MEMORANDUM

TO: Boris Lushniak  
   Dean, School of Public Health

FROM: Elizabeth Beise  
   Associate Provost for Academic Planning and Programs

SUBJECT: Proposal to Establish a Ph.D. in Environmental Health Sciences  
   (PCC Log. No. 16008)

On February 17, 2017, the Board of Regents approved your proposal to establish a Ph.D. in Environmental Health Sciences. On September 27, 2017, the Maryland Higher Education Commission gave final approval. A copy of the approved proposal is attached.

The change is effective Spring 2018. Please ensure that the change is fully described in the Graduate Catalog and in all relevant descriptive materials.

MDC/
Enclosure

cc: Dylan Roby, Chair, Senate PCC Committee  
    Barbara Gill, Office of Enrollment Management  
    Reka Montfort, University Senate  
    Huifang Pan, Division of Information Technology  
    Pam Phillips, Institutional Research, Planning & Assessment  
    Jason Speck, University Archives  
    Linda Yokoi, Office of the Registrar  
    Ryan Long, Graduate School  
    Coke Farmer, School of Public Health  
    Stephen Roth, Maryland Institute for Applied Environmental Health
September 27, 2017

Dr. Wallace D. Loh
President
University of Maryland, College Park
Main Administration Building
College Park, MD 20742

Dear Dr. Loh:

The Maryland Higher Education Commission has reviewed a request from University of Maryland, College Park to offer a new Doctor of Philosophy (Ph.D.) in Environmental Health Sciences. I am pleased to inform you that the program has been approved. This decision is based on an analysis of the program proposal in conjunction with the law and regulations governing academic program approval, in particular Code of Maryland Regulations (COMAR) 13B.02.03. As required by COMAR, the Commission circulated the program proposal to the Maryland higher education community for comment and objection. No objections were received during the 30-day circulation period. The program meets COMAR’s requirements and demonstrates potential for success, an essential factor in making this decision.

For the purposes of providing enrollment and degree data to the Commission, please use the following HEGIS and CIP codes:

<table>
<thead>
<tr>
<th>Program Title</th>
<th>Award Level</th>
<th>HEGIS</th>
<th>CIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health Sciences</td>
<td>Ph.D.</td>
<td>1214.04</td>
<td>51.2202</td>
</tr>
</tbody>
</table>

Should University of Maryland, College Park desire to make a substantial modification to the program in the future, review by the Commission will be necessary. I wish you continued success.

Sincerely,

[Signature]

Dr. James D. Fielder
Secretary

JDF:MK:jmc

C:  Mr. Michael Colson, Senior Coordinator for Academic Programs
    Ms. Terri Hollander, Associate Vice Chancellor for Academic Affairs
    17190 - UMCP Ph.D. in Environmental Health Sciences
OFFICE OF THE CHANCELLOR

February 22, 2017

Dr. Wallace Loh
President
University of Maryland, College Park
1101 Main Administration Bldg.
College Park, MD 20742

Dear Wallace:

This is to officially advise you that the Board of Regents, meeting in public session on Friday, February 17, 2017 at the Universities at Shady Grove, approved for the University of Maryland, College Park the proposal to offer the Ph.D. and M.S. in Environmental Sciences.

The Committee on Education Policy and Student Life, meeting in public session on January 17, 2017, recommended approval.

Sincerely yours,

Robert L. Caret
Chancellor

RLC/weo

cc: Joann Boughman
Teri Hollander
Janice Doyle
I am pleased to forward for your consideration the attached legislation entitled, “PCC Proposal to Establish a Ph.D. in Environmental Health Sciences.” Andrew Harris, Chair of the Programs, Curricula, & Courses (PCC) Committee, presented the proposal. The University Senate approved the proposal at its November 2, 2016, meeting.

We request that you inform the Senate Office of your decision as well as any subsequent action related to your conclusion.

Enclosure: Approval of the PCC Proposal to Establish a Ph.D. in Environmental Health Sciences
Senate Document # 16-17-17

JG/rm

Cc: Mary Ann Rankin, Senior Vice President and Provost
    Reka Montfort, Executive Secretary and Director, University Senate
    Michael Poterala, Vice President and General Counsel
    Cynthia Hale, Associate Vice President for Finance and Personnel
    John Bertot, Associate Provost for Faculty Affairs
    Elizabeth Beise, Associate Provost for Academic Planning & Programs
    Sylvia B. Andrews, Academic Affairs
    Andrew Harris, Chair of the PCC Committee
    Jane Clark, Dean, School of Public Health
    Stephen Roth, Associate Dean of the School of Public Health and Interim Director of Maryland Institute for Applied and Environmental Health

Approved: ______________________ Date: 11-04-2016
Wallace D. Loh
President
# Program/Curriculum/Unit Proposal

**Program:** Proposal for PhD program in Environmental Health Sciences

**Department/Unit:** Maryland Institute for Applied Environmental Health

**College/School:** School of Public Health

**Proposal Contact Person (with email):** Stephen Roth, sroth1@umd.edu

<table>
<thead>
<tr>
<th>Type of Action (check one):</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] Curriculum change (includes modifying minors, concentrations/specializations and creating informal specializations)</td>
</tr>
<tr>
<td>[ ] Curriculum change is for an LEP Program</td>
</tr>
<tr>
<td>[ ] Rename a program or formal Area of Concentration</td>
</tr>
<tr>
<td>[ ] Establish/Discontinue a formal Area of Concentration</td>
</tr>
<tr>
<td>[ ] Other:</td>
</tr>
<tr>
<td>[ ] Establish a new academic degree/certificate program</td>
</tr>
<tr>
<td>[ ] Create an online version of an existing program</td>
</tr>
<tr>
<td>[ ] Establish a new minor</td>
</tr>
<tr>
<td>[ ] Suspend/Discontinue a degree/certificate program</td>
</tr>
<tr>
<td>[ ] Establish a new Master or Certificate of Professional Studies program</td>
</tr>
<tr>
<td>[ ] New Professional Studies program will be administered by Office of Extended Studies</td>
</tr>
</tbody>
</table>

*Italics indicate that the proposal must be presented to the full University Senate for consideration.*

**Approval Signatures** - Please print name, sign, and date. For proposals requiring multiple unit approvals, please use additional cover sheet(s).

1. Department Committee Chair: Amy E. Sepehri, [Signature] 2/22/16
2. Department Chair: Stephen M. Roth, [Signature] 2/21/16
3. College/School PCC Chair: Robin Sawyer, [Signature] 4/11/16
4. Dean: Jane E. Clarke, [Signature] 4/11/16
5. Dean of the Graduate School (if required): [Signature] 10/4/16
6. Chair, Senate PCC: Andrew Harris, [Signature] 10/7/16
7. University Senate Chair (if required): Elizabeth J. Beise, [Signature] 10/4/17

**Instructions:**
When approved by the dean of the college or school, please send the proposal and signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus-5031, and email the proposal document as an MSWord attachment to pcc-submissions@umd.edu.

**Summary of Proposed Action (use additional sheet if necessary):**
This proposal seeks to establish a PhD degree in Environmental Health Sciences for the School of Public Health, administered by the faculty within the Maryland Institute for Applied Environmental Health (MIAEH). The degree will focus on human health, environmental epidemiology, risk assessment, environmental justice, and occupational health consistent with the areas of expertise of the MIAEH faculty. MIAEH currently offers the Master of Public Health in Environmental Health Sciences as well as a PhD program in Toxicology that is administered by the USM. Because toxicology is the focus area of only a small minority of our faculty, student recruitment is a challenge (e.g., students are reluctant to be perceived as toxicologists when they are training and developing research foci within other areas of environmental health science). Thus, in order to better support the training of doctoral students and provide a better alignment of career aspirations with faculty expertise, we are proposing this new PhD program.

**Unit Code(s) (to be entered by the Office of Academic Planning and Programs):**

<table>
<thead>
<tr>
<th>Unit Code: 012033001331701</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPHL-Maryland Institute for Applied Environmental Health</td>
</tr>
</tbody>
</table>
PROPOSAL FOR
NEW INSTRUCTIONAL PROGRAM
UNIVERSITY OF MARYLAND AT COLLEGE PARK, MARYLAND

Ph.D. in Environmental Health Sciences

School of Public Health

Dean Jane Clark

Ph.D. Fall 2016 (with new admits anticipated Fall 2017)
I. OVERVIEW and RATIONALE

A. Briefly describe the nature of the proposed program and explain why the institution should offer it.

This is a proposal to establish a Ph.D. program in Environmental Health Sciences within the School of Public Health, administered by the faculty of the Maryland Institute for Applied Environmental Health (MIAEH). The degree will focus on human health, environmental epidemiology, risk assessment, environmental justice, and occupational health, consistent with the areas of expertise of the MIAEH faculty. MIAEH currently offers students flexible and individualized programs of study that lead to the Master of Public Health in Environmental Health Sciences. In 2010, MIAEH also became the UMD home of the USM-wide doctoral program in Ph.D. Toxicology (Toxicology Ph.D. curriculum shown in Appendix 1). Because toxicology is the focus area of only a small minority of our faculty, student recruitment has been challenging: students are reluctant to be perceived as toxicologists when they are training and developing research foci within other areas of environmental health science. Thus, in order to better support the training of doctoral students and provide a better alignment of career aspirations with faculty expertise, we are proposing a new Ph.D. program better matched to the full range of research within MIAEH.

Clarifying the differences between toxicology and environmental health sciences is important to understanding the basis for the present proposal. Environmental health is a branch of public health centered on all aspects of the natural and built environment that may affect human health. In contrast, toxicology is the study of the effect of chemicals and physical agents on living organisms. While there is overlap between the two fields (e.g., the study of chemical agents on human health), the research foci are quite different. Environmental health research includes environmental epidemiology, risk assessment, environmental justice, occupational health, among others, while toxicology has a stronger linkage with chemistry and pharmacology. As an example, the USM-administered Ph.D. in Toxicology has its largest student base from the UMB Schools of Pharmacy and Medicine with research primarily aligned with pharmacology faculty. Revising the Ph.D. in Toxicology would not serve the needs of environmental health students or faculty, nor would it serve UMB’s needs; the fields are different, and students will anticipate different career options. The breadth of research areas in environmental health sciences necessitates the establishment of a doctoral degree dedicated to the study and advancement of environmental health sciences, considered one of the five core elements of the field of public health.

MIAEH was established in 2006 with a mission to carry out research on a broad range of environmental factors and their effects on human health. Faculty members in MIAEH collaborate with state, federal, international and private agencies to develop research solutions that address pressing environmental and occupational health problems. Students will become experts in areas including exposure assessment, environmental epidemiology, environmental microbiology, children’s environmental health, environmental justice, occupational health, and risk assessment. They will also obtain a broad appreciation of public health as required for students graduating from a School of Public Health accredited
by the Council on Education in Public Health.

This degree program is also quite distinct from the environmental science-related Ph.D. programs offered by AGNR and CMNS, which focus primarily on ecosystem health and environmental science (e.g., graduate programs in Environmental Science and Technology and the system program in Marine, Estuarine and Environmental Sciences currently offered by other colleges, AGNR and CMNS, respectively).

Nearly every top 40 School of Public Health in the U.S. offers a Ph.D. in Environmental Health Sciences, and UMD will be more competitive in attracting top doctoral students with such a degree. The only Ph.D. program in Environmental Health Sciences within the state of Maryland is offered by Johns Hopkins University, a private institution, with one of the largest programs in the U.S. (15-20 doctoral enrollments per year). The only other Environmental Health Sciences doctoral programs near the mid-Atlantic region are at the following locations (enrollment data included, as determined from accreditation reports): West Virginia University (enrolled 2 students per year AY2013 and 2014); University of Pittsburgh (program size of 11 students in 2014); University of North Carolina (reports 5-10 enrolled students per year); and Rutgers University (enrolled 1-4 students per year in AY2013-15 – 4-7 MPH). UMD has lost top-quality doctoral students to peer programs because of the lack of a Ph.D. program. Our unique focus areas in environmental justice, cumulative burden of exposure, water re-use innovations (USDA-funded CONSERVE Center of Excellence), and climate change consequences on health will continue to distinguish UMD from peer schools to ensure strong recruitment of top-quality students.

Development of the environmental health workforce has been a key concern of the U.S. Department of Health and Human Services for many years. For example, the Healthy People 2010 publication articulated the concern that public health infrastructure in several areas, including environmental health, was lacking and that workforce development opportunities need to be expanded. In particular for the present proposal, the Centers for Disease Control and Prevention (CDC) has noted the paucity of leaders in environmental health and raised the concern that impending retirements and vacancies will leave the environmental health leadership ranks severely understaffed (supporting documents and statements can be found at http://www.cdc.gov/nceh/ehs/activities/training.htm). As such, the development of a doctoral program in environmental health sciences at a public land-grant university will help support the workforce development needs of the field.

B. How big is the program expected to be? From what other programs serving current students, or from what new populations of potential students, onsite or offsite, are you expecting to draw?

We expect a typical doctoral student population of approximately 15 students, with few if any students joining the existing Toxicology Ph.D. program into the future. As such, we are effectively transitioning our recruitment efforts away from the Toxicology Ph.D. program to the Ph.D. program in Environmental Health Sciences and foresee no substantial change in resource requirements or administrative burden with the establishment of this degree program. The Toxicology Ph.D. program currently has 7 students, reflecting the challenges
with recruitment into this program. The majority of faculty anticipate mentoring 1-3 doctoral students, based mainly on the ability to fund through extramurally funded research assistantships. Thus, we anticipate a slightly increased enrollment with higher quality students compared to our current program size, and enrollments will be matched to extramural funding to ensure adequate student funding support. We expect many existing Toxicology students will transition to the new Ph.D. program once available (especially those early in their programs), although we will maintain both degrees into the foreseeable future to ensure support for student completion.

II. CURRICULUM

A. Provide a full catalog description of the proposed program, including educational objectives and any areas of concentration.

Students in the doctoral program in Environmental Health Sciences at the Maryland Institute for Applied Environmental Health (MIAEH) in the School of Public Health will master an essential core of knowledge in environmental and occupational health, epidemiology and biostatistics. Elective courses and rotations with faculty field studies and laboratories will offer students the knowledge and skills needed to specialize within the broader area of environmental health and become independent researchers.

Degree Requirements

The Ph.D. program in Environmental Health Sciences consists of a minimum of 46 credit hours of graduate courses depending on the incoming student’s previous coursework. In particular, students without an MPH degree will require additional coursework as required by the public health accrediting body (CEPH). Graduate courses include (1) core courses within environmental health, epidemiology and biostatistics; (2) supporting courses in environmental health research, ethics, public health, and grant writing; (3) specialized courses selected within the research foci; and (4) dissertation credits. Program requirements for a Ph.D. degree also include successful completion of a written and oral comprehensive exam, oral defense of a written dissertation research proposal, and a minimum of 12 credits of Ph.D. dissertation research, written dissertation, and a final dissertation defense. The program can be completed on either a full- or part time basis. It is anticipated that students will complete more than the minimum number of credits.

The curriculum for the Environmental Health Sciences Ph.D. program is designed to provide an essential core of knowledge in environmental and occupational health, together with elective courses that offer students the background needed to specialize within this broad area.

Students are able to customize their selection of courses and lab rotations based on their specific career objectives. Students must file a preliminary program of study with the graduate program director before registering for their first semester of classes. They will submit an amended, final plan of study before the start of their second semester, approved by a program of study committee.
All students will complete a comprehensive written and oral qualifying examination overseen by a committee of graduate faculty, of whom the majority of members will be from within MIAEH. After passing the qualifying examinations, the student will be advanced to candidacy. Generally, the examining committee will serve as the dissertation committee. The candidate will then write a dissertation research proposal in consultation with the committee, submit the written proposal to the committee at least two weeks prior to a scheduled oral defense of the proposal, and finalize the proposal following the oral defense. The procedures for the dissertation defense and examining committee are as specified in the Graduate School Catalog. In general, student committees are formed with three MIAEH graduate faculty, with additional committee members coming from supporting units across campus and occasionally off-campus. A graduate committee oversees admissions and ensures that faculty workload burdens around advising and committee support are equitably spread across research foci (in addition to considering extramural funding support).

B. List the courses (number, title, semester credit hours) that would constitute the requirements and other components of the proposed program. Provide a catalog description for any courses that will be newly developed or substantially modified for the program.

See Table 1: Ph.D. Program in Environmental Health Sciences

The only newly developed course will be MIEH700 (bold in Table 1), planned as a follow-up (advanced) course after MIEH600. VPAC for MIEH700 will be submitted in tandem with this PCC proposal. The catalog description for MIEH700 is as follows:

**MIEH700:** (Pre-req: MIEH600) Advanced analysis of the chemical, physical and biological hazards present in our living and working environment and their effects on human health. A focus on analysis of recent research and development of new hypotheses. Topics include: exposure assessment, environmental justice, occupational health and safety, children’s environmental health, ambient and indoor air pollution, food-borne diseases, solid and hazardous wastes, water resources, risk assessment, ecological issues and environmental laws.
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Courses (24 Required Credits)</strong></td>
<td></td>
</tr>
<tr>
<td>MIEH 600 Foundations of Environmental Health</td>
<td>3</td>
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<tr>
<td><strong>MIEH 700 Applied Environmental Health</strong></td>
<td>3</td>
</tr>
<tr>
<td>MIEH 720 Principles of Toxicology</td>
<td>3</td>
</tr>
<tr>
<td>MIEH 740 Risk Assessment</td>
<td>3</td>
</tr>
<tr>
<td>MIEH 771 Exposure Assessment of Environmental Hazards</td>
<td>3</td>
</tr>
<tr>
<td>EPIB 610 Epidemiology I</td>
<td>3</td>
</tr>
<tr>
<td>EPIB 650 Biostatistics I</td>
<td>3</td>
</tr>
<tr>
<td>EPIB 651 Biostatistics II</td>
<td>3</td>
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<tr>
<td><strong>Supporting Courses (11 to 19 Required Credits)</strong></td>
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</tr>
<tr>
<td>MIEH 609 Methods in Toxicology and Environmental Health (1 or 2 rotations)**</td>
<td>3 to 6</td>
</tr>
<tr>
<td>EPIB 641 Ethics in Public Health</td>
<td>1</td>
</tr>
<tr>
<td>MIEH 688 Environmental Health Seminar**</td>
<td>3</td>
</tr>
<tr>
<td>Course(s) that will expose the student to concepts in health behavior and health services administration (This could include HLTH 665, HLSA 601 or a survey course that covers all five foundation areas of public health.)</td>
<td>1 to 6</td>
</tr>
<tr>
<td><strong>Specialization Area (12 to 15 Credits)</strong></td>
<td></td>
</tr>
<tr>
<td>The specialization area would be created by and tailored to each student. If the student takes 2 lab rotations, s/he would take 12 credits of specialization. If s/he takes 1 lab rotation, s/he would take 15 credits of specialization.</td>
<td>12 to 15</td>
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<tr>
<td><strong>Dissertation (12 Required Credits)</strong></td>
<td></td>
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<tr>
<td>MIEH 899 Doctoral Dissertation Research</td>
<td>12</td>
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</tbody>
</table>

* Students could waive out of some of these courses with coursework taken at UMD or in previous master's programs.
** Students would not be able to waive out of all rotations or the seminar requirements. Rotations can be in physical labs or with faculty conducting non-laboratory based research. At least 1 rotation must be outside of the students focus area.

*** Students would not be able to waive out of any of the 12 to 15 credits required for the specialization area. No more than 6 credits of MIEH 898 could be taken as part of the specialization area.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Year 1</td>
<td>MIEH 600 Foundations of Environmental Health</td>
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<tr>
<td></td>
<td>MIEH 609 Methods in Toxicology and Environmental Health</td>
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<tr>
<td></td>
<td>EPIB 650 Biostatistics I</td>
<td>3</td>
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<tr>
<td></td>
<td>MIEH 688 Environmental Health Seminar</td>
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<tr>
<td></td>
<td><strong>MIEH 700</strong> Applied Environmental Health</td>
<td>3</td>
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<tr>
<td></td>
<td>EPIB 610 Epidemiology I</td>
<td>3</td>
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<td></td>
<td>MIEH 688 Environmental Health Seminar</td>
<td>1</td>
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<tr>
<td></td>
<td>HLTH 665 – Health Behavior</td>
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<tr>
<td>Year 2</td>
<td>MIEH 740 Risk Assessment</td>
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<td></td>
<td>MIEH 771 Exposure Assessment of Environmental Hazards</td>
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<tr>
<td>Year 3</td>
<td>Course Description</td>
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<tr>
<td></td>
<td>MIEH 688 Environmental Health Seminar</td>
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<td>MIEH 609 Methods in Toxicology and Environmental Health</td>
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<td></td>
<td>EPIB 651 Biostatistics II</td>
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<td></td>
<td>MIEH 720 Principles of Toxicology</td>
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<td></td>
<td>EPIB 641 Ethics in Public Health</td>
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<tr>
<td></td>
<td>HLTH 665 – Health Behavior I</td>
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<td></td>
<td>MIEH 688 Environmental Health Seminar</td>
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<tr>
<td></td>
<td>Specialization Course</td>
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<td></td>
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<td></td>
<td>Specialization Course</td>
<td>3</td>
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<tr>
<td></td>
<td>HLSA 601 - Introduction to Health Systems</td>
<td>3</td>
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<tr>
<td></td>
<td>MIEH 689 – Independent Study</td>
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<table>
<thead>
<tr>
<th>Year 4</th>
<th>Course Description</th>
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<tr>
<td></td>
<td>KNES 771 Grant Writing or Equivalent</td>
<td>3</td>
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<tr>
<td></td>
<td>MIEH 688 Environmental Health Seminar</td>
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<td></td>
<td>Specialization Course</td>
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<tr>
<td></td>
<td>Specialization Course</td>
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<tr>
<td></td>
<td>MIEH 689/898 Independent Study</td>
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<td></td>
<td>MIEH 899 Doctoral Dissertation Research</td>
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<table>
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<th>Year 5</th>
<th>Course Description</th>
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<tr>
<td></td>
<td>MIEH 899 Doctoral Dissertation Research</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>MIEH 899 Doctoral Dissertation Research</td>
<td>6</td>
</tr>
</tbody>
</table>
C. Describe any selective admissions policy or special criteria for students selecting this field of study.

Admission to the program is limited to Ph.D. students. We plan to admit both BS and MS (or equivalent) degree holders depending on their qualifications. Applicants will typically hold degrees in biology, environmental sciences, engineering, public health, chemistry, or related fields. While we are submitting a separate MS program in Environmental Health Sciences, we will not actively recruit students into the MS program. The MS program is offered as an exit path for doctoral candidates who cannot or choose not to complete the Ph.D., or to those students who successfully complete the requirements and opt to obtain the additional credential.

Program requirements for the MS degree include a minimum of 31 course credits, including completion of either a non-thesis project or MS thesis.

Application Requirements:

1. Minimum 3.0 undergraduate GPA; 2. Undergraduate transcripts; 3. GRE scores taken within the past 5 years; 4. 3 letters of recommendation that address the applicant's academic capabilities and probability of success in graduate school; 5. Statement of goals and interests and their congruence with those of the program; 6. Relevant academic/work experience, including previous coursework in biology, chemistry, mathematics, statistical methods, and/or statistical software packages.

To apply to the Ph.D. program in Environmental Health Sciences, applicants must complete their application in SOPHAS: www.sophas.org

III. STUDENT LEARNING OUTCOMES AND ASSESSMENT

A. List the program's learning outcomes and explain how they will be measured.

B. Include a general assessment plan for the learning outcomes. (In lieu of a narrative for both IIIA and IIB, you may attach the program's learning outcomes assessment forms.)

Competencies, Outcomes, and Assessments

1. Synthesize environmental health knowledge, including explaining and analyzing key theories, principles, methods and controversies, and identify opportunities to advance the field of environmental health.

Measure: Successful completion of the qualifying examination.

Criterion: 100% of graduates will pass the examination.
Assessment: Student comprehensive examination performance will be assessed yearly.

2. **Develop testable hypotheses that will advance the field of environmental health.**

Measure: Successful completion of the qualifying examination, dissertation research proposal, and oral defense of the dissertation proposal.

Criterion: 100% of graduates will pass the examination, and prepare and defend a research proposal.

Assessment: The rigor and quality of the research proposal components of these activities will be assessed for each student and compiled annually.

3. **Design and conduct research studies, analyze data and test hypotheses that advance the science of environmental health.**

Measure: Successful completion of dissertation research and submission of a completed dissertation.

Criterion: 80% of graduates will successfully defend and submit a dissertation within 5 years and 95% within 6 years of matriculation.

Assessment: The time to graduation will be assessed after there are at least six graduates from the program and annually thereafter.

4. **Effectively communicate results of environmental health research to the scientific community.**

Measure: Successful publication of research in peer reviewed journals and acceptance of abstracts at scientific conferences.

Criterion: 100% of graduates will present research either as posters or podium presentations at scientific meetings; 100% will have submitted three research papers to peer reviewed journals; 80% will have at least one paper accepted; and 50% will have two papers accepted for publication prior to defending their dissertation.

Assessment: Student CVs will be reviewed at program completion and publications and presentations will be confirmed by the advisor or other faculty.
IV. FACULTY AND ORGANIZATION

A. Who will provide academic direction and oversight for the program?

The Maryland Institute for Applied Environmental Health (MIAEH) will provide academic direction and oversight for the program, in collaboration with our colleagues in SPH and across campus.

B. If the program is not to be housed and administered within a single academic unit, provide details of its administrative structure.

N/A

V. OFF CAMPUS PROGRAMS

Not applicable.

VI. OTHER ISSUES

A. Describe any cooperative arrangements with other institutions or organizations that will be important for the success of this program.

None.

B. Will the program require or seek accreditation? Is it intended to provide certification or licensure for its graduates? Are there academic or administrative constraints as a consequence?

No.

VII. COMMITMENT TO DIVERSITY

Identify specific actions and strategies that will be utilized to recruit and retain a diverse student body.

The MIAEH faculty are a diverse group (e.g., 50% women; 50% underrepresented minorities) committed to recruiting, retaining, and graduating a diverse student body. Many of the faculty focus their research efforts on issues that impact health disparities. The faculty will use their networks of colleagues and professional organizations to ensure a diverse pool of applicants from which to recruit, retain, and graduate a diverse and excellent student body.

VIII. REQUIRED PHYSICAL RESOURCES
A. Additional library and other information resources required to support the proposed program. You must include a formal evaluation by Library staff.

No additional library resources are required, as evaluated by the UMD Libraries staff.

B. Additional facilities, facility modifications, and equipment that will be required. This is to include faculty and staff office space, laboratories, special classrooms, computers, etc.

None required.

C. Impact, if any, on the use of existing facilities and equipment. Examples are laboratories, computer labs, specially equipped classrooms, and access to computer servers.

Because we anticipate that nearly all of our future Ph.D. students will matriculate into the Ph.D. program in Environmental Health Sciences rather than the Ph.D. program in Toxicology, we foresee little impact on existing facilities. Student numbers should be very close to those anticipated for the Ph.D. in Toxicology. The School of Public Health and MIAEH have adequate desk space for funded students and the research staff of our faculty.

IX. RESOURCE NEEDS and SOURCES

Describe the resources that are required to offer this program, and the source of these resources. Project this for five years. In particular:

A. List new courses to be taught, and needed additional sections of existing courses. Describe the anticipated advising and administrative loads. Indicate the personnel resources (faculty, staff, and teaching assistants) that will be needed to cover all these responsibilities.

MIAEH will offer MIEH700, the only new course required for the proposed curriculum, every 2-3 semesters as needed to ensure student progress to degree completion. Any of our MIAEH faculty would be able to teach this course and we anticipate a rotation of faculty instructors. We anticipate no significant change in enrollments of our other courses due to these changes. MIEH700 would be a potential elective course for students in other SPH and campus master’s and doctoral programs; we expect as many as 20% of seats would come from such students.

MIAEH has the necessary faculty to teach the necessary courses and advise doctoral candidates. No new resources are requested.
B. List new faculty, staff, and teaching assistants needed for the responsibilities in A, and indicate the source of the resources for hiring them.

None anticipated or needed.

C. Some of these teaching, advising, and administrative duties may be covered by existing faculty and staff. Describe your expectations for this, and indicate how the current duties of these individuals will be covered, and the source of any needed resources.

Our current faculty are in a position to add MIEH700 to our existing course schedule by minor shifting of some elective course offerings. We anticipate no significant burden with this course addition.

D. Identify the source to pay for the required physical resources identified in Section VIII above.

Not applicable.

E. List any other required resources and the anticipated source for them.

None.

F. Provide the information requested in Table 1 and Table 2 (for Academic Affairs to include in the external proposal submitted to USM and MHEC).

See attached.
Appendix 1: Toxicology Ph.D. curriculum requirements

The doctoral program in Toxicology is a 58-credit (minimum) professional degree. Dependent upon entry level qualifications, all Ph.D. students will complete a minimum of:

- 12 credits in Toxicology and Environmental and Occupational Health
- two Laboratory Rotations for 3 credits each
- 3 credits of Environmental Health seminar
- 6 credits each to cover the Basic Biostatistics and Epidemiology courses
- 1 credit in Scientific Ethics
- 6 credits in each of two specialized areas:
  - Advanced Epidemiology and Biostatistics
  - Analytical Chemistry
  - Pharmacology
  - Pathology/Immunology/Microbiology
  - Environmental Science/Ecology/Climate
  - Environmental Justice
TABLE 1: RESOURCES

<table>
<thead>
<tr>
<th>Resources Categories</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reallocated Funds</td>
<td>$736,820</td>
<td>$906,874</td>
<td>$934,080</td>
<td>$962,102</td>
<td>$990,965</td>
</tr>
<tr>
<td>2. Tuition/Fee Revenue (c+g below)</td>
<td>$121,115</td>
<td>$124,748</td>
<td>$128,491</td>
<td>$132,346</td>
<td>$136,316</td>
</tr>
<tr>
<td>a. #FT Students</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>b. Annual Tuition/Fee Rate</td>
<td>$8,315</td>
<td>$8,564</td>
<td>$8,821</td>
<td>$9,086</td>
<td>$9,359</td>
</tr>
<tr>
<td>c. Annual FT Revenue (a x b)</td>
<td>$108,095</td>
<td>$111,338</td>
<td>$114,678</td>
<td>$118,118</td>
<td>$121,662</td>
</tr>
<tr>
<td>d. # PT Students</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>e. Credit Hour Rate</td>
<td>$651</td>
<td>$671</td>
<td>$691</td>
<td>$711</td>
<td>$733</td>
</tr>
<tr>
<td>f. Annual Credit Hours</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>g. Total Part Time Revenue (d x e x f)</td>
<td>$13,020</td>
<td>$13,411</td>
<td>$13,813</td>
<td>$14,227</td>
<td>$14,654</td>
</tr>
<tr>
<td>3. Grants, Contracts, &amp; Other External Sources</td>
<td>$698,750</td>
<td>$606,591</td>
<td>$624,788</td>
<td>$643,532</td>
<td>$662,838</td>
</tr>
<tr>
<td>4. Other Sources</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL (Add 1 - 4)</td>
<td>$1,556,685</td>
<td>$1,638,213</td>
<td>$1,687,359</td>
<td>$1,737,980</td>
<td>$1,790,120</td>
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TABLE 2: EXPENDITURES

<table>
<thead>
<tr>
<th>Expenditure Categories</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Faculty (b+c below)</td>
<td>$585,200</td>
<td>$753,445</td>
<td>$776,048</td>
<td>$799,330</td>
<td>$823,310</td>
</tr>
<tr>
<td>a. #FTE</td>
<td>4.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>b. Total Salary</td>
<td>$440,000</td>
<td>$566,500</td>
<td>$583,495</td>
<td>$601,000</td>
<td>$619,030</td>
</tr>
<tr>
<td>c. Total Benefits</td>
<td>$145,200</td>
<td>$186,945</td>
<td>$192,553</td>
<td>$198,330</td>
<td>$204,280</td>
</tr>
<tr>
<td>2. Admin. Staff (b+c below)</td>
<td>$75,810</td>
<td>$75,345</td>
<td>$77,605</td>
<td>$79,933</td>
<td>$82,331</td>
</tr>
<tr>
<td>a. #FTE</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>b. Total Salary</td>
<td>$57,000</td>
<td>$56,650</td>
<td>$58,350</td>
<td>$60,100</td>
<td>$61,903</td>
</tr>
<tr>
<td>c. Total Benefits</td>
<td>$18,810</td>
<td>$18,695</td>
<td>$19,255</td>
<td>$19,833</td>
<td>$20,428</td>
</tr>
<tr>
<td>3. Total Support Staff (b+c below)</td>
<td>$75,810</td>
<td>$78,084</td>
<td>$80,427</td>
<td>$82,840</td>
<td>$85,325</td>
</tr>
<tr>
<td>a. #FTE</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>b. Total Salary</td>
<td>$57,000</td>
<td>$58,710</td>
<td>$60,471</td>
<td>$62,285</td>
<td>$64,154</td>
</tr>
<tr>
<td>c. Total Benefits</td>
<td>$18,810</td>
<td>$19,374</td>
<td>$19,956</td>
<td>$20,554</td>
<td>$21,171</td>
</tr>
<tr>
<td>4. GA stipends</td>
<td>$442,635</td>
<td>$342,792</td>
<td>$353,076</td>
<td>$363,668</td>
<td>$374,578</td>
</tr>
<tr>
<td>5. GA health benefits</td>
<td>$135,000</td>
<td>$139,050</td>
<td>$143,222</td>
<td>$147,518</td>
<td>$151,944</td>
</tr>
<tr>
<td>5. Tuition Remission</td>
<td>$121,115</td>
<td>$124,748</td>
<td>$128,491</td>
<td>$132,346</td>
<td>$136,316</td>
</tr>
<tr>
<td>6. Equipment</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>7. Library</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>8. New or Renovated Space</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>9. Other Expenses: Operational Expenses</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>TOTAL (Add 1 - 9)</td>
<td>$1,435,570</td>
<td>$1,513,464</td>
<td>$1,558,868</td>
<td>$1,605,634</td>
<td>$1,653,804</td>
</tr>
</tbody>
</table>
February 29, 2016

Dr. Stephen Roth
Professor and Interim Director
Maryland Institute for Applied Environmental Health
School of Public Health
University of Maryland
College Park, Maryland 20742

Dear Dr. Roth,

The faculty of the Department of Environmental Science and Technology in our Ecosystem Health and Natural Resource Management Graduate Program have reviewed both the MS and PhD Program Proposals in Environmental Health Sciences. We strongly support the development of these two degree programs and will collaborate fully with you in ensuring that they are a success.

Please contact me if you have any further questions or need assistance at wbowerma@umd.edu or by phone at 301-405-1306. Good luck.

Sincerely,

William W. Bowerman, Ph.D.
Professor and Chair
Subject: Re: FW: PhD Proposal for Env Health Sci
Date: Sunday, February 28, 2016 at 10:29:20 PM Eastern Standard Time
From: Wolfgang Losert
To: Robert L. Infantino Jr, Stephen M. Roth

Dear Steve,

the proposal has CMNS support. No concerns were raised by the CMNS graduate program directors.

best regards
Wolfgang Losert

On 2/19/2016 8:38 AM, Robert L. Infantino Jr wrote:

Hi Steve,
I am forwarding this proposal to Wolfgang Losert. He is serving as my fellow Associate Dean for faculty affairs/research and graduate programs. Wolfgang has been shepherding PCC related grad program matters. I suspect he will consult with our grad directors about your proposal to see if they have any inputs, and then will get back to you with support.
Bob

Robert L. Infantino, Ph.D.
Associate Dean
College of Computer, Mathematical, and Natural Sciences
2300 Symons Hall
University of Maryland College Park, MD 20742-5511
Phone: (301) 405-6892 FAX: (301) 314-9949
e-mail: rinfanti@umd.edu
http://biology.umd.edu/faculty/robertinfantino

From: Stephen M. Roth
Sent: Friday, February 19, 2016 8:35 AM
To: Robert L. Infantino Jr <rinfanti@umd.edu>
Cc: Stephen M. Roth <sroth1@umd.edu>
Subject: PhD Proposal for Env Health Sci

Dear Roh,

Please find attached a forthcoming PCC proposal for a PhD program in Environmental Health Sciences coming from SPH. Though CMNS doesn’t have anything that really crosses over this program, having
your CMNS approval would be valuable as we move into the PCC process. I would appreciate very much your support of this program. Please contact me with any questions.

Thank you,

Steve

Stephen M. Roth, Ph.D.
Professor & Interim Director
Maryland Institute for Applied Environmental Health
School of Public Health
University of Maryland
College Park, MD 20742
301-405-2504; fax 301-405-8397
http://www.sph.umd.edu/miah

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Wolfgang Losert, Professor of Physics
Interim Associate Dean
Director, Partnership for Integrative Cancer Research
College of Computer, Mathematical, and Natural Sciences
University of Maryland

Physical Sciences Complex Room 1147, p: 301-405-0629
http://www.ireap.umd.edu/losertlab/
DATE: April 15, 2016

TO: Stephen M. Roth, Professor, Applied Environmental Health (MIAEH), Kinesiology, Office of the Dean & Associate Dean for Educational Innovation; Interim Director of the Maryland Institute for Applied Environmental Health

CC: Daniel Mack, Associate Dean for Collection Strategies and Services, Libraries
Margaret Saponaro, Interim Head, Collection Development, Libraries

FROM: Nedelina Tchangalova, Physical Sciences & Public Health Librarian

RE: Library Resources to Support New Instructional Program – PhD in Environmental Health Sciences

The University of Maryland (UM) Libraries’ mission is “to enable the intellectual inquiry and learning required to meet the education, research and community outreach mission of the University.” Currently they support undergraduate and graduate students in a variety of face-to-face, online and distance learning programs, as well faculty working collaboratively with internal and external partners. The University of Maryland Libraries collections will continue adequately support the instruction and research needs of the newly proposed PhD program in Environmental Health Sciences.

As a department with strong ties with other departments/schools on and off campus, the Maryland Institute for Applied Environmental Health is confident that library resources are readily available and accessible. Ease of access and flexible availability of library materials is paramount, and researchers, as well students expect this flexibility to be coupled with high academic quality and integrity. The current purchasing practices and available collections at the UM Libraries will ensure that these two goals can be met, both now and for the life of the department. In addition, the establishment of the new Collaborative School of Public Health provides even greater access and flexible availability; the School of Public Health (SPH) students and faculty at the University of Maryland—College Park (UMCP) have access to the Health Sciences and Human Services Library at the University of Maryland—Baltimore (UMB). Thus, the broader medical and global health journals available there are a part of UM Libraries available resources without additional expenditures. Moreover, UM Libraries’ existing public health and collections of journals and databases will continue to support the research and teaching needs of the Maryland Institute for Applied Environmental Health.

Public & Environmental Health Science Library Collections

While the Maryland Institute for Applied Environmental Health is part of the School of Public Health, many of their faculty members have secondary appointments to other UMCP departments and UMB. McKeldin Library supports the undergraduate and graduate students in SPH, housing the majority of the monographs and serials pertaining to public health in general, and environmental health in particular. A significant portion of these collections are electronically accessible, both on and off campus, and therefore are not location dependent.

1. Monographs

The Libraries’ current collection of books related to environmental health is sufficient to meet the needs of the department. The ongoing acquisition of scholarly books is expected to be adequately covered through existing acquisition practices and budgeting. As a land grant institution, the University of Maryland already has a tradition of emphasizing public health, including environmental health, epidemiology, environmental justice,
and occupational health, and current collection development practices in the Libraries already support these topics.

At this time, UM Libraries have access to several multidisciplinary ebook collections related to human and environmental health, and health policy and law (Credo Reference, ebrary, EBSCO ebook collection, Gale Virtual Reference Library, Springer, World Scientific eBooks and more). Due to the UM Libraries’ purchasing preference for electronic materials, especially prevalent across the STEM fields, the number of electronic book collections is expected to continue to increase significantly in the coming years.

2. Electronic Resources: Journals and Databases

The Libraries’ current list of subscriptions includes both core and related journals that support research and teaching in public and environmental health, and policy.

A search was performed in Journal Citation Reports 2014 (JCR), a database that uses citation data to rank and determine the impact factor of journals in an academic field. To support the existing courses, at the present time the Libraries provide access to all of the top ten ranked journals from the JCR categories of Environmental Sciences, and Public, Environment & Occupational Health.

While other aspects of public and environmental health, and policy do not fall as neatly into a JCR-specified category, the UM Libraries provide access to numerous highly ranked journals from cross-sections of the JCR categories of Agricultural Economics & Policy, Behavioral Sciences, Family Studies, Law, Political Science, Public Administration, as well as the majority of top ten ranked journals from all engineering disciplines.

Relevant top-ranked titles include:

- Energy & Environmental Science
- Nature Climate Change
- Global Change Biology
- Environmental Health Perspectives
- Frontiers in Ecology and the Environment
- Lancet Global Health
- International Journal of Epidemiology
- Epidemiologic Reviews
- Annual Review of Public Health
- Epidemiology

In addition to journal subscriptions, the UM Libraries subscribe to the following significant databases, that will support the department by providing access to the previously mentioned journals as well as other relevant resources:

- Academic Search Complete (EBSCO)
- Congressional Publications (ProQuest)
- Environmental Science Collection (ProQuest)
- Environmental Studies in Video
- Environment & Energy Daily
- Health Reference Policy Center (EBSCO)
- Public Health (ProQuest)
- PubMed

At this time, the UM Libraries’ purchasing preference is for electronic materials (i.e. those that can be accessed online), a trend that will serve to enhance research and teaching experience. This is especially relevant to the collaboration initiatives, where online flexibility is presented with no reduction in educational and research quality. The UM Libraries purchasing and access priorities are in line with this goal.
Interlibrary Loan & Article Express

With the admission of the University of Maryland into the Committee for Institutional Cooperation (CIC), the academic arm of the Big Ten, our faculty and students are able to take advantage of a number of new materials access options in the coming years. The Libraries joined the CIC UBorrow\(^1\) program, which allows rapid access to the collections of other CIC member libraries.

When resources are not part of our holdings within the sixteen University System of Maryland and Affiliated Institutions (USMAI) libraries, the Interlibrary Loan unit can obtain materials from other libraries at no charge to the student or faculty. Most recent journal articles can be provided through electronic delivery, allowing students and faculty to make the most flexible use of their time.

Additionally, through the auspices of the Interlibrary Loan unit, graduate students and faculty can make use of Article Express, an electronic document delivery service for in-house materials. Article Express allows graduate students and faculty to place requests for book chapters and journal and/or conference papers that are available in print in the Libraries, and have them scanned and delivered electronically within three business days. This service is also free of charge.

Conclusions

At the present time, UM Libraries holdings are adequate to support the proposed new PhD program in environmental health sciences, and current purchasing preferences and trends are especially beneficial for collaborative projects and programs. While it is anticipated that this will continue, the Libraries collections are vulnerable to budget and market fluctuations. Journal collections and other continuing resources remain particularly vulnerable. The level of future support is thus dependent upon ongoing funding and other circumstances affecting continuing subscriptions.

Statement from Associate Dean, Collection Strategies and Services

Nedelina Tchangalova, Physical Sciences and Public Health Librarian, has prepared this report according to standard practices for collection assessment in research libraries. I have reviewed Ms. Tchangalova’s report and I concur with her findings.

Daniel C. Mack

\(^1\) [http://www.cic.net/projects/library/reciprocal-borrowing/uborrow](http://www.cic.net/projects/library/reciprocal-borrowing/uborrow)
UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

X New Instructional Program

Substantial Expansion/Major Modification

Cooperative Degree Program

X Within Existing Resources, or

Requiring New Resources

University of Maryland College Park

Institution Submitting Proposal

Environmental Health Sciences

Title of Proposed Program

Ph.D.

Award to be Offered

Fall 2017

Projected Implementation Date

51.2202

Proposed CIP Code

Stephen M. Roth

Department Contact

301-405-2504

Contact Phone Number

sroth1@umd.edu

Contact E-Mail Address

Signature of President or Designee

Date

05-10-2017
A. Centrality to the University’s Mission and Planning Priorities;

As the flagship campus of the University System of Maryland, and the original 1862 land-grant institution in the State, the University of Maryland, College Park (UMD) has a mission to provide excellent teaching, research, and service to nourish a climate of intellectual growth and provide outstanding instruction in a broad range of academic disciplines and interdisciplinary fields. UMD has as a primary goal to provide knowledge-based programs and services that are responsive to the needs of the citizens across the state and throughout the nation. Education and training of doctoral students who can become the next generation of educators and research leaders is central to this mission. In response to this call, the UMD School of Public Health proposes to offer a new doctoral program in Environmental Health Sciences, overseen by the faculty of the Maryland Institute for Applied Environmental Health (MIAEH). The degree will focus on human health, environmental epidemiology, risk assessment, environmental justice, and occupational health, consistent with the areas of expertise of the MIAEH faculty.

MIAEH was established in 2006 with a mission to carry out research on a broad range of environmental factors and their effects on human health. Faculty members in MIAEH collaborate with state, federal, international and private agencies to develop research solutions that address pressing environmental and occupational health problems. Students will become experts in areas including exposure assessment, environmental epidemiology, environmental microbiology, children’s environmental health, environmental justice, occupational health, and risk assessment. They will also obtain a broad appreciation of public health as required for students graduating from a School of Public Health accredited by the Council on Education in Public Health.

MIAEH currently offers students flexible and individualized programs of study that lead to the Master of Public Health in Environmental Health Sciences. In 2010, MIAEH also became the UMD home of the USM-wide doctoral program in Toxicology. Because toxicology is the focus area of only a small minority of our faculty, student recruitment has been challenging: students are reluctant to be perceived as toxicologists when they are training and developing research foci within other areas of environmental health science. Thus, in order to better support the training of doctoral students and provide a better alignment of career aspirations with faculty expertise, we are proposing a new Ph.D. program better matched to the full range of research within MIAEH. As a result of the existing MPH program, and the anticipated transition of doctoral students from the Toxicology Ph.D. to this new program, MIAEH’s existing resources are sufficient to launch the Ph.D. in Environmental Health Sciences.

B. Adequacy of Curriculum Design and Delivery;

The degree requirements are in Appendix A. The doctoral program consists of a minimum of 46 credit hours of graduate courses, depending on the incoming student’s previous coursework. Elective courses and rotations with faculty field studies and laboratories will offer students the knowledge and skills needed to specialize within the broader area of environmental health and become independent researchers. Students who enter the program without an MPH degree will require additional coursework as required by the public health accrediting body (CEPH). Graduate courses include (1) core courses within environmental health, epidemiology and biostatistics; (2) supporting courses in environmental health research, ethics, public health, and grant writing; (3) specialized courses selected within the research foci; and (4) dissertation credits. Program requirements for a Ph.D. degree also include successful completion of a written and oral comprehensive exam, oral defense of a written dissertation research proposal, and a minimum of 12 credits of Ph.D. dissertation research, written dissertation, and a final dissertation defense. The program can be completed on either a full- or part-time basis. Students will be able to customize their selection of courses and lab rotations based on their
specific career objectives. They will file a preliminary program of study with the graduate program director before registering for their first semester of classes, and then submit an amended, final plan of study before the start of their second semester, approved by a program committee.

All students will complete comprehensive written and oral qualifying examinations overseen by a committee of graduate faculty, of whom the majority of members will be from within MIAEH. After passing the qualifying examinations, the student will be advanced to candidacy. Generally, the examining committee will serve as the dissertation committee. The candidate will then write a dissertation research proposal in consultation with the committee, submit the written proposal to the committee at least two weeks prior to a scheduled oral defense of the proposal, and finalize the proposal following the oral defense. The procedures for the dissertation defense and examining committee are as specified in the University of Maryland Graduate School Catalog.

Course descriptions, both existing courses and the one additional course that will be developed specifically for this degree program, are included in Appendix B.

This proposal is joined by a companion proposal creating an M.S. in Environmental Health Sciences. Students will not be actively recruited or admitted into the M.S. program; it will be offered as an exit path for doctoral candidates who cannot or choose not to complete the Ph.D., or to those students who successfully complete the requirements and opt to obtain the additional credential. The companion proposal describes the M.S. program in more detail.

**Educational Objectives**

Students in the doctoral program in Environmental Health Sciences will master an essential core of knowledge in environmental and occupational health, epidemiology and biostatistics. Program objectives are characterized by the following learning outcomes, with assessments tied to benchmarks along students’ path through to completion. Outcomes will be evaluated as part of the campus-wide Graduate Outcomes Assessment process and will be used for continuous improvement of the curriculum.

Successful Ph.D. students will be able to:

1. Synthesize environmental health knowledge, including explaining and analyzing key theories, principles, methods and controversies, and identify opportunities to advance the field of environmental health.
2. Develop testable hypotheses that will advance the field of environmental health.
3. Design and conduct research studies, analyze data and test hypotheses that advance the science of environmental health.
4. Effectively communicate results of environmental health research to the scientific community.

**C. Critical and Compelling Statewide Need;**

Nearly every top 40 School of Public Health in the U.S. offers a doctoral program in Environmental Health Sciences, and the UMD School of Public Health will be strengthened with such a degree. Our unique focus areas in environmental justice, cumulative burden of exposure, water re-use innovations
(USDA-funded CONSERVE Center of Excellence), and climate change consequences on health will continue to distinguish UMD from peer schools to ensure strong recruitment of top-quality students.

Development of the environmental health workforce has been a key concern of the U.S. Department of Health and Human Services for many years. For example, the Healthy People 2010 publication articulated the concern that public health infrastructure in several areas, including environmental health, was lacking and that workforce development opportunities need to be expanded. In particular for the present proposal, the Centers for Disease Control and Prevention (CDC) has noted the paucity of leaders in environmental health and raised the concern that impending retirements and vacancies will leave the environmental health leadership ranks severely understaffed (supporting documents and statements can be found at http://www.cdc.gov/nceh/ehs/activities/training.htm). As such, the development of a doctoral program in environmental health sciences at a public land-grant university will help support the workforce development needs of the field.

D. Market Supply and Demand;

From the Bureau of Labor Statistic’s Occupational Outlook Handbook, the field of Environmental Science (which includes Environmental Health Science) is expected to grow 11% across the nation (faster than average across employment sectors) through 2024, with over 10,000 jobs added over that time. Within the state of Maryland, the growth rate is 23%, reflecting an even stronger job market.

While a fraction of these positions will require only a Bachelor’s degree, nearly 50% of these positions require a Master’s degree (37%) or Doctoral degree (9.4%) (data from the Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections). Thus, there is a growing market for environmental health scientists in Maryland and across the nation predicted through 2024.

Some of our students will also work within the field of Occupational Health and Safety. Within Maryland, such positions are expected to grow 14% through 2024, and 25% of such positions will require Master’s (22%) and Doctoral (3%) degrees.

We anticipate an enrollment of between 5 and 15 students per year, depending on the quality of applications and the availability of research funding to support students in graduate research positions.

E. Reasonableness of Program Duplication, if any;

The only Ph.D. program in Environmental Health Sciences within the state of Maryland is offered by Johns Hopkins University, a private institution, with one of the largest programs in the U.S. (15-20 doctoral enrollments per year). The only other Environmental Health Sciences doctoral programs near the mid-Atlantic region are at the following locations (with enrollment data as determined from accreditation reports): West Virginia University (enrolled 2 students per year AY2013 and 2014); University of Pittsburgh (program size of 11 students in 2014); University of North Carolina (reports 5-10 enrolled students per year); and Rutgers University (enrolled 1-4 students per year in AY2013-15).

This degree program is also quite distinct from other environmental science-related Ph.D. programs offered by UMD and jointly with other USM institutions (e.g., graduate programs in Environmental Science and Technology and the system program in Marine, Estuarine and Environmental Sciences), which focus primarily on ecosystem health and environmental science.

Clarifying the differences between toxicology and environmental health sciences is important to understanding the basis for the present proposal. Environmental health is a branch of public health
centered on all aspects of the natural and built environment that may affect human health. In contrast, toxicology is the study of the effect of chemicals and physical agents on living organisms. While there is overlap between the two fields (e.g., the study of chemical agents on human health), the research foci are quite different. Environmental health research includes environmental epidemiology, risk assessment, environmental justice, occupational health, among others, while toxicology has a stronger linkage with chemistry and pharmacology. As an example, the USM-administered Ph.D. in Toxicology has its largest student base from the UMB Schools of Pharmacy and Medicine with research primarily aligned with pharmacology faculty. Revising the Ph.D. in Toxicology would not serve the needs of environmental health students or faculty, nor would it serve UMB’s needs; the fields are different, and students will anticipate different career options.

**Enrollment Characteristics and Admissions Requirements**

Students will be recruited nationally and internationally, as well as from UMD’s program in Public Health Science. To apply to the Ph.D. program in Environmental Health Sciences, prospective students must complete their application in SOPHAS: [www.sophas.org](http://www.sophas.org).

Admission to the program is competitive. Requirements for admission include 1) a bachelor’s degree with a minimum GPA of 3.0; 2) undergraduate transcripts; 3) GRE scores taken within the last five years; 4) 3 letters of recommendation that address the applicant’s academic capabilities and probability of success in graduate school; 5) statement of goals and interests and their congruence with those of the program; 6) relevant academic/work experience, including previous coursework in biology, chemistry, mathematics, statistical methods, and/or statistical software packages.

**F. Relevance to Historically Black Institutions;**

We do not believe the proposed program will impact the uniqueness, institutional identities, or missions of Maryland’s Historically Black Institutions (HBI’s).

**G. Distance Education Program;**

N/A

**H. Adequacy of Faculty Resources;**

Faculty will be drawn from throughout the School of Public Health but most specifically from the Maryland Institute for Applied Environmental Health, who will provide academic direction and program oversight, and who will serve as the primary research mentors for students in the program. Brief biographies of the MAIEH core faculty are included in Appendix D.

**I. Adequacy of Library Resources;**

The University of Maryland Libraries has conducted an assessment of library resources required for this program. The assessment concluded that the University Libraries are able to meet, with its current resources, the curricular and research needs of the program.

**J. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources;**

Delivery of this program will require modest classroom utilization in existing buildings and laboratory research space that is already assigned to MAIEH faculty. Classes will be folded into our regular scheduling process.

**K. Adequacy of financial resources;**
See the resources and expenditures tables. MIAEH has sufficient faculty to teach the required courses and advise doctoral candidates, and students are expected to transition from the existing Toxicology program into this new program over time. Thus, no new resources are requested. There is only one new course, MIEH 700, in the proposed curriculum. MIEH 700 will be offered every 2-3 semesters as needed to ensure student progress to degree completion. Any member of the MIAEH graduate faculty would be able to teach this course, and a rotation of instructors is anticipated. The other required courses are part of the existing curriculum for the Master of Public Health degree. Because the overall enrollment in the Ph.D. program is expected to be small (a maximum of 15 students per year), no significant changes in enrollments in the remaining courses is anticipated.

L. Adequacy of Program evaluation;

See Appendix E for the Learning Outcomes Assessment Plan. Program Review is monitored following the guidelines of the campus-wide cycle of Graduate Outcomes Assessment (http://www.irpa.umd.edu/Assessment/LOA.html). As syllabi and details of the curriculum are developed, this program will be integrated into UMD’s GOA cycle of review. Formal program review is also carried out according to the University of Maryland’s policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (http://www.president.umd.edu/policies/2014-i-600a.html). Faculty within the department are reviewed according to the University’s Policy on Periodic Evaluation of Faculty Performance (http://www.president.umd.edu/policies/2014-ii-120a.html). Since 2005, the University has used an online course evaluation instrument that standardizes course evaluations across campus. The course evaluation has standard, university-wide questions and also allows for supplemental, specialized questions from the academic unit offering the course.

Finally, the University of Maryland School of Public Health programs are evaluated through its professional accreditation body, the Council on Education for Public Health (CEPH). The School was recently re-accredited for a seven year term, extending to December 31, 2022.

M. Consistency with Minority Student Achievement goals;

As stated in the University of Maryland’s Strategic Plan for Diversity and Inclusion, “the University of Maryland has embraced diversity as a central driver in all its activities and has supported and promoted pioneering scholarship of diversity in academic programs.” The Strategic Plan further states, “Our diversity is fundamental to our excellence and has enriched our intellectual community. The University’s capacity to educate students for work and life in the 21st century and to be a leader in research and scholarship is greatly enhanced by a community that reflects the nation and world.”

The MIAEH faculty are a diverse group (e.g., 50% women; 50% underrepresented minorities) committed to recruiting, retaining, and graduating a diverse student body. Many of the faculty focus their research efforts on issues that impact health disparities among minority groups. The faculty will use their networks of colleagues and professional organizations to ensure a diverse pool of applicants from which to recruit, retain, and graduate a diverse and excellent student body.

N. Relationship to Low Productivity Programs;

N/A
## Estimated Resources and Expenditures (reflects both the Ph.D. and M.S. programs)

### TABLE 1: RESOURCES

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Reallocated Funds</td>
<td>$736,820</td>
<td>$906,874</td>
<td>$934,080</td>
<td>$962,102</td>
<td>$990,965</td>
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<tr>
<td>2. Tuition/Fee Revenue (c+g below)</td>
<td>$121,115</td>
<td>$124,748</td>
<td>$128,491</td>
<td>$132,346</td>
<td>$136,316</td>
</tr>
<tr>
<td>a. #FT Students</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>b. Annual Tuition/Fee Rate</td>
<td>$8,315</td>
<td>$8,564</td>
<td>$8,821</td>
<td>$9,086</td>
<td>$9,359</td>
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<tr>
<td>c. Annual FT Revenue (a x b)</td>
<td>$108,095</td>
<td>$111,338</td>
<td>$114,678</td>
<td>$118,118</td>
<td>$121,662</td>
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<td>d. # PT Students</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>e. Credit Hour Rate</td>
<td>$651</td>
<td>$671</td>
<td>$691</td>
<td>$711</td>
<td>$733</td>
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<tr>
<td>f. Annual Credit Hours</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>g. Total Part Time Revenue (d x e x f)</td>
<td>$13,020</td>
<td>$13,411</td>
<td>$13,813</td>
<td>$14,227</td>
<td>$14,654</td>
</tr>
<tr>
<td>3. Grants, Contracts, &amp; Other External Sources</td>
<td>$698,750</td>
<td>$606,591</td>
<td>$624,788</td>
<td>$643,532</td>
<td>$662,838</td>
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<td>4. Other Sources</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td><strong>TOTAL (Add 1 - 4)</strong></td>
<td><strong>$1,556,685</strong></td>
<td><strong>$1,638,213</strong></td>
<td><strong>$1,687,359</strong></td>
<td><strong>$1,737,980</strong></td>
<td><strong>$1,790,120</strong></td>
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### TABLE 2: EXPENDITURES

<table>
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<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Faculty (b+c below)</td>
<td>$585,200</td>
<td>$753,445</td>
<td>$776,048</td>
<td>$799,330</td>
<td>$823,310</td>
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<td>a. #FTE</td>
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<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
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<tr>
<td>b. Total Salary</td>
<td>$440,000</td>
<td>$566,500</td>
<td>$583,495</td>
<td>$601,000</td>
<td>$619,030</td>
</tr>
<tr>
<td>c. Total Benefits</td>
<td>$145,200</td>
<td>$186,945</td>
<td>$192,553</td>
<td>$198,330</td>
<td>$204,280</td>
</tr>
<tr>
<td>2. Admin. Staff (b+c below)</td>
<td>$75,810</td>
<td>$75,345</td>
<td>$77,605</td>
<td>$79,933</td>
<td>$82,331</td>
</tr>
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<td>a. #FTE</td>
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<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>b. Total Salary</td>
<td>$57,000</td>
<td>$56,650</td>
<td>$58,350</td>
<td>$60,100</td>
<td>$61,903</td>
</tr>
<tr>
<td>c. Total Benefits</td>
<td>$18,810</td>
<td>$18,695</td>
<td>$19,255</td>
<td>$19,833</td>
<td>$20,428</td>
</tr>
<tr>
<td>3. Total Support Staff (b+c below)</td>
<td>$75,810</td>
<td>$78,084</td>
<td>$80,427</td>
<td>$82,840</td>
<td>$85,325</td>
</tr>
<tr>
<td>a. #FTE</td>
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<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>b. Total Salary</td>
<td>$57,000</td>
<td>$58,710</td>
<td>$60,471</td>
<td>$62,285</td>
<td>$64,154</td>
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<tr>
<td>c. Total Benefits</td>
<td>$18,810</td>
<td>$19,374</td>
<td>$19,956</td>
<td>$20,554</td>
<td>$21,171</td>
</tr>
<tr>
<td>4. GA stipends</td>
<td>$442,635</td>
<td>$342,792</td>
<td>$353,076</td>
<td>$363,668</td>
<td>$374,578</td>
</tr>
<tr>
<td>5. GA health benefits</td>
<td>$135,000</td>
<td>$139,050</td>
<td>$143,222</td>
<td>$147,518</td>
<td>$151,944</td>
</tr>
<tr>
<td>5. Tuition Remission</td>
<td>$121,115</td>
<td>$124,748</td>
<td>$128,491</td>
<td>$132,346</td>
<td>$136,316</td>
</tr>
<tr>
<td>6. Equipment</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>7. Library</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>8. New or Renovated Space</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>9. Other Expenses: Operational Expenses</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td><strong>TOTAL (Add 1 - 9)</strong></td>
<td><strong>$1,435,570</strong></td>
<td><strong>$1,513,464</strong></td>
<td><strong>$1,558,868</strong></td>
<td><strong>$1,605,634</strong></td>
<td><strong>$1,653,804</strong></td>
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<tr>
<td>Course Title</td>
<td>Credits</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 600 Foundations of Environmental Health</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 700 Applied Environmental Health</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 720 Principles of Toxicology</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 740 Risk Assessment</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 771 Exposure Assessment of Environmental Hazards</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPIB 610 Epidemiology I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPIB 650 Biostatistics I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPIB 651 Biostatistics II</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 609 Methods in Toxicology and Environmental Health (1 or 2 rotations)**</td>
<td>3 to 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPIB 641 Ethics in Public Health</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 688 Environmental Health Seminar**</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course(s) that will expose the student to concepts in health behavior and health services administration (This could include HLTH 665, HLSA 601 or a survey course that covers all five foundation areas of public health.)</td>
<td>1 to 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KNES 771 Grant Writing or Equivalent</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The specialization area would be created by and tailored to each student. If the student takes 2 lab rotations, s/he would take 12 credits of specialization. If s/he takes 1 lab rotation, s/he would take 15 credits of specialization.</td>
<td>12 to 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIEH 899 Doctoral Dissertation Research</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Students could waive out of some of these courses with coursework taken at UMD or in previous master's programs.

** Students would not be able to waive out of all rotations or the seminar requirements. Rotations can be in physical labs or with faculty conducting non-laboratory based research. At least 1 rotation must be outside of the students focus area.

***Students would not be able to waive out of any of the 12 to 15 credits required for the specialization area. No more than 6 credits of MIEH 898 could be taken as part of the specialization area.
Appendix B: Ph.D. in Environmental Health Sciences -- Course Descriptions

Existing Courses

MIEH 720 Principles of Toxicology (3): Overview of toxicology, including exposure pathways, toxico-kinetics, dermal toxicants, carcinogens, and genetic, reproductive, immuno-, neuro-, target organs, complex mixtures, structure-activity analysis, and determinants of hypo- and hyper-susceptibility. Case studies of global national and regional interest.


EPIB 610 Foundations of Epidemiology (3): Introduction to the discipline of epidemiology and its applications to health issues and practices. Basic epidemiologic concepts and methods will be covered.

EPIB 650 Biostatistics I (3): Basic statistical concepts and procedures for Public Health. Focuses on applications, hands-on-experience, and interpretations of statistical findings.

EPIB 651 Biostatistics II (3): Introduction to a variety of statistical tools with applications in public health, including one- and two-sample inference, nonparametric methods, categorical data, ANOVA, simple and multiple regression.

MIEH 609 Methods in Toxicology and Environmental Health (3 to 6): This research-based rotation in toxicology and environmental health will provide doctoral students with the opportunity to work closely with one of the faculty researchers in the Maryland Institute for Applied Environmental Health (MIAEH) within the School of Public Health. Our research covers multiple fields within the environmental health sciences (e.g. environmental epidemiology, exposure science, risk assessment, environmental microbiology, environmental microanalysis, toxicology, airborne infection transmission, environmental justice, and children's environmental health) that involve either laboratory-based research or non-laboratory based studies. Students will not only gain invaluable research experience and interpersonal skills but also contribute to MIAEH's ongoing environmental health research programs.

EPIB 641 Ethics in Public Health (1): Overview and discussion of ethical issues that face public health practitioners and researchers.

MIEH 688 Environmental Health Seminar (3): Repeatable to 3 credits. Invited and in-house research presentations from guest scientists, faculty members, and students, and critical analysis of journal articles on current topics in environmental and occupational health.

KNES 771 Grant Writing (or equivalent) (3): Enhance continued professional development through an exploration of culture, climate, expectations, and mentoring in research I universities. Generate a grant application including the hypothesis, structure, specific aims, background and significance, and submission of a total grant. Grant process and product will be emphasized.
New Courses

MIEH 700 Applied Environmental Health (3): Advanced analysis of the chemical, physical and biological hazards present in our living and working environment and their effects on human health. A focus on analysis of recent research and development of new hypotheses. Topics include: exposure assessment, environmental justice, occupational health and safety, children’s environmental health, ambient and indoor air pollution, food-borne diseases, solid and hazardous wastes, water resources, risk assessment, ecological issues and environmental laws.
Appendix C: Ph.D. in Environmental Health Sciences – Review of comparable programs

The proposed Ph.D. in Environmental Health Sciences offered through the University of Maryland, College Park and the Maryland Institute for Applied Environmental Health (MIAEH) is structured similarly to comparable degrees at similar institutions. For example:

**Johns Hopkins University:** The closest comparable degree at JHU is the Exposure Sciences Ph.D. program, which requires environmental health courses, a toxicology course, coursework in epidemiology and biostatistics, seminar, research-related and grant writing courses, and an ethics course. Beyond these required courses, students take electives in environmental health and exposure sciences. This structure is similar to the UMD proposed program, which also includes environmental health courses, courses in toxicology and risk assessment, coursework in epidemiology and biostatistics, seminar, laboratory rotation, and grant writing courses, and an ethics course. Beyond formal coursework, both degree programs require students to successfully complete written and oral comprehensive examinations and a scholarly doctoral dissertation.

**West Virginia University:** The closest comparable degree at WVU is the Occupational and Environmental Sciences Ph.D. program, which requires 54 credits, including environmental and occupational health courses, a health and policy course, coursework in epidemiology and biostatistics, seminar and research-related courses, and a scientific integrity course. Beyond these required courses, students take electives in environmental and occupational health. This structure is similar to the UMD proposed program, but UMD differs by not requiring a dedicated emphasis on occupational health, though some students may pursue that research direction with specific faculty. Beyond formal coursework, both degree programs require students to successfully complete written and oral comprehensive examinations and a scholarly doctoral dissertation.

**University of Pittsburgh:** The closest comparable degree at Pitt is the Environmental and Occupational Health Ph.D. program, which requires environmental health courses, a toxicology course, coursework in epidemiology and biostatistics, seminar and research rotation courses, and a molecular fundamentals course. Beyond these required courses, students take electives in environmental and occupational health. This structure is similar to the UMD proposed program. Beyond formal coursework, both degree programs require students to successfully complete written and oral comprehensive examinations and a scholarly doctoral dissertation.

**Rutgers University:** The closest comparable degree at Rutgers is the Public Health Ph.D. program, within which students select the Environmental & Occupational Health concentration, which requires 9–15 credits of core public health courses, 33 credits of concentration-specific courses within environmental and occupational health (including environmental health courses, epidemiology and biostatistics, and environmental health electives), and 24 credits of doctoral research. This structure is not as similar to the UMD proposed program, in that the program is more focused on general public health courses and the concentration courses are more flexible, being individually approved for each student. This is due to the nature of a single Ph.D. program in Public Health with multiple concentrations in a wide range of areas.
Appendix D: Faculty Credentials

Don Milton, MD, Professor, is board certified in internal and occupational medicine and has 20 years of experience in occupational medicine referral practice. He teaches courses on environmental and occupational hygiene, aerobiology, toxicology, indoor air quality, respiratory epidemiology, physiology, pathology, pathophysiology. He is actively pursuing multidisciplinary investigations of the health effects of bio-aerosols with three major themes: 1) investigation and prevention of airborne infection transmission and applications to biodefense, 2) exhaled breath analysis, and 3) the relationship of asthma onset and exacerbation to exposure to allergens and microbial products. Currently, his research on mechanisms and prevention of airborne infection transmission is focused on influenza.

Amy Sapkota, PhD, Associate Professor, has research interests in the areas of environmental microbiology, environmental microbial genomics, exposure assessment and environmental epidemiology. Her projects focus on evaluating the complex relationships between environmental exposures and human infectious diseases. Her work seeks to 1) characterize the microbiome of environmental samples relevant to human health, including water, food, tobacco and air, and 2) understand how exposures to these media can impact the human microbiome and infectious disease risk.

Robin Puett, PhD, Associate Professor, is an environmental, spatial, and chronic disease epidemiologist with degrees in environmental health sciences and in epidemiology. Much of her NIH-funded research and publications have focused on chronic disease health outcomes related to ambient air pollution exposures and the pathophysiology underlying these outcomes. Additionally, she has begun exploring the impact of integrative health modalities as protective factors for chronic disease and stress.

Amir Sapkota, PhD, Associate Professor, focuses his research on development and application of novel exposure metrics for the study of the impact of climate change on human health. He is currently leading an NIH funded study to investigate the relationship between frequency of extreme events, changes in plant phenology and increased risk of respiratory diseases in the contiguous United States. In a separate study funded through the CDC’s Climate Ready City and States program for the Maryland Department of Health and Mental Hygiene (DHMH), his team is collaborating with investigators at DHMH to develop public health strategies against climate change effects for the State of Maryland.

Paul C Turner, PhD, Assistant Professor, has research interests focused on exposure assessment and molecular epidemiology of chronic disease. Is specific focus is on better understanding the role of naturally occurring toxins, especially fungal toxins in cereals, on human disease. An estimated 25% of crops are contaminated with such toxins. He has been funded by the Gates Foundation for his work. He teaching Food Toxicology and Toxicology for the program.

Sacoby Wilson, PhD, Assistant Professor, is an environmental health scientist with over ten years of experience working in community-university partnerships on environmental health and justice issues. He has expertise in exposure science and applied environmental health including community-based exposure assessment, environmental justice science, social epidemiology, environmental health disparities, built environment, air pollution monitoring, and community-based participatory research (CBPR). For the past two years, he has been building a program on community engagement, environmental justice, and health (CEEHJ) to engage impacted communities, advocacy groups, and policymakers in Maryland and the Washington, DC region on environmental justice issues and environmental health disparities.

Lesliam Quiros-Alcala, PhD, Assistant Professor, has research focused on children’s environmental health and, more broadly, environmental exposures and their potential health effects in highly vulnerable populations including mothers, children, low-income/underserved communities, and occupational populations. She is interested in assessing the impact of environmental exposures in homes and at schools/early childhood education (ECE) facilities; and the health impacts of pesticides, chemicals in consumer products, and
unconventional gas development on vulnerable populations. She has experience working in children’s environmental health research, occupational health, science communication, working with Latino communities, and conducting exposure and epidemiologic pesticide research.

**Devon Payne-Sturges, PhD,** Assistant Professor, focuses her research on racial and economic disparities in exposures to environmental contaminants and associated health risks with the aim of improving the science our society uses to make decisions about environmental policies that impact the health of communities and populations, especially vulnerable, low income and minority populations.

**Stephen M. Roth, PhD,** Professor and MIAEH Interim Director, has extensive training in human genetics and has researched the genetic aspects of health in the context of aging. He has been funded by the NIH (R21, K01, R01) to perform a variety of genetic investigations.
Appendix E: Learning Outcomes Assessment Plan

1. Synthesize environmental health knowledge, including explaining and analyzing key theories, principles, methods and controversies, and identify opportunities to advance the field of environmental health.

Measure: Successful completion of the qualifying examination.
Criterion: 100% of graduates will pass the examination.
Assessment: Student comprehensive examination performance will be assessed yearly.

2. Develop testable hypotheses that will advance the field of environmental health.

Measure: Successful completion of the qualifying examination, dissertation research proposal, and oral defense of the dissertation proposal.
Criterion: 100% of graduates will pass the examination, and prepare and defend a research proposal.
Assessment: The rigor and quality of the research proposal components of these activities will be assessed for each student and compiled annually.

3. Design and conduct research studies, analyze data and test hypotheses that advance the science of environmental health.

Measure: Successful completion of dissertation research and submission of a completed dissertation.
Criterion: 80% of graduates will successfully defend and submit a dissertation within 5 years and 95% within 6 years of matriculation.
Assessment: The time to graduation will be assessed after there are at least six graduates from the program and annually thereafter.

4. Effectively communicate results of environmental health research to the scientific community.

Measure: Successful publication of research in peer reviewed journals and acceptance of abstracts at scientific conferences.
Criterion: 100% of graduates will present research either as posters or podium presentations at scientific meetings; 100% will have submitted three research papers to peer reviewed journals; 80% will have at least one paper accepted; and 50% will have two papers accepted for publication prior to defending their dissertation.
Assessment: Student CVs will be reviewed at program completion and publications and presentations will be confirmed by the advisor or other faculty.