

The MACH Evaluation Model

MACH is a complex collaborative endeavor involving thirteen institutions and their non-profit, public sector, and other partners working to co-produce integrated transdisciplinary research that informs the field and is both useful for, and used by, those responsible for climate response and resiliency decision making in the project's target region ranging from Philadelphia through New York City.

The MACH evaluation includes:

- ✓ Developmental evaluation and debriefing Interviews with Key Personnel

Participating in key project activities and engaging with those involved to ensure the evaluation remains context-aware and to understand decisions and shifts in practice, the factors catalyzing and informing those shifts, and the desired and achieved effects on the project and its participants.

- ✓ Principles Focused Evaluation

Tracing the evolution of the MACH principles of engagement and how they shape the project, its implementation and outcomes, largely through artifact analysis and participant observation.

- ✓ Social Network Analysis

Documenting who is involved in MACH, whether and how they engage with one another, and how that engagement supports and contributes to MACH-related activities.

- ✓ Program evaluation of MACH's BI activities including:

- Community College Program

Exploring whether, how, and how well the 2YC program activities are meeting the learning goals participating faculty establish for their students as well as MACH's BI program goals to enhance public knowledge and positively impact student interest in environmental STEM education and careers.

- Documentary Film Program

Documenting the impact that engaging in the film making has on the interests and goals of participating students and gathering insights on audience impact of completed/distributed films.

- Workforce Development Strategy and MACH Studio Activities

Exploring how MACH is supporting participants professional development and career goals and preparation: particularly graduate students, post docs, and early career faculty and their peers working in sectors outside of higher education.

The results of these evaluation activities are synthesized to generate key learning across areas of particular importance for MACH's success in achieving project goals.

To learn more about MACH, visit <https://coastalhub.org/>

To learn more about the external evaluation team from the Science Education Resource Center (SERC), visit us at <https://serc.carleton.edu/serc/about/evaluation.html>

Key Learning in Year 1-2

Early evaluation activities focused on documenting and assessing the extent to which foundational elements of the project were successfully established. Those included the development and early implementation of the project's *principles of engagement* and *governance structure*. In Y2, it also included initial work on the project's BI programming and examining the network formation.

PRINCIPLES FOCUSED EVALUATION

- ✓ Meaningful principles were articulated and align with underlying project values and with GUIDE criteria to provide a suitable basis for the Principles-Focused Evaluation. However, some appear to be values statements or statements of fact rather than principles.
- ✓ Evaluators saw evidence of the principles showing up in team discussions and considered as part of strategy planning and efforts to enact mechanisms to promote principle-informed practice.
- ✓ Y1 recommendations to engage the advisory groups more deeply in the efforts to interpret, integrate, and implement the principles in practice were realized in Y2.

GOVERNANCE STRUCTURE

- ✓ Affirmed that all proposed bodies had formed, memberships reflected the proposed representation and expertise, and initial activities aligned with planned responsibilities.
- ✓ The planned community of practice approach was explored by project leadership and CSAP over Y1 and Y2. Ultimately other collaboration strategies were adopted.

BI PROGRAMMING

- ✓ Leaders of the 2YC program redesigned their approach to be responsive to the needs and interests of 2YC students as guided by 2YC faculty. The new approach is consistent with the MACH principles.
- ✓ Interviews with participants in Documentary Film activities revealed impacts on recognition of and interest in diverse professional pathways. All expressed a profound impact of engaging with residents of a climate-impacted coastal community during the film making process.
- ✓ Although early in the process, the initial implementation of the Social Network Analysis survey in Y2 revealed extensive and often strong connections forming across roles and project teams. Senior personnel reported more connections at that time than other groups. Team members reported using insights from other teams and awareness of ways other teams were making use of their research.

RECOMMENDATION

- ✓ Recognize and address disciplinary differences in practice and language that appeared to be contributing to misunderstandings and some frustration across the project teams.

Key Learning in Year 3

In Y3, evaluation activities were framed by the continued evolution and implementation of the MACH principles.

EVOLUTION OF THE PRINCIPLES

- ✓ MACH's original principles centered academic researchers and guided engagement with co-producers and partners. The final iteration better reflects foundational values, equalizes power, and acknowledges agency, vulnerability, and inter-dependence on all sides.

IMPLEMENTATION THROUGH ADAPTATIONS IN PROJECT GOVERNANCE

- ✓ MACH adopted a new holocracy-based governance structure expanding opportunities for earlier career researchers to assume leadership.
- ✓ Adapted circle reporting processes to document and enhance opportunities to learn from successful strategies and challenges. Surfaced procedural adaptations and workforce development strategies to enhance research success and student impact.
- ✓ Adoption of a formal Translation & Co-Production plan operationalized the principles to ensure equitable engagement.
- ✓ The original CSAP was split to create the new GAC to encourage engagement on shared interests and make better use of members' expertise. Overall positive response although members of both groups viewed reduced engagement across sectors as a loss.

SOCIAL NETWORK ANALYSIS

- ✓ Network analysis indicated that MACH had successfully leveraged existing relationships and effectively built networks that span organizations and sectors and link research team members across institutions.
- ✓ While there was greater density around the lead institution, there also density surrounding and connecting other partners. These patterns indicate that MACH is establishing the preconditions to facilitate transdisciplinary and co-produced research.
- ✓ Network members expressed a good sense of belonging in MACH which varied significantly by role and was correlated with the number of reported connections. At that time, senior personnel tended to have more connections and felt the strongest sense of belonging in MACH.
- ✓ Network health assessment indicated that MACH was building a healthy network where most members reported balance between the extent to which they contribute to and receive essential resources through the MACH network.

Key Learning in Year 4

EVOLUTION OF THE MACH NETWORK: EXPANDING AND DEEPENING CONNECTION

- ✓ Appreciable growth and decentralization of the MACH network provides a foundation for enduring collaboration across institutions, disciplines, and sectors. Members across roles report stronger belonging year-to-year.

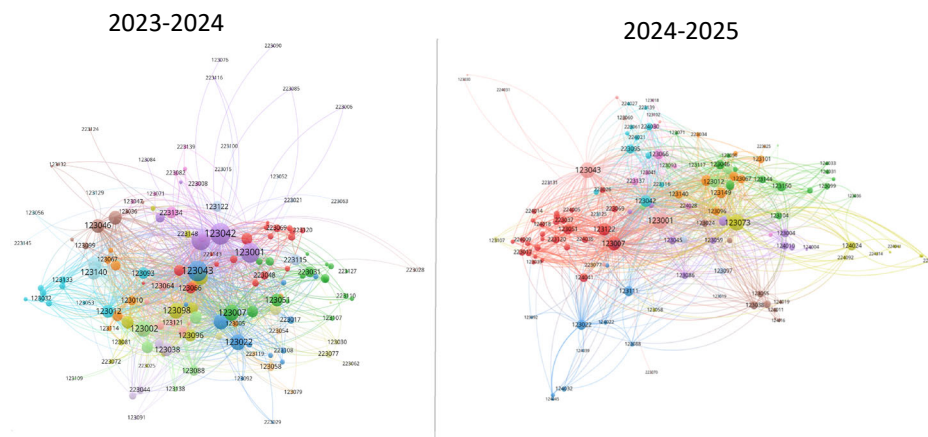


Figure 1: The Evolving MACH Network

EVIDENCE OF CONTINUED GROWTH IN CO-PRODUCTION

- ✓ Artifact analysis affirms that MACH has generated an impressive pool of useful, co-produced, transdisciplinary research through principle-aligned activities. Insights are exchanged between researchers and stakeholders using the “two loop-back processes.” Implementation of open data policies promotes transparency and usefulness.
- ✓ To strengthen co-production, success in building translation and science communication skills requires robust implementation of the second loop-back process to ensure researchers also hear from and enact adaptations informed by stakeholder insights.
- ✓ Integration across project teams over the remaining two years is central to the project’s ultimate success. Learning from the Y4 evaluation can help identify priorities to guide that effort.

BI AND WORKFORCE DEVELOPMENT: LEARNING BY DOING

- ✓ MACH provides outstanding opportunities for early career team members to develop research, co-production, translation, and leadership skills.
- ✓ MACH’s BI activities reach the broader community and help early career research team members explore diverse career paths and expand partnership building and science communication skills.
- ✓ Early career researchers express interest in research leadership convergence research training.
- ✓ Advisory body members expressed interest and commitment to engaging with early career team members as they continue to develop and longer term career goals.