

Key SEI CRA features: implementation

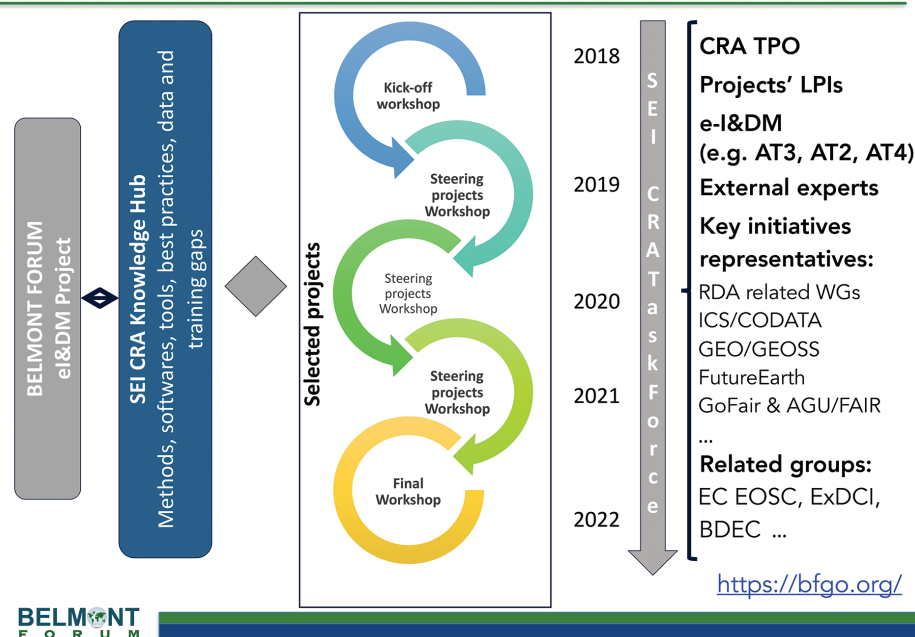


Figure 2: A "Task Force" will steer the SEI CRA implementation in synergy with the Belmont Forum e-Infrastructures & Data Management Project, continuously monitoring the progress and activities of the funded projects through regular workshops, fostering collaboration and maximizing the outcomes across projects. This will contribute to a knowledge Hub catalyzing research efficiently through sharing of best practices, methods and software implementations, to allow delivery of recommendations and priorities to the Belmont Forum for transnational federated data e-infrastructures, data policies and capacity building.

Outputs Management Annex, so researchers will understand the end-to-end expectations of both funders and publishers regarding management of their research data to maximize openness, accessibility, and reuse.

Addressing the barriers to transnational data sharing and reuse

The capability is emerging to bring computer science and technology, as well as large and complex data sets, to bear on interdisciplinary and transdisciplinary science. It is therefore critically important to establish and enable transnational frameworks so that data-driven scientific knowledge can transcend both disciplinary and geographical borders, ultimately increasing the scientific underpinnings of policy and action. International collaboration within the Belmont Forum research priorities holds the potential to establish international foundations for federated data integration and analysis systems with shared services. It can also bring together best practices from the public and private sectors, foster open-data and open-science stewardship among the science communities, including related areas such as publishing, and encourage data and cloud providers and others to adopt common standards and practices for the benefit of all.

For these reasons, the Belmont Forum recently closed a four-year competitive call on *Science-driven e-Infrastructure Innovation (SEI) for the Enhancement of Transnational, Interdisciplinary and Transdisciplinary Data Use in Environmental Change*⁸. The SEI call will fund initiatives that bring together environmental, social, and economic scientists with data scientists, computational scientists, and e-infrastructure and

cyberinfrastructure developers and providers to solve methodological, technological and/or procedural challenges currently facing interdisciplinary and transdisciplinary environmental-change research.

The SEI call is being implemented under a "task force" structure (Fig. 2) that requires all funded projects to share results, participate in annual steering workshops, and contribute to a knowledge hub that will catalyze efficient research through sharing of best practices, methods and software implementations. Information in the knowledge hub may also be used to deliver research-driven recommendations to the Belmont Forum to address needs or enhance current strategies for transnational federated data e-infrastructures, data policies and capacity building.

Building researchers' data skills

The Belmont Forum e-I&DM strategy document, 'A Place to Stand'⁹, recommended that a "cross-disciplinary training curriculum was required to expand human capacity in technology and data-intensive analysis methods for global change research" and that a new data literacy was required for the 21st century. Consequently, the e-I&DM Project developed the Data Skills Curricula Framework¹⁰, based on a global survey¹¹ (Skills Gap Analysis), data skills workshop¹² and extensive consultation with data-management experts and trainers.

The Curricula Framework outlines core modules to enhance the skills of domain scientists specifically to make data handling more efficient, research more reproducible and data more shareable - including visualizations for end-users. The five core skills comprise programming, particulars

of environmental data, visualization, data management, and interdisciplinary data exchange. Further, a number of optional modules are suggested for more-established researchers as useful introductions to widen their data skills, such as machine learning and object-oriented programming. Two additional modules aim to provide Principal Investigators with an overview of data management and skills needed for open data.

Of the core curricula, the two skill areas addressed least by existing training are 'Environmental data: expectations and limitations' and 'Interdisciplinary data exchange'. Since materials on the former are likely to exist in university courses, 'Interdisciplinary data exchange' is the current focus of the Belmont Forum, to be taught in a mixed class of environmental scientists, social scientists and engineers.

To build on existing capabilities, e-I&DM is investigating the training activities currently available from Belmont Forum member agencies. In addition, e-I&DM is working closely with the data-science community to identify existing training offerings available from around the world and augment content and provision of courses as needed.

Taken as a whole, the Belmont Forum's focus on data management, e-infrastructures and data skills is a critical step forward in advancing open-data sharing, data accessibility and data reuse.

AFFILIATION

Belmont Forum e-Infrastructures and Data Management Project, Montevideo, Uruguay

CONTACT

c3o@bfe-inf.org

LINKS

¹belmontforum.org

²belmontforum.org/wp-content/uploads/2017/04/belmont-challenge-white-paper.pdf

³bfgo.org

⁴belmontforum.org/about/open-data-policy-and-principles/

⁵bfe-inf.org

⁶bfe-inf.org/sites/default/files/doc-repository/CRA_Data_Digital_Outputs_Management_Annex_20180501.pdf

⁷force11.org/group/fairgroup/fairprinciples

⁸bfgo.org/opportunity/index.jsp#sei2018

⁹bfe-inf.org/sites/default/files/doc-repository/Community_Edition_A_Place_to_Stand-Belmont_Forum_E-Infrastructures_Data_Management_CSIP_0.pdf

¹⁰bfe-inf.org/sites/default/files/doc-repository/Outline_Data_Skills_Curricula_Framework.pdf

¹¹bfe-inf.org/sites/default/files/doc-repository/BF-Skills-Gap_Analysis-2017_0.pdf

¹²drive.google.com/file/d/0B-s5Of-9WNvBQd2d6ZnpXNXZIZDA/view