

School of Earth Society Environment

Strategic Plan (AY 2019-2020-AY 2024-2025)

Draft: July 30, 2019

A. Scope of this strategic plan

The three departments within the School of Earth, Society, & Environment (SESE) have considerable autonomy in SESE and thus have separate strategic plans that describe in detail their operations and strategies for success. This document focuses mostly on the central functions of SESE, i.e. those carried out by the Director, the Associate Director for Academic Affairs, the SESE teaching faculty, the Business Affairs Office, and the Information technology group. Included in this plan are the overarching goals and synergistic activities of the departments, as they work together to form a whole stronger than the sum of the parts.

B. SESE Mission

SESE has been in existence for 13 years as the central academic hub at Illinois for Earth Science and the aspects of Social Science that analyze society's use of the Earth's spaces. Its mission is to provide a world-class education to a diverse body of students, training them to be future leaders, and challenging them to pursue careers of discovery and service to humanity; to build strengths and reputations in each of the SESE core disciplines; to support disciplinary and cross-disciplinary state-of-the-art research pertaining to the Earth system and its human dimensions; to contribute to the mission of the College and University; and to form bridges for collaboration between faculty in SESE departments and across the campus.

C. SESE Vision

SESE aspires to be a world-renowned premier school that bridges related disciplines to tackle the greatest earth science and environmental and social problems facing humankind, where students come to understand the physical and social sciences needed to tackle these problems, where students will be trained as leaders and citizens to challenge the present and enrich the future, and where students are encouraged to pursue life-long intellectual discovery and service to their communities, country, and humankind.

D. Components of SESE and its administrative structure

SESE resides in the College of Liberal Arts and Sciences (LAS), and occupies parts of four buildings on campus. SESE's home, the Natural History Building (NHB), is where faculty offices and laboratories, graduate student offices, and several classrooms reside. SESE has a large computer cluster, Keeling/Virtual ROGER, located in the Advanced Computing Building (ACB) on the northeast corner of campus. SESE also has classrooms in Davenport Hall, located on the main quad of the university, and an atmospheric observatory, currently under development, with an office in the Dalkey Archive Press Building in the South Farms section of campus.

SESE consists of the following individuals and entities

- SESE Director
- SESE Associate Director for Academic Affairs
- SESE Associate Director for Finance and Business Operations
- SESE Facility Manager (shared with Mathematics and Statistics)
- SESE Executive Committee (SESE EC)
- SESE Business Affairs Office
- SESE Information Technology Office
- Earth, Society, & Environmental Sustainability (ESES) Interdisciplinary Major
 - Faculty for teaching, advising and maintaining the ESES Major
- The Department of Atmospheric Sciences (ATMS)
- The Department of Geography & Geographic Information Science (GGIS)
- The Department of Geology (GEOL)
- Research Initiatives, Programs, and Centers anchored or co-anchored in SESE
 - CyberGIS Center for Advanced Digital and Spatial Studies

The *SESE Director* serves as the executive officer of the School. The *SESE Associate Director for Academic Affairs* is responsible for overseeing the ESES Interdisciplinary Major, SESE-anchored online education programs, SESE-anchored certificate or degree programs, ESES-related academic advising, ESES-related specialized faculty, and other duties as assigned by the SESE Director. The *SESE Associate Director for Finance and Business Operations* oversees all SESE business, finance, human resources, IT, and other operational functions, and reports to the SESE Director. Office support staff assist the SESE Administrators and report to the SESE Associate Director for Finance and Business Operations or the SESE Director. The SESE Facility Manager is responsible for all SESE facilities. The SESE EC consists of: (1) the Director of SESE, (2) the Head of each department in SESE; (3) a faculty representative from each department in SESE, selected by the department according to departmental rules, (4) the SESE Associate Directors; (5) the IT Coordinator. The detailed responsibilities of these entities are specified in the SESE by-laws.

The departments within SESE believe it is essential for each department to maintain separate academic programs, with each department retaining greater autonomy, as compared to departments in similar schools in the College, such as the Schools of Integrative Biology and Molecular and Cell Biology. This is essential to SESE success because the departments' academic and research programs have longstanding excellent external reputations, and tend to be separate and distinct on most R-1 university campuses. Each department requires distinct curricula to prepare their students for career success. Furthermore, given the wide variety of methodologies and paradigms practiced by faculty, including physical sciences, computational sciences, social sciences, and humanities, individual departments are better positioned to evaluate and support faculty research. Each department has an executive officer, the Head, who reports to the SESE Director.

On the other hand, SESE provides a means to combine forces in certain key ways. The School is committed to maintaining a flexible undergraduate major, separate from the three department's programs, to meet the educational needs of a diverse student body, while supporting the needs of the core departments that form the pillars of the School's interdisciplinary bridge. The popular interdisciplinary ESES major is similar to programs at many other universities, and provides

students with flexibility not afforded in the three departments' programs. In this way, SESE achieves academic rigor and flexibility. The School acts as an anchor for centers of excellence in environmental, geospatial, and social sciences while fostering inter- and trans-disciplinary collaboration in the context of Earth, environment and society. Furthermore, the SESE business and IT offices, which serve all three departments, are large enough to provide quality service that is superior to what could be attained within separate departments. Finally, the overall footprint of SESE is optimized for the College and University to allocate appropriate resources to achieve desirable and amplified impacts. Overall, SESE's structure strikes a balance between the advantages of combined efforts versus the strengths and identities of the three departments.

E. Strategic Goals

1. Stabilize the financial foundation of the School to be resilient to fluctuations in state and federal resources

The financial health of the School and its member departments depends on availability of funds from four sources: 1) State/Tuition funding provided by the College for faculty salaries, TA salaries and an operating budget; 2) indirect cost return from contracts and grants; 3) tuition revenue returned from summer and winter semester online undergraduate courses, online Masters programs in each of the Departments, and a GGIS Professional Master's program coordinated with the College of Business; 4) gift funds, which are often restricted to comply with donor intentions. Although not a direct funding source, SESE can cost-effectively expand graduate programs through 3+2 agreements with international universities.

SESE will take the following actions to pursue this goal:

1. Develop online Masters programs in each of the three departments, using recently awarded *Investment for Growth* funding from the campus;
2. Sustain and expand summer and winter online courses, supported by revenue from the courses;
3. Seek to expand our 3+2 programs from the current program with Zhejiang University to other universities abroad;
4. Seek addition funding sources for research, including private sector funds;
5. Seek efficiencies in our business model;
6. Engage LAS, the Office of the Vice-Chancellor for Research, and other campus entities to invest in SESE by providing faculty lines, support for staff, and targets of opportunity;
7. Hold annual budget meetings with the EC to review budgets and set priorities.

2. Rebuild faculty strength and expertise

Faculty strength is currently below historical norms and far below optimal strength. By the end of FY19-20, after accounting for known departures and retirements, SESE will host 32.25 tenure-track FTEs, down from 39.7 in FY16-17. In FY18-19, SESE had 310 undergraduate majors, and 134 graduate students. Of the 2019-20 FTEs, GGIS will have 9.25, GEOL 11.25, and ATMS 12.75. As of Spring 2020, GGIS will have had, since August 2015, 6 tenure-track faculty

departures and only 2 replacements, GEOL will have had 3 departures and 1 replacement, and ATMS will have had 2 departures and 1 replacement. Our internal analysis of faculty service years and physical age suggests that we can expect at least a 2.75 FTE reduction due to retirements in the next three academic years across the departments.

SESE's hiring plan is designed to enhance each of our departments' reputations of providing a modern, world-class education to our students, which nurtures leadership and exemplary citizenship, and enables intellectual growth throughout our students' careers. Our plan assures that our graduate students will continue to conduct transdisciplinary research on challenging problems related to the Earth and environment for the betterment of society.

SESE's three-year component of our vision for faculty hiring is to develop excellence in research and education in five key cross-disciplinary areas important to the School, College, and Campus (Fig. 1, top). These five areas align directly with the strategic plans of LAS and the Campus, as discussed below, as well as with national research priorities. The five areas, Big Geodata Science, Geospatial Discovery and Innovation, Human and Environmental Interaction and Prediction, Remote Sensing, and Climate Change Impacts, are transdisciplinary in that students educated in any of these areas will have employment options across a range of academic, governmental and industrial sectors within and beyond the actual majors. Within these five broad areas, the SESE departments have all targeted specific hires for moving forward on departmental strategic goals.

The research objectives of the Campus strategic plan squarely focus on digital transformation at the service of society. With proposed hire (1), we seek an expert on the Global Urban South, the most threatened, impoverished, and overpopulated region of our planet. Our expectation is that this scholar will conduct research related to food, nutrition, water, energy, and/or health resources in the important global "hot zones" within the Urban South. Proposed hires (2), Environmental and Geospatial Data Science, (3), Remote Sensing Geology, (4) Seasonal to Sub-seasonal Prediction, and (6), Geophysical processes in the Earth system, target scholars who will utilize global data and/or other advanced methods to address issues related to resources, risks, and other societal challenges. Proposed hire (5) is a scholar focusing on the geographic dimensions of health and environment, particularly the cultural diversity of health and health care in cities and communities, which matches very well with the LAS priority on diversity in society. The Campus strategic plan has a focus on providing leadership in areas such as environmental monitoring and sustainability, and e-Learning. Each of the proposed hires addresses aspects of environmental sustainability. Each will contribute to our departmental online M.S. programs, as part of the SESE Investment for Growth Grant. SESE plans to expand 100-level offerings, particularly online, as a means to develop resources for the departments and School. The new hires will be key contributors toward this effort, addressing the campus goal of resource development.

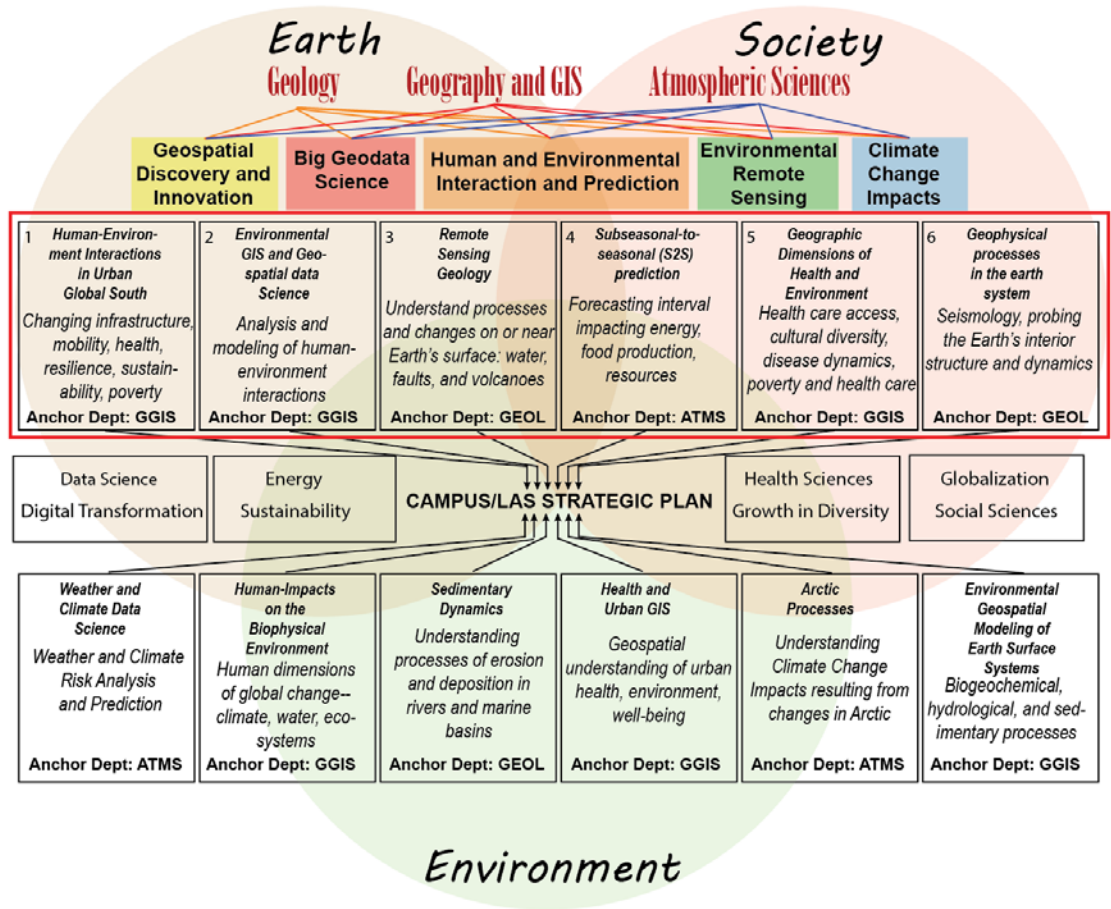


Fig. 1: SESE three-year strategic hiring plan. Red outlined box denotes ranked 2019-20 position requests.

3. Exploit research synergies between SESE departments and across closely affiliated departments

The GGIS, GEOL and ATMS departments each host nationally and internationally recognized research programs. For most of SESE history, the GGIS, GEOL and ATMS departments were housed in separate buildings or temporary space, with little opportunity for cross-departmental faculty interaction. In summer 2017, the Departments moved into the newly renovated Natural History Building. Sharing this new facility, with its new classroom and meeting space, now provides the environment for faculty to engage and pursue the cross-disciplinary research goals upon which SESE was founded. Now in a central campus location, SESE faculty are also in a much better position to engage other faculty beyond SESE in related disciplines (e.g., the School of Integrated Biology (SIB), the Department of Civil and Environmental Engineering (CEE), Natural Resources and Environmental Science (NRES), the National Center for Supercomputing Applications (NCSA), and the Department of Agriculture and Consumer Economics (ACES)).

SESE will pursue cross-disciplinary research critical to the Earth, its sustainability, and society, aligning with, and complementing the Campus Strategic Plan. This is not to say that discipline-specific research will be de-emphasized within each of the three departments. We believe that research opportunities develop not from top-down ideas, but rather from collaborations that develop from mutual interests of the faculty. SESE will facilitate these interactions by sponsoring events such as brown-bag research presentations, SESE colloquia, communicating cross-discipline grant proposal opportunities, and other events that bring faculty across SESE closer together. SESE faculty will seek areas where the departments can take advantage of synergies and special opportunities within SESE and across campus that enhance our success in pursuing national centers (e.g. NSF Science and Technology Center) and institutes (e.g. NSF Software Institute) anchored at SESE.

4. Exploit instructional synergies across the departments

SESE Faculty are experts in the physical processes that govern earth's systems and affect human existence on earth, and/or the social processes and structures that control how society interfaces with earth's spaces and processes. Many of them are experts in working with large geophysical and geospatial datasets, advanced scientific programming, and cyberGIS (that is, new-generation geographic information science and systems based on advanced computing and cyberinfrastructure). Many areas of interest to SESE undergraduate students bridge the three departments and ESES major. These include courses in Geographic Information Science and Systems, data analysis using Python and R languages, climate change, assessing environmental risk, and water and energy resources.

A key SESE action to achieve this goal is to develop synergistic Online Master's Degree programs within each of the three departments that provide educational advancement for distance-learning students in each of the three core disciplines while taking advantage of the strengths of each department's expertise in computational and data sciences as well as geospatial analytics (Fig. 2). SESE recently competed for, and was awarded a University of Illinois Investment for Growth grant to launch these programs. SESE's goal is to move rapidly forward with implementation of the programs, so that they become cost effective and popular within the time frame of this strategic plan or earlier.

A second action related to instructional synergies is to adapt our courses so as to serve students enrolled in all SESE majors, and, where appropriate, cross-list them. In this way, undergraduate students will have a wide range of elective courses that satisfy their specific career objectives, obtain a comprehensive education centered on Earth, environment, and society, and develop skills needed to succeed in those careers.

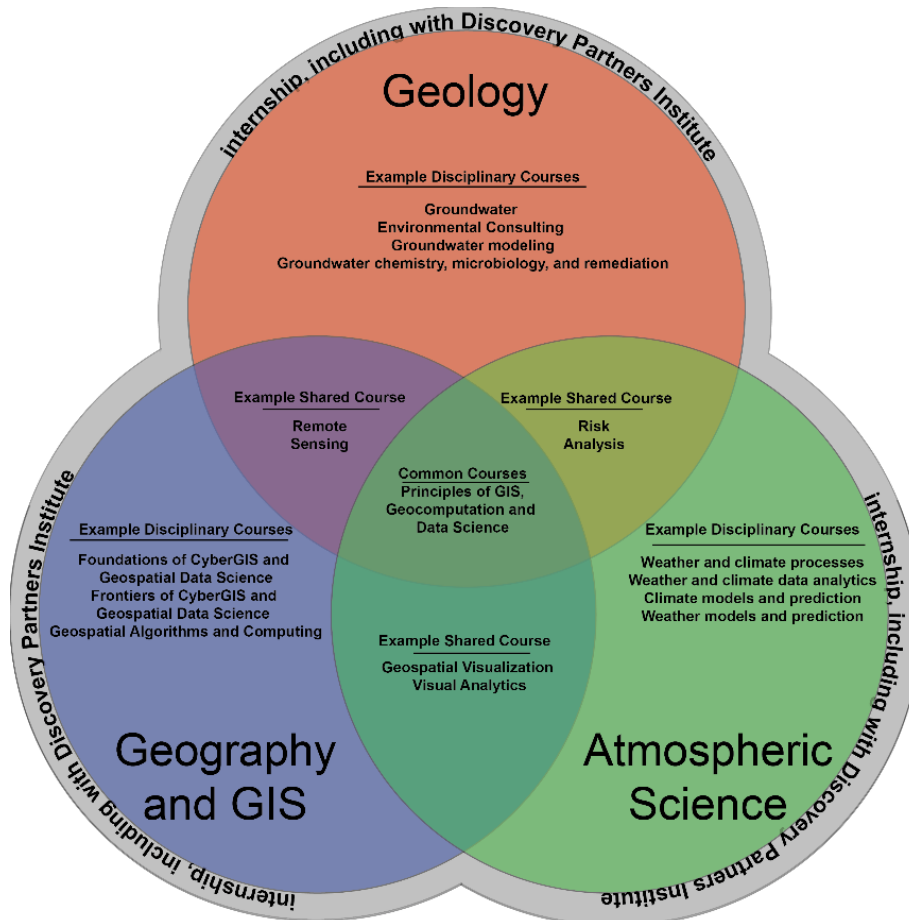


Fig. 2: The relationship between the courses offered in the three proposed online Master's degree programs within the School of Earth, Society and Environment

5. Establish sustainable support for and growth of the ESES undergraduate program

In addition to academic programs housed in the departments, the School offers the interdisciplinary Earth, Society and Environmental Sustainability (ESES) Bachelor of Science degree. This undergraduate program started in 2007 and now has ~150 enrolled majors. It is unique on campus as it seeks to blend both social and natural science approaches to understanding sustainability and the environment. This is a strong program, with a healthy and diverse number of majors. It is the most efficient academic program on campus with the highest ratio of students to faculty of any major. Even with this lean model, the program has been highly innovative in both course content—offering multiple concentrations and new certificates in Environmental Writing and Environmental Sustainability—and in form, with an emphasis on blended, experiential, and field-focused classes. Although we have a young alumni base, our graduates are successfully entering their desired fields of work (principally in environmental and sustainability fields) and progressing to advanced degrees. Most students are on-campus, but it is also possible to undertake the degree online. This is the only online undergraduate degree at the University. The online program has been net-revenue generating for both the College and the School since inception, and has simultaneously funded courses that are offered to on-campus students.

The lean teaching structure, although very efficient, creates weaknesses in the program as well. There is no resource slack (in either faculty time or money) so we are unable to pursue opportunities that would grow the major, and we are severely limited in our ability to offer student opportunities that require significant time investment (such as research mentorship, or cohort-building classes). With very limited faculty capacity dedicated to the ESES major, we continually have to pursue outside revenue streams (through self-funded online classes, for example) to teach core classes. The small number of current faculty is the largest threat to the program. Currently, three faculty, two of whom have joint appointments (and teaching commitments) in other departments, offer the academic program. There are effectively 2.0 FTE academics responsible for the entire academic program, including teaching classes in the major and providing departmental advising for all 150 undergraduate majors and 30 undergraduate minor and certificate students. The loss of a single faculty member would significantly, and perhaps unacceptably, downgrade the student advising and instructional experience. Furthermore, all three current faculty are supported through dual-career hire agreements, and so their departure would not free up sufficient funds for the School to allow for their replacement. There are opportunities. As a young program, our alumni network is becoming a potential resource for our students to find employment and learn about opportunities beyond graduation, so we are working to increase our alumni connections. Our unique online program provides us with a strong niche in online education and has the potential to grow, which would lead to enhanced revenues.

SESE will pursue actions to increase faculty numbers associated with the ESES program. Any increase in faculty numbers would allow us to devote resources to improving the student-learning experience, for example by allowing us to develop deeper links with the Prairie Research Institute (PRI; includes the Illinois State Water and Geological Surveys), the UIUC Research Park (includes corporations such as State Farm and John Deere), and the Discovery Partners Institute (Chicago-based academic-industry nexus), as well as other high-impact student research and internship experiences. We will build on our strong student experience by making our undergraduate academic programs more sustainable. SESE will take actions to provide ESES students with more opportunities to develop a sense of belonging within the School. This will require an investment in faculty, which we will seek to fund by increasing the size and scope of our off-campus programs, and growing and leveraging the faculty of the three departments.

6. Develop ways to inform ESES students about opportunities beyond the classroom

SESE Departments each have programs to inform their students about opportunities beyond the classroom. ESES students do not have a department affiliation, and miss some of these opportunities. SESE will take actions to improve learning outcomes of ESES undergraduate students—the success journeys of our students and alumni. SESE will explore ways to enhance our current programs for professional development with the objective to provide more opportunities for ESES students to participate in research, attend professional meetings and conferences, obtain external internships, participate in field experiences, and study abroad. As part of this effort, SESE will develop an undergraduate (1 credit) research class that exposes ESES students to the spectrum of research underway across SESE. We will also develop online information on potential internships across all of our disciplines to help students identify and obtain internships, and hold workshops to help students write successful applications for internships. SESE has recently received a large donation to support undergraduate and graduate

student participation in scientific conferences and meetings. Our goal is to leverage these funds to send as many students as possible to academic and professional meetings and conferences.

7. Continue investment in SESE infrastructure within NHB, ACB, and other SESE spaces

SESE infrastructure includes (1) faculty, staff, and graduate student offices; (2) the SESE computer cluster Keeling/Virtual ROGER in ACB, (3) Research laboratories, field instrumentation platforms (boats, vans, trailers) and the atmospheric observatory (under development), (4) the CyberGIS Center for Advanced Digital and Spatial Studies, (5) Specialized classrooms (GIS/Synoptic Computer Laboratory, Microscope Teaching Laboratory, scanning electron microscope laboratory, sedimentology laboratory, atmospheric instrument laboratory, and flexible teaching classrooms shared with the School of Integrated Biology (SIB)), and (6) the SESE Core (study and social space).

SESE strategic actions to maintain and improve this infrastructure include:

- 1) Establishing a sustainable, fair financial model for continual evolution and upgrade of Keeling/Virtual ROGER as system components age and more modern components become available on the market;
- 2) Seeking ways to support expansion of our IT department to maintain the excellent service they provide to SESE and associated stakeholders.
- 3) Exploring ways to further adapt classrooms to provide best teaching experience and practice;
- 4) Remodeling the Core displays to increase its usefulness for related activities;
- 5) Developing long-term plans for expansion of space available for growth of faculty, staff, and graduate students;
- 6) Developing long-term plans for maintaining quality laboratory space as systems age;
- 7) Continuing branding of our spaces so that the SESE footprint is highly visible in all areas of campus where we are present.

8. Increase diversity within SESE

A strategic goal of SESE is to attract outstanding faculty, staff, and students who reflect the full diversity of our state, country and world. SESE has continued to make progress in increasing the diversity of our faculty. Although, when compared to the College, we have slightly lower percentages of tenure system faculty who are from underrepresented minorities (11.2% vs. 12.2%) and who are women (34.2% vs. 43.2%), we have much higher ratios of Assistant Professors who are from underrepresented minorities (25% vs. 14.2%) and who are women (62.5% vs 42.4%). Our strategic goal is to continue to recruit a diverse faculty in the future.

Our students currently do not yet fully reflect the diversity of society. However, compared to the College, we have similar rates of underrepresented minority (URM) students in our undergraduate and graduate programs (19.4% of undergraduates and 11.2% of graduates, as compared to 20.8% and 10.8% in the College) and women students (43.2% of undergraduates and 39.6% of graduates, as compared to 49.4% and 49.6% in the College). A strategic goal of SESE is to work to have a

faculty and student body that reflects the diverse composition of the State of Illinois. Much of this recruiting effort occurs in the SESE departments, which host graduate and undergraduate programs, as part of their strategic objectives.

SESE plans distinct actions to create opportunities to recruit a diverse student body of graduate students, as SESE departments control the admission process for graduate students. We plan to make concentrated efforts to reach out beyond the university. The departments are considering dropping the GRE as a graduate admissions requirement, targeting visits to specific undergraduate programs that are URM such as universities in Puerto Rico and traditionally African-American colleges, recruiting graduate students from Illinois undergraduate colleges. We are also targeting known programs such as the Significant Opportunities in Atmospheric Research and Science (SOARS) at the University Corporation for Atmospheric Research (UCAR), and the UIUC Summer Research Opportunities Program (SROP), and coordinating and partnering with professional societies such as the American Meteorological Society, the Geological Society of America, the American Association of Geographers, and the University Consortium of Geographic Information Science. Undergraduate recruitment represents a greater challenge. Undergraduate admissions are controlled at the University level without department input. However, SESE is exploring possible avenues of engagement such as Earth Science and Stewardship summer camps (the first one offered in Summer 2019) to involve underrepresented high school students and interest them in SESE majors.

9. Increase School visibility

A strategic goal of SESE is to increase the visibility of our academic programs and the footprint of our School within the College of LAS, across campus, within the local community and the State of Illinois, and nationally and internationally.

To achieve this goal, SESE will work closely with the college and university news outlets to ensure that achievements within SESE, such as recent SESE outstanding research findings, faculty and student awards and honors, publication of scholarly material such as books, and undergraduate and graduate success stories are widely dispersed via news and appropriate social media outlets. Given that SESE disciplines are often not well represented in high school curricula, especially at rural and underrepresented minority-serving schools, we will explore actions to make more students aware of the opportunities SESE offers as excellent professional alternatives to the standard STEM tracks most of them follow, beginning in high school. SESE's will also to highlight alumni success stories, since visible positive student outcomes is a key to future recruitment of the next generation of excellent SESE students.

SESE also plans to increase its presence at external functions and meetings, such as a SESE booth at the State Fair, Illinifest in Chicago, and sponsor booths at disciplinary meetings, such as the American Geophysical Union (AGU), the Geological Society of America (GSA), the American Meteorological Society (AMS), the American Association of Geographers (AAG), and the American Association for the Advancement of Science (AAAS).

10. Support SESE Departments through SESE administration

A strategic goal of SESE is to provide School-level human and resource support to the three departments to advance individual department strategic plans. Examples include:

Business Operations: SESE will seek ways to improve the structure and operation of our business office to provide the most efficient and transparent support possible for faculty research, academic activities, facility management, and human resource management. These include, among others, grant proposal processing, grant financial management, financial services, academic and student appointments, business travel, and course activities such as field trips. SESE will make every effort to increase the capacity of business staff, particularly in the area of grant support, to account for the increased activity in grant proposal submissions and awards across the school.

Collaborative programs: SESE will identify and implement ways in which the School can serve as an anchor for discipline-based and interdisciplinary research centers, programs, or initiatives that will foster collaboration and provide the flexibility and critical mass to pursue emerging new research directions and opportunities with potential significant impacts.

Advancement: Advancement opportunities within SESE are primarily at the individual department level since the ESES undergraduate program only began in 2006, and graduates are still in early stages of their careers. A strategic action SESE will take is to provide support to the departments for advancement opportunities, for example by sponsoring alumni gatherings and booths at key conferences such as the annual meetings of the AGU, GSA, AMS, and AAG, and having the SESE Director attend alumni events, and travel with LAS advancement, to present talks and communicate to potential donors the opportunities for students and faculty that support can provide.

Anchoring Online M.S. Program management: Specialized faculty, anchored in each of the three departments, as well as a School-level program coordinator and an additional Information Technology employee, will be hired to sustain the SESE Online MS programs being spun up using recently awarded Investment for Growth funds from campus. SESE will carry out these hires and coordinate their activities to quickly advance the development and implementation of the Online MS programs in each of the three departments.

Coordinating with Discovery Partners Institute: The Discovery Partners Institute (DPI) is a joint education, research and innovation institute led by the University of Illinois System, its three universities and partners, with a mission to establish collaborative partnerships that address 21st century societal grand challenges, promote entrepreneurship, and educate the next-generation workforce. A central component of DPI is “targeted thematic and cross-cutting education and workforce development.” SESE will engage and partner where possible with DPI. SESE envisions that corporate partners within DPI would be willing to engage SESE students in the program to provide internships with their companies. SESE will actively seek these partnerships as DPI develops and particularly as our M.S. online degrees populate.