

## KTO2: Storytelling and Social Media Innovation.

**E7. Storytellers in Residence.** LEAP will launch a Storytellers in Residence program, each semester bringing a Harlem-based artist, writer, or journalist to embed and creatively translate LEAP's purpose and key findings to internal and external audiences. Residents will learn how climate data science tools are developed, thereafter supporting the Staff Writer in crafting storytelling content across owned and earned media. Residents will temporarily join the Knowledge Transfer Subcommittee as *ex officio* members, and take *Challenges* with full tuition remission. **Gizmodo** will designate a senior writer to serve as the inaugural Spring 2022 Storyteller; future Storytellers will be selected by the Knowledge Transfer Subcommittee.

**E8. "Translate-a-Thons."** The Staff Writer (Section F2) and Storytellers in Residence, in partnership with the **American Museum of Natural History** and **Gizmodo**, will organize quarterly, half-day intensive sessions on scientific translations, wherein LEAP faculty, postdocs, and Fellows will collaboratively develop visualization, videos, and interactive web tools. Public Engagement Director **Revin** will maintain a list of existing knowledge needs, and prepare task descriptions, tutorials, and tools before each event, then review and refine tools and products afterwards.

**E9. Public Lectures.** With **Columbia's** Center for Science and Society, LEAP's Climate Justice Leadership Board (Section F8) will organize a "*Public Conversations*" in *Climate Data Science* series connecting natural and social scientists, policy and business scholars, and the general public. Four events per year will forge convergent research and knowledge transfer, and will each host 200 attendees in-person and 500 live-streaming, each featuring a cross-disciplinary panel including an Executive or Storyteller in Residence. Events will be live-tweeted through LEAP's social media channels and recorded; the Knowledge Transfer Program Manager will post all video recordings LEAP's YouTube channel.

**E10. Sharing Products.** LEAP will create, organize, translate, and disseminate research findings to aid public servants, community organizations, and corporations in adapting and innovating in response to climate variability. Providing superior climate projections for 10-40 years is crucial for firms in real estate, finance, and reinsurance, and for those not yet versed in exploiting and interpreting climate data. For climate-dependent investors (**AllianceBernstein**), reinsurance companies (**SwissRe**, **AonRe**), and start-ups (**Four Twenty Seven**), access to superior climate data in an easily analyzable form creates value for core business propositions; climate data is further relevant for large technology companies (**Google**, **Microsoft**, **BlackRock**). LEAP's city and community partners will directly benefit from improved climate projections when setting climate policy, programming, and fiscal budgets, particularly the new \$20B investment launching the **New York City Office of the Mayor's** OneNYC 2050 Livable Climate initiative, the largest and most prominent urban climate response program in the United States.

**E11. Monthly Newsletter.** The Staff Writer will publish a monthly online newsletter targeting Center affiliates and external policy makers and private firms. Each newsletter will describe one key climate change indicator (e.g., NYC sea level rise, heat wave frequency), best estimates of ESM projections and uncertainties, and practical implications for various sectors (e.g., real estate investment, supply chain).

**E12. Annual Report.** LEAP will translate appropriate information from its NSF reports into a public and graphics-heavy annual report for the Center's website, including letters from Center Director and Diversity Co-Director **Gentine**, Deputy Director **McKinley**, and one of its Executives or Storytellers having taken residence over the year. It will highlight annual milestones and key scientific discoveries, reporting research and education seed grants activity; hackathon and translate-a-thon results; and quantified *At a Glance* accomplishments (e.g., code created, committee membership, new partnerships, and website user traffic).

## F. DESCRIPTION OF THE MANAGEMENT PLAN FOR THE RESEARCH, EDUCATION, BROADENING PARTICIPATION, AND KNOWLEDGE TRANSFER ACTIVITIES OF THE CENTER.

LEAP will be administratively housed within **Columbia** Engineering's Office of the Dean, affording a greater quantity and quality of resources than a single department alone could provide, further ensuring broad and equitable engagement. LEAP's management structure encourages shared knowledge development and frequent interactions between geoscientists and data scientists, trainees, and all partners. LEAP's pro-

grams and dedicated headquarters space will sustain collaborative interaction across disciplines (see Facilities Statement). Per Figure 8, LEAP financially prioritizes all four initiatives, and strongly support its integrated broader impacts; these budget ratios map onto space allocations in the present work.

**F1. Convergent Leadership.** Center Director and Diversity Co-Director **Gentile** pioneers using ML for

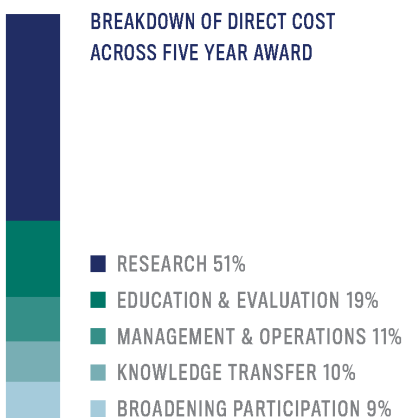


Figure 8: Breakdown of direct cost across award period.

climate convection modeling, terrestrial biosphere observation, and atmospheric turbulence. He is currently Co-Lead of NOAA's Drought Task Force, member of the World Climate Research Program's Working Group on Seasonal to Interannual Prediction, and **Columbia's** representative to the Consortium of Universities for the Advancement of Hydrologic Science. As Center Director, **Gentile** will be responsible for all Center research, broader impacts, and operations. He will Chair the Center's Executive Committee, and will establish a Director's Council. His co-leading LEAP's broadening participation efforts ensures that equity will be achieved across all Center operations. If Center Director **Gentile** must step down, Deputy Director **McKinley** will serve as the new Center Director. If **McKinley** is then unable to continue leading, the Executive Committee will nominate two LEAP engineering faculty to assume the Directorship, and the final incumbent will be selected by the External Advisory Board at its annual meeting.

Deputy Director **McKinley** holds expertise in ocean carbon and biogeochemistry, facilitating knowledge transfer between geophysicists and data scientists. She is on the editorial board of *Annual Reviews of Earth and Planetary Science*, and is the current chair of *Ocean Carbon & Biogeochemistry's* Working Group on Ocean Carbon Gaps; she currently chairs the Diversity Committee for **Columbia's** Department of Earth and Environmental Sciences. **McKinley** marshals substantial experience communicating with policy-makers and the public. She will co-chair the Convergence Subcommittee alongside Chief Convergence Officer **T.Zheng**, and supervise Research Directors **Vondrick** and **Zanna**.

Data & Computation Director **Abernathy** is a physical oceanographer with expertise in mesoscale turbulence and deep-ocean transport. He will oversee the LEAPangeo cloud platform, and ensure integration across stakeholder computational resources, notably **Columbia's** Data Science Institute and its Office of Information Technology. He will supervise two cloud engineers, and report jointly to Center Director **Gentile** and Deputy Director **McKinley**.

Chief Equity Officer and Knowledge Transfer Director **Cogburn** is a social worker, psychologist, and data scientist with expertise in the psychological and cultural foundations of racism, with recent interests in media-based racism and its effects on population health. She will oversee three workshops and the DEI consultant, the annual Equity Assessment, and personnel recruitment and evaluation protocols. She will supervise both Engagement Directors (**Burbano** and **Revkin**) and co-supervise the Knowledge Transfer Program Manager. She will chair the Knowledge Transfer Subcommittee.

Chief Convergence Officer and Education Director **T.Zheng** holds expertise in ML, spatiotemporal modeling, pattern identification, and educational innovation. As **Columbia's** Chair of Statistics and its Data Science Institute's Associate Director for Education, she will develop innovative pedagogical and evaluation initiatives positioning LEAP's faculty, trainees, and K-12 stakeholder as agents to unify all Center efforts. She will supervise the evaluation of LEAP's education, broader impacts, and knowledge transfer activities.

Data Science Director **Vondrick** will supervise ML and causality development; Geoscience Director **Zanna** will oversee geoscientific research spanning all four Earth subcomponents. Both will report to Deputy Director **McKinley** and join the Convergence Subcommittee.

Two Engagement Directors will report to Chief Equity Officer and Knowledge Transfer Director **Cogburn**: Corporate Engagement Director **Burbano** studies corporate sustainability, will govern website and print communications targeting LEAP's industry partners, and will conduct research into corporate communication design. Public Engagement Director **Revkin** is Founding Director of **Columbia's** Initiative on Communication and Sustainability, for 30 years previously a climate journalist and scientific visualization expert. He will strategize internal and external storytelling efforts, including coordinating the Storyteller in Residence program, developing public programs, and building knowledge transfer partnerships.

**NCAR** Model Development Liaison **Lawrence** will supervise integration within the CESM; **GISS** Model Development Liaison **Schmidt** will supervise integration of LEAP's parameter estimation strategy into ModelE. Both will co-supervise LEAP Fellows and join the Executive Committee.

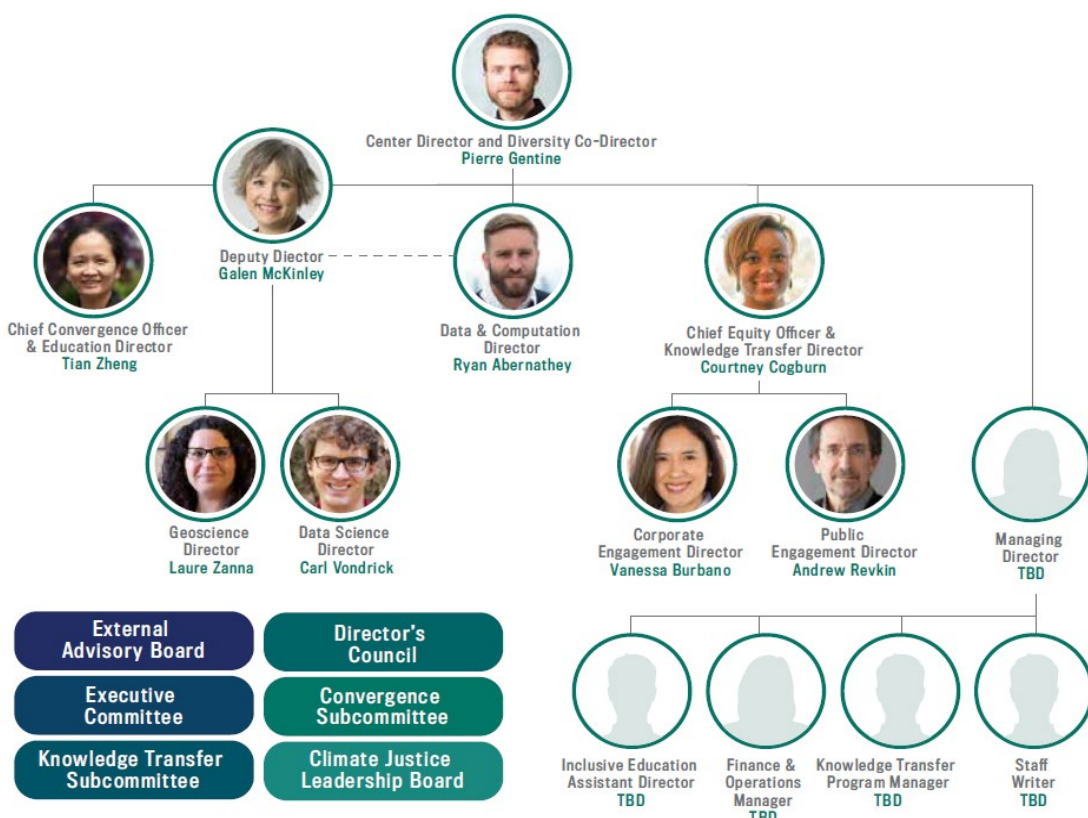


Figure 9: Organizational chart of LEAP faculty and governance committees.

**F2. Administrative Management.** A **Managing Director** will report to Center Director and Diversity Co-Director **Gentine**, serving as the chief guardian of Center resources and policies; the incumbent will assume responsibility for all Center operations, staff supervision, grants administration and compliance, NSF reporting, annual Site Visit planning, staffing all governance bodies, and undertaking special projects. The Managing Director will be expected to participate actively in professional research administrator societies.

Supporting the Managing Director will be four full-time administrators: An **Inclusive Education Assistant Director** will support LEAP's educational programs for faculty, graduate, undergraduate, K-12, teacher, and parent trainees, will facilitate rotation of LEAP Fellows to **NCAR**, and will support the Climate Justice Leadership Board. A **Knowledge Transfer Program Manager** will support programming linking academia with external stakeholders; the incumbent will manage the Center's website and social media platforms, author publications and opinion pieces, and steward and establish external partnerships with industry, state, and local governments, and NGOs. A **Finance & Operations Manager** will serve as LEAP's financial accounting, procurement, and HR specialist. The incumbent will be responsible for trainee hiring and payroll, and the two Residence programs. Finally, LEAP's **Staff Writer** will author content targeting corporate, non-profit, and public audiences. The incumbent will author a monthly newsletter and the annual report, publish articles across owned and earned media outlets, and supervise communications vendors.

#### Convergent Governance Committees.

Six groups will govern LEAP's research, education, broader impacts, knowledge transfer, and operational initiatives. Each group's membership spans disciplines and institutions to steward convergence.

**F3. External Advisory Committee.** A 6-person External Advisory Committee (EAC) of non-affiliate executives will meet annually, timed with the NSF's Site Visit, and will contain two representatives from diversity in science organizations, one director of an expired STC, one chief executive officer of a private firm, one senior geoscientist, and one senior data scientist. The EAC will receive an annual review, first reviewed by the Director's Council; the EAC will advise on strategic partnership formation, the external competitive environment, and the pursuance of complementary NSF grants that bolster its broader impacts (e.g., NRT).

**F4. Director's Council.** Six to eight senior executives across LEAP's core institutions – primarily Deans and Institute Directors – will meet each March or April to receive a preliminary annual report in advance of the EAC, and provide feedback for improvement, identify areas for providing administrative guidance, and support continuous and streamlined inter-institutional integration. This Council will include Center Director **Gentine** and **McKinley** as *ex officio* members, and will be staffed by the Managing Director.

**F5. Executive Committee.** Chaired by Center Director and Diversity Co-Director **Gentine**, an Executive Committee (EC) will be robust with nine other voting members: **McKinley**, **Abernathey**, **Burbano**, **Cogburn**, **T.Zheng**, **Lawrence**, **Schmidt**, **Vondrick**, and **Zanna**. Staffed by the Managing Director and meeting monthly, the EC will be LEAP's principal forum for strategic and operational decision-making. Among its primary responsibilities, the EC will select LEAP Fellows, steward existing and forge new institutional partnerships, resolve internal conflicts, receive operational updates from the Managing Director, and granularly review Center progress to dissolve institutional barriers.

**F6. Convergence Subcommittee.** Co-chaired by Deputy Director **McKinley** and Chief Convergence Officer **T.Zheng**, and with Research Directors **Vondrick** and **Zanna**, Chief Equity Officer **Cogburn**, and evaluator **Lang**, a Convergence Subcommittee will meet monthly to review research progress, evaluate overall Center integration, select LEAP Fellows, award research seed funds, and plan the monthly *Convergence Luncheons*. Importantly, the Convergence Subcommittee will be responsible for: 1) advancing promising research projects; 2) launching new projects based upon formative evaluation data; and 3) determining whether existing projects should be expired and its resources distributed elsewhere. Projects will be expired depending upon NSF feedback, waning faculty or trainee interest, emergence of new projects that more directly align with LEAP's Knowledge-Data Continuum, and/ or improper productivity.

**F7. Knowledge Transfer Subcommittee.** Chaired by Chief Equity Officer and Knowledge Transfer Director **Cogburn**, including Engagement Directors **Burbano** and **Revkin** and Senior Personnel **Goddard**, **Sukthankar**, **Joppa**, and **Newman**, and staffed by the Knowledge Transfer Program Manager, a Knowledge Transfer Subcommittee will: 1) govern the Storytellers in Residence program; 2) plan the DEI Workshops, Hackathon, Translate-a-thon, and AI4Earth symposium, particularly stewarding corporate and public engagement; and 3) track website usage. Subcommittee members will support the Convergence Subcommittee in selecting trainees and in anonymizing personal identifying information, and support Center Director **Gentine** and Deputy Director **McKinley** in selecting Executives and Storytellers in Residence.

**F8. Climate Justice Leadership Board.** LEAP will support over 40 Fellows across its initial award period. This graduate community will annually elect a President, Vice President, and Communications Director to form a Climate Justice Leadership Board (CJLB), with each position holding one-year terms. The CJLB will work with Chief Equity Officer **Cogburn** and evaluator **Lang** to accomplish two objectives: 1) annually partner with an NYC-based climate organization that targets vulnerable populations to engage in broadening participation, education, and knowledge transfer initiatives, and semiannually co-author opinion pieces on the nexus of climate prediction and social justice, for publication in earned and owned media, with editorial support by the Staff Writer; and 2) led by **Lang**, be trained and gain experience in evaluating LEAP's comprehensive impact. Each August and January, evaluator **Lang** will lead a daylong pro-seminar training the CJLB in formative and summative evaluation methods and data collection. CJLB members will receive additional compensation for designing their own studies, collecting data through mixed methods, and developing an annual SWOT Analysis for presentation to the EAC. In addition to its formative evaluation work, the CJLB will coordinate *Conversations*, including speaker invitation, marketing, and post-event evaluation.

**F9. Quantum LEAP.** Shortcomings in both geoscience and ML stunt sufficiently accurate climate prediction for the benefit of human populations, societal resiliency, and economic progress. Our team sees tremendous promise in developing a convergent approach to ML-guided climate projections that substantially reduces climate model uncertainty. This highly-ambitious endeavor is only possible with trailblazing engagement by our nation's top climate research laboratories and major computing organizations, and, perhaps most importantly, with the talent of new and diverse trainees and community organizations with vested interests in consuming more accurate future projections. Ameliorating this critical shortcoming is a worthy and necessary venture for our nation, and will pay dividends for many generations to come. *This is LEAP.*