



ENVIRONMENTAL DATA SCIENCE INNOVATION AND INCLUSION LAB

STRATEGIC PLAN 2022-2027

INTRODUCTION

The Environmental Data Science Innovation & Inclusion Lab (ESiIL) is pleased to present its 5-year strategic plan. ESiIL is a next-generation NSF synthesis center led by the University of Colorado Boulder in collaboration with NSF's CyVerse at the University of Arizona, and the University of Oslo. ESiIL enables a global community of environmental data scientists to leverage the wealth of environmental data and emerging analytics to develop science-based solutions to solve pressing challenges in the environmental sciences. ESiIL holds inclusion as a core principle and method for diversifying environmental data science at a time when society needs all perspectives, and science needs to serve all. Over the next five years, ESiIL will support the environmental data science community to catalyze basic discoveries and generate novel research approaches by combining: 1) cutting-edge team science, 2) innovative tools and collaborative cyberinfrastructure, 3) data science education and training, and 4) inclusive participation within diverse groups. The ESiIL Network, a diverse community of over 2,000 researchers and students, will be a 21st-century team committed to generating data-driven discoveries that enhance societal and ecosystem resilience. This plan highlights ESiIL's mission, vision, and objectives, outlining a roadmap that will guide our efforts towards fulfilling the mission of accelerating innovation and driving just and equitable solutions through the power of data and technology.

MISSION

*ESiIL empowers an inclusive and diverse community
to accelerate open Environmental Data Science*

VISION

At ESiIL, we envision a world where data-driven discovery, innovation, and evidence-based solutions are accelerating environmental sustainability from local to global scales. Over the next five years, we will establish ESiIL as a leading incubator and accelerator of Environmental Data Science (EDS), creating and promoting supportive, inclusive environments where groundbreaking science happens, next-generation data scientists are trained, diverse teams thrive, and data, tools, training opportunities, and community are openly accessible and foster collaboration.

VALUES

ESiIL's vision is grounded in the conviction that breakthroughs in environmental data science will be precipitated by a diverse, collaborative, curious, and inclusive research community empowered by open and ethical data and infrastructure, cross-sector and community partnerships, team science, and engaged learning. Our core values center:

1. **PEOPLE:** We value inclusion, kindness, respect, collaboration, and genuine relationships. We strive to cultivate a community that is welcoming to individuals from all backgrounds and experiences, recognizing the power of diversity in strengthening our teams and driving innovation.
2. **INNOVATION:** We value collaborative, cross-sector and cross-discipline science and synthesis, open and accessible data and tools, and fun, creative, and diverse teams. We invite new definitions of what is novel and believe that by pushing boundaries, we can drive transformative change and make a lasting impact on the world.
3. **LEARNING:** We value curiosity and accessible, inclusive research and education opportunities. We recognize that the best solutions often come from looking beyond our own areas of expertise, which takes cultivating humility. We are committed to enabling our community members to develop new skills, knowledge, and deeper appreciation for diverse perspectives.

At ESiIL, we are committed to grounding all of our work in these values as we work towards our vision.

WHAT IS ENVIRONMENTAL DATA SCIENCE?

Environmental Data Science (EDS) is a convergent discipline that focuses on using big data and emerging technologies to drive discovery, solutions, and science to better understand the environment and the interactions between humans and the natural world. EDS draws upon natural and social sciences (such as biology, ecology, geography, sociology, anthropology, geology, hydrology, and economics) and data sciences (such as computer science, information science, mathematics, and econometrics). EDS aims to develop innovative approaches to collect, analyze, and interpret complex environmental data sets to inform policy and decision-making. Our aim is to establish ESiIL as the go-to destination for environmental data scientists from any sector and to support and empower people from traditionally underserved backgrounds to join us and help shape the future of EDS.

GOALS & STRATEGIC PRIORITIES

1. Advance convergent research and co-create a decadal research agenda in Environmental Data Science

- Build bridges between data sciences, natural sciences, and social sciences to create a community of next-generation environmental data scientists.
- Survey the environmental data science community and ESiIL partners to support co-development of a decadal research agenda in EDS to refine and inform ESiIL activities and priorities.
- Develop tools and frameworks that enable data harmonization and cutting-edge analysis to support transdisciplinary research and synthesis to improve understanding of the complexity of our changing Earth system.
- Leverage recent advances in Artificial Intelligence (AI) and machine learning for the benefit of EDS, through recruitment from the AI research community for events, sharing benchmarked data sets from Hackathons with both the AI and EDS communities, and seeking postdocs with AI training to join the ESiIL cohort.
- Support cross-sector and community engagement, including training in knowledge co-production and encouraging participation by and collaboration among industry, government, and nonprofit representatives in ESiIL events and activities to generate new discoveries and facilitate pathways from data to teams to solutions.

2. Empower a diverse and inclusive Environmental Data Science community of practice with shared values around open, ethical science and education

- Support a diverse and inclusive community spanning environmental, social, computer, and data sciences across activities, with a commitment to serve underrepresented groups within STEM fields.
- Work closely with Tribal Colleges, Universities, and other Tribal partners to share opportunities, co-create initiatives, collaborate on projects, provide training, and co-build a Tribal EDS workforce model.
- Advance team science and the science of science at ESiIL by using research-based best practices to facilitate collaboration within the center and by studying ESiIL teams to improve basic understanding of interdisciplinary, transdisciplinary, and cross-cultural team science and the science of science.
- Provide inclusive team science training for ESiIL staff and working group leaders.
- Develop processes and procedures based on proven practices that reduce implicit and explicit biases, break down barriers, empower diverse teams, and enable safe meetings, training opportunities, and workshops.
- Collect data on the effectiveness of ESiIL diversity initiatives and the planned infusion of strong diversity, equity and inclusion norms and the impacts these practices have on the center outcomes and use these for iterative improvement of the Center.

3. Lower the barriers to advanced cyberinfrastructure to enhance data analysis and synthesis capabilities

- Promote inclusion and accelerate discovery through streamlined multi-source data curation, shared code for novel analytics, and seamless access to scalable, cloud-native computing and tools in partnership with CyVerse.
- Build cyberinfrastructure that is community-driven, based on input from a user needs assessment.
- Connect the ESiIL community by facilitating team science through easy-to-use, collaborative cyberinfrastructure.
- Support FAIR, CARE and TRUST data principles to ensure that ESiIL research is done with the highest standards of data sharing, transparency, accountability, and research ethics.
- Foster strategic partnerships with the NSF public research computing ecosystem (ACCESS-CI, CyVerse, PATH, etc.) to promote widespread adoption of cloud computing in environmental data science.

4. Build capacity within Environmental Data Science through education, training, and creation of open educational resources

- Increase diverse participation in EDS career pathways through the ESiIL Stars Program offered to students from Tribal Colleges and other minority serving institutions.
- Build capacity for EDS teaching and research through the ESiIL Data Short Course offered to early career scientists and researchers to develop the next generation of EDS educators who will be versed in pedagogy related to teaching technical data science skills.
- Make EDS education open and universally accessible by publishing an *Analytics for Environmental Data Science* textbook, hosted on an open learning portal that reaches millions.
- Support place-based learning that makes data relevant, by working with ESiIL Stars alumni to co-create culturally relevant Earth Data Stories that can be used as open EDS teaching modules.

5. Create an inspiring space and place for ESiIL at CU Boulder

- Create an inviting and inspiring physical space in the Sustainability, Energy and Environment Community (SEEC) building for the ESiIL community to create, innovate, and collaborate.
- Build on existing synergies with CU Boulder's research and education strengths in environmental data science through partnership with Earth Lab and the larger campus research community.
- Leverage the robust infrastructure at the Cooperative Institute for Research in Environmental Sciences (CIRES) to operate ESiIL's finances, human resources, information technology, and communications so that ESiIL runs effectively and efficiently.
- Evaluate all ESiIL efforts through a collaborative approach that supports dynamic and iterative development and improvement of all ESiIL activities.

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