Department of Geography & Environmental Systems

UMBC

Academic Program Review 2025

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Academic Program Review 2025

GES department faculty and students at 50th anniversary celebration, May 2023.

The Department of Geography & Environmental Systems at the University of Maryland Baltimore County (UMBC) conducted this self-study of our academic programs as part of the mandatory program review required every seven years by the University System of Maryland (USM). Detailed quantitative and qualitative data about the programs supplied by the Office of the Provost and Institutional Research, Analysis & Decision Support (IRADS) are provided in the associated appendices, and the information is summarized here.

1. Executive Summary

The Department of Geography & Environmental Systems (GES) at UMBC is an interdisciplinary unit committed to understanding the complex interactions between natural and social systems. This Academic Program Review (APR) assesses the department's progress since the last review in 2018, highlighting achievements, challenges, and future directions.

Program Overview and Achievements

GES is a leading department in integrating environmental and social sciences, offering Bachelor of Arts (BA), Bachelor of Science (BS), Master's, and PhD programs, along with a Master of Professional Studies (MPS) and a Post-Baccalaureate Certificate (PBC) in Geographic Information Systems (GIS). The department has maintained a strong commitment to high-quality research, teaching, and community engagement, contributing to UMBC's R1 classification and Carnegie elective classification in community engagement.

Since the last APR, GES has:

- Strengthened research output, averaging 26 peer-reviewed publications annually and securing approximately $380,000 per year in external funding.
- Enhanced interdisciplinary collaborations with institutions such as NASA Goddard's GESTAR-II, the Center for Urban Environmental Research and Education (CUERE), and various NSF-funded projects.
- Increased faculty diversity and expertise, aligning with the department's mission of fostering an inclusive learning environment.
- Expanded research and teaching, with a growing focus on international engagement (Latin American & sub-Saharan Africa), critical human geography, coastal and wetland ecology, and climate change.
- Acted as a connector and collaborator for other programs linking natural sciences, social sciences, and humanities within UMBC.

Despite significant progress, the department faces several challenges:

1. Space and Facilities: The department's research and teaching facilities are inadequate, with many labs and offices in Sondheim Hall requiring renovation. While planning for the renovation is underway, the timeline remains uncertain.
2. Graduate Assistant (GA) Support: The department lacks sufficient GA lines to support its growing undergraduate and graduate programs. Increasing these resources is critical for sustaining teaching quality and research productivity.
3. Operating Budget Constraints: GES's operating budget has remained largely flat for over a decade, limiting the ability to expand programs, update equipment, and support faculty research. This extends to front office staff and support.
4. Student Recruitment and Retention: While undergraduate enrollment has remained steady, the department aims to enhance visibility and recruitment efforts, particularly for the BA program, which competes with other interdisciplinary programs on campus.
5. Career Development and Alumni Engagement: Strengthening connections with alumni is a priority to enhance career pathways for graduates.

To address these challenges and sustain its momentum, GES is focusing on:

- Advocating for increased space and improved facilities, particularly through the planned Sondheim Hall renovation.
- Expanding financial support for graduate students to enhance research opportunities and teaching support.

- Leveraging external funding sources and university support to increase the department's operating budget.
- Implementing targeted recruitment strategies to attract more students to the BA and graduate programs.
- Reviewing and refining our undergraduate program to ensure comprehensive curriculum mapping and reducing bottlenecks in course sequences.
- Launching a pilot alumni mentorship program to support career development and networking opportunities.

Conclusion

The Department of Geography & Environmental Systems is at a pivotal moment. While we have made significant strides in research, teaching, and community engagement, addressing critical resource and infrastructure challenges is necessary to maintain our trajectory of inclusive excellence. We remain committed to fostering interdisciplinary scholarship, preparing students for impactful careers, and contributing to a just and sustainable future.

2. Program Review

a. Description of Programs

The Department of Geography & Environmental Systems (GES) is an interdisciplinary department with an emphasis on examining the dynamic relationship between social and natural processes. GES recognizes that human-environment relationships encompass a wide range of phenomena, and we are committed to integrative research, teaching, and mentoring that reflects the current complexity of social, environmental, and climate change issues today.

A hallmark of the Department of Geography & Environmental Systems is its broadly integrative nature, drawing on the expertise of faculty with diverse backgrounds but with a common mission. Our research seeks to contribute to cutting edge debates across the natural and social sciences, as well as inform policy through our empirical findings. We practice a broad range of methodological techniques that include environmental and physical geography field and laboratory studies, GIS, spatial statistics, remote sensing, modeling, community engagement and citizen science, ethnography, interviews and surveys, historical research, and document analysis. By advancing diverse and interdisciplinary methodologies, we strive to produce knowledge that is both academically rigorous and transformative. As a community, we are dedicated to promoting an inclusive and collaborative environment that values critical perspectives, ensuring that our research and teaching contribute to a more equitable and sustainable world. The research developed from within GES involves further interdisciplinary and collaborative work of local, regional, and international scope, and includes many partner organizations and collaborators at other institutions, agencies,

and organizations. In recent years, our strengths have continued to develop in the realm of urban ecosystems and urban geography. We remain actively engaged in informing science-based and evidence-based policy and management connected to the Chesapeake Bay watershed and region. And we have increased our engagement in international research and teaching to include more emphasis in Latin America, as well as sub-Saharan Africa.

Because of our interdisciplinary breadth and depth on the environment, society, and climate, we sit at the nexus of a variety of campus initiatives. GES serves as a "connective tissue" between the natural and social sciences, and humanities on campus. We see our program as playing a critical role in helping UMBC to fulfill its vision and mission. Since our last APR in 2018, UMBC has reached R1 status as a doctoral university with "very high research activity" , while also achieving the new Carnegie elective classification in community engagement. The intersection between both of these Carnegie rankings, which together reflect the mission and vision of UMBC, is evident in much of the work by departments across our College of Arts, Humanities and Social Sciences (CAHSS). As one of the five PhD-granting programs in CAHSS, we see our role as pivotal in helping the college and UMBC continue to strengthen this vision.

Program History and Timeline

We trace our roots as a program to our first degree offering in 1967, a BA in Geography (Figure 1). For the first two decades, the department was like other traditional geography departments of the time, with faculty specialties comprising a mix of natural science or physical geography, human geography, and an early emphasis on cartography and map production. With the advent of Geographic Information Systems (GIS) in the early 1990s, the department added computer-based spatial analysis to our list of specializations. At this same time, we noticed a demand for a BSc degree offering, since many of our students were seeking employment in environmental and science-oriented public agencies or consulting firms, and felt impeded by the lack of BSc. By 1994, we received approval and began offering a BSc in (Physical) Geography and a Cartography certificate.

At the same time, in the mid-1990s, the department recognized its core focus on the environment and identified the need for degree programs that would embrace an interdisciplinary approach to the environmental sciences and environmental studies. With support from the administration, along with dialogue across several departments at UMBC, our department took the lead in developing a series of proposals to establish two new degrees (a BSc and BA). After a long process with revisions after an initial rejection by the Maryland Higher Education Commission, the updated proposal was accepted. By 2002, the name of our department became "Geography & Environmental Systems" (GES), and we offered two degrees (BSc and BA) in Geography, and two degrees (BSc and BA) in Environmental Science and Environmental Studies, respectively. By this time, we also updated our Cartography certificate to include GIS, as a newly branded "GIScience & Cartography" certificate, and two Minor programs, one in Geography and one in Environmental Science.

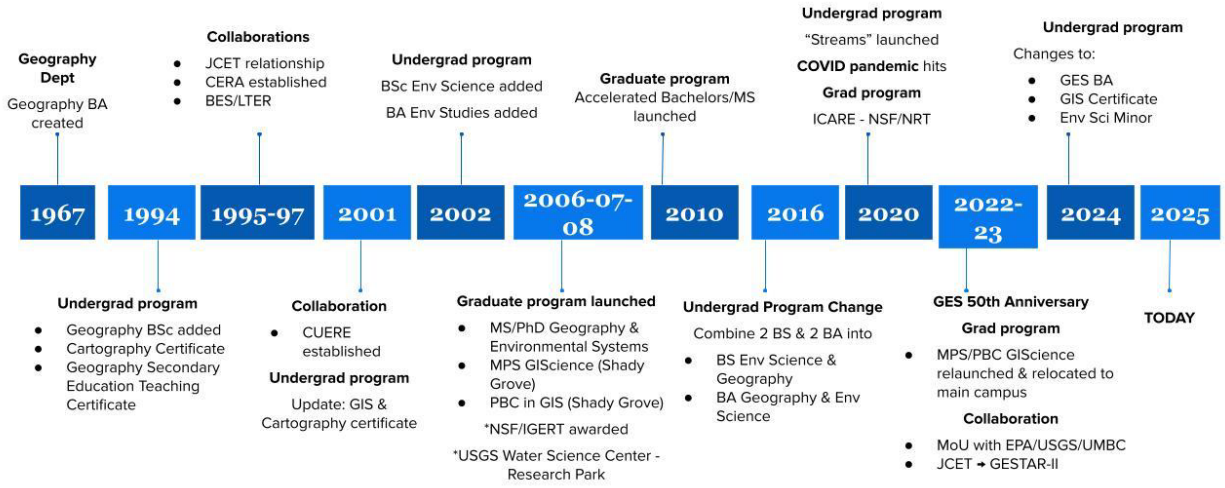

Figure 1. Timeline of main programs and collaborations, 1967-2025.

The UMBC administration approved the addition of three tenure-track faculty lines in the environmental sciences and a fourth faculty line in environmental policy, and committed support to the creation of an environmental science teaching lab. The teaching lab was opened in 2003, and the faculty lines were filled over the next several years, with the final line (environmental policy) filled in 2009.

The initiation of the two environmental degree programs in 2002 was linked to our longstanding desire for a graduate program with an interdisciplinary focus on the environment. The department received very strong encouragement from the administration to develop a graduate program. After several hurdles due to logistical issues and concerns over mission duplication, the GES graduate program proposal was submitted (2006), approved (2007), and our first full cohort of MS and PhD students started their studies in 2008. The accelerated 5-year program for Bachelor's/MS option was in place by 2010. Boosted by support from a successful NSF IGERT proposal, our enrollment goals were met and exceeded within the first few years. Average enrollments have remained the same overall since our last APR (2018), though the balance has shifted to a higher number of MS students. In the current academic year, 2024-25, we have 14 PhD students enrolled and 23 MS students.

In addition to our MS/PhD programs, we launched a Masters of Professional Studies (MPS) in GIScience program in 2008, along with a Post-Baccalaureate Certificate (PBC) in GIS. Both of these programs were based at UMBC's Shady Grove campus and initial enrollment goals exceeded expectations. By the time of our most recent APR, however, enrollments had experienced decline, and there was concern about the future viability of the program. In coordination with the Division of Professional Studies (DPS), we

placed the MPS/PBC on hold in 2021-2022, and embarked on a process of full redesign of the curriculum and a relocation of the program itself to our main campus. This came into effect in 2023. In this current academic year, 2024-25, we have 6 MPS students enrolled and 11 PBC students (Appendix 1, Table 3c).

Collaborations

A description of our program would be incomplete without considering the role that collaborations have played throughout the GES department's history (Figure 1). One of our longest standing collaborations is with NASA Goddard's **GESTAR-II** (formerly known as JCET). GESTAR-II (JCET) researchers have held roles as affiliate research faculty with the department for three decades, and regularly offer courses within the department, collaborate with other faculty on research, and host undergraduate and graduate students as research interns. The newest director of GESTAR-II joined our GES faculty as Professor of GES in 2023, and this further solidifies the reciprocal relationship that we have formed over the years.

The **Center for Urban Environmental Research and Education** (CUERE) was established in 2001, through the leadership of a longtime GES faculty member, and in connection with the department of Chemical, Biochemical, and Environmental Engineering (CBEE). CUERE was initially funded by the EPA, and has remained an important collaborator and research center since its founding.

Three major NSF-funded projects have played important roles in the evolution and strengthening of GES programs over the years: the **Baltimore Ecosystem Study** (BES), originally funded as one of two Urban Long Term Ecological Research (LTER) projects, the **IGERT-funded program** in collaboration with other departments in the College (Economics & Public Policy) and Chemical, Biochemical, and Environmental Engineering (CBEE), which jump-started our PhD program, and most recently the **ICARE** program, a NSF NRT grant (2020-2025) in collaboration with departments across all three UMBC colleges and the Marine, Environmental, and Estuarine Sciences (MEES), which has boosted enrollment in our MS program.

These represent the major collaborations that have influenced our academic programs, and generated relationships across research, teaching, and mentoring. Other collaborations abound and are not captured in this description, rather noted later in our program planning section (#3).

2b. Analysis of Data Provided by IRADS & the Provost's Office

Admission Trends

Undergraduate Program

The department has remained relatively consistent in first-year admissions since the last APR (Appendix 1, Table 1a). Since Fall of 2018, our numbers have ranged from 81 - 120 applying *and* admitted students to the BSc in Environmental Science and Geography, with an average of 18% of admitted students enrolling. For those who applied and were admitted to pursue the BA in Geography and Environmental Studies, this ranged from 10 – 16, with an average of 15% admitted students enrolling. Low enrollment in the fall of 2020 and 2021 we attribute to the COVID-19 pandemic. We remained teaching fully online for AY 2020-21, and were only back to in-person instruction (mostly) by fall 2021.

For transfer students (Appendix 1, Table 1b), while far fewer apply to either program, most are admitted and many enroll, with an average of 81% admitted students enrolling in the BS Environmental Science and Geography and 46% of admitted students enrolling in the BA Geography and Environmental Studies. Although not included in these numbers as they are already enrolled at UMBC, we also see several students transferring into our majors from other programs at UMBC, such as Biology or Environmental Engineering.

In both cases, with both first-year students and transfer admissions, we have more students applying and enrolling in the BS program in Environmental Science and Geography Program than the BA in Geography and Environmental Studies. Our sense is that we lose prospective majors to the Global Studies program and recognize this as an area where we need to focus. We are trying to increase our admission numbers in both programs by actively participating in college recruitment activities such as *Just for Juniors*, targeting high school juniors, *Admitted Student Sneak Peek*, *Transfer Day*, and the *Majors Event,* which is a daylong celebration and recruitment event for all of UMBC's majors every fall semester.

Graduate Program

Our graduate program encompasses a variety of degree programs: Masters, Doctoral, and a Master of Professional Studies (MPS) in Geographic Information Systems (GIS) We also offer a Post-Baccalaureate Certificate in GIS.

Since Fall 2018 in our Master's Program the number of applying and admitted students has ranged from 10-16, with 54% of admitted students enrolling, while our Doctoral program ranges from 4-23 applicants and 33% of those admitted enrolling (Appendix 1, Tables 1c).

Our MPS Program ranges from 6-16 applicants from 2018 – 2024; however, in the fall 2020, 2021, and 2022 semesters there were no applications (Tables 1e & f). During this time the program was essentially put on hold and GES faculty worked

to redesign and renovate the curriculum for the MPS and the associated one-year Post-Baccalaureate Certificate (PBC) program. This redesign included a shifting of the program from being physically located at UMBC's Shady Grove campus over to our main campus. The average of admitted students enrolling is 22% across all seven years. If the years of no applications are removed, the average enrollment is 33%. In the same year(s) we saw low enrollment to the MPS, we saw record high numbers (2021) enroll in the MSc program within the department (Appendix 1, Table 1c). We see two major factors that likely influenced this outcome. The first was the COVID-19 pandemic. Students who would normally have considered the MPS were likely subsumed with other commitments and did not have the bandwidth to add graduate studies, and prospective MS students were perhaps looking for an alternate to a job in a difficult time and a way to ride out the rest of the pandemic. We also recognize the role that the NSF-funded NRT program known as ICARE helped to attract additional applicants to our MS program, especially in the first year of ICARE's launch (AY 21-22).

For the Post-Bacc. Certificate Program, we saw an average of 26% of admitted students enrolling over the past seven years, with no applicants in fall of 2020 or 2021. If those years are removed, the average enrollment was 37% of admitted students. Again, we attribute the zero application years as likely due to pandemic fallout.

Enrollment Trends and Degrees Awarded

Undergraduate Enrollment

Enrollment has increased from 198 students in the fall of 2018 to 243 students in 2024 (Appendix 1, Tables 2a and 2b). Most of these gains are in the Environmental Science and Geography major (from 144 to 177), although the Geography and Environmental Studies major showed some gain as well (54 to 66). Environmental Science minors have averaged 26 students and ranged from 19 (in 2023) to 37 (in 2019); currently, there are 25 minors. Minors in Geography have shown a steady increase from 1 student in 2018 to 6 in 2024. In our GIS Certificate Program, enrolled students range from 7 to 20. There was a decline in the pandemic years (2020, 2021), but numbers have increased from 2021 onward (Appendix A, Table 2a).

In any given year, we have seniors as the largest number of students in a class level. This is likely because we draw a number of transfer students into our program. The overwhelming majority of our students are full-time, and most are in-state residents (Appendix 1, Table 2e).

Freshmen make up 51% of students enrolling in the fall, while transfer students make up 49% (Table 2a). Our percentage of transfer students is likely higher than the university's; for fall 2024, approximately 26% of new students were transfer students (800 of 3050 total), while 74% were first-year (2250 of 3050).

The number of graduates in the BS program is 33, while in the BA, it is 14 (Appendix 1, Table 2f). Numbers for Environmental Science, Environmental Studies, and Geography

reflect students finishing their degree under the old version of our program (enrolled prior to 2016).

Undergraduate Demographics

Undergraduates are more or less evenly split between males and females. While UMBC has made it possible for students to indicate their gender identity and preferred pronouns, the data available to us through IRADS do not offer summaries of this information. Most students enrolled in GES are within traditional ages for college students (18-22). We have also had roughly 20 students in the 25-29 range. As the age bands increase, the number of students in those groups decreases. In terms of race/ethnicity, most of our students identify as white (55%), then Black (13%), Asian (11%), or Hispanic (8%). Six percent identify as 2 or more ethnicities. The smallest groups of students are American Indians (0.3%) and Hawaiian/PI (0.5%) (Appendix 1, Tables 2d).

Graduate Enrollment

Enrollment in the PhD program was 20 and 21 in fall 2018 and 2019, respectively. Our numbers declined during the pandemic years (15 and 13 in fall 2020 and 2021) and have remained at those levels since (Table 3a). Masters' enrollments saw a substantial increase, with numbers doubling during fall 2021 and 2022, likely a response to the pandemic and the draw of the ICARE program, and those numbers have remained higher than pre-pandemic levels. Post Bac GIS Certificates have seen an increase in 2024. It is too early to know if this will remain consistent going forward (Appendix 1, Table 3a). The average number of PhD graduates is 2 per year, while for Masters students it is 6.4; Master of Professional Studies and Post Bacc graduates is also 6 (Appendix 1, Table 3g)

Graduate Demographics

Our graduate students have skewed majority male from 2018-2022 while 2023 and 2024 saw more females joining the program (Tables 3c, d, e, f). In terms of age, most students fall into the 25-29 and 30-39 age bands. Our graduate students are predominantly white (61%), with international students the next largest group (18%), followed by those who are Hispanic (9%). We have very few Black students in our program, reflective of underrepresentation in the environmental and geosciences as a whole (Appendix 1, Tables 3d, 3e, 3f).

Ratio of Transfer Students to 1st Time First Year Students

The ratio of transfer students to first time first year students enrolling in the BS or the BA exhibits different trends in change over time than those for the college (CAHSS) and UMBC (Appendix 1, Tables 4a & b). In both cases for CAHSS and UMBC, the ratio has declined since 2018, and the number of transfer students joining CAHSS and UMBC for the first time has declined while the number of first time first year students has increased. In both cases, this was happening prior to the onset of the COVID-19 pandemic. For the two main major programs in GES, the BS and the BA, the transfer/first year ratio has varied. With the GES BS, the lowest enrollment and highest ratio of transfer/first year was set in 2020, quite possibly connected to the pandemic. With the GES BA, the ratio has been above 1.0 for all but two years during this time period, 2019 and 2020. And the highest ratio (2.33) was set this past year (2024).

3. Curriculum

Program Structure

We currently offer students majoring in our programs the option to pursue a B.A. in Geography & Environmental Studies or a B.Sc. in Environmental Science & Geography. For non-majors, we offer two minors (Environmental Science or Geography). Finally, we offer a GIScience certificate that is open to both majors and non-majors. The program strives to adapt, evolve, and integrate practical and scholarly advancements within the fields of both geography and the environmental sciences to engage students and scholars across disciplines. For instance, coursework in the GIScience certificate, long-based on industry standard software in geographic information systems and remote sensing (GIS/RS), has been modified to include structure-from-motion, open source software, and advanced classes in GIS customization and programming to provide students with tools for integrating open source applications in data acquisition, analysis, and communication.

Undergraduate Degrees and Their Requirements

Due to their disciplinary overlap, our degrees share some core courses. All students are required to take *The Changing Earth: Climate, Ecosystems, Water, and Landscapes* (previously *Introduction to Physical Geography*, or GES 110), and all majors are required to gain spatial analysis skills by taking *Exploring the Environment: A Geospatial Perspective* (GES 286) as well as *Introduction to Geographic Information Systems* (GES 386). GES 286 serves as a broad introduction to geospatial techniques, including cartography, GIS, and remote sensing, whereas GES 386 is focused on manipulating and analyzing data with geographic information systems. These courses reflect the common themes of the physical template in understanding both geographic and environmental phenomena as well as technical skills necessary to engage with geographic topics. In addition to GES 110, BSc students are required to take eponymous introductory courses in *People, Place, and Environment: A Global*

Geographic Perspective (previously *Introduction to Human Geography*, or GES 102) and *Introduction to Environmental Science and Conservation* (GES 120), whereas BA students and minors must take either GES 102 or GES 120. There has been some discussion about leveling those requirements so that all students take all three 100-level courses, and we expect a faculty vote and change during spring semester 2025.

Both degree programs rely on and assume University distribution requirements to provide students with adequate exposure to social sciences, art and humanities, culture, introductory mathematics and science, and language. In addition to freshman composition, UMBC students are required to complete an additional writing intensive course; GES offers four courses that may be used to complete this requirement within the degree program offerings: three human geography courses (GES 326 *American Conservation Thought*; GES 328 *Environmental Policy*; GES 329 *Geography of Disease and Health*) and one physical geography course (GES 319 *Watershed Science & Management*).

Substantive Changes to the Curriculum Since Last Review

Over the past seven years, our course offerings have been updated to include current issues and changing faculty expertise, while also maintaining a stable offering of the number of sections and seats at each level (Appendix 1, Tables 5a & b). GES faculty have been working to make our curriculum more attuned to student needs. Per the external review, students favored the idea of specialized streams to guide them with class choices and career paths. As faculty, we view the streams as meeting two objectives: (1) the streams provide students with clear focal pathways within our curricula, and (2) they allow more specific teaching and research specialization areas in our department to be highlighted. Having such focal areas should also suggest connections with other departments on campus with related interests. Thus, this not only helps our students better gain their own identities as they grow and mature through the education our department offers, but also these specialization areas will help with "branding", i.e., they will help define specific areas of scholarly and societal importance that our department can deliver.

These eight streams include three on the BS side (watershed science; earth and atmospheric science; ecology and conservation); two on the BA side (environment, society, and health; cities, economies, and development), and three that bridge the BA and BS (urban systems; global sustainability; conservation science). Up to this point in time, the streams that we established have remained as *guidance for students only and optional*, are not formally part of our programming, or included on a student's transcript. There is some indication that we will be urged to formalize these through an approval process at the UMBC level and through MHEC (Maryland Higher Education Commission). We are actively considering this in our Undergraduate Program Committee.

Since the time of the last program review, we have hired several new faculty, and this has led to the development of a suite of new courses that have substantially expanded offerings within the department:

GES 308L Ecology w/Lab
GES 302 Black Geographies
GES 320 Urban Ecosystems
GES 330 Economic Geography
GES 347 Gender, Race, and Space
GES 350 Climate Change and Society
GES 360 Latin American Geographies
GES 400/600 Watershed Biogeochemistry
GES 400/600 Qualitative Methods
GES 400/600 Life on Land in Africa
GES 400/600 Geographies of Migration

Further courses, already on the books, have been given new life, including:
GES 383 Statistical and Thematic Cartography
GES 433 Sustainability, Land Use and Natural Resources

In addition, we will offer a summer field course (in 2025) to Oaxaca under the course code of GES 400/600 Climate Change in Context: Resilience and Migration in Oaxaca. This is a faculty-led study abroad class, co-led by Drs. Valencia and Holland.

Concurrently, several courses have not been offered since the last review due to redundancy with other courses, lack of departmental expertise, or availability:

GES 105 World Regional Geography
GES 111 Principles of Geology
GES 220 Lab and Field Techniques for Environmental Science
GES 314 Geography of Soils
GES 317 Water Quality
GES 318 Natural Environment of the Chesapeake Bay
GES 325 Historical Geography
GES 327 Cultural Ecology
GES 342 Metropolitan Baltimore
GES 435 Global Patterns of Production and Trade
GES 482 Cartographic Internship

We have also created a plan to make our introductory courses follow an active learning model, as per the recommendations of the 2018 APR process, including feedback from the External Review and the Dean's Review. As noted in our 2023 three-year review, without increased GA support, we've been unable to implement this approach.

4. Student Progression

Undergraduate students in the GES department take one of two majors: a Bachelor of Science in Environmental Science and Geography, and a Bachelor of Arts in Geography and Environmental Studies. These majors were created in 2017 to consolidate and replace earlier separate majors in Geography (BSc & BA), Environmental Science (BSc), and Environmental Studies (BA). As such, this is the first official evaluation of student progression in these majors, and it is informed by both official statistics and advising of hundreds of students in both majors. The department also offers a separate minor in Environmental Science, a minor in Geography, and a GIS certificate program. To increase enrollment and bring it in line with other certificate programs at UMBC, the GIS certificate requirement was reduced from three to two electives in 2023, and enrollment has increased since then. However, because issues with these minors and certifications have been few, the focus of this section will be on the two main Bachelor degrees. The tables relevant to this section are located in Appendix A, labeled Tables 6a - g.

The Bachelor of Arts has relatively limited lower-level requirements (GES 102 or 120, GES 110, GES 286, and a STAT course) and a wide range of possible electives within GES, with the only specific upper-level class being GES 386. By contrast, the Bachelor of Science requires numerous general science requirements (PHYS 111 or 121, CHEM 101 and 102, BIOL 141, and Math 151), all the GES introductory courses (GES 102, 110, and 120, and GES 286) and several upper-level electives (GES 310 or 311, GES 308, GES 386, and one upper-level STAT course).

In general, rates of students receiving D, F, or W grades ('D/F/W rates') for our introductory GES courses can be as high as 24% (e.g., in GES 110). D/F/W rates tend to be lower in the other courses (GES 102 and 120) but can still exceed 10% in some semesters. Since these courses include large populations of non-GES majors, it is difficult to say if they impede major progression. Each of these introductory courses counts as a different GEP credit for undergraduates at UMBC (Appendix 1, Tables 6a, 6d).

The quantitative geospatial lab courses (GES 286 and 386) can be a bottleneck to student progress in some semesters, with D/F/W rates regularly ranging from 10-25% for GES 286. D/F/W rates varied widely for GES 386, spiking to 24% during the pandemic semesters but regularly below 10% otherwise. Securing seats for majors in those courses was a challenge during this time period, but the set-aside of a cluster of major-only seats for 286 and summer courses for 286 and 386 have eased this pressure in the last 2-3 years. We decided this was a necessary step due to increased interest in our GIS sequence (286/386) from undergraduate students majoring in Information Systems or Computer Science. More work is needed to make it possible for students to

reliably directly progress from 286 to 386 in the following semester, or to immediately re-take 386 if they fail it the first time.

The general courses required for the Bachelor of Science major pose a greater challenge to student progression. One particular bottleneck is the requirement of Pre-Calculus (Math 150) in order to take the university's introductory Biology course (BIO 141), which is in turn required to take GES 308 (Ecology), which is in turn required for all upper-level ecology courses. If a student arrives at the university to take college algebra (MATH 106), they have four semesters to go before they can take Ecology (Math 106-Math 150-Bio 141-GES 308). Failing at any point along this chain delays their progression, and the DFW rates for introductory math courses are high. For example, Math 151 (Calculus) has a two-year (2018 and 2024) average D/F/W rate of 34.5% for freshmen and 60.5% for transfers. Other general science requirements are similar. Introductory physics (PHYS 111/121) has an average D/F/W rate of ~25% for freshmen and ~38% for transfers. The introduction to chemistry (CHEM 101) has an average D/F/W of 31% for freshmen and 48% for transfer students. Given that the GES department has always drawn heavily from transfer students, these high D/F/W rates for transfer students are a concern for GES BS student progression.

Depending on the semester, the required BS courses focused on physical geography (GES 310, 311, and 319) can have relatively high rates of D/F/W grades, with one or more of these courses consistently having D/F/W rates between 10 and 26.5% between Spring 19 and Spring 24. However, since these courses are not barriers to taking upper-level courses in the major in general, they do not often impede student progression in the BS. However, if a student enters the major with a weak background in mathematics and struggles, they can find themselves barred from upper-level B.S. courses other than GES 311 (Weather and Climate) until they pass Math 150. Math 150 acts as a gatekeeper to BIOL 141, GES 308, and GES 310. While it is perfectly acceptable to require pre-calculus to take junior-level courses, BIOL 141 is unusual in this respect.

Time to Degree

Undergraduates Students-Joined as First Years

Overall, the time it has taken our undergraduates to complete a bachelor's degree between 2018 and 2024 has fluctuated yearly and looks different across the types of degrees our department offers. Time to graduate has ranged from as low as 4 years in 2019 to as high as 6.5 years (one outlier year). GES's wide range of time to a degree does not mirror our college (CAHSS)'s 4.4 to 4.7 years, or UMBC's 4.4 to 4.6 years, but this may be a function of sample size (Tables 7a and b).

Focusing on our current BA (Geography and Environmental Studies) and BS (Environmental Science and Geography) degrees, the time to graduate has grown slightly over time for our BS degree (4.4 years in 2018 and 4.5 years in 2019) to ~4.8

years in recent years. By contrast, with the exception of one odd pandemic year (5.7 years in 2022), the BA time to degree has hovered between 4 to 4.6 years, with no clear trend over time. We see the high D/F/W rates in non-GES science and math requirements as a main factor influencing this increased time to degree for BS majors.

More recently (in 2024), students took about five years (4.8 years) to complete their BS degree and closer to four years (4.3 years) to graduate with their BA degree (Table 7a). The four-and-one-half years (4.5) overall average time to degree (BA and BS) in our department aligns with the average time to degree in our college (CAHSS) and the university (4.4 years) in 2024 (Appendix 1, Table 7a).

Undergraduate-Transferred Students

Overall, the time it has taken our transfer students to complete a bachelor's degree between 2018 and 2024 has greater fluctuation as compared to those who joined as first year students and also looks different across the types of degrees our department offers. Time to graduate has ranged from as low as 2.8 years to as high as 4.3 years (Table 7b). GES's wide range of time to a degree does not mirror our college (CAHSS)'s 3.2 to 3.7 years or UMBC's 3.2 to 3.6 years, but again, that is likely a function of both sample size and the large number of transfer students in our major. The time to obtain a degree has gradually increased in the past six years for both the college and university. Focusing on our current BA and BS degrees, although there are big fluctuations between years, the time to graduate has been consistent for both degrees. It has taken between 2.8 and 4.2 years to complete a BS, and between 2.9 and 4.3 years to acquire a BA (Appendix 1, Table 7b).

More recently (in 2024), transfer students took about three years (3.3 years) to complete their BS degree and about four years (4.3 years) to graduate with their BA degree. That is, transfer students who graduated in 2024 took an additional year to complete their BA as compared to those who graduated with a BS. The increase in time to degree for the BA (4.3 years) occurred in the last two years, but it remains to be seen if that is a true change or a random fluctuation. There have been no degree changes in that time. The 3.8 years overall average time to degree (BA and BS) in our department is slightly higher than our college's (3.7 years) and the university's (3.6 years) in 2024. Overall, the differences in progression between the freshman and transfer students may reflect challenges in completing university-level requirements, particularly for B.S. students. Transfer students frequently enter the BA program from majors that are not adjacent to human geography, which can lead to more extensive class requirements. Some transfer students from community colleges might also start with the GES BS, and then switch over to the GES BA before graduation due to challenges of successfully completing the outside science/math requirements and the set of core courses expected of the BS.

Graduate Students

The average time to degree years for our MS and MPS students has been 3 years for both programs (2018-2024) (Appendix 1, Table 8a). The time degree for our MS graduates reached a maximum of 3.5 in 2019 and 2020, but has decreased to 2.8 years in 2023 and 2024. As a predominantly thesis-based Master's program, and often with students enrolled who are working part- or full-time outside of graduate school, we as faculty expect the average to be in the 2-3 year range.

The overall average time to degree for our PhD students is 6.4 years, based on data from 2018-2024 (Appendix 1, Table 8b). Similarly, we have several PhD students enrolled at any given time who are otherwise employed outside the program, and this can add significantly to the average time to degree. The most recent year of 2024, for example, represented a max of 8.5 years for the average time to degree. This was because we celebrated the graduation of two long-time PhD students, both of whom have been employed full-time in other work for several years. That said, additional GA support and research funding can help to accelerate progress and reduce this time to degree.

Faculty Profile

Over the past six years, the number of tenured/tenure-track faculty has fluctuated slightly with hires, leaves of absence, resignations, and departures and returns from serving as a CAHSS Associate Dean. Overall, according to the data provided to us, we have added a net of two additional full-time, permanent faculty over the period of 2017-2023, beginning with 14, and ending with 16 (Appendix 1, Table 9). This increase reflects the redefinition of one position that was not previously counted as instructional faculty: when our long-time Director of GIS Labs and Cartographic Services retired in 2021, we converted this position from associate staff to instructional faculty, while keeping both administrative and teaching functions within their portfolio. Although the previous Director of GIS Labs, taught three courses per year, he was not counted as faculty in the data provided. Our new colleague in the updated version of that position is now counted among the faculty. During this period, we also saw the resignation of two Assistant Professors for other opportunities, on otherwise amicable terms. Also, this number reflects a faculty member not included in the 2023 data but who was on a leave of absence for a Fulbright fellowship abroad. Please note that these numbers do not include our faculty currently serving as Deans (Interim and Associate) in the Graduate School and CAHSS.

The 2023-24 profile of the department faculty includes 14 tenured/tenure-track faculty, one Teaching Professor, one Teaching Assistant Professor, and 2 post-doctoral fellows. Of full-time, permanent faculty in the department (including tenure-stream faculty and teaching faculty) in the 2023-2024 year, 6 are women, and 10 are men. The number of women in tenured/tenure track positions has seen a net gain over the past 6 years with an increase from 3 in 2017 to 5 in 2023 (counting our newest faculty member while on leave). The current (for the end of the reporting period, academic year 2023-2024)

racial composition of the department remains primarily white, although the faculty now includes one Latinx scholar (joined August 2019) who is tenure-track, one Black tenured faculty (joined 2023), and one Black diversity postdoctoral fellow (joined August 2024) (Appendix 1, Table 9). Two additional post-doctoral fellows included in our faculty numbers in 2023-2024 are international scholars and are no longer at UMBC.

Three of the 14 tenured/tenure-track faculty were hired since 2017 (2 women and 1 man). Additionally, the department was awarded a Fellow through the Postdoctoral Fellows for Faculty Diversity program in 2023. This scholar deferred their start date and therefore was not counted in the data here. They can potentially move into a tenure track faculty line, pending their performance while a postdoc at UMBC.

Over the past six years, one woman has been tenured and promoted to Associate Professor, which marks the third time a female faculty member has been tenured in GES. In the previous APR, we projected that three Associate Professors would seek promotion to Full Professor during the 2017-2023 reporting period. However, these faculty have yet to seek further promotion, in part because of delays related to the pandemic. We do anticipate that these faculty will seek promotion to Full within the coming few years. In addition, two more Assistant Professors will be reviewed for tenure and promotion to Associate Professor before our next APR. With promotions in recent years and the resignation of two assistant professors, GES's tenure-stream faculty has transitioned from a fairly even balance of all three ranks to a skew toward tenured professors. (Appendix 1, Table 9).

We anticipate two faculty hires in the near-term, based on the Multi-year Hiring Plan established by CAHSS in 2023. The College hiring plan scheduled a hire of an Assistant Professor of Coastal Science in the 2024-5 academic year; that search is well underway as of this writing. The College hiring plan also includes an advanced assistant/associate professor in Physical Geography for the 2025-2026 academic year. This line will continue the important role filled for decades by a colleague who retired at the end of 2024, who has taught Geomorphology and other upper-level courses related to hydrology, and contributed substantially to our department's strong focus on water and environment. We are awaiting confirmation that we can conduct this search during AY25-26.

During the past six years, the role of part-time faculty in our undergraduate courses has fluctuated, from a high of about ten part-time instructed courses during the academic year in 2017 to as few as 3-4 according to the provided data. However, we have on more occasions tapped a graduate student to teach a large introductory course, and these instructors are not listed in the data. In addition, GES benefits from the participation of NASA scientists in the GESTAR II program; we have seven GESTAR faculty each of whom teaches a course in GES (usually for undergraduates or cross-listed at the undergraduate and graduate levels) once every two years. GESTAR faculty are vital for our department, teaching courses that are required for the BS (GES 311: Weather and Climate) and the GIS Certificate (GES 381: Remote Sensing)

along with other important electives. However, they are not counted in the data provided to us by IRADS for the attached tables. Furthermore, with the resumption of our Master's of Professional Studies program, we have relied on part-time adjunct instructors, many of whom represent industries using geospatial technologies, in addition to our Associate Graduate Program Director for the MPS. These faculty are also not counted in the data provided by IRADS.

Faculty-Student Ratio

The FTE Students per Full-Time Instructional Faculty in GES ranges from a maximum of 28.4 in 2018 to a minimum of 20.4 in 2021 (Appendix 1, Table 10). The current rate of 22.6 is above the CAHSS average of 17.1 and the UMBC average of 20.7. While the FTE Students per Full-Time Instructional Faculty has decreased from 2018-2023, it has increased slightly from its low in 2021. The FTE Students per All Instructional Faculty in GES ranges from a maximum 23.1 in FY18 to a minimum of 14.7 in 2020. The current rate of 21.9 is close to the FY18 maximum. It is significantly above the CAHSS rate of 10.9 and UMBC's rate of 12.5. Despite a dip in 2019 and 2020, the current rate of 21.9 is close to the maximum rate from 2018. The FTE Students per FTE Instructional Faculty for GES ranges from a maximum of 26.4 in 2018 to a minimum of 18.2 in 2020. The current rate of 21.9 is well above the CAHSS rate of 14.4 and the UMBC rate of 17.

The FTE Students per FTE Instructional Faculty has dropped from the 2018 rates and has fluctuated over a smaller range than FTE Students per Full-Time Instructional Faculty and FTE Students per All Instructional Faculty. FTE Students per Tenured and Tenure-Track FTE Instructional Faculty ranges from 27.8 in 2018 to 21.4 in 2019. It has steadily increased from its low in FY19 to the current rate of 26.1, which is close to the FY18 high. The current rate of 21.9 is significantly higher than the CAHSS 14.4 rate and the UMBC rate of 17. The FTE Students per Tenured and Tenure-Track FTE Instructional Faculty in GES ranges from a maximum of 27.8 in FY18 and a minimum of 21.4 in 2019. It has steadily increased since the low in 2019, the 2023 rate of 26.1, which is close to the 2018 maximum. The current FTE Students per Tenured and Tenure-Track FTE Instructional Faculty in GES is above the CAHSS rate of 24.7, but below the UMBC rate of 29.7 (Appendix 1, Table 10).

The relatively high ratios compared with CAHSS are driven by GES's role in teaching three large courses that fulfill General Education Program (GEP) requirements: GES 102, 110, and 120. Furthermore, in many semesters we offer two sections of one or more of these courses. GES is thus providing an important service to the university; indeed, students from all of UMBC's colleges and schools take these courses. The faculty who teach these courses take very seriously our role in preparing students as global citizens and participants in the broader web of life. Contributing to Social Science, Culture, and Science (lab and non-lab) requirements, we advance critical thinking about environmental, social, and spatial matters that affect all of our lives. In semesters when we offer two sections of a high-enrollment GEP course, we often hire a graduate student to teach one of the sections for the purpose of helping that student gain teaching experience, and also so we can allocate more full-time faculty effort to

broadening our upper-level course offerings. However, we consider it important that full-time faculty play the largest role in teaching these courses, to ensure a high, consistent quality of instruction, and for us to maintain our connection with the material and with students encountering that material for the first time.

The lower student-faculty ratios among all instructional faculty likely reflects our use of adjuncts and affiliate faculty to support a broader array of upper-level course offerings by scholars and professionals teaching in their specific areas of expertise. Examples include special topics courses such as GES 302: *Wetland Ecology*, GES 302: *Population Geography*, and GES 302: *Arctic Geography*, which expose students to experts in their respective fields. We have occasionally had a seasoned adjunct instructor teach a 100-level course.

The dip in student-faculty ratios in 2019 likely reflects our higher full-time faculty numbers that year, before one faculty member left for a promising opportunity elsewhere. Also, enrollments in upper-level courses may have taken a hit during the peak of the pandemic lockdown.

Faculty Productivity

Research and Scholarly Activity

A general summary of the faculty research expertise is provided in Appendix V. GES is a highly interdisciplinary department with research and teaching interests ranging across a very broad sweep of intellectual inquiry. There is a wide range of research areas within the department. Both social science and physical/natural science faculty regularly incorporate GIS and remote sensing technologies into their research which, as noted in Section B, has a common focus on the importance of landscape patterns in relation to human activities and their environmental consequences.

Research and scholarly activity since 2018 has been robust, averaging 26 peer-reviewed publications per year between CY16 and CY23 (Table Appendix 1, 11a). Peer-reviewed works varied from a low of 23 in CY16 to a high of 39 in CY20, with an overall average of about 30 peer-reviewed papers and book chapters per year. Faculty have also published articles in high-impact journals, including *Nature*, *Science,* and *PNAS*, as well as leading disciplinary journals such as *Annals of the American Association of Geographers*, *Ecological Applications*, *Water Resources Research, Lancet Planetary Health,* and *Global Environmental Change*. GES faculty were lead authors or editors for five book volumes during this time.

Faculty continue to be active in presenting their research at national and international meetings and conferences: in CY23 there were 28 presentations by GES faculty.

Regarding external funding, GES faculty are consistently impressive in obtaining local, state and federal funding. Over the eight-year period from FY16 to FY23, the faculty

averaged approximately $380,000/year in external funds (Appendix 1, Table 11c). Funding agencies include the National Science Foundation (NSF), National Aeronautics and Space Administration (NASA), U.S. Department of Defense (DoD), U.S. Environmental Protection Agency (EPA), as well as dozens of other national, state, and local agencies, nonprofit organizations, and private foundations.

Faculty research highlights, beyond high profile journal articles and books, include new statistical indicators for biodiversity now in global use and published as an open-source R package (TITAN), an online system for global synthesis of local knowledge (GLOBE), developed through a $1.9M NSF grant in collaboration with faculty of Computer Science and Electrical Engineering and leadership of synthesis research at the German Centre for Integrative Biodiversity Research.

In making hiring decisions in recent years, we prioritized recruiting scholars who can contribute to the breadth of the department while also nurturing synergies among faculty that result in collaborative research. We see these collaborations as an essential element of our strategy for supporting graduate education, and our growing success in this arena bodes well for the future.

Teaching Activity

The teaching load in the GES department for tenure-track/tenured faculty is 2:2. According to our department workload policy, an overload on teaching in a given semester can represent a course release in a subsequent semester, given planning with the department Chair and Associate Chair. All GES faculty, tenure-track, tenured, and teaching faculty, are instructors in our introductory level courses that satisfy UMBC General Education Program (GEP) requirements. We otherwise coordinate and rotate our teaching through our intro courses, upper-levels (300- and 400- elective classes), and graduate-level teaching.

The full-time faculty (tenure-track and teaching faculty) have remained consistent over time in the level of upper-level and graduate credit hours taught (Appendix 1, Tables 11d and e). This is slightly different for lower-level courses, where we offered fewer credit hours overall in the most recent year on record (2024). This has since adjusted for 2025. In the available data on instructional activity (Appendix 1, Tables 11d-f), we can see that in the most recent years, graduate student instructors represented some proportion of instructional activity at both the lower and upper levels. This is in direct response to a desire on the part of the graduate program, faculty, and graduate students to generate more opportunities for our doctoral students to be instructors of record on courses.

The GES Department employs both formal and informal means to assess, promote, and facilitate high quality teaching.

Course evaluations are heavily relied upon to provide guidance as to the quality of teaching, with full awareness, however, that these are at best imperfect instruments. The previous pen and paper Student Course Evaluation Questionnaires (SCEQs) were

replaced in 2016-17 with new Student Electronic Evaluation Questionnaires (SEEQs). The SEEQs have been validated, have the potential for a higher rate of completion, and are thought to be a better representation of teaching. Course evaluations are used in the tenure and promotion process and contribute to merit increase evaluations. In addition, students participate in the teaching evaluation portion of the Promotion and Tenure process, including 3rd year contract renewals.

The department-initiated peer observations of faculty teaching in 2018. We developed a rubric for the observations, and to encourage objectivity, faculty are evaluated simultaneously by two faculty who collaborate on a report. Both tenure track and tenured faculty receive multiple evaluations prior to going up for tenure or full professor, with opportunities for faculty to build on the feedback they received from their peers.

Service Activity

One of the GES department's strengths is its collegial atmosphere, and the diverse interests and energy that our young pool of faculty bring to the table. The charts and details available in Appendix 1, Table 11b summarizes the metrics of service. The Chair distributes administrative tasks and committee assignments on a revolving basis as well as based on interest. Within the department, faculty serve on numerous committees, including those dealing with promotion and tenure (DP&TC), new faculty or staff hires, undergraduate program, GIS committee, Council of Majors, Writing Working Group, graduate program, and graduate student admissions.

Service responsibilities within the department have increased with the inception of the new graduate degree program in 2008, the reorganization of the old four-degree system into two primary undergraduate degrees, a new departmental focus on "writing across the discipline", and efforts to consolidate existing courses into multiple "streams" or pathways.

GES faculty are broadly represented on campus-level committees including (but not limited to) the Faculty Senate, Faculty Senate Executive Committee, Academic Conduct Committee, Conservation and Environmental Research Area (CERA) Committee, Climate Action Plan working groups, ILSB Research Space Advisory Committee, Course Evaluation Steering Committee, Gender, Women's, and Sexuality Studies, CAHSS Public Humanities Working Group, Sign Language Interpreter services, New Student Book Selection Committee, Regents Faculty Awards Committee, Fulbright Sciences Committee, Library Strategic Framework Committee, Interdisciplinary Studies Committee, Global Studies Steering Committee, and Landscape and Steward Committee, Center for Social Science Scholarship (CS3) Advisory Board, Inclusion Council, Land Acknowledgement Working Group, Institutional Review Board (IRB), Community Leadership program Advisory. Again, this represents a sampling of our department's university-level involvement, with examples chosen to highlight the tremendous diversity of ways in which our faculty contribute to the larger mission of UMBC.

Service to the profession includes refereeing journal articles and research grant proposals, journal editorships, offices held in professional organizations at the state and national level, and attendance, session organization and paper presentations at professional meetings. Some notable professional service venues include the Anthropocene Working Group, International Commission on Stratigraphy; Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC); Baltimore County Commission on Environmental Quality; Mid-Atlantic Chapter of the Society for Freshwater Science; Maryland Water Monitoring Council; Ecological Society of America; Associate Editor, Urban Naturalist; and Associate Editor, Ecoscience.

Our departmental faculty and instructional staff typically advise 200-250 majors per year on average, spread across several degree programs (Appendix 1, Table 11b). Through our advising efforts in Fall and Spring, the Department places a priority on individual student contact. Our advising efforts not only help students select the optimum combination and sequence of courses, but include overall management of UMBC GEP requirements, managing their overall trajectories toward graduation, resolving time management issues, identifying honors program and internship opportunities for exceptional students, cultivating the interest of potential majors, and simply just getting to know each student better. The Department Chair, Associate Chair, and the Director of GIS Labs and Cartographic Services are also available to advise any undergraduate student in our program on a walk-in basis. Our "door is always open" policy on student advising remains one of the cornerstones of faculty-student interaction, and it is a departmental and university service function in which we take great pride.

Service to the public is substantial. Here are some illustrative examples:

- Rent Court Campaign, Jews United for Justice, Baltimore, MD
- Expert Witness in Federal Court, Appalachian Mountain Advocates, WV
- Expert Witness in Tax Court (Conservation Easements), Internal Revenue Service, Baltimore, MD
- Expert Witness in State Court, Montgomery County, Baltimore, MD
- Expert Testimony, Land development hearings, Montgomery County Council, MD
- Software development, Baltimore City Office of Sustainability
- Baltimore City Green Network Advisory Committee
- Writer and Severe Storms Expert, The Washington Post Capital Weather Gang
- Environmental Justice Advisor, Baltimore Coalition for Positive Change
- Team Member, iAMResponsible (Antibiotic Stewardship Campaign)
- Membership of the Maryland Aerospace and Technology Commission (MATC)
- Membership of the National Academies of Science, Engineering, and Medicine (NASEM) Committee on Earth Science and Applications from Space (CESAS)

Budget
Thirteen percent of our budget in the past year went to non-salary expenditures, with a near even split between "General Instruction-State supported" expenditures ($178k) and "Research expenditures-Restricted" expenditures ($173k) (Appendix 1, Table 12a). In 2023 and 2024, we made significant equipment purchases to update both our GIS lab workstations and our Environmental Science teaching lab. We update the computer workstations in our GIS labs every 3-4 years, and work to reserve a portion of our budget each year in order to cover those regular costs.

In our last APR in 2018, we noted that our operating budget had remained flat for nearly a decade, with a dip in operating budget in 2018 itself, and only a slight trend in increase across part-time instructors and student hourly budgets. For the most recent time period, 2018-2024, the operating budget has remained at the same level, albeit with a slight increase in 2020 (Appendix 1, Table 12b). Even in our most recent year (2024), we are not back to the level that we were in 2017 for our operating budget, and in fact remain $8k below what had been in place at that time. Our student hourly budget has increased steadily over these recent years, but our part-time instructor allocation followed a similar trend to our operating budget (Appendix 1, Table 12b).

As with other departments, we rely on revenues generated by Summer-Winter semester course offerings as well as unused GTA tuition monies and returns on grants (DRIF) to supplement our budget. Returns on grants have been modest historically but are useful to contribute to research infrastructure and supplies. Our USM Foundation account has also increased in donations in recent years, due to some targeted campaigns that have helped us mobilize gifts to the department.

The flattened, or even decreasing, trend in our department operating budget represents a constraint that can limit our ability to grow our graduate and undergraduate student communities, and to support our growing faculty. This trend has been a noticeable one in our two most recent APRs. As we access and make plans for reserve funds, we hold concern for maintaining that growth and improving the quality of our programming in the future.

c. Analysis of Data Provided by the Program

1. Educational goals, learning outcomes, and program assessment plans:

In our last APR (2018), we stated:
"The Department of Geography and Environmental Systems' goals and student learning outcomes are linked to the University's general education program highlighting critical analysis and reasoning; scientific and quantitative reasoning; technological competency specifically in geospatial techniques; oral and written communication; socio-cultural competency related to citizenship at multiple scales; information literacy related to environmental, urban, and global and local geographic issues; and application of these reasoning and communication competencies to solve real-world problems. The program's goals emphasize that students should be able to apply thinking from both

natural sciences and social sciences to solve important environmental, urban, and geospatial problems."

Within the BA program, goals are for students "to analyze, evaluate, and implement environmental policies, conservation and risk management strategies, urban and development planning tools, and systems of environmental ethics, while within the BS, the goal is for students to master quantitative analysis and laboratory and field techniques related to environmental sciences, ecology, and physical geography" (APR 2018). Finally, "one of the major goals of both programs is for students to develop skills in Geographic Information Systems and other geospatial tools to analyze physical and human landscapes and solve critical environmental and geographic problems, in preparation for the many careers that now require use of geospatial techniques" (APR 2018).

Since our last APR, and the consolidation in 2016 of our majors in the BS and BA programs, the department has continued working to provide students with a framework for choosing their courses within each of our two programs. Within each major, we have developed streams that students can use to structure their course selection.

On the BS side, students majoring in Environmental Science and Geography may choose streams in Watershed Science, Ecology and Conservations, or Earth and Atmospheric Sciences. On the BA side, students majoring in Geography and Environmental Studies may choose from the streams Cities, Economies and Development or Environment, Health and Society. Additionally, we have two streams that bridge the BS and BA: Conservation and Environmental Management, Urban Systems, and Global Sustainability.

While the streams are optional for students, and do not appear on transcripts, they help students to create a coherent set of classes that align with their interests and also help with advising for possible career pathways post-college. For example, a student interested in ecology and conservation and following that stream, might take several field courses, a course in environmental policy, and one in natural resource management.

In addition to the streams, we are working as a department to craft a mission statement. In order to assess the success of our program, we need to be clear as to what we are trying to accomplish. The mission statement will serve as a guiding statement for our department and will be used to formulate a set of measurable goals; our intent is to make explicit the implicit goals and philosophy we already embody. In terms of more concrete assessment of courses (Appendix C), one of the courses which has recently been revised is GES 286, an introductory core course on both sides of our program. The instructor teaching it for many years retired, and the replacement faculty member has put considerable time into our GIScience Certificate program and making sure GES 286 aligns with the needs of that certificate. In addition to being a course for our majors, this course also functions as a university general education course for

students outside our major, being especially popular with computer science and information systems majors.

GES 286 has the following Student Learning Outcomes: be able to apply and implement canonical steps of the scientific method (question, data collection, analysis, results), have a basic understanding of the most commonly used tools in Geographic Information Systems, understand the basic principles of cartographic design, and be able to apply these tools to other domains of inquiry. These learning outcomes prepare students in the major for our required Introduction to GIS Class (GES 386), as well as meeting university functional competencies in scientific reasoning and technical competency. Learning outcomes are assessed through a variety of laboratory exercises, both in the field and in a computer lab, as well as with online quizzes and homework assignments.

At the upper division level, another course we are assessing is GES 308: Ecology, which is required on the BS side of our program and can be used as an elective on the BA side of the program. The course was part of a realignment in which a free-standing lab and field techniques course that was not a prerequisite for any other course, was converted to an Ecology lab, bringing Ecology from a 3 to 4 credit course. Ecology is a prerequisite to the upper division field labs, so making sure students had the necessary field experience was an important consideration in this decision. In spring of 2022 and 2023, the faculty member teaching Ecology has given quizzes at the start and end of the semester. The quiz serves to get a baseline on students' understanding of ecological concepts and vocabulary and at the end of the semester checks for mastery of those concepts. Student scores shift from 61% to 81% between the two quizzes demonstrating marked improvement in comprehension and application of ecological concepts.

In terms of program assessment, in 2023, we administered a survey to GES alumni (Appendix C-1). We had 205 respondents. Questions included asking about additional education, employment, what students felt they gained from the program, and where they felt it was lacking. Overall, 54% of our alumni respondents indicated that they go on to pursue graduate education across a variety of disciplines ranging from Urban Planning to Wildlife Management to Science and Natural History Filmmaking. Forty-three percent are employed in the public/government sector, 31% in the private sector, 8% in non-profits, and 16% in education.

When asked about how they felt their degree was a benefit, several respondents stated that the faculty, the technical classes, and the variety of electives were important. They also highlighted the exceptional teaching in environmental thought, with one respondent commenting that while they learned technical skills on the job, the foundational knowledge they received was "extremely relevant to nearly all aspects of…environmental work".

Strengths of the Program: We are able to provide a robust array of courses to our students, almost all of which are taught by full-time faculty. Our graduates feel well prepared for the working world upon completion of our program and cite learning critical thinking and analysis as important skills learned. They also appreciate the technical skills they learned from our GIS classes and the care and interest faculty take in them as students.

Weaknesses of the Program: We are not where we would like to be. Some of this has largely been the result of the COVID-19 pandemic, transitions in the department chair, shifts by some senior faculty to university administration, and administrative staff turnover. Since returning to in-person teaching (late 2021), electing a new chair (2023/24), onboarding new faculty (2022-24), and hiring a new Program Management Specialist in the front office (2024), we have been taking steps to assess our program and course offerings. We are concerned with outside required courses such as Calculus and Chemistry slowing our students down in terms of progression towards degree. As a Department we are working to craft a cohesive program mission statement with updated program goals. Other issues, such as the lack of discussion sections in our larger introductory courses are contingent on the university providing resources such as additional TA Lines that have not yet materialized.

2. Student Advising

Undergraduate

For many years, it has been a source of pride for our department that each of our majors (and minors) can expect to have regular advising from a GES faculty member. Indeed, when we have surveyed our program alumni, this level of attention has been a frequently reported benefit of the GES experience for our students. Each semester, undergraduate majors in the department can sign up for an advising slot (~30 min each) with a faculty advisor. For a long time, we were not in the practice of assigning advisors. Rather, students could sign up for advising slots by visiting our sign-up sheets on our office doors, or talking with our front office staff to identify a faculty advisor who might fit with the student's interests. This worked fairly well for many years, and faculty had a regular set of student advisees. There were some issues with inequitable distribution of workload: students would often opt for faculty whom they had as instructors in intro-level or other core courses, for instance. The heavier advising load was often carried by the department chair, associate chair, or GIS lab director, among others. When COVID-19 struck, our advising system necessarily shifted, and since that point in time we have maintained on-line sign-ups, and (often) on-line advising sessions. We have noticed in recent years that this shift has made it more difficult for students to connect with an advisor, and for faculty to be "found", or as accessible. This has also seemed to exacerbate the inequitable load of advising, while also making that less visible. In the past 1.5 years, we have tried to actively address these issues using a few strategies: (1) To reduce our overall load as our program grows, we now direct first year first time students (fewer than 30 credits) to advising with the College (CAHSS) advising team. This group is best equipped to advise new students on general

education requirements and planning for overall curriculum. They then pass students along to us and help with funneling to GES faculty advisors for the student's second year; (2) our new program management specialist helps to receive general inquiries for advising via e-mail and helps to assign "walk-ins" to faculty advisors; and (3) we are holding "open house" sessions for general GES advising each semester to walk students through our upcoming course offerings. This does not replace individual advising; rather, it helps students prepare for their advising and helps streamline the sessions. While these are still recent strategies, we are finding that this is helping us in terms of overall communication, making sure we reach our students in a timely manner for enrollment, and helps more fairly distribute the work of advising.

Graduate Mentoring

Incoming graduate students attend orientations organized jointly by the department and by the Graduate School. Advisement of students is managed by their academic advisor (mentor) in consultation with the graduate program director (GPD). Students also receive general support and information from GES office staff. The program management specialist is also responsible for helping to coordinate the graduate program. The two core graduate courses, GES 701 and GES 702, typically taken the first year, provide substantial feedback to and evaluation of graduate students. GES 701 supports cohort-building among incoming students and learning what it means to be a graduate student, engaging in the process of scholarly inquiry. Students in GES 701 are also required to research and write a literature review related to their area of study, which typically involves several check-ins with graduate advisors that are scheduled throughout that first semester. GES 702 requires students to develop a research proposal, which should also be written in consultation with the advisor. At the end of each year, faculty mentors offer a written assessment of their graduate students that is also provided to the GPD. By the third semester, graduate students should have arranged a meeting with their faculty advisory committee (mentor plus at least two more members) to discuss the thesis or dissertation project. This committee usually follows the progress of the student until graduation with formal meetings minimally every 12 months. Since the last APR (2018), we have developed a Graduate Handbook specific to GES, which we see as providing a comprehensive and in-depth resource to our graduate students on all steps, policies, and procedures within our program.

Student Research

Undergraduate

Undergraduate students are frequently encouraged to pursue independent research endeavors, with many opportunities to collaborate with faculty. Research activities within GES span from focused readings under faculty supervision to comprehensive laboratory and fieldwork for more extensive projects. Each year, approximately 10-12 students engage in independent research by enrolling in GES 491 (independent study) or GES 497 (research internship). In addition, an additional 3-5 students, on average,

conduct research internships using GIS skills through GES 483, most often directly with our geospatial-focused faculty. Some of these endeavors have resulted in co-authored publications with faculty, and in some cases, students have been listed as lead authors. From 2017 to 2024, undergraduate students at UMBC have co-authored publications with GES faculty members a total of 26 times. During this period, 20 undergraduates received an Undergraduate Research Award (URA) to conduct independent research with a GES faculty mentor, and 28 undergraduates presented their work at UMBC's Undergraduate Research and Creative Achievement Day (URCAD). Furthermore, undergraduate research is supported by UMBC's Undergraduate Research Assistantship Support (URAS) and by faculty who allocate their own grant funds and startup budgets to help students advance their investigations.

Graduate

Graduate students are encouraged to share their research findings at professional conferences and receive annual travel support of up to $800 from GES, which can be supplemented by travel funding from the Graduate Student Association (up to $750). Presentations have taken place at a variety of high-profile academic conferences, including the Association of American Geographers, the American Studies Association, the American Geophysical Union, the Ecological Society of America, and the International Association for Landscape Ecology. From 2017 to 2024, graduate students at UMBC have been published 52 times in peer-reviewed academic journals, usually with GES faculty members. Graduate students also secured competitive external funding from organizations such as the National Science Foundation, the National Oceanic and Atmospheric Administration, the National Aeronautic and Space Administration, and the Maryland Department of the Environment.

Financial Support for Graduate Students

We have been able to provide financial support to our graduate students through graduate assistantships (GAs), faculty research grants, the ICARE program (from 2021-2025), and various additional grants or fellowships awarded to students (Appendix J). For the period of the review (2018-2024), we have prioritized awarding graduate assistantships first to PhD students. We have also awarded assistantships to Master's students of exceptional merit or if it meets the department's teaching needs. The GES department guarantees funding for four years for all doctoral students accepted, with the hope of providing a more competitive recruiting package. The length of assistantships for Master's students are made on an ad hoc basis and have ranged from one semester to two years. GA support includes salary, tuition remission for up to 10 credit hours per semester, all fees (which can be a substantial cost at UMBC, and most other departments in the university do not fund these for their graduate students), and health benefits. All Ph.D. graduate students are expected and encouraged to seek financial support for their dissertations research, and faculty are encouraged, where appropriate, to write graduate student support into grant proposals.

Our GA funds consist of seven GTA lines provided to GES and three GTA lines provided through the Science 100 program. On the teaching support side, these GTA lines in

general only allow us to provide TA support for lower division core courses, for the GES 286 and 386 GIS courses required by all students, and for a few of our upper division classes that have laboratory sections. In general, we do not have adequate TA support for many of our upper division courses, and we also do not have TA support to consider expanding some of our courses into lab and field sections, which would allow our students to gain more experiential education and to allow them to have more direct engagement with citizens groups and urban outreach efforts within their formal education. This would further enhance the ways in which our teaching and scholarship support UMBC's commitment to community engagement.

In terms of supporting our graduate students, we have roughly been able to fund approximately 20 graduate students per year, which equates to just a little more than one graduate student per faculty. Clearly more GA lines need both to be provided by the University in the form of GTAs and to be generated by the faculty in terms of externally funded GRA lines. Any future growth in our graduate program depends on these increases. Given the proposed budget cuts to higher education funding by the State of Maryland (2025) as well as the general decrease in funding available by federal agencies such as NSF, it is difficult to project any substantial growth in our funding in the near future.

Facilities

The 2018 APR describes a reality that has not fundamentally changed in the intervening years: GES occupies space that was not intended for a department with significant research space. We have used improvisation and expediency to "get by" but as our department has grown and flourished, we increasingly face the prospect that these strategies no longer work (Appendix K). At present, we are anticipating the renovation of Sondheim Hall, where GES is centered. The precise timing of this project is yet to be determined. And when it occurs, we will be faced with a roughly two-year period of challenges with a temporary space. Thus, GES is faced with insufficient space for which it is challenging to plan and improvise given the uncertainty about when we will at least temporarily be housed elsewhere.

CAHSS and the Office of the Provost know of GES's needs — as well as the needs of other units assigned to Sondheim. Representatives from Facilities Management, CAHSS, and the Office of the Provost met with Sondheim stakeholders to learn about each department's needs and how to best renovate the space to meet these needs. These three parties continue to meet to program the building. At this level of discussion, a CAHSS Associate Dean, holding a tenured GES faculty line, actively represents GES's interests.

At present, primary GES departmental spaces include three disconnected floors in Sondheim Hall and scattered rooms across campus. The department has a single hooded and vented wet lab research space on the 5th floor of Sondheim. The Sondheim basement houses departmental teaching space, including teaching labs, research labs (converted from classrooms), in addition to faculty and graduate student offices and storage.

The Science 100 (SCI100) program, a University-wide interdisciplinary program effectively administered by GES, occupies space in the Physics Building, providing instructional lab space for two teaching faculty as well as graduate student teaching assistants.

Moreover, the Interdisciplinary Life Sciences Building (ILSB) and its ultimate use and occupancy were speculated about and anticipated by the 2018 APR. While initially some discussion was given to relocating GES to that building, ultimately the building was dedicated to facilitating interdisciplinary science research rather than housing any particular department. Since the ILSB's opening, several faculty have had research and other space in the building. Presently, two GES faculty have office and lab space. The building also provides office space for several graduate students, including those who are ICARE-GES MS students.

While the additional space in the ILSB has provided badly needed lab space and overflow-office space, it has contributed to the already existing fragmentation of the departmental facilities.

The second floor of Sondheim Hall houses the GES administrative offices, many faculty offices, and a small conference room (that doubles as the departmental mini-kitchen and break room). The arrangement of space is rather ad hoc. The original departmental space was reclaimed from the Office of Information Technology by combining three classrooms that had occupied half of the length of the building on the east side of a long central hall. The ad hoc layout imposes physical constraints on departmental staff. For instance, the photocopier and mailroom are down the long, narrow corridor of faculty offices. All of the faculty offices are in use, and office space remains a perennial problem.

Two flights down, in the basement of Sondheim Hall, are the GIS and Cartography Labs, the Environmental Sciences Lab, seven research labs, and graduate student office space. Of these, the GIS and Cartography labs have gone through the most cosmetic and functional updating. That said, most of our facilities are showing their age. Most of the spaces are both for the most part in need of renovation and not sufficient to house departmental research and instructional activities. As an example, though prone to flooding, the floors throughout the basement are made of asbestos tile. In place, these, too, are beginning to show their age, provoking occasional anxiety about the safety of working in the setting. Lab research and teaching equipment is stored in makeshift lockers in the basement hallway.

We remain concerned regarding the history of flooding in the basement where our teaching and research labs are located. A major flood in December 2022 led to significant damage to Sondheim Hall. The carpeting in the GIS lab had to be replaced, leading to the abatement of the existing asbestos floor tiles. Of course, these tiles remain on the floors of most offices and labs, though we are assured that they are not an active risk. In recent years, both the GIS and Cartography Labs have been repainted. Both labs contain computing facilities (53 desktops in all). All of these machines were replaced over the summer of 2023. Moreover, new audiovisual and video conferencing equipment has been installed in these labs. New a/v equipment was installed in the Environmental Sciences Lab over the winter break of 2023-24.

While these space improvements have been very important, it is crucial to recognize that they are minor compared to the existing space and infrastructure needs of the department. One of the greatest challenges confronting the GES department in moving forward, and in sustaining the remarkable progress we have made in recent years, is posed by our limited facilities, which are highly constrained in terms of both quantity and quality.

Given that we are at capacity in terms of both faculty offices and faculty labs, we are very concerned that these limitations will discourage applicants for faculty positions. As the 2018 APR also notes, it should be noted that the Dean's Office and the Provost's Office have worked with GES in the past for possible space enhancements. We do recognize that the provision of adequate space is a university-wide challenge, yet GES is probably one of the most space-limited departments at UMBC. According to the 2018 APR, CAHSS had at that time listed creating new space for GES as one of the highest priorities of the College.

The following list of needs and concerns regarding facilities and space is not exhaustive but is reflective of a fundamental reality: we occupy space that was not intended for a department with significant research space, particularly regarding the wet laboratory needs of environmental science research. In effect, our department space on the second floor is cobbled together out of three former classroom spaces that we were obliged to relocate roughly 20 years ago. Similarly, our basement research labs are all repurposed classrooms. We have used improvisation and expediency to "get by" but as our department has evolved over time, we increasingly face the prospect that these strategies no longer work.

Faculty Offices

Our department has grown since the 2018 APR. We now occupy every available office space in Sondheim Hall. Given that GES has been prioritized for two hires in the CAHSS multi-year hiring plan, we are still in need of two additional faculty offices.
As a practical matter, we lack graduate student office space for GAs to meet in office hours with students. We also lack flexible office space for our adjunct faculty to meet with students during office hours.

Any planning for improving conditions is contingent on the overall plan for renovating Sondheim Hall, which will not be completed for at least 4-5 years. Thus, while we

anticipate further growth in the coming 5-8 years in the environmental science area, both in terms of undergraduate and graduate student populations, these constraints on faculty office facilities are worrisome, mitigated only by the fact that they are putatively transitional.

Research Space

Researchers in GES require a range of work space ranging from vented, wet laboratory spaces to technologically-enabled meeting spaces for collaborative work. The current research workspace is for the most part inadequate for many of our faculty. And most of our departmental research space is in the basement of Sondheim Hall and are therefore functional but suboptimal and in declining condition.

Things have improved since the 2018 APR. That document, however, describes a physical geography faculty member without any laboratory space storing equipment in a colleague's lab, a condition that continues to this day. Beyond lab space, the complete lack of collaborative space constrains interdisciplinary research. Many faculty have indicated a desire to have lab spaces that open onto a "research commons" that would encourage communication and synergies between and among research groups in our early visioning for the renovated Sondheim Hall. As faculty succeed in competing for externally funded research awards, space becomes a constraint on the ability to carry out research, and can even be a limitation on the development of research proposals.

Another basic constraint for research is that Sondheim Hall does not have a loading dock, which makes it challenging for researchers to transport sometimes heavy field equipment to vehicles for field work. A further example of constraints is that UMBC does not have a robust motor vehicle pool, and the GES department does not have a dedicated field vehicle, so researchers must use either their own private vehicles or commercial rental car agencies for transportation to field sites. Recent purchase of passenger vans by CAHSS has allowed their use for field trips, and we have already made use of this resource for a field course and for class-related field trips. That said, these larger capacity vans aren't necessarily well-suited for field research, due to challenges with maneuverability and relative size.

Staff Space and Common Space

Our 2018 APR Self Study argues that the current departmental space is entirely inadequate. With respect to our common spaces and staff work spaces, that remains unchanged. Our conference room is too small to fit the current faculty much less anticipated new hires. The conference room is the only space within the department that can support meetings involving more than four people; it's the only space where people can talk over lunch; and it's the only place we can conduct reading groups and small seminar classes. While we recognize that there are other departments on campus without adequate conference rooms, there are also quite a number of departments at UMBC with generous conference room facilities.

We do not have a space sufficient for large gatherings. For instance, the departmental seminar series doesn't fit well in the Cartography Lab which seats 24. Additionally, our monthly faculty meetings occur in the Cartography Lab, requiring that we displace students since the space also functions as a teaching lab. As we regularly have 30 to 40 attendees; recently we have had to "scavenge" for space across campus to accommodate seminar audiences. We lack any sort of general space to host events, even small receptions, something common to research university departments. There is no department lounge for faculty and/or graduate students, we lack any sort of gathering space for undergraduates, and we have no space that can serve as a library/reading room. Our hallway that accesses faculty offices is so narrow that folks have to turn sideways to pass; students waiting in outside faculty offices have to get out of the way when others come down the hall.

Our supply room, which also acts as the departmental mail room, is very inadequate due to limited space. We lack kitchen facilities, including a sink. We recognize that some departments in CAHSS do not have kitchen facilities, at the same time UMBC does have a number of departments with kitchen facilities; moreover, our faculty who have worked at other universities have found kitchen facilities in departments of our size to be standard features.

We lack workspace for student workers, and our office file storage area is inadequate. We all note as we visit colleagues in other departments on campus, that our severe space constraints are not generally true for other departments at UMBC.

Computer Lab Space

The 2018 APR explains the persistent need for research computer lab space. That document envisions a dedicated research computer lab space (8-10 seats) for graduate students and post-docs working on GIScience, Remote Sensing, and other data-intensive projects. That space would ideally provide equipment for visualization-based research and development. In the 2018 document, the present graduate student computing space, which shares space with a GES faculty member's research laboratory, is described essentially as a stop-gap, yet another effort to provide a substandard space because that is the only space available.

Thus in 2024 that persistent need remains. The department has carved out a small space for graduate students from a new faculty member's research space. The space is small and is currently shared by multiple undergraduate and graduate students working with three different faculty. This is at best a Band-Aid, which only works because the individuals involved are so collegial.

Teaching Space

Our department controls five spaces dedicated for instructional use by GES courses. This is in addition to the registrar-owned classrooms available for course instruction, which are updated regularly by Facilities Management and DoIT. There are three teaching labs in the Sondheim basement. The Conference Room in Sondheim 211 often doubles as a de facto classroom. The Science 100 program controls instructional spaces in the Physics Building.

Recent renovations and updates to the GIS and Cartography Labs have been a dramatic improvement. We have updated the computers and the a/v capabilities of each. Each Lab has also undergone a facelift (new paint, new carpet in the GIS Lab). That said, we've encountered factors beyond our control, such as episodic flooding of varying severity and unpredictable but frequent power outages. In the larger scheme of things, these are mere blips. But they point to a constant and demoralizing sense that our facilities have been serially under-resourced.

Our current environmental science lab is in need of renovation. In 2024, the department invested funds in updating the equipment, supplies, and technology within the lab. Ideally, we would also have a physical geography lab and a second environmental science lab for instruction. In a perfect arrangement, those spaces would be wet lab teaching spaces. However, because of ongoing space constraints, we were forced to choose between faculty research space or the physical geography lab. We chose the faculty research lab space, otherwise, we would have been unable to hire new faculty who needed lab space to conduct their research.

Sondheim Hall Renovation

Many of our departmental space woes would hopefully be mitigated by the planned renovation of Sondheim Hall. Several faculty have participated in the early-stage planning with staff from Facilities Management, which includes architects, engineers, and space planners actively engaged in planning the upcoming Sondheim renovation along with representatives from CAHSS and the Office of the Provost. We have had no update since an initial needs and use assessment was conducted in early 2024, but our perception was that early designs assumed our current space needs were met–we saw no indication of an increase to GES space in the designs. As of May 2024, we were informed that the precise timing of renovation is contingent at least in part on decisions yet to be made by the MD state legislature, which in 2025 is managing a series of budget cuts, including to higher education (USM-wide). Despite the uncertainty of when these renovations will occur, some details have come into focus.

Based on designs we've seen, the basic structure will remain, though everything from the severe brick face of the present structure to the configuration of all interior spaces is up in the air. We presently share Sondheim Hall with portions of the Psychology Department (mainly faculty offices), the Hilltop Institute, and teaching classrooms on one entire floor. A primary question will be how the various floors are allocated to departments. We are hopeful that the ultimate design will allow more departmental cohesion yet will contain the lab, research, teaching, gathering, social, and office spaces we require.

Of course, one thing the department will have to plan for is the inevitable temporary move we will make while renovation occurs. CAHSS and the Office of the Provost, including the Registrar's Office and Facilities Management, will work with GES to manage this move.

Before we inhabit redesigned and better spaces, we will be housed in an as-yet undetermined location. At present, while the momentum toward much-needed renovation is encouraging, we remain in the eternal now of inhabiting insufficient and deteriorating space.

Contextual Program Analysis

The last Academic Program Review for the Department of Geography & Environmental Systems took place in 2017-2018. The external review report and the Dean's review noted at that time that GES had made good progress since its prior APR in 2011-2012. The Dean's report from 2018 endorsed and promoted many of the external review's recommendations, with the following seven highlighted:

1. Address the inadequacy of GES's existing space and facilities;
2. Implement an active learning approach to be included within the large introductory GES courses (which are both core to the majors and satisfy GEPs);
3. Increase the number of GA positions to keep up with undergraduate teaching demands;
4. Provide graduate students with teaching opportunities within the department;
5. Develop an approach for transportation for students for off-campus field experiences as a part of GES majors courses;
6. Consider revamping the department's MPS program; and
7. Complete hiring plan priorities for GES that were approved by CAHSS.

Most of these represented the central elements of the Post-APR Action Plan for GES that was approved by UMBC in 2018.

Of course, it is hard to overstate the level of disruption that the COVID-19 pandemic rendered on our lives, and on the way in which we had to adjust our work, both during the height of the pandemic, and even to this day. It certainly delayed some of the progress that we would have otherwise been able to make toward the actions outlined above. It also delayed the university's ability to respond and offer support.

The regular program review process was also interrupted by the COVID-19 pandemic, in that our "Year Three" APR review, which should have taken place in early 2021, was delayed by two years to 2023. We, therefore, will summarize what was reported in terms of progress at that stage and update it to include the last two years.

Space

Since 2018, we have experienced an expansion and slight retraction in space available for faculty research activities. With university support (primarily navigated by our CAHSS Dean's office), we were able to expand research lab space on the 5th floor of Sondheim Hall for one faculty member, and access lab spaces for three faculty members in the new Interdisciplinary Life Sciences Building (ILSB). This freed up some lab space in the basement of Sondheim Hall for faculty members (Mahmoudi and Holland) who previously did not have labs. We also used reserve budget funds to

replace all GIS workstations in the GIS and Cart labs (2023) and update equipment in the Environmental Science teaching lab (basement of Sondheim Hall, 2024). We made important updates to the AV technology setup in the Cart lab that facilitate hybrid teaching and seminars in that space, which has become our default location for department and other faculty-related meetings.

In the past year, we were asked to release one of our faculty lab spaces over in the ILSB that at the time was underutilized. This was to make space for an incoming faculty member from the College of Natural and Mathematical Sciences (CNMS). This means we are now down one lab space, and are considering how best to accommodate our Coastal Science faculty hire (process happening now) for August 2025, and a second faculty hire for AY 2025-2026 (Physical Geographer).

We were invited to participate directly in the planning process for a renovation of Sondheim Hall, which we understand to be among the top two campus buildings slated for renovation next. The planning discussions took place during AY 2023-2024, and we reviewed three potential plans. As things stand in early 2025, we understand that process to be paused (or stalled), likely due to budget constraints at the MD state level. As a department, we are therefore considering how our space constraints will continue to challenge us over the next five years, up until the next APR.

Faculty

We were able to make important progress with our faculty hiring plans, thanks to support from the Dean's and Provost's offices. The addition of three faculty colleagues in 2018-2019 represented an important shift in diversity and representation among our faculty, which greatly augmented our ability to reflect our student population.

Following the retirement in 2021 of our longtime GIS/Cartography lab and program director, we were able to convert the position to a Lecturer (now Teaching Professor) track and hire a new colleague. These successes in faculty hires were tempered by the departure (on good terms) of two faculty (2020 and 2023), representing a loss of some of the faculty diversity and representation that we had gained. Since 2021, two separate tenure faculty have served in sequence as Associate Dean for the Dean's Office (CAHSS).

In 2023 and 2024, we were able to rebuild among our faculty ranks through hiring a tenure-track Assistant Professor in Human Geography (focus: Environmental Justice). Dr. Ellen Kohl accepted this position in 2023, and the successful recruitment of a Postdoctoral Fellow for Faculty Diversity, who will be considered for a conversion to full faculty during spring 2026. Additionally, we were identified as the department of choice for the newly hired GESTAR-II Director, and for the new Vice Chancellor of Research and Economic Development (University System of Maryland). Both of these new colleagues were unanimously voted by the faculty to join the department as tenured Full Professors. The GESTAR-II Director has become an active member in GES, including teaching one course per semester, conducting research, and mentoring GES undergraduate and graduate students.

We have experienced an internal transition in the Department Chair during the past two years. The previous Chair was selected as Associate Dean in CAHSS in 2023, and one of our tenured faculty was elected first as Interim (AY 2023-24) and now as Department Chair, with a term to conclude in August 2026. We also have a full professor as an Associate Dean (and current Interim Dean) in the Graduate School. These shifts have meant that some of our senior faculty (full professors) have been rotating in and out as active department faculty during recent years.

The CAHSS Dean's approved faculty hiring plan for 2023-2026 confirmed two new faculty hires for GES. The first hire, an Asst. Professor (tenure-track) in Coastal Science, is an active search at the time of this writing. We just concluded five finalist candidate visits and will soon deliberate to make an offer. We look forward to welcoming a new colleague for AY 25-26. Our second approved hire, an advanced Asst/Associate Professor in Physical Geography, represents an effort to replace the retirement of a long-time GES faculty member. This hire was approved for a search process in AY 25-26. At the time of this writing, due to MD state budget cuts, we are in a holding pattern to see whether this is confirmed to move forward in the next year.

GES faculty have continued to be productive in terms of scholarship and grants, despite the pandemic. Several GES faculty have been active on the NSF-funded NRT project known as "ICARE: Broadening Participation across the Environmental Sciences in Baltimore Harbor", with two GES faculty as co-PIs. GES has been the home department for twelve of the twenty ICARE-supported graduate students. Two other notable NSF-funded projects in which GES faculty have been investigators are "Urban Water Innovation Network (U-WIN): Transitioning toward Sustainable Urban Water Systems" and "Resting Safe: Collaborative Informal STEM Learning between Researchers and Homeless Communities". Additional notable awards in recent years include one GES faculty being named as Presidential Research Professor by UMBC, and holding status over the past few years as among the set of "Globally Highly Cited" Researchers, as tracked by Clarivate. In 2022-23, another GES faculty member received the prestigious Career Enhancement Fellowship from the Mellon Foundation.

We see our teaching, scholarship, and service as not only reflecting the mission of UMBC, but helping to actively serve as an example of that mission in action.

Advancing State of the Fields in Research and Curriculum

Interdisciplinarity is one of our greatest strengths as a program and as a faculty community. One important outcome of valuing collaboration and interdisciplinarity is that we are uniquely tuned into the pressing and emerging challenges facing society and the environment, and we adapt and update our research and our teaching so that our students feel equipped to address these challenges as they move on with their lives and work.

Much of this is reflected in the more recent changes to the curricula across all our programs. At the undergraduate level, we have launched several new courses that help students think critically about issues such as climate change, migration, and social and

environmental justice, while also offering new geospatial techniques and methods classes to guide them through the analytical tools they can use to research and generate strategies for addressing these challenges. For our methods and field classes, we have not only been able to add a new class in Qualitative Methods, but have strengthened our offerings in spatial statistics and quantitative ecology, and shifted a lot of our instruction to include programming in R, and learning other open-source softwares. Our fieldwork classes have remained hugely popular, and students have a chance to learn with new instruments and techniques in those classes. This will only be enhanced as we bring in two new faculty who will be able to offer fieldwork courses as well. The recent creation of a small van pool for our college (CAHSS) is helping to meet the need for shuttling students to nearby field sites for our classes. We're also exploring opportunities to leverage the vans for field trips in other classes, mainly connected to community organizations in Baltimore.

In our graduate curriculum, we are now regularly hosting graduate-only seminar classes to enhance the learning environment. Through the ICARE grant, GES faculty have worked with faculty from other colleges to design and teach classes on Justice, Equity, Diversity, and Inclusion (JEDI) in the Environmental Sector, along with additional 1-credit classes on engaged research, writing, and public speaking. These have added to the options for not only our graduate students, but students from other programs as well. And finally, the restructuring and relocation of our MPS in GIS program has also allowed for an updated and enhanced series of graduate-level geospatial courses to become a part of what is accessible to all our graduate students, and even some high-level undergraduates. This has further bolstered the reputation of our geospatial program, and helped with pathways for our undergraduates and graduate students to secure jobs post graduation.

Program Assessment of Student Learning Outcomes

We have taken some important steps in the past several years to assess student learning outcomes connected with individual courses and course sequences. This has been tied primarily to our introductory-level and core classes that are common for both of our majors (BS and BA). Our newly revamped MPS and PBC in GIS programs have also done an excellent job connecting course-level learning outcomes to the program-level learning objectives and outcomes. We recognize, however, that there is work to be done in this realm. At the undergraduate level, we see the importance of mapping out our learning objectives and assessing outcomes through the full series of course sequences that our majors tend to follow, and can see the importance of communicating this to students as they plan their progression, but also as they reach the point of graduation and are exploring ways to communicate their degree and major to prospective employers, institutions, and programs.

Our two main department committees focused on the undergraduate curriculum (Undergraduate Program Committee and GIS Committee), have this work as part of their set of priorities over the next year. For our main graduate program, we have worked over the past two years to assess the GES 701/702 core course sequence, including surveying recent graduate students about their experiences with the courses, and dedicating a portion of a recent faculty retreat to ways to better align and update the plan for both courses.

Overall, at this stage, we are still in the process of connecting our course-level outcomes with program, college, and university-level outcomes. Recent faculty retreats have helped us to clarify how our program-level learning objectives have shifted and updated, and have helped mobilize us to update course names and register new courses permanently within the UMBC catalog. Our next challenge is to clearly articulate those, ensure that our courses are connecting to them, and then to make use of our assessment data to improve and update our approach to teaching.

What GES does well

We dedicate a lot of effort and care to our teaching and mentorship, and we see that our students respond to this. We see ourselves as innovative and collaborative in our research and teaching as well. We have mobilized in recent years to generate more opportunities for our students to focus on climate change, social justice, and the biodiversity crisis in our programmatic offerings. As a faculty, we step up for service and contribute to many of the initiatives and standing committees that serve our students and the UMBC community. We have worked hard to help our students access internships, research opportunities, and job opportunities. We even start these efforts in our classrooms, by offering opportunities to connect with outside organizations and communities in Baltimore and beyond.

A lot of this success has been due to the care that we put into advising and mentoring students. When we have surveyed our recent graduates, many of them express how they felt supported by faculty and motivated by the example that we set in terms of our research and teaching.

Program Planning

The time since the COVID-19 pandemic has represented a time of fairly rapid change for our department, not just in terms of changes in faculty and personnel, but also in terms of our collective direction, as a faculty and for our programs.

We are constantly considering ways to improve the experiences of our students, and also for our community overall. The areas that are in the forefront for improvement are separated here according to those areas that we can control and work on as a department, and those that require coordination and support from beyond GES.

Improvements by GES

With the recent turnover and adjustment in faculty positions and roles, we have noticed that several of our department-level policies and processes need updating and need to be made more transparent across the faculty. Since 2022, we have restarted the practice of holding semi-annual faculty retreats, and focus this time on working to update or craft new department policies, discuss budget priorities, and focus on updating our department mission and learning objectives. This work has been slow, but deliberate. We need to continue with this in the upcoming years, so that we can have smoother leadership transitions, more clarity on department roles, and continue with the important work of improving our curriculum and student learning outcomes.

We need to dedicate ourselves more to the work of student assessment and mapping across the curriculum, especially as this continues to grow as a University-led effort. To do this work, we will need to find ways to prioritize this within our faculty workload and planning, or explore ways to bring in other resources to assist with the process.

For our undergraduate program, we would like to do better at recruiting new students as majors. We feel as though our programs are less visible to prospective students, and know that we can implement some key strategies so that high school applicants, and even new first year students can find us.

For our graduate programs, we also see a need to target and boost recruitment, not only for the MS/PhD programs, but also for the MPS/PBC in GIS program. The recent contributions by the CAHSS Dean's office targeting support for PhD students through summer research fellowships and a one-year GRA fellowship, are important steps in helping with recruitment to our PhD program. As the ICARE program comes to a close, and with the recent developments and cuts across the federal government, we are acutely aware that we will need to explore more diverse outlets for funding and for supporting our graduate students once they are enrolled.

Connected to all of our programs, we can do more to help our students find the next step in their career journey. This is also feeling especially important during this time of upheaval across the federal government, and the cuts to scientific research. So many of our students end up working within the public sector and for various federal agencies. We are already aware of the need to adapt and help guide our students towards other opportunities, and will focus on leveraging our ever-growing alumni network and our institutional collaborators to accomplish this.

Improvements that require collaboration and support outside of GES

When it comes to improvements that we want to prioritize that would require collaboration and support from outside of the department, there are three main areas:

(1) Department access to space,

(2) More Graduate Assistant support, and

(3) Operating budget increase and support.

Space, and the ability to meet the space needs of our growing department and programs, has been a recurring issue in our APRs for several rotations. Our existing building, Sondheim Hall, faces multiple maintenance and plumbing issues, and we observe that the quality of the basement spaces has been on a solid decline in recent years. We are excited about the prospect of this building being renovated, but are less optimistic about that taking place in a timeframe that would help us avoid further issues with the existing building. We have made use of our reserve budget to update the equipment and technology in the spaces we manage, but could use support to improve the conditions of the infrastructure itself, especially if we are looking at a longer time frame before renovations occur.

We would also request support in securing additional lab space for our faculty (research and even teaching), either on the fifth floor of Sondheim, or in the Interdisciplinary Life Sciences Building. We see this as central to our ability to recruit, hire, and retain our next two faculty hires, as well as support our current colleagues.

Graduate Assistant Support, through increasing the number of GA lines available to us, is also an improvement that echoes the most recent Academic Program Review (2018). This was seen as an important priority by our external review report, recognized by the College and the Provost's office, and yet we only were able to increase our lines by 0.5, rather than the requested three (3). The landscape for external funding opportunities is looking grim at the time of finalizing this report. We are looking to grow and strengthen our graduate program, while also improving our active learning activities and introductory courses at the undergraduate level. The *additional GA lines* help make this a possibility, and without them we lack the capacity to make these changes.

Finally, our *operating budget* has fluctuated slightly during this past time period, and has mainly remained flat for more than a decade. We have worked to reserve some funds and leverage other non-state funds to pay for periodic investments (i.e., GIS lab workstations), but the MD state budget and the federal funding landscape are both of concern at present. While less of an immediate concern than space and GA lines, the static nature of our operating budget is something that we see as unsustainable when connected with our goals for growing our undergraduate and graduate programs. We would welcome an increase in our regularly allocated operating budget (for department operations), so that we can continue to meet our own growth within the department, but also save the funds needed for our periodic updates to equipment and other teaching resources. Our current front office team is currently comprised of one full-time Program Management Specialist and one part-time Administrative Assistant (II). The ability to *increase our front office capacity to even two full-time positions* would help with the additional workload that is managed by the staff, especially as our faculty numbers and student numbers increase.

Innovative Resources the GES Department Can Leverage

We are actively exploring ways to leverage our existing funds, including the non-state funds, to improve the quality of our programming. We are launching a pilot program for young alumni to serve as mentors to upper-level undergraduates. The goal of this program is to build and strengthen our alumni network while also helping facilitate a broader set of mentoring relationships and career advice for our undergraduates. Our initial pilot is launching in April 2025 and will take place over six months. Ten alumni mentor-student pairs will sign a mutual agreement to meet 1-2x per month for mentoring sessions, following a recommended schedule of topics that we have compiled from similar programs for them to consider and discuss. At the end of the six-month period (late October 2025), we'll hold a gathering for the student-alumni mentor pairs and will discuss revisions to the program. Our hope is to offer this each year.

We are assessing our course offerings in Summer/Winter programs, and exploring ways to more effectively make use of that opportunity to both offer core courses to students over the Winter or Summer sessions, while also considering the opportunity it can generate for our graduate students as course TAs, and the potential as a source of program revenue.

We are exploring options for adding a lab/materials fee for our environmental science labs and GES 286. This can help us with ongoing updates to our equipment and materials available to students in our lab spaces.

We are more actively participating in fundraising campaigns facilitated through the Office of Institutional Advancement (OIA) at UMBC, and regularly participate in the Black&Gold campaigns via our social media channels.

We are making use of some reserve funds to offer summer research scholarships to our graduate students, to increase the travel stipend we support for graduate students (from $800 to $1000 effective FY26), and to support undergraduate research and awards.

Our department maintains a healthy fund for hiring part-time instructors, and we could consider a slight increase in our offerings by part-time instructors in order to reduce the teaching load for a full-time faculty member to focus on programmatic initiatives. This has not been a regular part of our practice as a department, and close to 85-90% of our classes are taught by full-time faculty and in-person (on average). While this reflects an important departmental value, there is room to make adjustments so that we can also make progress towards these broader program goals.

Since 2023, we have reinvigorated our engagement in the Conservation and Environmental Research Area (CERA) spaces on campus. Our department helps manage CERA on behalf of the Provost's office, and the CERA committee has made several steps to improve access to these spaces and use of them for research and teaching. We are committed to continuing to expand this access and programming, and see this as another strategy for leveraging existing resources to enhance opportunities for our students and programs.