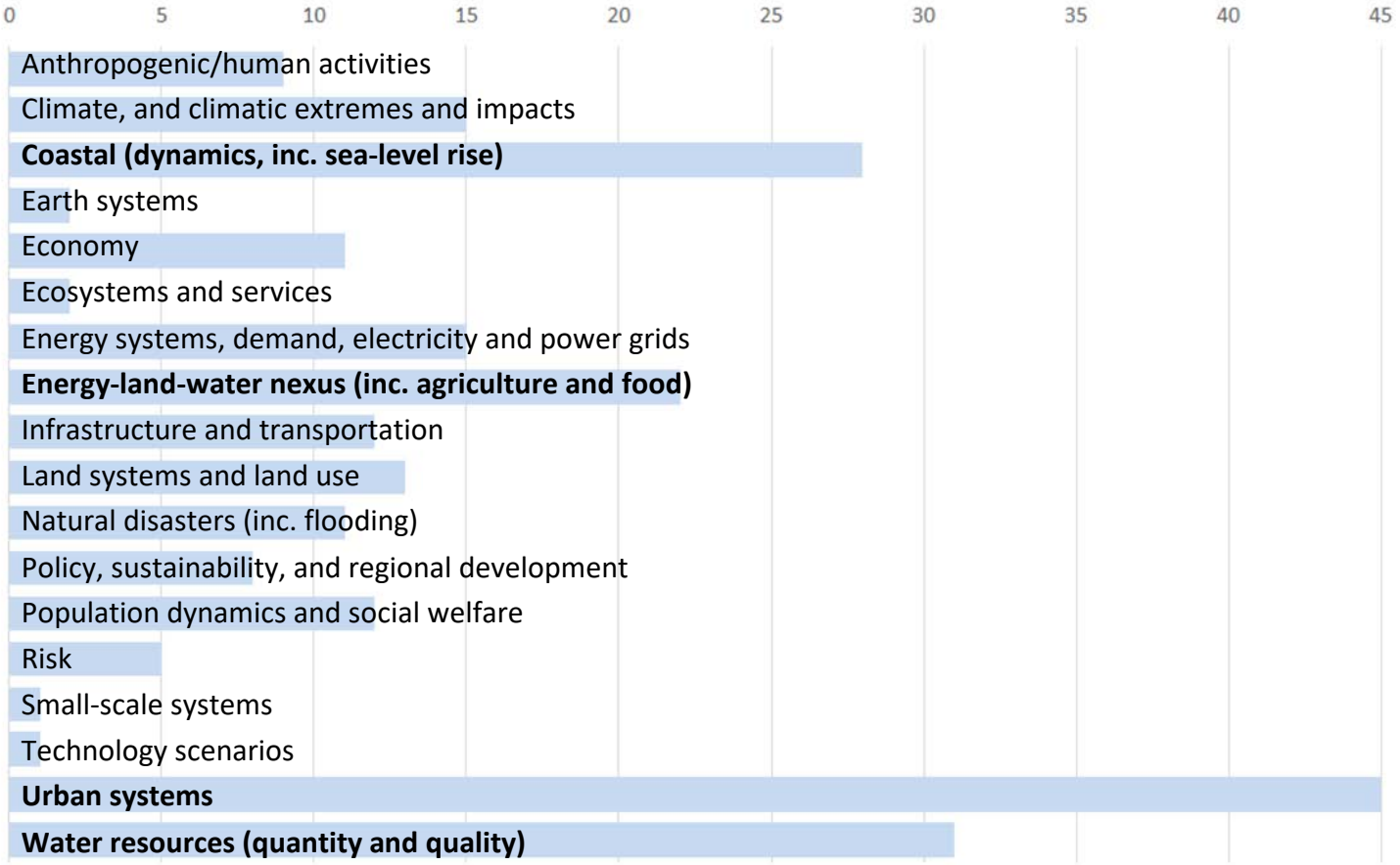
Activities: As agreed by each WG, but generally would include virtual meetings, topical webinars, sessions at scholarly meetings, proposals, publications

Principles: Autonomy, transparent decision making, support early career researchers

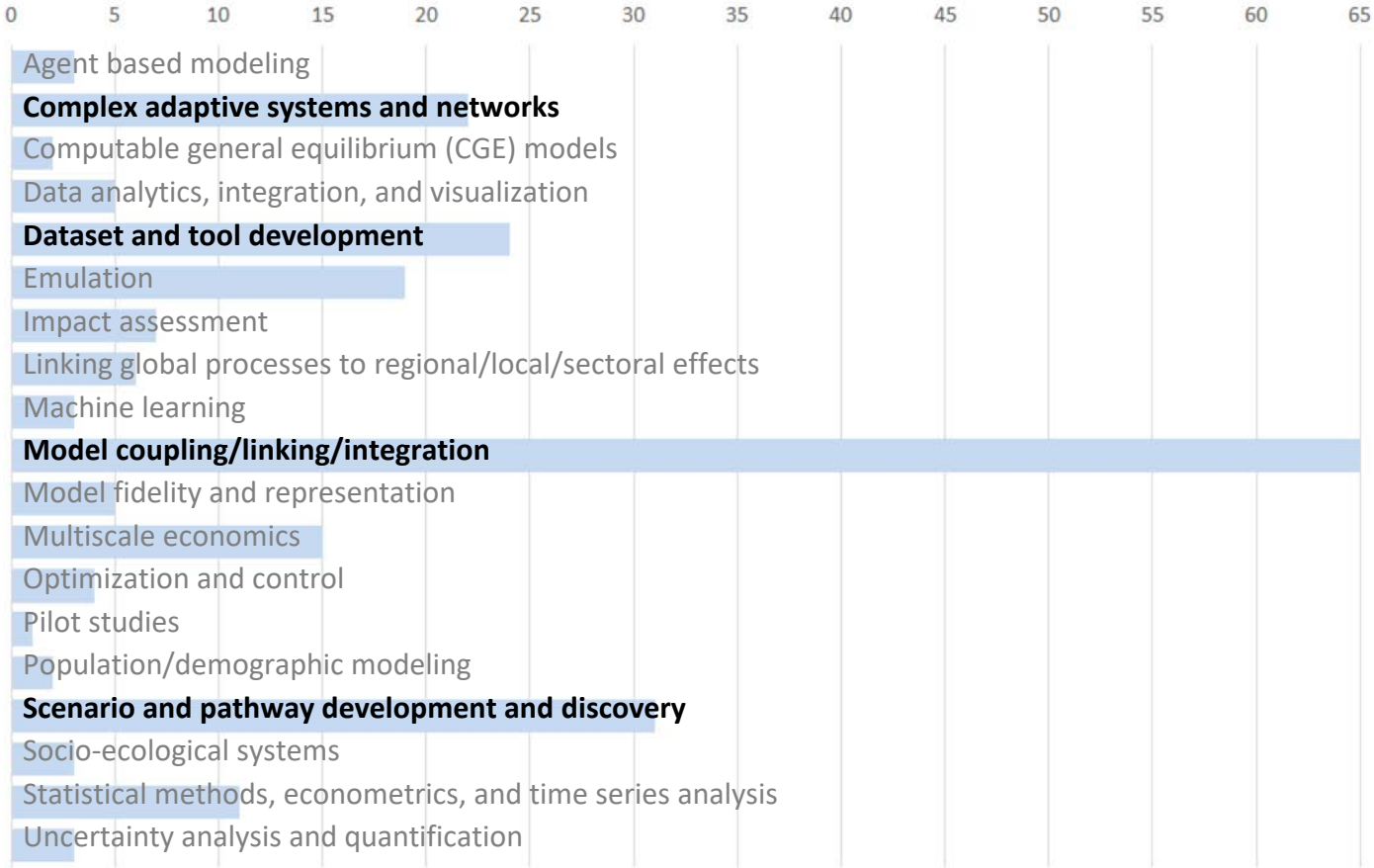
Members: MSD members, additional experts or stakeholders as agreed by WG

Leadership: Typically two co-chairs appointed by Scientific Steering Committee, two-year term with possibility of reappointment but expectation of rotation

Domains/use cases interested to work on



Methods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Agent based modeling
Complex adaptive systems and networks
Computable general equilibrium (CGE) models
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Linking global processes to regional/local/sectoral effects
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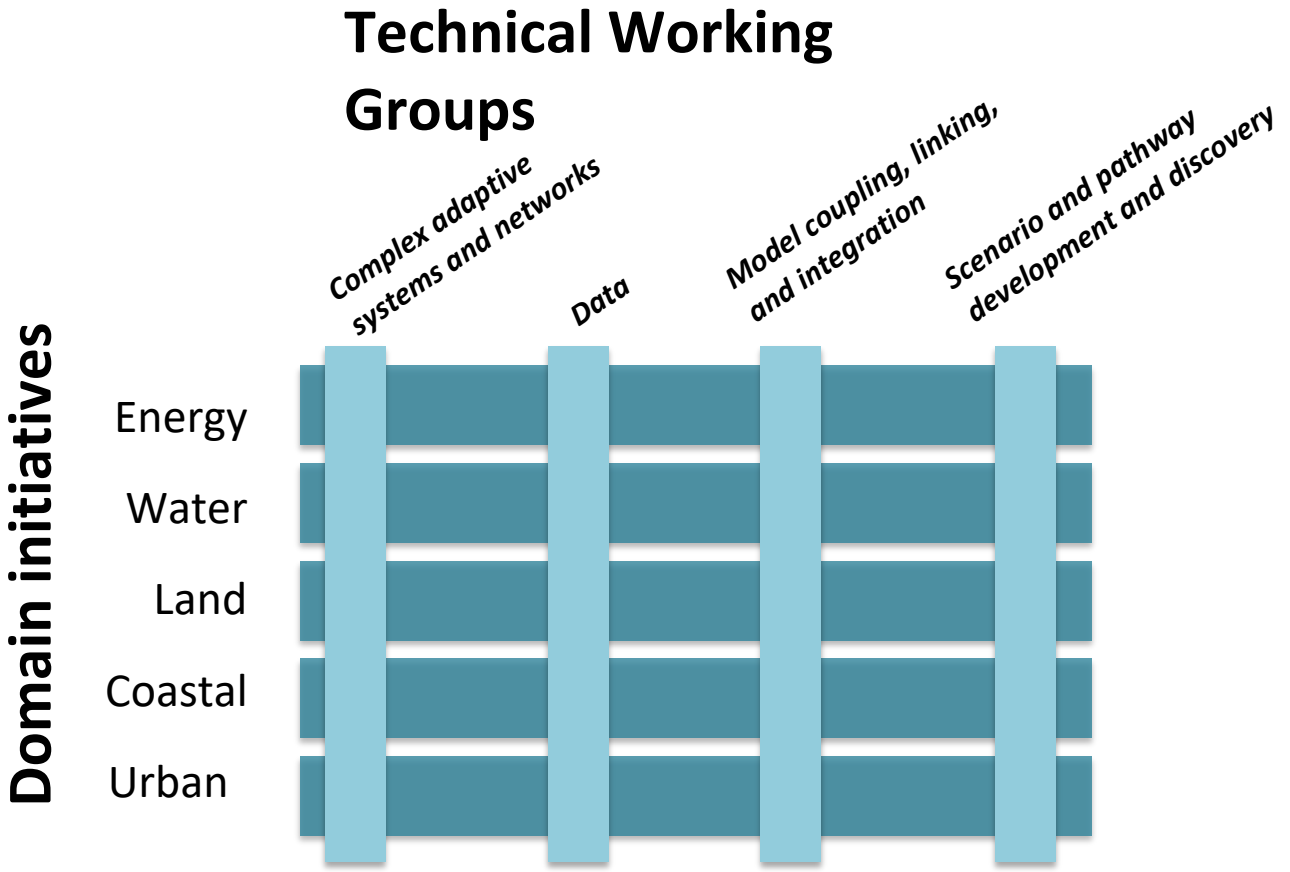
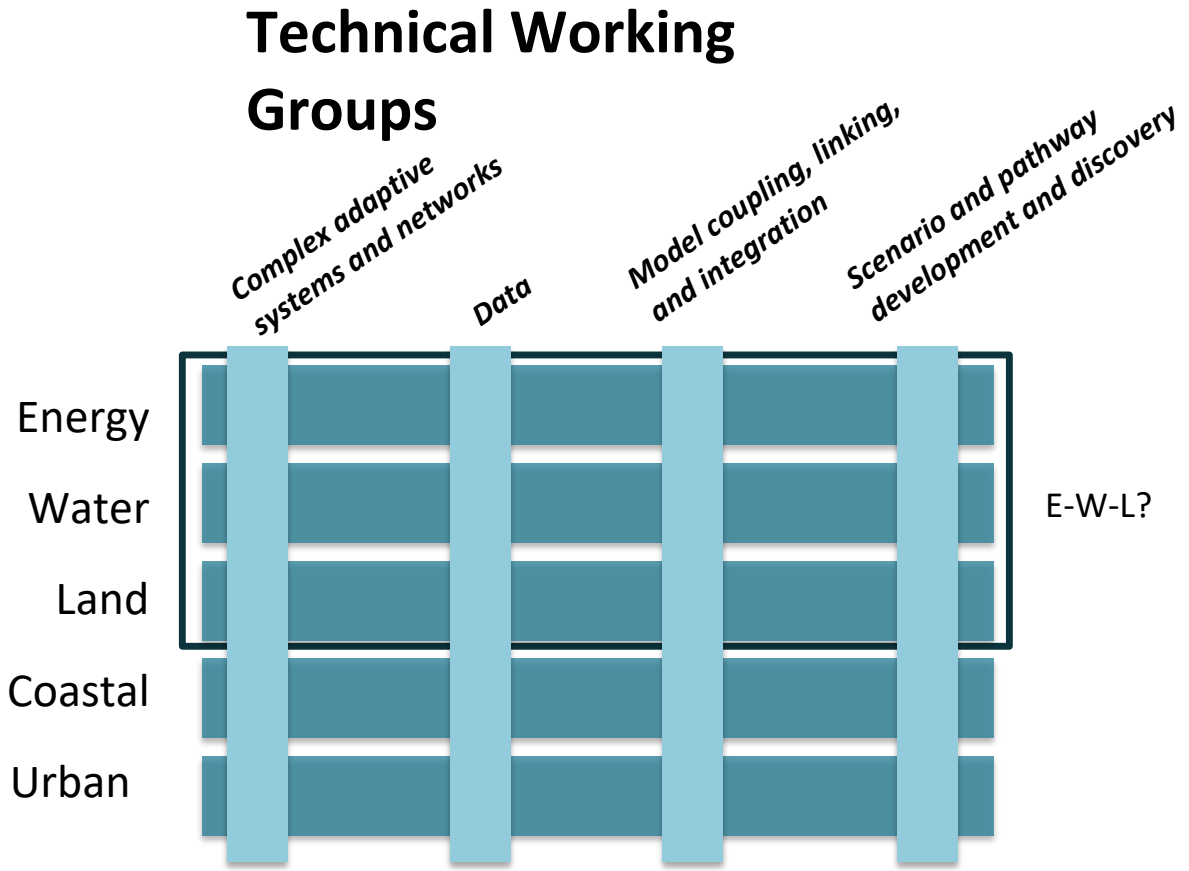
Socio-ecological systems
Statistical methods, econometrics, and time series analysis
Uncertainty analysis and quantification

Working Groups *Preliminary Candidates*



Working Groups *Preliminary Candidates*

Domain initiatives



Working Groups *Preliminary Candidates*

Domain initiatives

Energy

Water

Land

Coastal

Urban

Rural/Ecosystems/etc…?

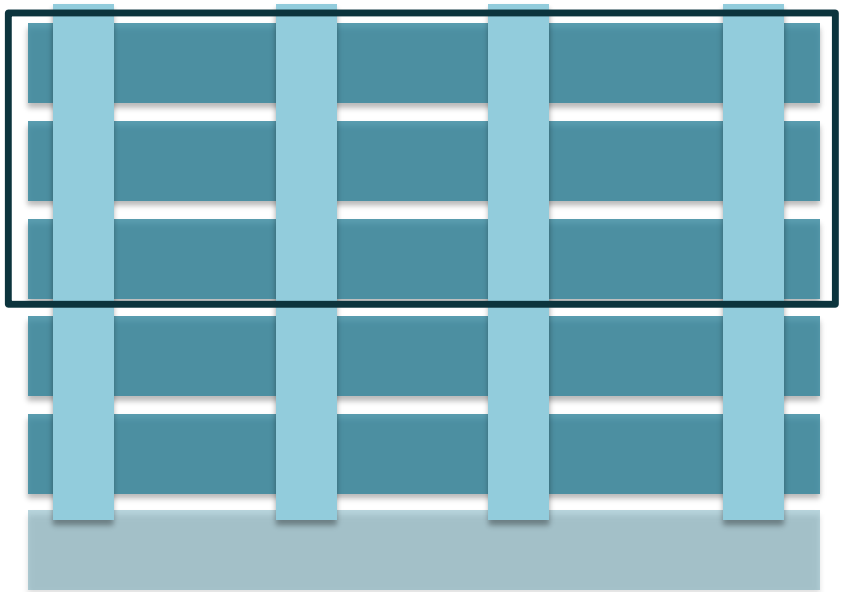
Technical Working Groups

Complex adaptive systems and networks

Data

Model coupling, linking, and integration

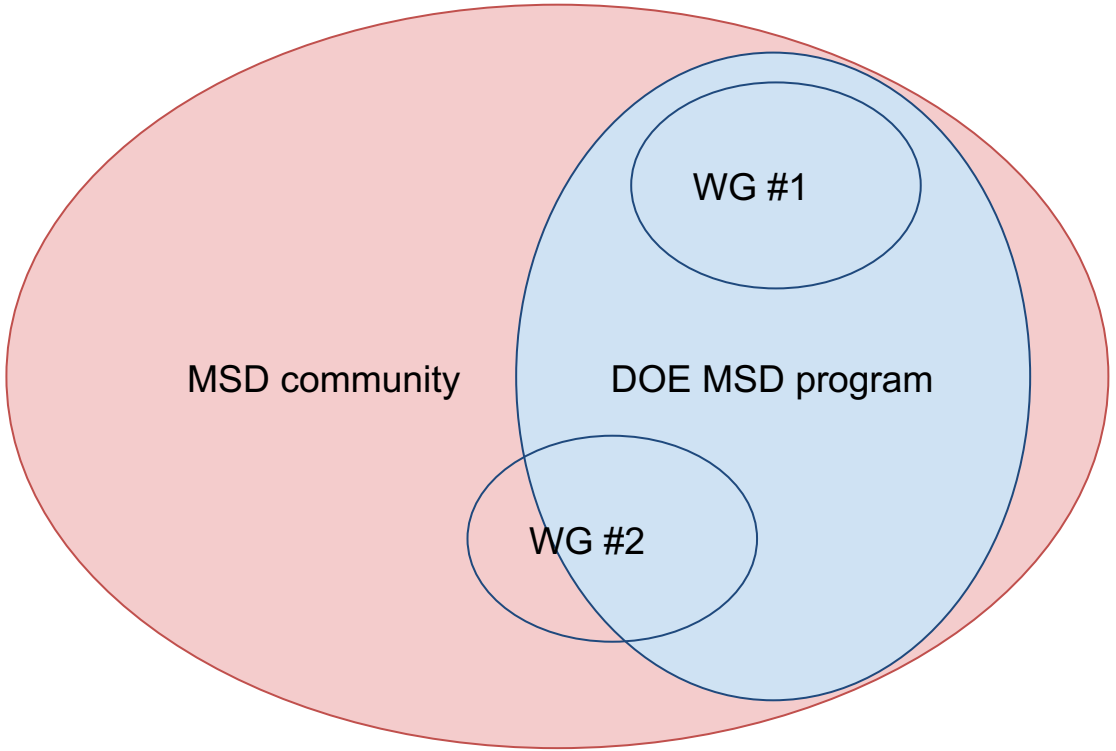
Scenario and pathway development and discovery



E-W-L?

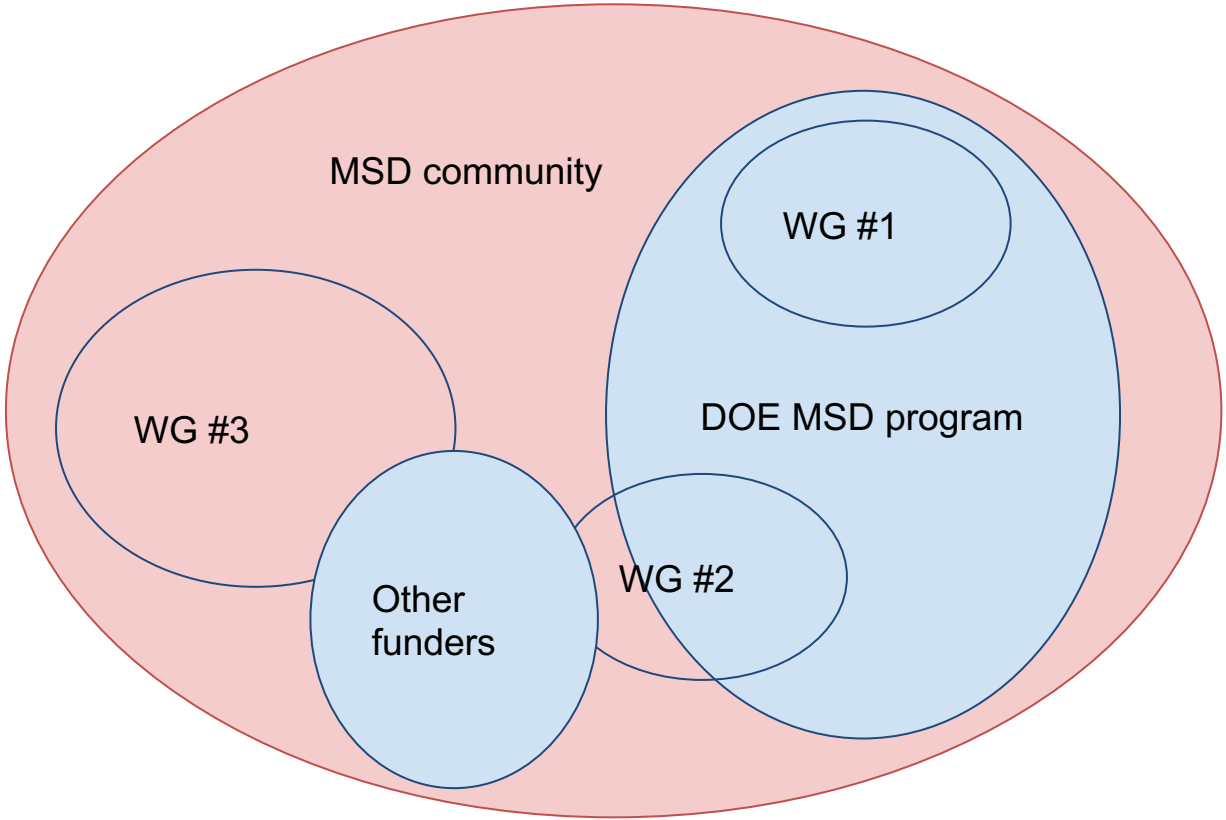
Initial Community Structure

Lay basis for broad community, but start with initial focus on DOE MSD program priorities

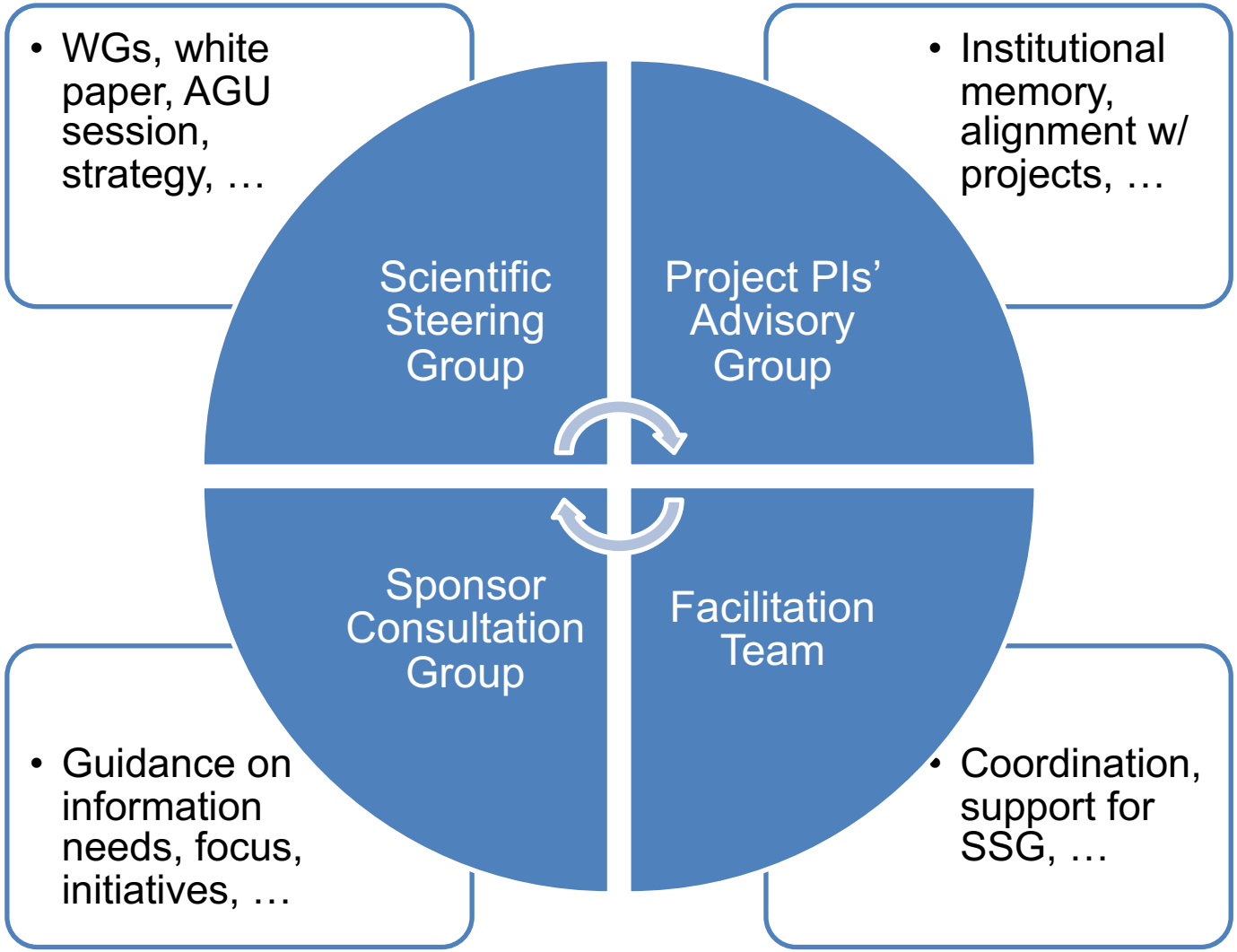


Long-Term Community Structure

A community that is open to collaboration, additional sponsors



Preview: Broader MSD Community Governance Context for WGs



For Discussion

How many WGs?

How to promote cross-fertilization?

How to fund working group activities?

Alignment with DOE foci?

Friday Discussion w/ PIs and Sponsors

- Lessons from other communities
- Cross-project coordination, communication, and workflow
- Domain/scope of MSD community (science drivers)
- Membership and governance
- Activities and communications
- Next steps and community plan

NOTE: Full community discussion will occur in Aug/Sept

Friday Session on MSD Community Coordination and Next Steps

Friday Agenda

8:00 AM Introduction/overview/objectives for the day (MSD coordination team)

8:15 AM

Lessons from other communities (John Weyant)

8:30 AM

Cross-project coordination, communication, and workflow (Bob Vallario)

9:15 AM

Domain/scope of MSD community (science drivers) (Pat/Antonia)

10:00 AM Break

10:15 AM

Membership and governance (Richard/All)

11:45 AM

Activities and communications (Erwan)

12:30 PM

Break -- grab lunch

12:45 PM

Next steps and community plan (Richard/All)

2:00 PM

Adjourn

Informal working groups as needed

Domain and scope of MSD community

Early Origin in 2016 Workshop

Key Focus

"…co-evolving interdependent systems…"

Domains

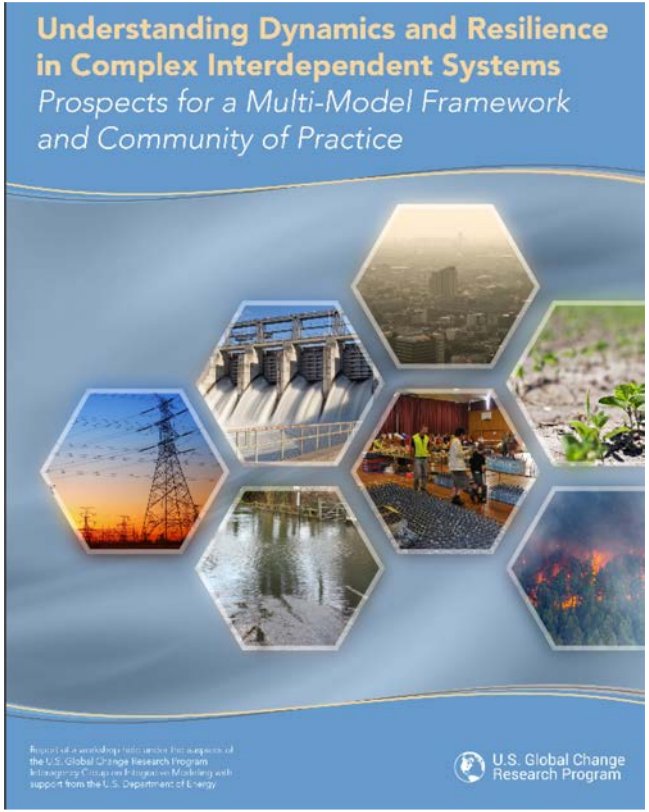
Evolving coastal & urban systems

Cross-cutting themes

Representing adaptive behavior, uncertainty, complexity, thresholds

Identified core need

"Framework" = agile environment for modeling and learning (this includes projects & people!)



MSD COMMUNITY RESPONSES FOR DOMAIN & SCOPE

Emerging definitions of MSD

Identifying and understanding how **key processes** act across the multiple scales that shape the **complex interactions and multidirectional feedbacks** among human and Earth systems

Emphasizing processes that become key when considering interactions between systems

Understanding the **co-evolution of human and natural systems** over time, and building the next generation of **tools** that bridge across **sectors** (energy, water, land, economy) and **scales** (spatial, temporal), and offer a holistic view of systems-of-systems

Emphasizing the evolution of the systems themselves through an MSD perspective

Representative questions for MSD

Dependencies & Interactions

How do different sectors interact and what are the key processes controlling the interactions? Are there synergies or tradeoffs when sectors interact?

Stressors & Uncertainties

What are the key drivers, stressors, and uncertainties when considering MSD? How do these propagate through the various systems? Can the path-dependencies of “failure” be identified, as well as any tipping points?

Representative questions for MSD

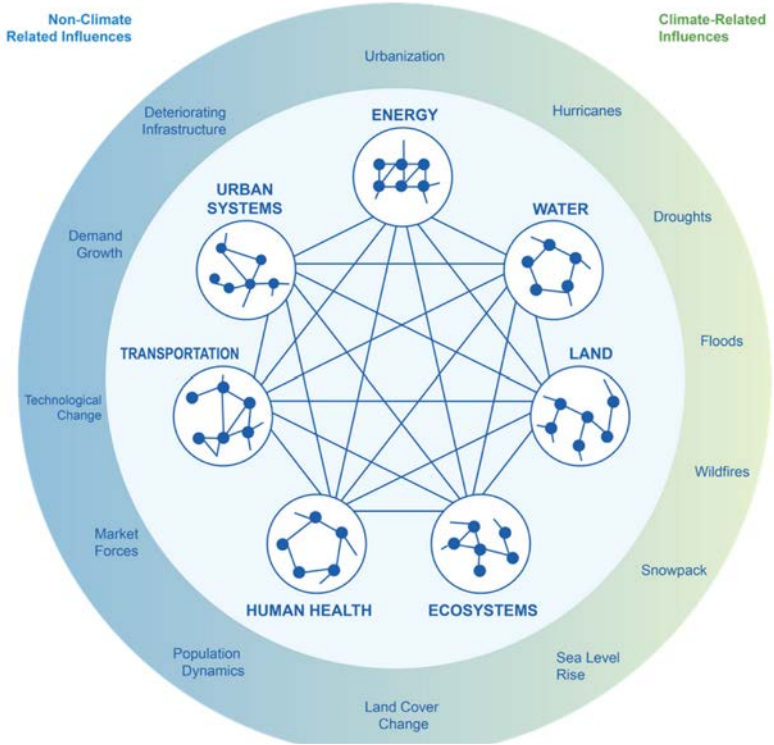
Coupling & MSD model evaluation

How do cross-sector integration and coupling affect system uncertainty of projections? What are some best practices for coupling and model evaluation? How are key concepts (e.g., resilience and vulnerability) defined consistently across systems?

MSD insights for adaptive human actions

What representation (resolution, included processes and entities) is necessary for representing adaptive actions? Are there unique insights that can only be achieved through a MSD perspective? Can they be leveraged to improve our understanding of a particular sector? How can MSD insights inform the management of interdependencies across sectors?

Domain & Scope of MSD as a Field?



New modelling needs?
Scalable inclusion of broader sectoral expertise?
State-Action-Consequence feedbacks?
State thresholds?
Path dependency of failures?
Model-based inferences across many futures?

Source: Ch17 NCA 4
https://nca2018.globalchange.gov/chapter/17/

Discussion on Domain and Scope

- *Reflections on the elicited definitions of MSD?*
- *Implications of the representative questions?*
- *Opportunities for new tools and use cases?*
- *Emerging breakthroughs?*

Membership and governance

Framing the issue/importance:

- Who should the MSD community be? In both short and long term...
  - DOE focus vs. opened to other researchers/communities?
  - Different memberships? Different roles/expectations/benefits? Who decides? How?
- How should it be organized?
  - What kind of management structure (i.e. steering group)? Who decides? How?
- How inclusive are the boundaries of MSD research and strategies?
  - What is the alignment between MSD research and DOE research priorities?
  - Long-term direction of research?

Membership and governance

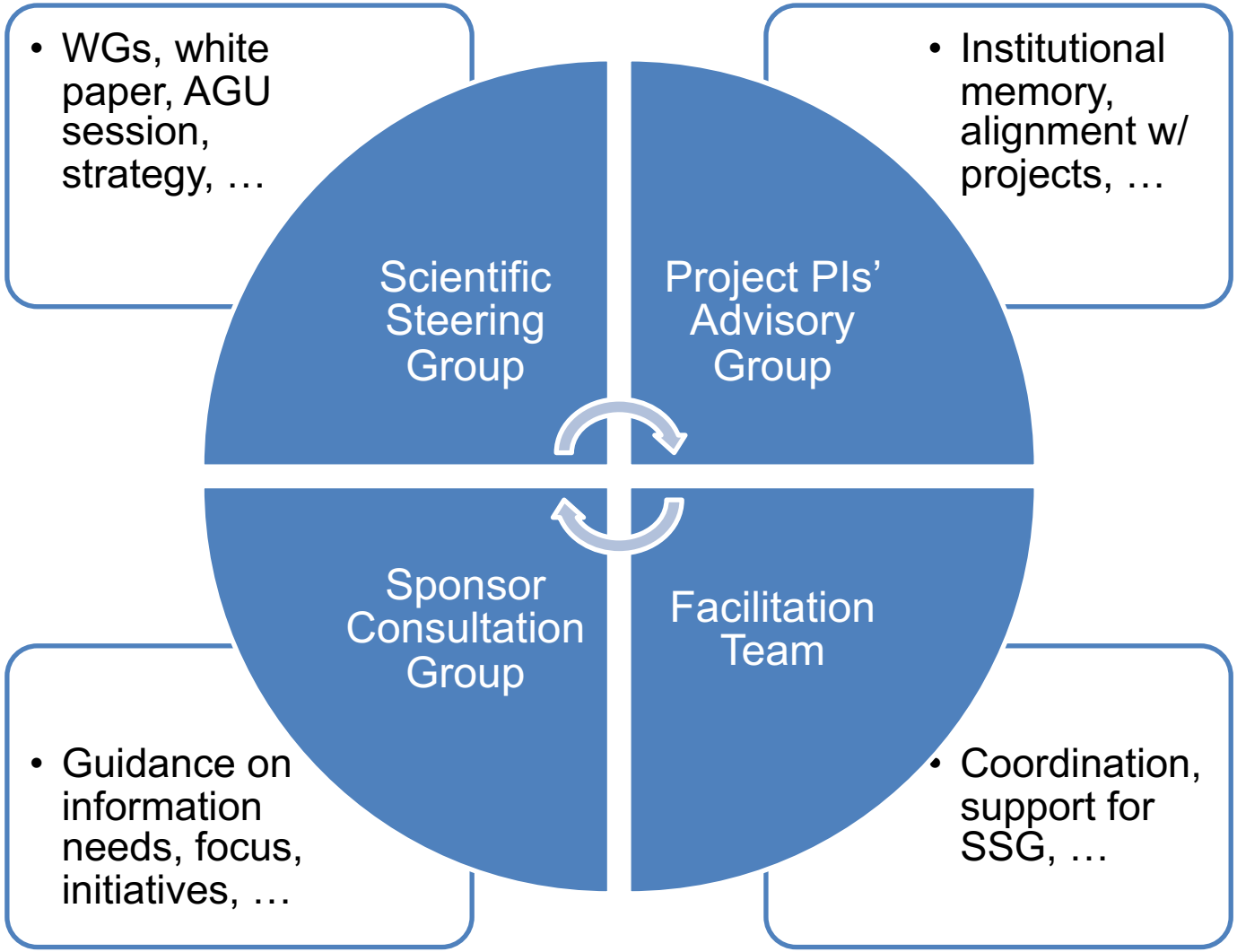
Key points from previous days:

Membership and governance

Proposal/initial ideas:

- Form a community that is open to collaboration while maintaining an initial focus on DOE MSD program priorities
- Potential members:
  - Members from DOE sponsored MSD research projects
  - Members from topically relevant research projects and activities outside of DOE
  - Practitioner members from application domains
- Governance:
  - Scientific steering group
  - Project PI's advisory group
  - Sponsor consultation group
  - Technical working groups
  - Project facilitation team

MSD Community Governance



Membership and governance

Proposal/initial ideas:

Scientific steering group

- What will it do?
  - MSD community “white paper”, organize MSD sessions (AGU, etc.), broader MSD group strategy, technical working groups
- Who will it include?
  - Leads of working groups, nominated members (incl. self-nomination)
- Who will decide?
  - Project PI’s advisory group, sponsor consultation group, project facilitation team
- How?
  - Review of CV, candidate’s statement...

Discussion on membership and governance

- *Membership*
- *Community management structure (components and process)*

Working groups

Framing the issue/importance:

- Expectations and ideas for making them effective, given what we have learned about collaboration
- How many? What topics? Who approves?
- Issues related to membership (related to broader MSD community discussion)
  - DOE focus vs. opened to other researchers/communities?
- Leadership? Rotation?
  - What kind of management structure (i.e. steering group)? Who decides? How?

Working Groups

Key points from previous days:

Working Groups

- Focused on MSD scientific priorities
- Strengthen and expand coordination and collaboration on selected topics
- Share information across projects
- Can serve additional substantive, professional growth, and community-building objectives

Working Groups *Preliminary Candidates*

Domain initiatives

Energy

Water

Land

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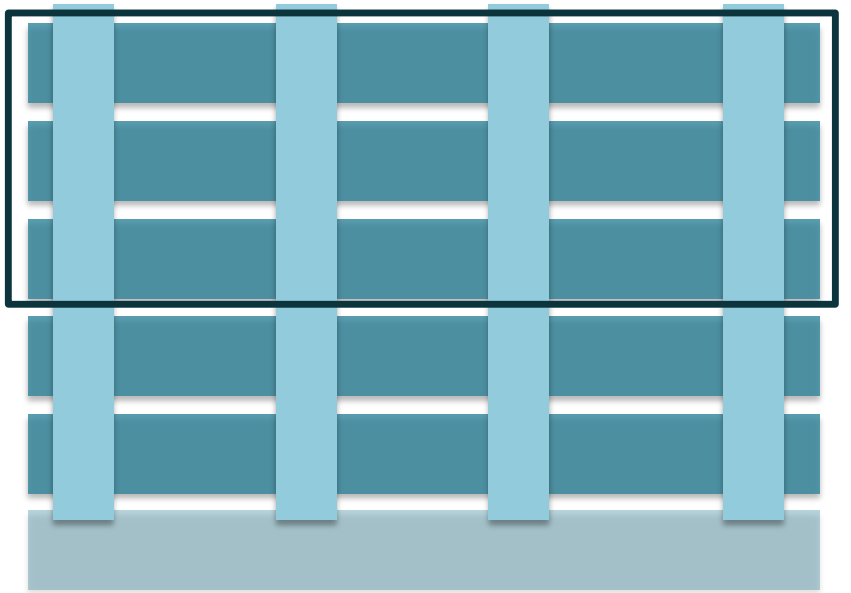

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Activities: As agreed by each WG, but generally would include virtual meetings, topical webinars, sessions at scholarly meetings, proposals, publications

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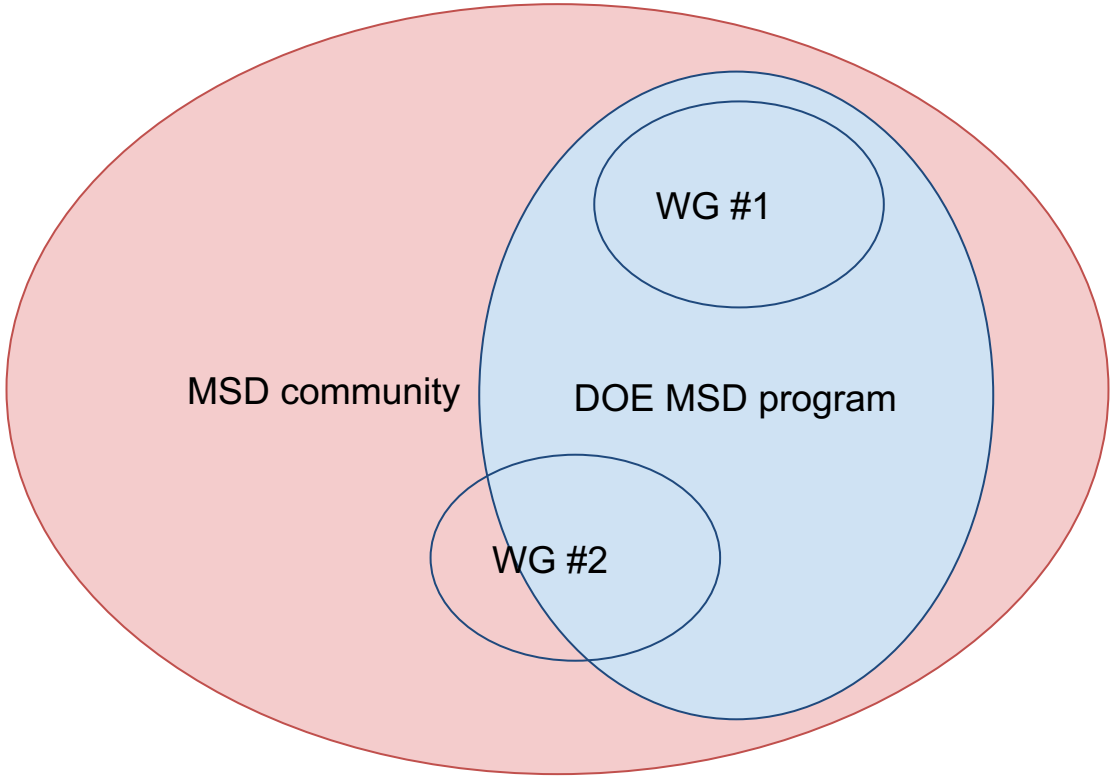
Members: MSD members, additional experts or stakeholders as agreed by WG

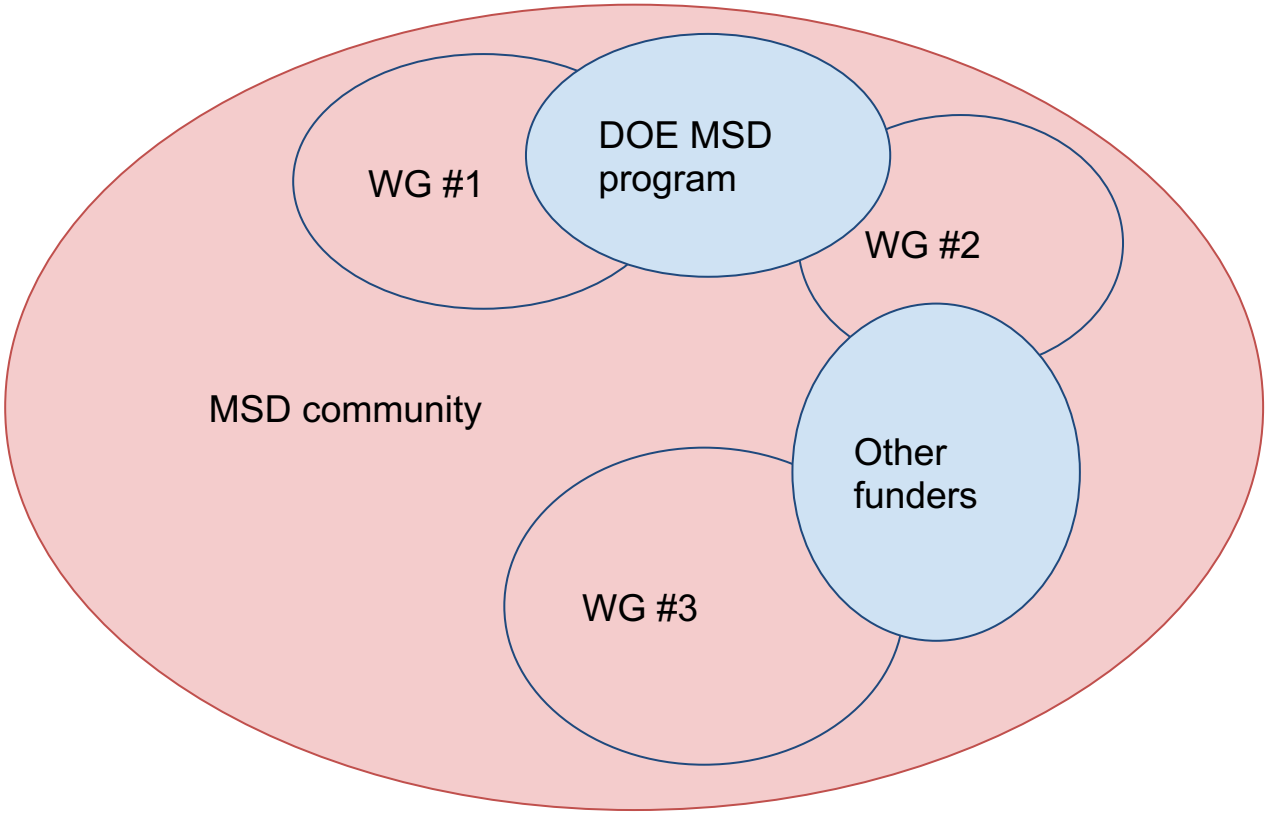
Leadership: Typically two co-chairs appointed by Scientific Steering Committee, two-year term with possibility of reappointment but expectation of rotation

Establishment: Draft TOR reviewed and approved by governance structure

Initial Community Structure



Long-term Community Structure



For Discussion

How many WGs?

How to promote cross-fertilization?

How to fund working group activities?

Alignment with DOE foci?

…

Activities and communications

Framing the issue/importance:

- Need to establish a public face of the MSD community
  - Physical presence (i.e. conferences/workshops), virtual presence (i.e. website)
- Facilitate the coordination/communication within MSD community
  - Collaborations between teams (communication, data sharing...)
  - Centralized way to update entire MSD community (articles, model development...)
- Advertise and expand the MSD community
  - Recruitment of new researchers
  - Spotlights on research achievements, personnel...
- How do we incentivize participation?
  - Need volunteers for a successful establishment/coordination of MSD community

Activities and communications

Key points from previous days:

Activities and communications

Proposal/initial ideas:

- Develop an MSD website
  - Highlighting publications, achievements, working groups, personnel...
- Create listservs
  - Working groups, publications, job announcements...
- Webinar series
- Support and highlight the involvement of early career scientists
  - Awards for outstanding contributions to MSD community
  - Spotlights MSD website, newsletter, etc...
- Use scientific and technical working groups to accelerate collaboration

Activities and communications

Proposal/initial ideas:

- Advance development and sharing of community resources and tools
- Support and highlight the involvement of early career scientists
  - Awards for outstanding contributions to MSD community
  - Spotlights MSD website, newsletter, etc...
- Scientific and technical conferences/workshops
  - Organize sessions at existing meetings (AGU...), annual MSD meeting?
- Facilitate coordinated research and joint publications
  - MSD community “white paper”, MSD special issues in existing journals, MSD journal

Discussion on activities and communications

- *October goals: internal website, listservs & webinar series*
- *Engaging with broader community*
- *…*

Next steps and community plan

Goals:

- October 2019
  - Charter, working groups, initial management structure appointment, internal website, listservs & webinar series
- April 2020
  - AGU MSD session proposal, community white paper draft, MSD special issue proposal
- October 2020
  - Strategy for launch of the broader MSD community
- December 2020
  - Official launch of broader MSD community at AGU
- 2021
  - MSD annual meeting? MSD journal discussion?

Discussion on next steps

- …

Email Addresses:

Antonia Hadjimichael: ah986@cornell.edu
Erwan Monier: emonier@ucdavis.edu
Richard Moss: rhm2137@Columbia.edu
Pat Reed: patrick.reed@cornell.edu
Robert Vallario: Bob.Vallario@science.doe.gov

OLD SLIDES

March 2019 questionnaire

78 responses

26 institutions/organizations

127 research questions

54 key terms

170 pages of response text

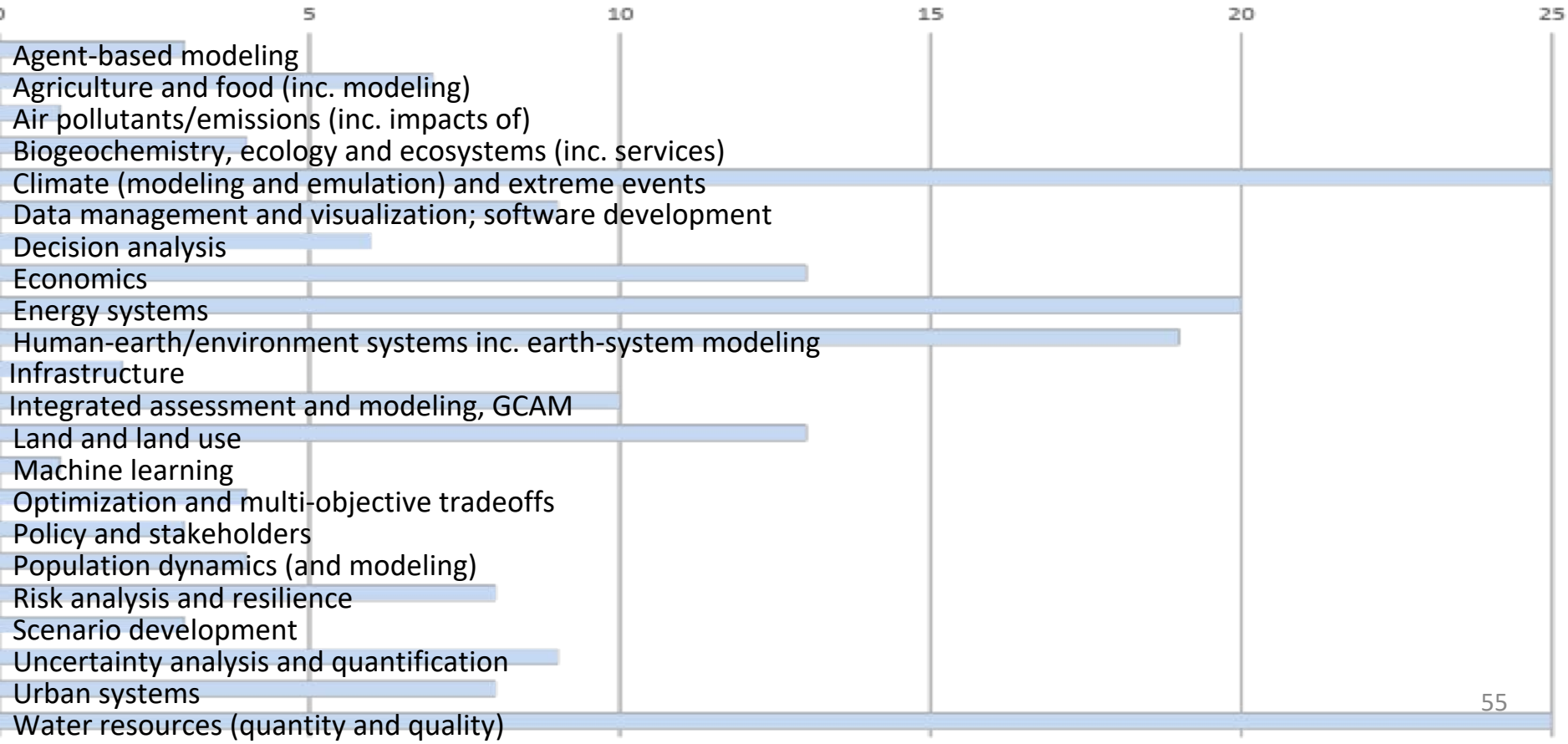
Detailed anonymized responses can be found here:
https://rebrand.ly/MSDresponses

Affiliations

https://rebrand.ly/MSDaffiliations

Organizations and Institutions

Current research interests



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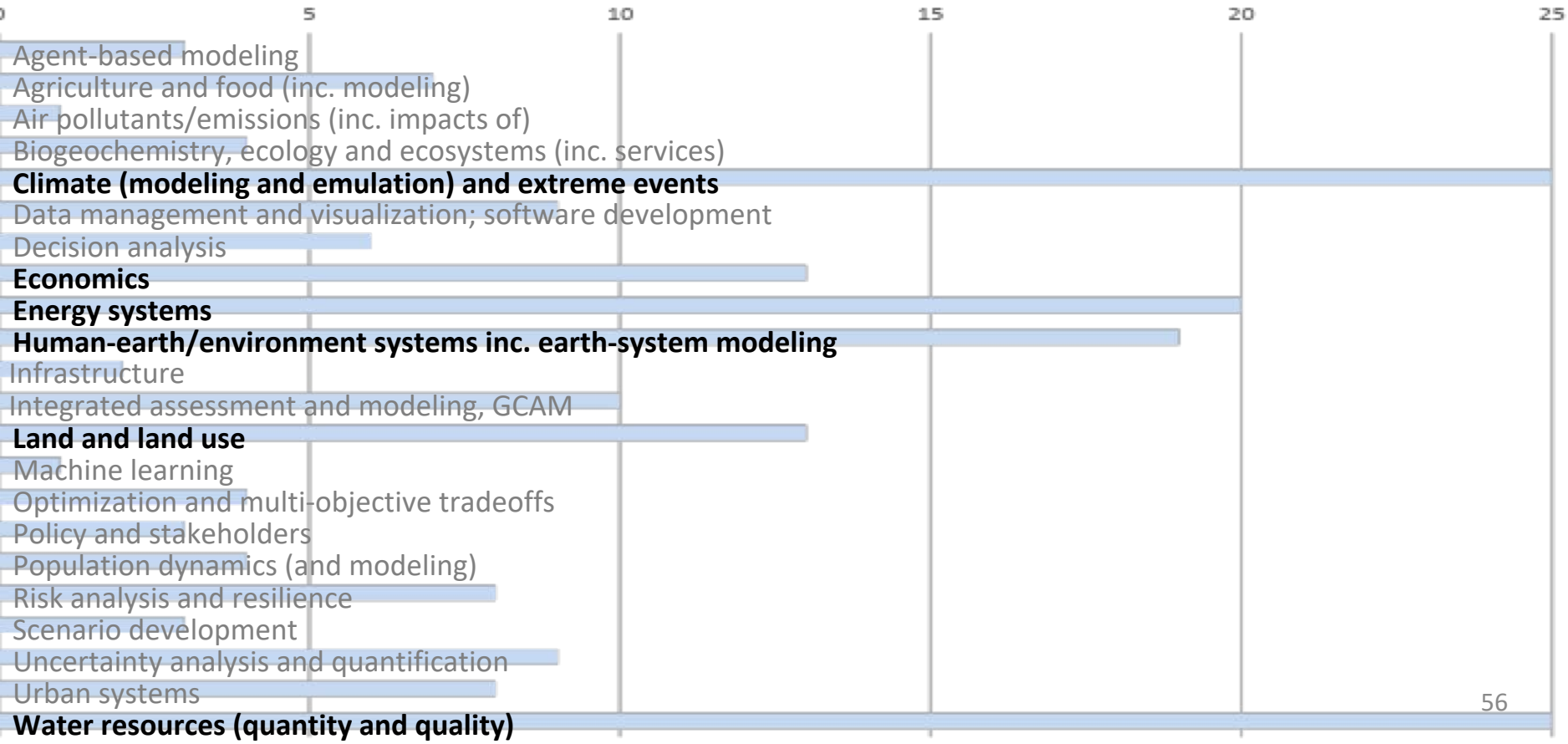
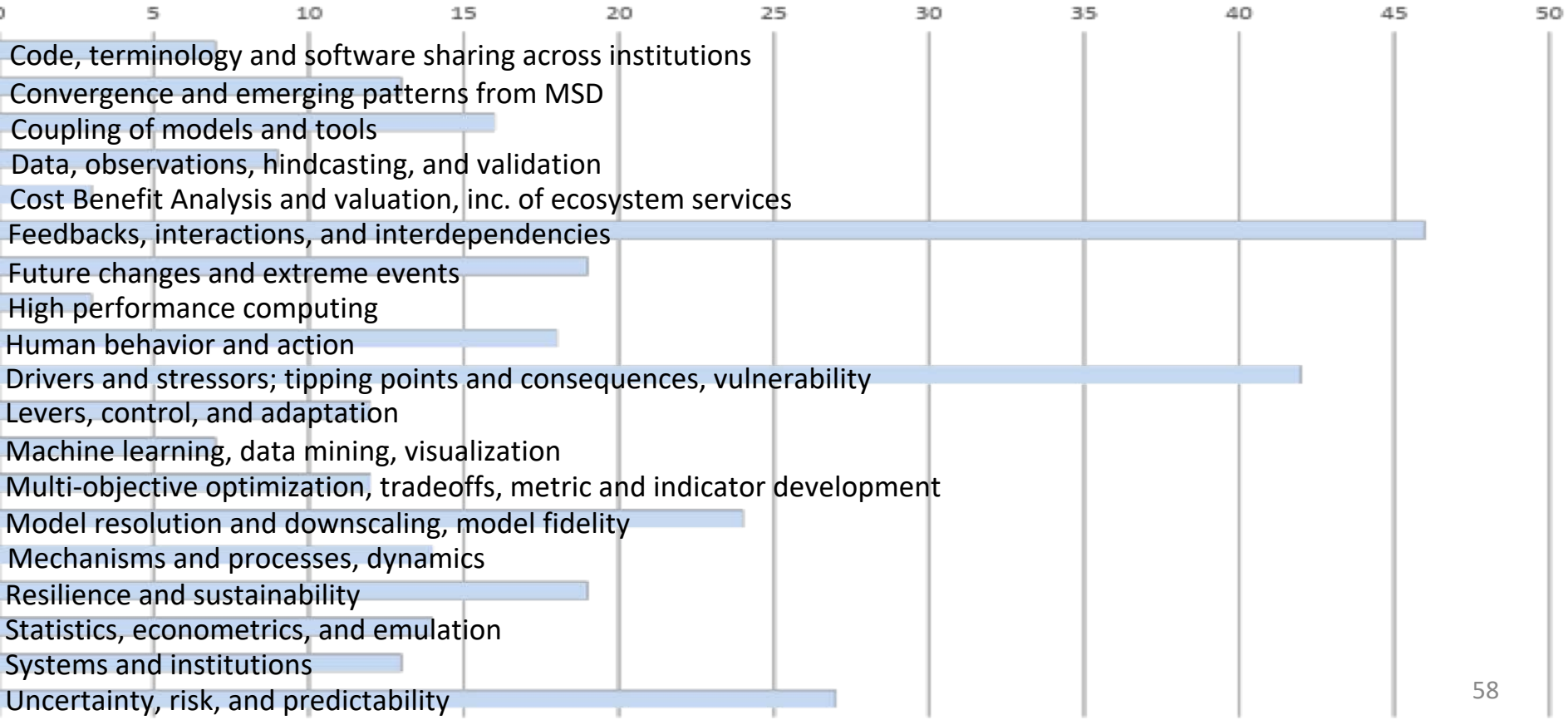


Defining *MultiSector Dynamics as a field: What are the* ***key questions****,* ***terms****,* ***tools****, etc. that are central to the study of multi-sector dynamics?*

Key terms and tools



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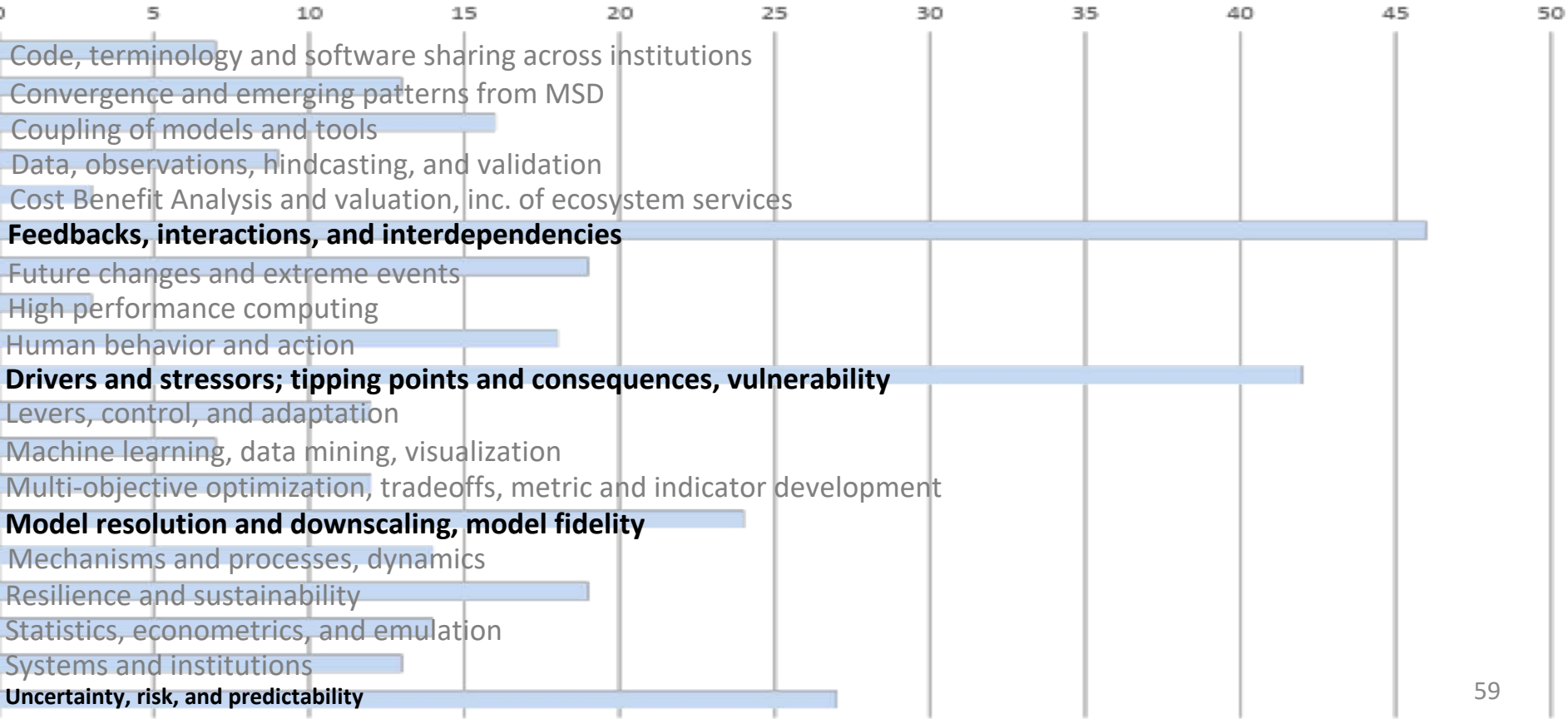
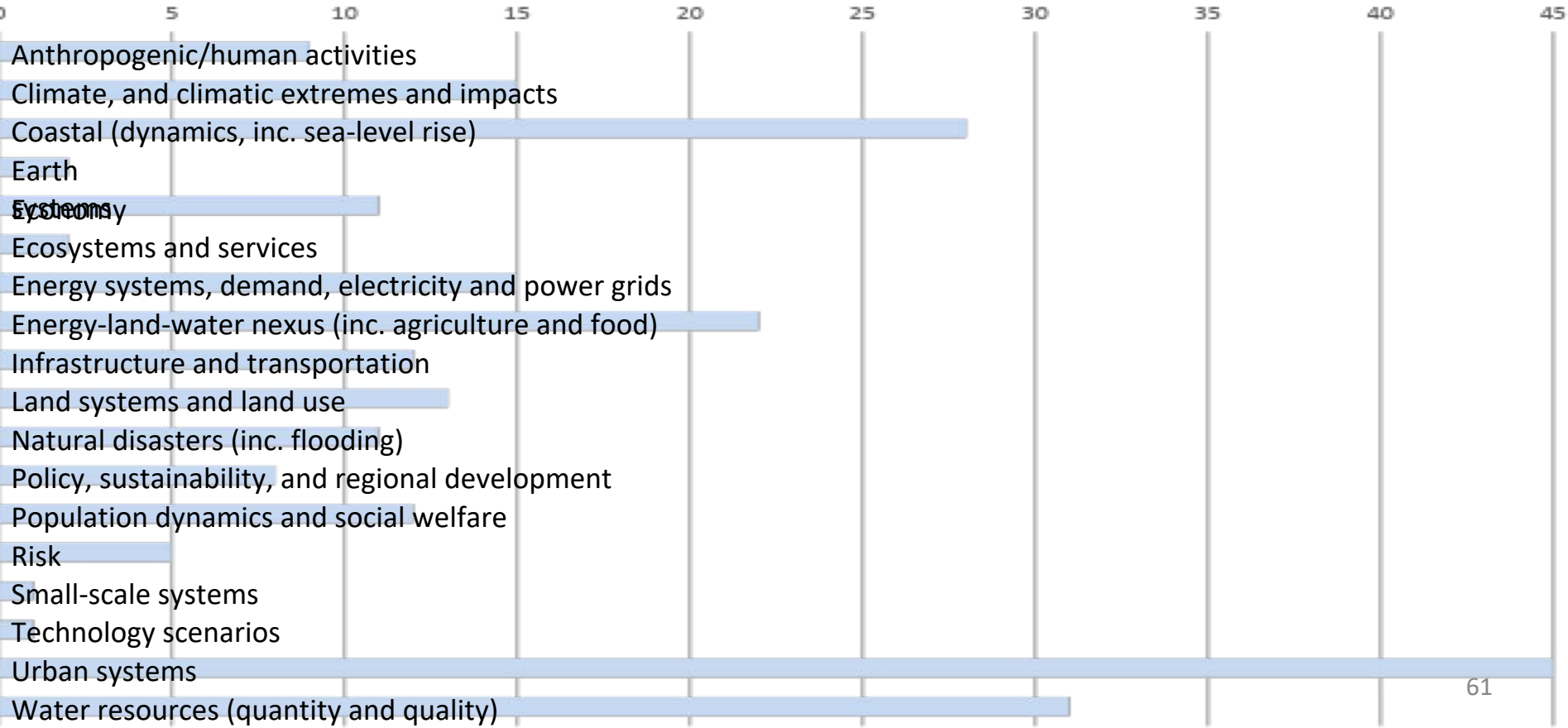


***Domains/use cases**: At the PI meeting, we explored several topical areas/"use cases" (e.g., coastal dynamics, urban systems). Please list **topics/use cases** you would be interested in working on. What **specific tools/capabilities** could you bring to the use case(s) you are interested in?*

Domains/use cases interested to work on



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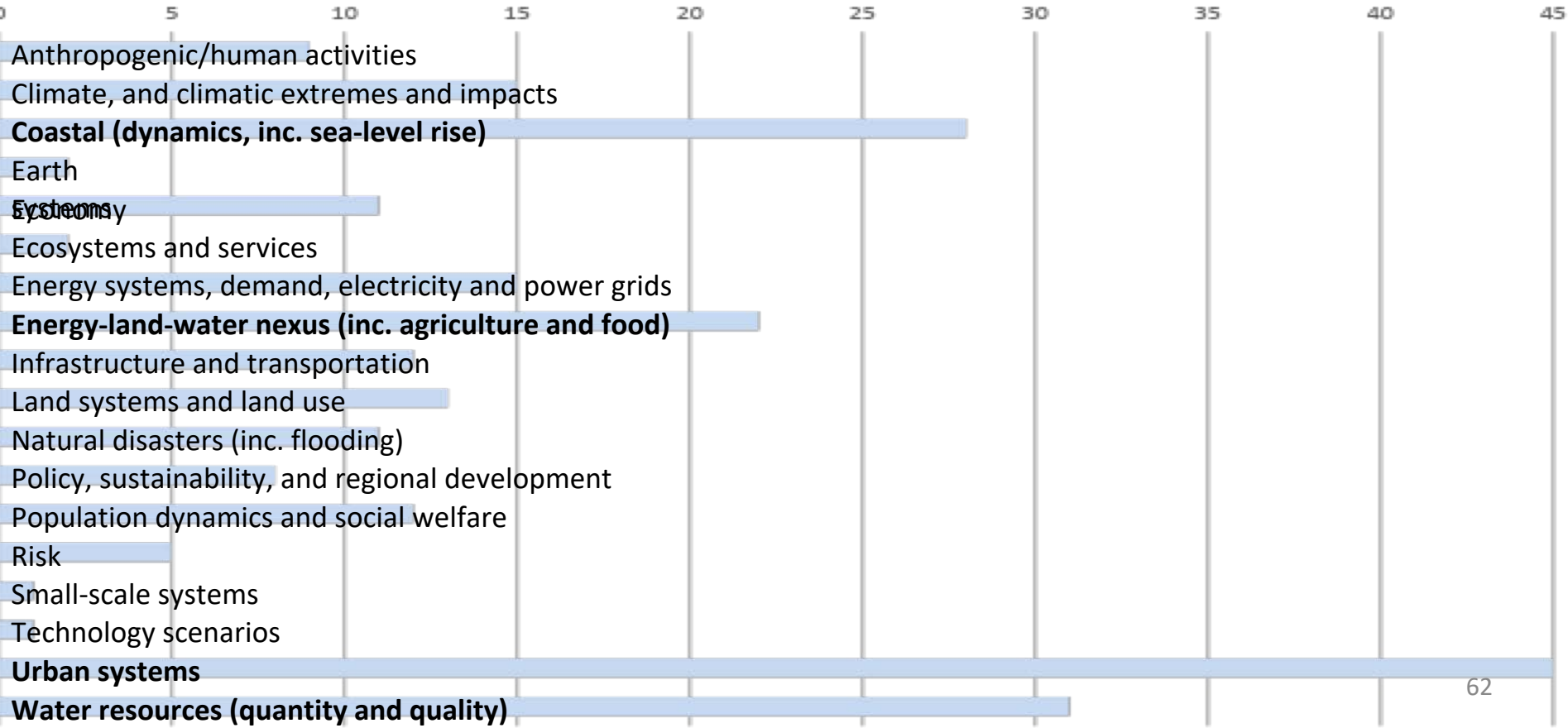
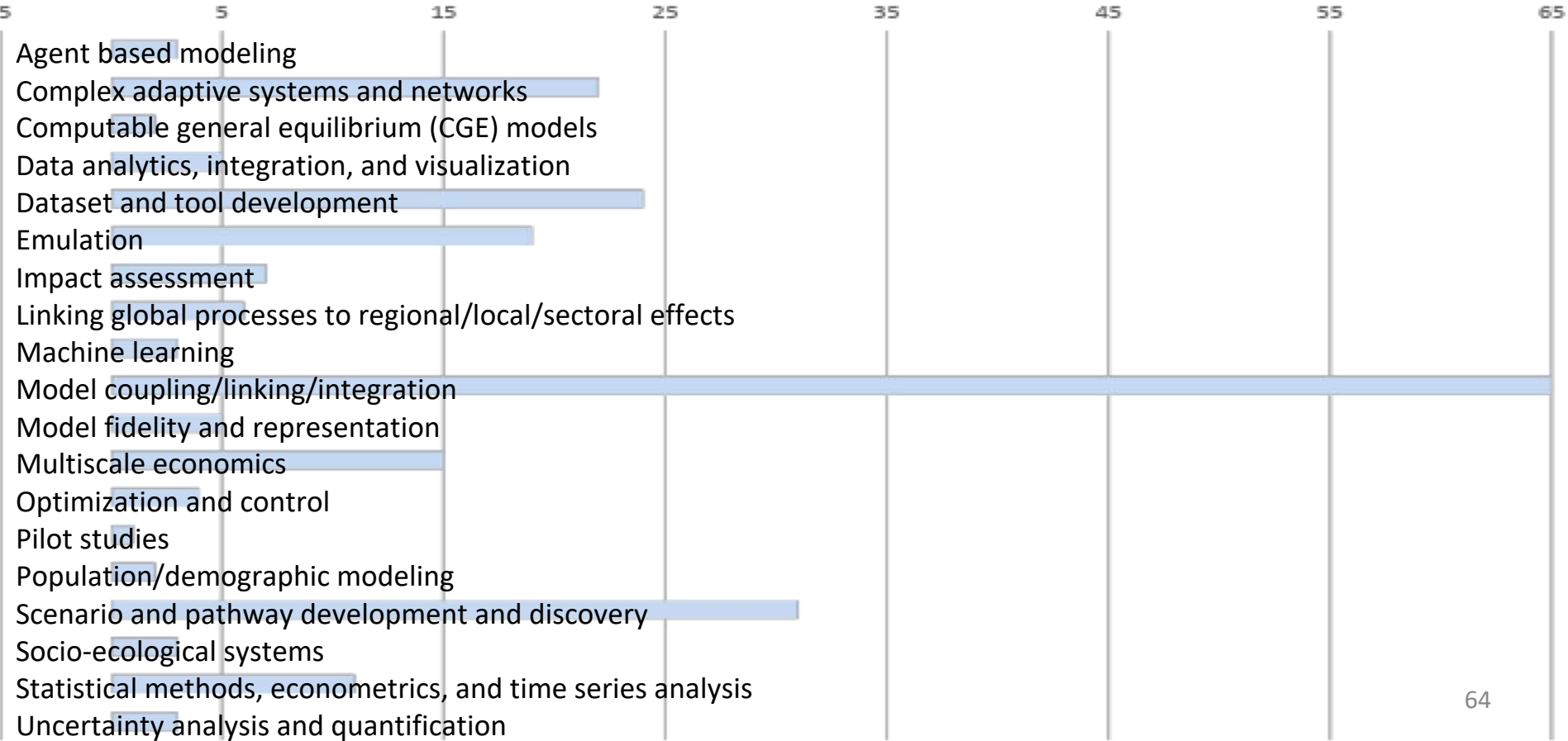


*Cross-cutting **methodological topics** and community **resources**: The PI meeting also included discussion of methodological topics […]. Which of these or others would you be willing to spend time working on? What **specific tools, capabilities, or resources** might you bring?*

Methods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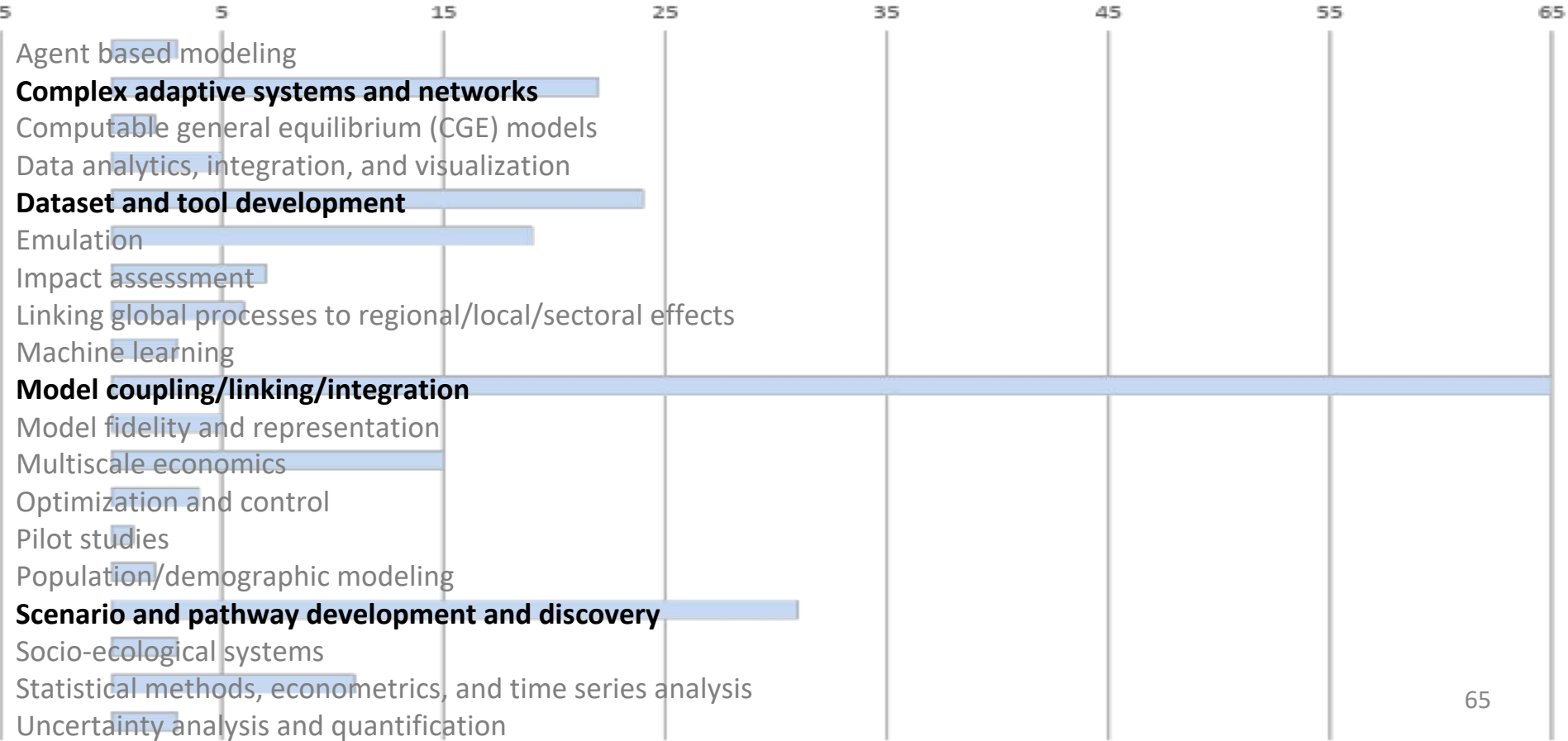
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Representative questions for MSD

120+ questions in total across respondents

Questions encapsulated in the following four themes

Discussion of Community Coordination & Questionnaire (~10 minutes)

MSD definitions?

Core questions?

Tools? Use cases?

Opportunities?

ELEMENTS OF A MSD COMMUNITY OF PRACTICE CHARTER

Today: Float Initial Ideas and Encourage Feedback

- Key topics related to charter:
  - Mission
  - Membership
  - Governance
  - Technical Working Groups
  - Activities
- Use an iterative process that builds on community feedback
  - Balance opportunity for community input with impatience to get going
  - Discussion of next steps for community development following “announcements”
- Goal: October “launch”

Mission

- Build understanding of key processes that shape the co-evolution of energy, water, land, human, and earth systems, considering complex interactions and feedbacks across sectors, multiple spatial/ temporal scales, and processes
- Support development and use of a next generation of data, modeling, and analysis tools to study these processes and contribute to a usable understanding of complex adaptive human-natural systems

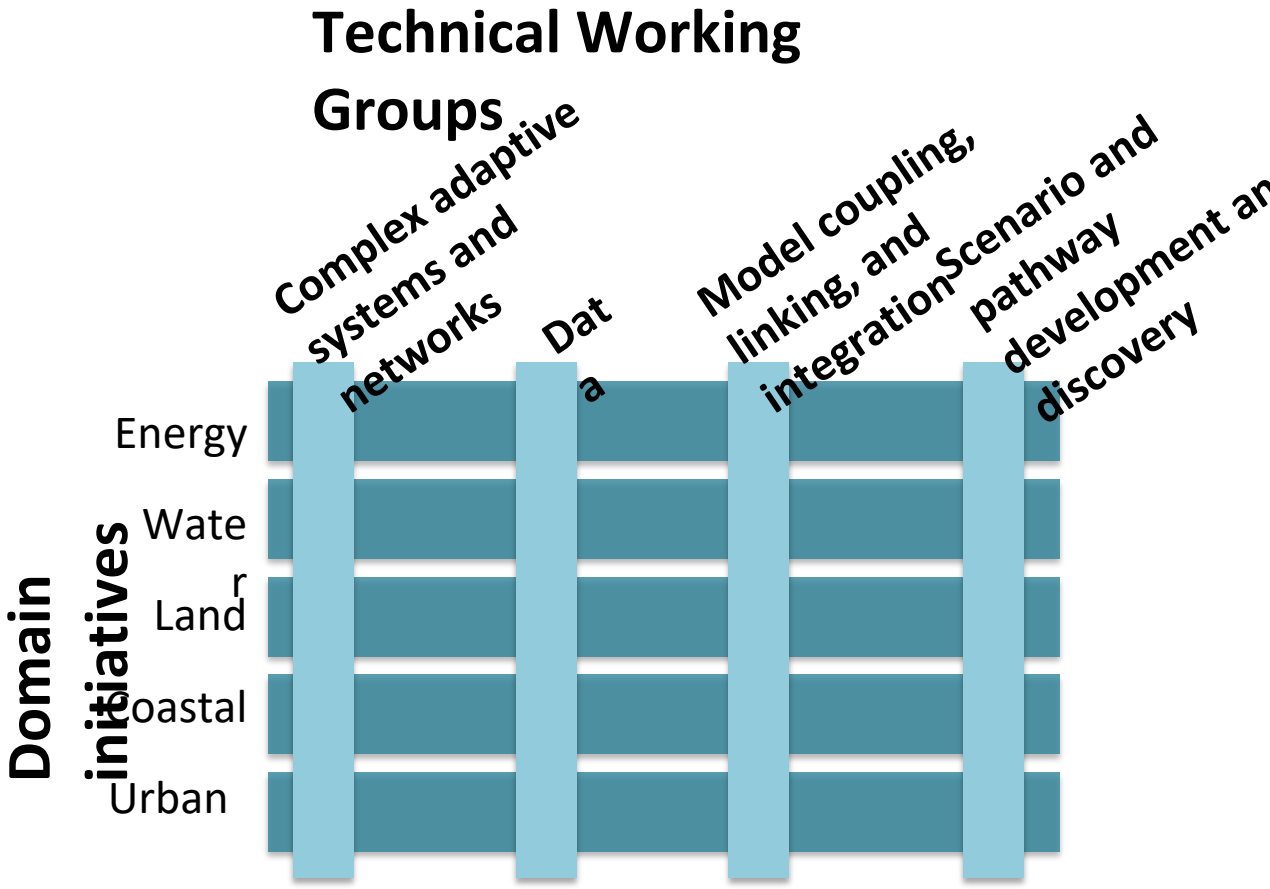
Members

- Form a community that is open to collaboration while maintaining an initial focus on DOE MSD program priorities
- Potential categories of members:
  - Investigators from DOE sponsored research projects on multisector dynamics
  - Research affiliates from topically relevant research projects and activities
  - Practitioner affiliates from representative application domains

Governance

- Identify and implement shared activities that support scientific objectives and align community and project priorities
- Potential components:
  - Scientific steering group
  - Project PI's advisory group
  - Sponsor consultation group
  - Technical working groups
  - Project facilitation team

Technical Working Groups *Preliminary Candidates*



Activities

- Use scientific and technical working groups to accelerate collaboration
- Advance development and sharing of community resources and tools
- Maintain community communications (next segment)
- Organize sessions at scientific and technical conferences/ meetings (annual meeting?)
- Facilitate coordinated research and joint publications (e.g., published MSD “white paper”)
- Recognize technical achievement/progress

Discussion of Community Charter Elements (~15 minutes)

Process?

Mission?

Membership?

Governance?

Working groups?

Activities?

MSD COMMUNITY WEBSITE & COMMUNICATIONS

Short-term

- Website

  A public face for the MSD community

  https://multisectordynamics.wordpress.com
  - Mission/Charter/White papers
  - Working groups
  - Meetings
  - Webinars
  - Recent publications
  - Career opportunities
  - Blog/Forum

- Listserv
  - Meeting announcements (meetings@xxx.org)
  - Job announcements (jobs@xxx.org)
  - Publications announcements (pubs@xxx.org)
  - Working groups (wg@xxx.org)

- Webinars

Long-term

- Monthly newsletter
  - Research highlights
  - Recognition of achievement
  - Spotlight on early career researchers
- Web portal for sharing
  - Documents
  - Data
  - Models
- Slack channel
- Annual MSD conference
- Dedicated MSD journal

Next Steps & Challenges

- Snowmass workshop
  - Session on existing collaborations
  - Friday session on community coordination
- Webinar in September
- Editorial continuity & dynamic content
  - Facilitators and volunteers
- DOE versus broader community
  - Blog/forum content and access
  - Communications and outreach with other functional communities (INFEWS, ESM, IAMC)

Discussion of Community Website & Communications (~5 minutes)

MSD community website?

Internal to DOE vs External?

Volunteer roles or ideas?

Opportunities?

MSD COMMUNITY UPDATES FOR UPCOMING EVENTS/EFFORTS

NEXT STEPS:

1. Please provide feedback to our facilitation team with your thoughts or concerns (by June 21 for use in drafting materials)

2. July 19 Snowmass discussion on near term MSD collaborations & community development

3. August/September webinar to follow up from Snowmass and formalize next steps for MSD community

4. October goal to launch community charter, governing/technical working groups, communications, etc.