



University of Puerto Rico, Río Piedras Campus

**I**ntegrative **G**raduate **E**ducation and **R**esearch **T**raineeship (**IGERT**)

**NATURAL-HUMAN SYSTEMS IN THE URBANIZING TROPICS**

**Handbook**

**Revised March 28<sup>th</sup>, 2011**



## 1. PROGRAM OVERVIEW

The program, *Natural-Human Systems in the Urbanizing Tropics*, is based at the University of Puerto Rico-Río Piedras (UPR-RP) in San Juan, Puerto Rico. Reflecting the strong interaction between natural and human systems, both research theme and training in UPR IGERT program are based on an iterative model of human-environment interactions, which points to the main research question: *How does human activity alter ecosystems, and, in turn, how do altered ecosystem services change human activity in an urbanizing tropical environment?* An additional question is: *How do we use answers to these questions to shape and implement solutions for environmental problems in the urbanizing tropics?*

Dissertations in our program will focus on these interactions and thus will have both natural and social science components. Students will be co-advised by faculty in natural and social sciences and other disciplines. Dissertations may include international work and collaboration with natural resource agencies and NGOs. Strong existing programs at UPR-RP and funded by NSF, such as Luquillo LTER, CREST, and PRLSAMP, will complement the research.

## 2. VISION AND GOALS

Puerto Rico has a dynamic environmental history, suffering nearly complete deforestation, and then enjoying forest recovery, followed by experiencing urban sprawl, as the economy modernized. This last shift has produced problems with waste, water supply, biodiversity, and aquatic habitats, overlaid by changes in climate and vulnerability to catastrophic storms. With its tropical island setting and developing economy Puerto Rico's environmental problems represent those in many parts of the Caribbean, the tropical, and the economically developing worlds.

The goal of our program is to train Ph.D. students to apply an interdisciplinary and collaborative approach to the problems that Puerto Rico is currently facing and in general the problems the urbanizing tropics are facing. Students will also have training experience and close contact with agencies, businesses, and other organizations, qualifying them for employment in the academic and government or private sectors.

The vision of our program is to foster a firm, enduring legacy after the five year NSF funding that will continue to promote interdisciplinary research and foster collaborations between the University of Puerto Rico-Río Piedras and private and governmental agencies.

### 2.1 UPR-RP IGERT program goals:

- Train 25-30 students as IGERT Fellows, and others as IGERT Associates
- Prepare Ph.D.s with interdisciplinary training in environmental sciences and other disciplines
- Train students to serve as agents of change in society
- Develop solutions to environmental problems in Puerto Rico and beyond
- Create a sustainable culture of interdisciplinarity between environmental science and other disciplines at UPR-RP
- Form a collaborative community for the duration of the Ph.D. and beyond.
- Create an academically and financially efficient program responsive to changing needs and participant feedback.

Maintain budget decisions transparent to all IGERT participants.

**Composition of IGERT Faculty.** The 32 IGERT faculties are a diverse group: 31% are women, 69% are minorities, 25% are the first generation in their family to attend college, and 28% are from a low income background. Collectively they have supervised at least 77 doctoral and 250 master's students

### **3. FELLOWS AND ASSOCIATES**

Students that receive stipends from the IGERT project are considered IGERT trainees throughout their graduate careers. IGERT Associates are students who have applied for associate status by submitting the required essay, take the 6 IGERT core courses, and participate in activities including IGERT seminars, workshops and reporting surveys.

#### **3.1 Application**

The UPR IGERT Program is mainly for first and second year students from all faculties that offer PhD's. First year students who apply and do not receive the fellowship could be offered the associate status for their first year, and apply again in their second year. The application procedure for all potential IGERT trainees (fellows and associates) is as follows:

- i. Contact a Core or Collaborative Faculty member with similar interests. After this the applicant should write a letter of interest to that faculty member with a copy to the IGERT Program Coordinator via email. The IGERT Program will be in contact with that faculty member.
- ii. Fill out an online application.
- iii. Attach a pdf version of the applicant's curriculum vitae and a statement of no more than 1,000 words indicating research interests, a proposed research project for the dissertation and how these fit into the IGERT Program goals. It is important to prepare this statement carefully, indicating how research interests integrate with the IGERT Program themes and approaches
- iv. Once the application is reviewed, an interview will be scheduled with potential trainees.

#### **3.2 Eligibility**

IGERT fellowships are available only for U.S citizens and permanent residents. IGERT Associates are also open to international students.

#### **3.3 IGERT Funding**

IGERT fellows are paid \$30,000 per year for a period of two years. In addition, Fellows receive payment of full tuition, fees and health insurance with the university. Students are not allowed under NSF rules to hold other fellowships, RA's or TA's while supported by IGERT. IGERT Associates receive full tuition, fees and health insurance with the university. In addition, both fellows and associates receive \$2,000 for purchase of equipment, materials and travel related to their research graduate education.

#### **3.4 Out-Year Funding and Support**

It is the responsibility of the IGERT trainee and his/her mentor to identify future funding sources for the end of the two years support from IGERT. Trainees are advised to consult early

with the graduate program director or coordinator in their academic departments to discuss departmental sources of support as well as other funding opportunities. Trainees should remember that other possible sources of funding are typically below the IGERT stipend rate, so they should plan accordingly.

#### **4. STUDENT RESPONSIBILITIES**

Regardless of funding, once a student is named an IGERT trainee (Fellow or Associate) that student assumes specific responsibilities during their graduate careers at the University of Puerto Rico-Río Piedras campus.

##### **4.1 Biographical Sketches**

Each trainee should submit a biographical statement and a photo for the UPR-IGERT website. These statements should include general information (name, education background, email, advisor, research interest, publications). These bios have been known to be useful for potential employers, journalist and potential collaborators from other research institutions and donors. These bios will also be used, with your permission and edits, on the IGERT.org web site that promotes the national NSF IGERT programs.

##### **4.2 Teaching Assistantships training**

The July before their first IGERT funded semester, all trainees must participate in the Teaching Assistant Training Program sponsored by the NSF-funded UPR Alliance for Graduate Education and the Professoriate (AGEP). These 12 work days are devoted to practice at teaching, up-to-date teaching techniques, preparation of exams, ethics, health and safety in the work place, working with students with disabilities, mentoring, stress management, audiovisual and electronic communications in college courses (Blackboard and web-based search engines), and introduction to seeking external funding.

##### **4.3 Brown Bag Seminars**

Trainees are expected to organize a seminar, reading group or workshop once a week throughout the academic year. The current trainees receiving funding for that year should decide who will be in charge of organizing the brown bags. These brown bags are meant to enhance the discussion of current issues in environmental science between students and faculty through the invitation of special speakers, discussion of current literature and mutual criticism of dissertation proposals, funding proposals and manuscripts, or informal presentation of ideas. Trainees organizing these brown bags should be in contact with the IGERT Coordinator to look for possible speakers, promote the activities and look for the appropriate facilities.

##### **4.4 IGERT Seminar Series.**

IGERT Students trainees will also be in charge of arranging the IGERT seminar series composed of seminars focused on cross disciplinary topics by visiting scientists and agency representatives. This will consist of about 4 seminars a year.

##### **4.5 Undergraduate Outreach**

We encourage trainees to participate in outreach activities through the participation in presentations at institutions with high undergraduate populations, hosting or mentoring students in undergraduate summer research programs (REU) or mentoring programs (EnviroMentors) as

well as annual society conferences with a strong undergraduate participation (SACNAS, ESA-SEEDS, ASLO).

#### **4.6 Submission of funding proposals**

To increase funding available for the last years of their Ph.D. program, students will be required by the 3rd year to submit an [NSF Doctoral Dissertation Improvement](#) grant proposal, plus a proposal to one other funding source.

#### **4.7 Student representatives**

IGERT trainees are responsible for voting for two representatives that will serve on the IGERT Steering committee (see section 7.1) for a period of one year. Voting will be done during the month of May to ensure uninterrupted participation for the following academic year. Student representatives will be formally presented during the Orientation Week and are expected to fulfill their duties from this day forward. The duties of the student representatives include but are not limited to: 1) attending all steering committee meetings, 2) send a summary of the topics discussed to the rest of the IGERT trainees.

### **5. STUDENT REQUIREMENTS**

Trainees in the IGERT program have a primary department at UPR-RP, where they are pursuing a PhD (all Fellows) or Master's Program (only for Associates). The IGERT program creates a layer of structure on top of the requirements of the primary department. The trainees must complete all the requirements of their primary department (some may overlap) as well as all IGERT requirements. Please see *Appendix A* at the end of this handbook for a proposed calendar for the successful achievement of these requirements.

#### **5.1 IGERT core courses.**

##### **IGERT Integrative Core Courses will promote:**

- 1) *Interdisciplinarity among the natural sciences and other disciplines.*
- 2) *Development of collaborative and leadership skills.*
- 3) *Immediate application to real world problems.* We will develop a list of course problems in consultation with cooperating agencies. Students will select 2-3 problems from this list to be addressed during the two semesters.
- 4) *Shared inquiry.* The component for this *Integrative Core* will be taught by faculty from both natural sciences and other fields in an atmosphere of mutual discovery. All participants are learners.
- 5) *Problem-based learning.* Students will use theory and established methods to work towards solutions of the selected problems.
- 6) *Practice in working across disciplines.* During the two semesters *Integrative Core* course students will become strongly aware of the possibilities and difficulties inherent in working across disciplines.
- 7) *Communication of finding to the public.* At the end of the second semester, students will present findings to the community, NGO, or agency that posed the selected questions.
- 8) *Modeling.* Students will model part of the social and natural components involved in the selected problems. Shared inquiry among faculty teaching courses and students

**Below are descriptions of the *IGERT Integrative Core courses (2 credits each):***

*CIAM8115 - Human Dimensions of Environmental Change.* Students will survey research on the relationship between human and natural systems in sociology, political science, anthropology, economics, public health, cultural studies, environmental studies, planning, geography, and other fields in relation to the selected Puerto Rico environmental problems. In addition to the results of these studies students will learn about the varied methods of these disciplines and examine the epistemological barriers between them.

*CIAM8116 - Policy and Ethics for the Environment.* This component will focus on how environmental policy evolves and on the ethics of different stakeholder positions, especially in relation to the selected Puerto Rico environmental problems. Students will explore “environmental capacity”, defined as both the possession of the proper resources necessary for the implementation of activities associated with environmental protection, as well as the willingness to use those resources. Environmental issues are questions of managing the commons (Hardin 1968), meaning that conflicting values are involved. Therefore students will need to apply an ethical perspective to environmental issues, health promotion issues and policy solutions.

*CIAM8117 - Urban Environment, Expansion, and Design.* Students will study environmental characteristics of cities and suburbs, the impacts of urban development on the environment, especially in the tropics, and principles of improved design for sustainable urban and suburban areas, especially as related to the selected Puerto Rico environmental problems. They will focus on the connections among land use, urban form, transportation patterns, tourism development, and environmental problems in Puerto Rico, the U.S., and elsewhere.

*CIAM8118 - Socio-Ecological Models and Ecological Informatics.* Ecological forecasting is the emerging imperative for environmental scientists (Clark et al. 2001). Students will be introduced to the methods of socio-ecological models and scenario building, as used example, by the Intergovernmental Panel on Climate Change and the Millennium Ecosystem Assessment (MES 2005, Carpenter & Folke 2006, Tallis & Kareiva 2006). Ecological informatics is a toolkit students will need for managing and using the large databases that accumulate in environmental monitoring programs and that can be used in ecological models. Students will develop a model to cover the natural and social system components of the selected Puerto Rico environmental problem.

*CIAM8119 - Ecosystem Services and Ecological Economics.* The ecological approach to resource allocation generates methods and research questions distinct from standard economics. Ecosystem services, classified as those which support, provision, and regulate, become focal (MES 2005, Carpenter & Folke 2006) in the rigorous and objective analysis of environmental and public health issues. Students will select environmental problems and/or opportunities in Puerto Rico and analyze, synthesize, and evaluate the relevant literature before constructing a research strategy. Informed policy is the objective.

*CIAM8120 - Communication on the Environment.* To engage diverse members of the community in environmental science and policy formation, students will develop skills of formal debate and argumentation. Special emphasis will be given to the emerging field of ecocriticism and the ethical dimensions of resource allocation. The module will analyze how the media portrays environmental science and the feedback of that portrayal on national and international initiatives. Through selected issues, students will explore the ethical foundations of different viewpoints with emphasis on clarity and accuracy in the communication of the supporting science to diverse members of the community.

IGERT faculty are also encouraged to participate in offering courses that enhance the IGERT Program’s curriculum.

## **5.2 Agents of Change Group Project**

The UPR-IGERT Program requires that all IGERT trainees conduct group research. Group Research projects (i.e. *Agents of Change*) will be developed while students are engaged in the *IGERT Integrative Core Courses*. *Agents of Change* project hopes to give the students the experience of working in groups in a complex problem while aiding government agencies, non-profit organization and private groups who are actively working toward a more sustainable Puerto Rico. The students will apply and integrate the knowledge learned in these courses to develop a project and a report that presents plausible solutions to a current environmental problem in Puerto Rico. Students will also model part of the social and natural components involved in the selected problems. The project and report will be presented to the proposing cooperating agency and will be given to the IGERT Steering Committee by June 1<sup>st</sup> after the year of core courses (for report guidelines see *Appendix B*). During the summer before the commencement of the core courses a list of possible current environmental problems with relevant contact information will be given to the students. It is required that students meet during Orientation Week (see section 6.1) to discuss these problems, decide on groups with similar interest and form a tentative calendar and responsibility description for each member of the group.

### 5.3 Doctoral Exams and Committee

Students should take their qualifying exams (Exam B under ES Graduate Regulations) no later than the end of their second year. Qualifying exams will help students develop their dissertation proposal through specific readings and questions about their research topics. IGERT trainees should present a copy of their primary department exam approval form signed by their advisor and committee members. These forms are usually found at the end of the program regulations given to all students.

Every IGERT PhD student must have a five member doctoral committee that includes **an advisor** affiliated to the Graduate Environmental Science Program and **a co-advisor** from the social sciences (broadly defined; see *Appendix C*). Students are encouraged to choose their primary thesis advisor by the end of their first year and their thesis committee before the end of the third semester (if student's primary department dates are before IGERT dates they should follow the department dates)

A faculty member who serves as a student's main thesis advisor or secondary advisor should: (a) allow the student to take the required IGERT core courses and, (b) annually provide a short summary of the student's academic progress to the IGERT Program Coordinator.

### 5.4 IGERT Doctoral Dissertation

Defense of the dissertation proposal should take place no later than the student's third year in the graduate program and consists of a presentation to the student's committee as well as a written proposal. IGERT trainees should present a copy of their primary department proposal dissertation approval form signed by their advisor and committee members. These forms are usually found at the end of the program regulations given to all students.

Students in the IGERT program will carry out dissertation research focused on problems in the urbanizing tropics. Part (or all) of the dissertation must take place at the interaction points between natural and human systems: **1. How does human activity alter ecosystems? 2. How do altered ecosystem services change human activity in an urbanizing tropical environment?** Students will thus necessarily study aspects of both systems. This will require an interdisciplinary and collaborative approach for their dissertation work. Dissertations will include collaborative work with a relevant external entity, for example, a business, local community, government agency, or a non-government organization. Dissertations will include comparisons with sites outside of Puerto Rico (preferably international). Students will make a presentation on their dissertation to the presenting agency. Dissertations will be written in English.

## 5.5 Teaching Experience

Students will be required to gain one of several types of teaching experience. They may hold a TA position for one year at the College of Natural Sciences. They may conduct a series of 6 lectures in an undergraduate class topically related to the IGERT program. They may also hold a teaching assistant position in a NSF funded K-12 program. This could be in conjunction with the local NSF-MSP (ALACIMA-2) program and a local nature center that regularly works with K-12 students to meet the Puerto Rico requirement for environmental education. To improve the IGERT students' interdisciplinary perspective, we will also provide teaching experiences that emphasize interdisciplinary development and participation in the teaching of courses outside of natural sciences. This teaching experience should be met no later than their fourth year in the graduate program (if your primary department has an earlier date you must comply with that.)

## 5.6 Reporting

Students in the IGERT Program are required to complete the annual IGERT Survey due in May of each year. Surveys will be done online, with a link sent to the student no later than April 30<sup>th</sup>. Students should start preparing their report throughout the year and include the following information:

- i. Publications- list full citation (include all authors)
- ii. Book Chapters
- iii. Conference Publications (Name of the conference and dates, title of publication or poster)
- iv. Conference Presentation (Name of the conference, date of presentation, title of presentation)
- v. Outreach activities (media: TV, radio, newspaper, schools, and universities). Include title of presentation or article, media, date of activity, audience and number of participants.
- vi. Research and/or Educational Achievement and why it is important

**5.7 Acknowledgement of IGERT funding.** All IGERT-related publications and presentations involving research carried out while you were an IGERT trainee at the UPR-RP (during and after your IGERT support years) must acknowledge funding from NSF. The acknowledgement should be stated as: "This work was supported by NSF IGERT Grant #0801577".

## 6. Other Student Requirements

### 6.1 Annual Orientation Week.

Every August before classes begin, an Orientation Week will be held in which new trainees and faculty will be introduced to the expectations and culture of the program. During this orientation week current IGERT trainees will present their research through poster or oral presentations. Furthermore, selected faculty will give short presentations on their current research and interest. Finally a key component of this orientation week will be a mentoring match program where new trainees will be match with a current IGERT trainee. Attendance by current IGERT trainees is expected and required. Teambuilding and communication exercises will be conducted by the Orientation staff of the College of Natural to improve their ability to work intensively in groups. Students and faculty will be trained in the cooperative approach to teaching and learning.

### 6.2 IGERT Council.

The IGERT Council consisting of all participating faculty, students, and staff, will hold its annual meeting during the Orientation Week to review the IGERT progress of the last year.

### 6.3 Internship with Agency/NGO/Community groups

This can be done in conjunction with the dissertation or Agents-of-Change Project. Students should spend minimum of 20-40 hours performing a task with agency/NGO//community group to understand entity goals, methods of operation, and interaction with environmental issues in Puerto Rico. Various external agencies have agreed to participate with students in their dissertation research (Supplementary Documents), including help with identifying research topics, mentoring, facilities, and equipment, or expertise for completing part of their research. Furthermore, the contacts and the networking thus established will help them in future job placement as post-doctoral fellows or as new hires in industry or government

#### **6.4 Field trips**

Periodic field trips are required events, held at field sites spanning the urban and natural environments. Students and faculty will discuss their disciplinary views of conditions, problems and processes while onsite. This exchange of ideas will build the students' ability to synthesize and to simultaneously appreciate and integrate different points of view. Government officials working in related areas and interested in applying our results to their questions will accompany us on the trips, which will also allow our students to start networks.

#### **6.5 IGERT Student Guide**

Students will also be responsible for creating and maintaining a student guide to the IGERT to assist students in navigating their IGERT experience.

#### **6.6 Presentations at meetings.**

IGERT students will start as early as possible to present results orally or by posters at local scientific meetings, of which there are an abundance in Puerto Rico. Presentation of dissertation research at a major professional meeting will be required before completion of the Ph.D.

#### **6.7 Training in ethics and responsible conduct of research**

This will be partially met by the *Integrative Core Series* and the initial TA training. Presentations will be made periodically by such visitors as from the Graduate School of Public Health of the Medical Sciences Campus of UPR, which has a program in Bioethics, from the UPR-RP Institutional Review Board on work with human subjects, and from the Office of the Dean for Research and Graduate Studies on related topics.

#### **6.8 Participation in professional and personal skills development activities.**

These activities are required and will be organized annually using the following campus resources. The UPR-RP Center of Academic Excellence workshops are open to graduate students and address personal and career issues and writing/speaking in English and Spanish. The Natural Sciences Library offers workshops on using library and internet resources, conducting a literature research, and making written and oral presentations. During the academic year, graduate students of the College of Natural Sciences participate in the AGEP Increasing Scholarly Productivity Program to support the development of dissertations, scientific publications, presentations, and posters. Workshops are also offered on special topics as well as social activities for increasing the sense of community among graduate students and interactions among those from different disciplines. PR-LSAMP includes teaching tools and strategies and specific assistance to students. The Dean of Graduate Studies and Research (DEGI) offers a full set of programs available to all graduate students from application to entry

into graduate study to completion of the thesis or dissertation, including such services as help with finding housing, funding for group study and research projects (PINCEL), workshops for professional development, and a student ombudsman. Graduate students can also participate in the NYU Faculty Resource Network, of which UPR is a member.

## **OTHER SUPPORT**

### **7.1 Competitive Small Grants Program**

IGERT trainees are eligible to apply for a one time fund (max \$5,000) from the Competitive Small Grants program (CSGP). The CSGP aims to cultivate the student initiative to apply to various funding sources by providing an opportunity for competitive funding. As part of this program, IGERT will offer a proposal workshop during the fall semesters. Proposal will be accepted on a continual basis and must follow the guidelines in *Appendix D*.

## **8. IGERT PROGRAM COMMITMENTS**

**Work to maximize IGERT student retention.** Retention will be maximized via effective mentoring, continued student support, the development of community among IGERT students, and several student development programs. We aim to create an open, non-elitist community of scholars. Therefore broad participation in IGERT activities and courses will be encouraged among interested graduate and undergraduate students.

**Provide office space** for IGERT students will have office space in a common area designed and equipped to facilitate interdisciplinary work. This area will have state-of-the-art computer technology to facilitate flexible teamwork and group problem solving.

**Incorporate a non-academic component**, encouraging regular gatherings of students and faculty to interact in a more social environment such as sports events and informal dinners.

**Encourage IGERT Students to be fully engaged** in campus and community life, taking leadership positions in graduate and professional student associations on campus.

**Maintain an IGERT website** with current information

**Set up training/ professional development opportunities.** The opportunities outlined under student responsibilities will be set up for IGERT students.

**Provide IGERT Fellowship support.** IGERT Fellows will be supported for two years during the first and second years of their course of study. Interested students who are performing well and who were not selected for entry as IGERT Fellows in the first year of doctoral study at UPR-RP may reapply for entry into the program in the second year. IGERT students will be enrolled in the Environmental Sciences Ph.D. program, which is designed for completion of the Ph.D. in five years. Foreign students as IGERT Associates would be supported by appropriate non-IGERT sources.

**Help obtain continued student support.** To retain students after the two years of support from the IGERT, funds for participating students will be available via teaching assistantships, NSF UPR AGEP, NSF UPR-RP CREST-CATEC, NSF LTER, and other sources. DEGI offers fellowships for students at the later stages of their research program, including the dissertation year. Teaching assistantships will be available for IGERT students. Students will also be required to apply for their own funding (see Education and Training section). UPR-RP students have been successful in applying for EPA, NSF, NASA, NSF dissertation fellowships.

**Provide faculty mentoring.** Upon arrival at UPR-RP for doctoral studies, each IGERT student will be assigned a faculty mentor (other than the major advisor) who has special interest in the success of IGERT students. The student will meet monthly with this mentor to resolve academic, research, or any other difficulties, and provide consultation on career and other issues. Students can change faculty mentors if the first is not suitable.

**Provide peer mentoring.** The Peer Mentoring program available from UPR-AGEP will be used to provide beginning AGEP students with an advanced graduate peer mentor. As the program matures, these mentors will be advanced IGERT Students. Peer mentoring will help both the new student acclimate to the UPR-RP graduate school environment, and the mentor to acquire advising skills. PR-LSAMP also sponsors mentoring activities in which the scholarship students will be able to take part. IGERT Associates may also participate in these mentoring programs.

**Provide counseling services.** The Student Counseling Office of the College of Natural Sciences is available to all students for counseling on personal and academic matters. Students will also be encouraged to talk to the IGERT leadership about any issues.

**Follow IGERT Student progress after graduation.** In order to monitor student progress after graduation, we will encourage them to sign up for an alumnus e-mail account.

**Make opportunities for undergraduate participation in IGERT-related research.** Undergraduates will be encouraged to participate in IGERT-related projects for credit and be mentored by IGERT Students.

We will apply for an IGERT site REU open to participation of undergraduates from both the natural and social sciences. Undergraduates will also be encouraged to participate through the existing LUQ-LTER-REU and MEB programs at UPR-RP, as well as through PRLSAMP.

## 9. INSTITUTIONAL COMMITMENTS

UPR-RP will ensure that:

- \* The IGERT PI has adequate release time to devote to the management of the IGERT program.
- \* The PI will have direct access to the deans of the participating colleges (Natural Sciences and Social Sciences), and via their offices, access to the Chancellor.
- \* Participating professors from both colleges will receive release time for serving as advisors to participating students. A new position shared between the two colleges in spatial analysis will be opened.
- \* Beyond the two years of support from the IGERT, support for participating students will be available via TShips, the UPR NSF AGEP and PR-LSAMP programs, the UPR-RP NSF CREST-CATEC program, NSF LTER program, and other sources.
- \* The College and Campus Offices of Sponsored Research will actively assist participating professors in seeking funds for research.
- \* The Campus will provide matching funds for a new vehicle dedicated to this project.
- \* The College of Natural Sciences will provide technical support for the Urbanizing Tropics IGERT website, and additional support for development of the core course components.

**IGERT Sustainability.** The administration of UPR-RP regards the IGERT program as a model for interdisciplinary graduate education. The proposed IGERT program will be a roadmap for developing interdisciplinary graduate education at UPR-RP. Because the interdisciplinary relationships between the natural and social scientists, and curriculum and dissertation structure will have been tested and improved over the five years of this program, we expect these elements to be fully integrated into the UPR-RP graduate program in environmental sciences. The interdisciplinary courses and research approach developed for this IGERT program will be sustained by integration into the overall Environmental Science Graduate Program at UPR-RP. Campus and UPR system programs will also be used for recruitment and to ensure diversity of students in the IGERT program.

## **10. Other guidance and questions**

Any faculty or student who cannot find answer to their question in this handbook should contact Rafael Ríos Davila, PI at [rafaelrios00936@yahoo.com](mailto:rafaelrios00936@yahoo.com)

## **11. Appendices**

**Appendix A – Proposed Calendar to Achieve IGERT Requirements**

**Appendix B – Agents of Change report Guidelines**

**Appendix C – Core and Collaborating Faculty of the IGERT Program**

**Appendix D – Competitive Small Grants Program Guidelines**

**Appendix E – IGERT Management**

**Appendix F – Recruitment**

**Appendix G - IGERT Performance Assessment/Evaluation**

**Appendix G – Non-Compliance with IGERT Requirements**

## APPENDIX A- SUGGESTED CALENDAR TO ACHIEVE IGERT REQUIREMENTS

Environmental Science (ES) Graduate Program Requirements (Interdisciplinary Option)	IGERT Student Requirements
<b>Pre-entry summer</b>	
Participate in College of Natural Sciences graduate student trainings (Teaching, laboratory safety, ethics, obtaining funding, etc.)	Participate in IGERT Orientation Week (August)
	Enter program with informal advisor or mentor
<b>First year</b>	
Take courses (20 credits total): ES Graduate Core (CIAM6115, CIAM6116, CIAM6117, CIAM6118); graduate seminars (CIAM 8901, CIAM 8902); Emphasis and elective courses (6 credits)	Submit biographical sketch
Interview faculty for potential main thesis advisor (1 <sup>st</sup> semester)	Attend Brownbag Seminars
Study for Exam A	Attend IGERT Seminar Series
Choose a main thesis advisor and turn in form (end of 2 <sup>nd</sup> semester)	Attend trainings
Start exploring dissertation topics	Dissertation should: (1) address interaction of human-natural systems in urbanizing tropics, (2) include collaborative work with external entity, (3) include comparisons with sites outside of PR (preferably international), (4) presentation made back to collaborating agency
Seek validation for previously taken graduate courses	Attend field trips
Attend departmental seminars	Develop and attend outreach activity
	Internship with external entity (1 <sup>st</sup> or 2 <sup>nd</sup> year)
	Submit IGERT semester progress reports.
<b>First summer</b>	
Take Exam A	Read and analyze Agents of Change potential environmental problems (end of summer)
Advance to Doctoral Student Status	Participate in IGERT Orientation Week (August; meet and discuss Agents of Change)
Meet with main thesis advisor to discuss ideas for dissertation and possible committee members	Evaluate IGERT program
Start working on dissertation methods, collect preliminary data	
<b>Second year</b>	
Take courses (18 credits total): IGERT Core (12 credits), Emphasis and elective courses (6 credits)	IGERT Integrative Core Courses (CIAM8115, CIAM8116, CIAM8117, CIAM8118, CIAM8119, CIAM8120)
Annual progress report	Start working on Agents of

	Change report (first semester)
Choose Thesis Committee, fill out form (by the end of first semester)	IGERT: Social science (broadly defined) coadvisor on committee
Take Exam B (by end of second semester)*****	Internship with external entity (1 <sup>st</sup> or 2 <sup>nd</sup> year)
Advance to Doctoral Candidate Status	Apply for other funding (many deadlines by November)
Attend departmental seminars	Submit biographical sketch
	Attend Brownbag Seminars
	Attend IGERT Seminar Series
	Attend trainings
	Attend field trips
	Develop and attend outreach activity
	Contribute to IGERT student guide
	Submit IGERT semester progress reports.
	Send final Agents of Change report (June 1 <sup>st</sup> )
<b>Second summer</b>	
Start writing dissertation proposal	Dissertation should: (1) address interaction of human-natural systems in urbanizing tropics, (2) include collaborative work with external entity, (3) include comparisons with sites outside of PR (preferably international), (4) presentation made back to collaborating agency
Continue working on dissertation methods, collect preliminary data	Collect agency ideas for Agents of Change (next IGERT class)
	Participate in IGERT Orientation Week (August)
	Evaluate IGERT program
<b>Third year</b>	
Take courses (18 credits): Specialty seminars (4 credits); Doctoral dissertation research (14 credits of CIAM8990)	Update biographical sketch
Teaching experience (1 year; see options)	Attend Brownbag Seminars
Meet with thesis committee for update (1 <sup>st</sup> semester)	Attend IGERT Seminar Series
Annual progress report	Attend trainings
Continue writing proposal	Attend field trips
Defend dissertation proposal, turn in form on project approval (by May)	Develop and attend outreach activity
Attend departmental seminars	Apply for other funding (many deadlines by November)
	Contribute to IGERT student guide
	Make IGERT semesterly progress reports.
	Make presentation at meeting (local, national, international)

<b>Third summer</b>	
Collect preliminary data	Participate in IGERT Orientation Week (August)
Verification that methodology is correct for your questions	Evaluate IGERT program
<b>Fourth year</b>	
Take course: (18 credits): Doctoral Dissertation Research (CIAM8990)	Update biographical sketch
Annual progress report	Attend Brownbag Seminars
Meet with thesis committee for update (1 <sup>st</sup> semester)	Attend IGERT Seminar Series
Collect data for dissertation	Attend trainings
Attend departmental seminars	Attend field trips
	Develop and attend outreach activity
	Apply for other funding (many deadlines by November)
	Contribute to IGERT student guide
	Make IGERT semesterly progress reports.
	Make presentation at meeting (local, national, international)
<b>Fourth summer</b>	
Collect data for dissertation	Participate in IGERT Orientation Week (August)
Start writing dissertation (intro, methods)	Evaluate IGERT program
<b>Fifth year</b>	
Take course: (18 credits): Doctoral Dissertation Research (CIAM8990)	Update biographical sketch
Meet with thesis committee for update (1 <sup>st</sup> semester)	Attend Brownbag Seminars
Annual progress report	Attend IGERT Seminar Series
Collect data for dissertation	Attend trainings
Attend departmental seminars	Attend field trips
	Develop and attend outreach activity
	Apply for other funding (many deadlines by November)
	Contribute to IGERT student guide
	Make IGERT semesterly progress reports.
	Make presentation at meeting (local, national, international)
<b>Fifth summer</b>	
Finish collecting data for dissertation	Participate in IGERT Orientation Week (August)
Continue writing dissertation (intro, methods, results...)	Evaluate IGERT program
<b>Sixth year</b>	

Take course: Continuation of Doctoral Thesis (CIAM 8896)	Update biographical sketch
Meet with thesis committee for update (1 <sup>st</sup> semester)	Attend Brownbag Seminars
Annual progress report	Attend IGERT Seminar Series
Attend departmental seminars	Attend trainings
Finish writing dissertation	Attend field trips
Submit at least one chapter for publication	Develop and attend outreach activity
Apply for graduation at beginning of semester of expected graduation	Contribute to IGERT student guide
Make oral presentation and defense of doctoral dissertation (by May or earlier)	Make IGERT semester progress reports.
Turn in dissertation (three bound copies and one electronic PDF file)	Make presentation at meeting (local, national, international)
Stay in contact with Env. Sci. Graduate program upon graduation	Stay in contact with IGERT program upon graduation

## **APPENDIX B- AGENTS OF CHANGE GUIDELINES**

### **Project Overview**

Many scientific and social problems lie at the interface of various disciplines. The IGERT Core courses adopt an interdisciplinary approach to problems and opportunities in a tropical urbanizing environment. The Agent of Change project integrates across the IGERT core courses, as a tool for applying the knowledge gained in the courses to an environmental issue in Puerto Rico. Our strategy combines formal academic rigor with hands-on experience.

### **Main Goal**

The Agents-of-Change project affords a collaborative experience in synthesizing concepts from IGERT Core Courses and addressing contemporary problems and opportunities.

### **Objectives**

- 1) To apply disciplinary knowledge and modeling skills to contemporary social-environmental issues*
- 2) To synthesize relevant concepts and methods across the disciplines for an inter- or transdisciplinary approach*
- 3) To develop social skills in collaborating with colleagues and stakeholders*
- 4) To evaluate state-of-the art solutions in light of the emerging results*
- 5) To communicate the paradigm to various audiences, recognizing the role of leadership in persuading the public to accept the value of expertise.*

### **Approach**

The IGERT Students (Scholars and Associates) must take the IGERT Core Courses as an ensemble. At the beginning of the first semester IGERT students will organize themselves in teams. Each team selects an Agents of Change environmental issue in collaboration with a proposing agency, non-profit organization, or community. The teams will then work together throughout the two semesters on the issue. Each IGERT core course will include an evaluation component for the issue chosen.

Each team will also select a mentor from the IGERT faculty. The mentor will help the team bring the project into focus for concrete, specific, and reasonable research activities. At the end of the second semester, the group will deliver the project and report to the agency, non-profit, or community that proposed the problem.

### **Participating Agencies, Non-profits, and Communities**

- The El Yunque National Forest
- The US Weather Service
- The International Institute of Tropical Forestry
- The San Juan Bay Estuary Program
- The Puerto Rico Department of Natural and Environmental Resources
- The Puerto Rico Water and Sewer Authority
- Sierra Club
- Los Acampadores de Puerto Rico
- La Sociedad Espeleológica de Puerto Rico

- The PR ULTRA Project

Suggestions can also be sought from other groups.

### **Calendar**

August – December, 2010: IGERT Core Courses: *Human Dimensions of Environmental Change*; *Policy and Ethics for the Environment*; and *Urban Environment, Expansion, and Design*.

January – May 2011: IGERT Core Courses: *Socio-Ecological Models and Ecological Informatics*; *Ecosystem Services and Ecological Economics*; and *Communication on the Environment*.

End of May: National Geographic Scientific Filmmaking Course (to be confirmed)

15 June 2011: Give project and final report to Steering Committee

30 June 2011: Evidence that report and presentation has been given to the appropriate stakeholder group.

### **Guidelines for project and final report**

**The Agents of Change project** should build on what you have learned in the six IGERT courses. We should invoke your creativity, intellect and as well as the knowledge gained from the courses in addressing the selected environmental issue. The project should be kept concrete, specific, and of reasonable effort. One is not expected to solve the entire problem but contribute toward the solution. The project can take different forms. For example, an environmental history based on interviews, a design for a green space developed with stakeholder participation, a law bill, a short video, a campaign plan for public awareness, an action plan, a GIS map with overlays indicating key areas needing protection or attention, or anything else you might invent.

**The Agents of Change final report** will give the background and context for the project. This report should be in English. The final report should be 10 pages or less (single spaced, 1 inch margins, 12 point font Times New Roman or 11 point font Arial). Here is the suggested guide for developing the report.

- A. Define the issue to be addressed (200 words)
- B. Past work conducted on issue (4-500 words)
- C. Summary of application of content of each IGERT course to the issue:
  - a. Social context (*Human Dimensions of Environmental Change*) (500 words)
  - b. Stakeholders, ethical perspectives, impinging policy (*Policy and Ethics for the Environment*) (500 words)
  - c. Relationship to urban systems (*Urban Environment, Expansion, and Design*) (500 words)
  - d. Economic analysis (*Ecosystem Services and Ecological Economics*) (500 words)
  - e. Problem as interactive system (*Socio-Ecological Models and Ecological Informatics*) (representational model – one page)
- D. Steps taken to address issue (literature searches, interviews, meetings, etc.)
- E. Recommendations toward addressing the problem and/or opportunity
- F. Next Steps.

NOTE: The *Communication on the Environment* course is the vehicle for developing the project and final report for presentation.

### **Evaluation**

Each Integrative IGERT Core Course has its own evaluation system designed by the professor. However all courses include evaluation of group analysis of the selected environmental issues, which will comprise a percentage of the grade for each course (example 35%). A final report of the project with an oral presentation will be scheduled for delivery to the government agency, non-profit organization, or community working with on the selected problem and/or opportunity. In addition to the grades received for the courses, the student projects and reports will be evaluated by the IGERT Steering Committee. Successful completion will be contingent on the grades in addressing the selected environmental issue for each course and the respective approval of the final report by the Steering Committee and Agency.

**APPENDIX C- CORE AND COLLABORATING FACULTY OF THE IGERT PROGRAM**

<b>Name</b>	<b>email</b>	<b>Affiliation</b>	<b>Interest</b>
Rafael A. Rios	<a href="mailto:rafaelrios00936@yahoo.com">rafaelrios00936@yahoo.com</a>	Environmental Sciences	environmental engineering
Nicholas Brokaw	<a href="mailto:nvbrokaw@ites.upr.edu">nvbrokaw@ites.upr.edu</a>	ITES	forest ecology
Maritza Barreto	maritzabarretoorta@gmail.com	Geography	coastal resources
Jess Zimmerman	<a href="mailto:jesskz@ites.upr.edu">jesskz@ites.upr.edu</a>	ITES	natural/human systems
Cecilio Ortiz García	<a href="mailto:Cecilio.ortiz@upr.edu">Cecilio.ortiz@upr.edu</a>	School of Public Admin.	society/environment interface
Joseph Vogel	<a href="mailto:josephvogel@usa.net">josephvogel@usa.net</a>	Economics	ecological economics
Marla Pérez	<a href="mailto:marla.perez2@upr.edu">marla.perez2@upr.edu</a>	Sociology (UPR-RUM)	ecological sociology
Angel D. Cruz	angeldavid.cruz@gmail.com	Geography	economic geography
Mario Rodríguez	mrodriguez@rcm.upr.edu	Pub. Health (UPR-RCM)	public health
Humberto Cavallín	hcavallin@uprrp.edu	Architecture	design theory, methods
Heeralal Janwa		Mathematics	bioinformatics, modeling
Thomas Mitchell Aide	<a href="mailto:tmaide@yahoo.com">tmaide@yahoo.com</a>	Biology	global ecology
Jorge Ortiz	jorgeortiz.ites@gmail.com	ITES	applied limnology
Olga Mayol	omayol@ites.upr.edu	ITES	atmospheric chemistry
Gary Toranzos	gatoranzos@uprrp.edu	Biology	environmental microbiology
Mei Yu	<a href="mailto:meiyu@ites.uprrp.edu">meiyu@ites.uprrp.edu</a>	ITES	landscape modeling
Xiaoming Zou	xzou2000@yahoo.com	ITES	biogeochemistry
James Ackerman	ackerman.upr@gmail.com	Biology	plant ecology
Paul Bayman	pbayman@uprrp.edu	Biology	mycology
Elvira Cuevas	<a href="mailto:epcuevas@gmail.com">epcuevas@gmail.com</a>	Biology	plant/soil interactions
María Gloria Domínguez	<a href="mailto:maria.dominguez1@upr.edu">maria.dominguez1@upr.edu</a>	Biology	enteric microbial ecology
Rafael Joglar	rjoglar@uprrp.edu	Biology	biodiversity
Elvia Meléndez-Ackerman	<a href="mailto:elmelend@gmail.com">elmelend@gmail.com</a>	ITES	biodiversity
Alonso Ramírez	alonso_ites@yahoo.com	ITES	aquatic ecology
Carla Restrepo	crestre@hpcf.upr.edu	Biology	landscape ecology
Indira Luciano	inlumo@yahoo.com	Economics	regional economics
David Román	d.roman@upr.edu;	School of Law	environmental law
William McDowell	Bill.McDowell@unh.edu	Univ. of New Hampshire, Natural	ecosystem ecology

		Resources	
David Pijawka	<a href="mailto:pijawka@asu.edu">pijawka@asu.edu</a>	Arizona State University, School of Planning	environmental planning
María Cruz-Torres	<a href="mailto:Maria.Cruz-Torres@asu.edu">Maria.Cruz-Torres@asu.edu</a>	Arizona State University, Women and Gender Studies	anthropology-coastal communities
Yogani Govender	<a href="mailto:ygovender@uprrp.edu">ygovender@uprrp.edu</a>	Post-Doc CATEC	Ecosystem Process and Function
Criseida Navarro-Díaz	<a href="mailto:criseida.navarro@gmail.com">criseida.navarro@gmail.com</a>	UPR{RP Planning School	Urban Design
Alberto Sabat	<a href="mailto:amsabat@gmail.com">amsabat@gmail.com</a>	Biology	
Oswaldo Rosario	<a href="mailto:rosario_o@msn.com">rosario_o@msn.com</a>	Chemistry	

## APPENDIX D - COMPETITIVE SMALL GRANTS PROGRAM (CSGP)

### Summary:

CSGP serve's to promote high quality research and to provide students with experience in the practical side of research-proposal writing. This funding can be used towards your dissertation research or another new or ongoing research project. The topic of the proposal needs not be related to the IGERT theme's and approaches. Team or group submissions are encouraged. Two or more students may team up and generate a joint proposal on shared research.

Awardees are expected to conduct an educational outreach activity to a relevant group (school, community group, NGO, government agency, mentor an undergraduate, etc...) and will be asked to provide an oral presentation on the project at the UPR-RP. Furthermore, awardees are expected to submit a report with preliminary results one year after funds are awarded. Relevant IGERT faculty may work with interested students to convert their proposal into a larger proposal to a standard funding agency. **It is expected that awardees will submit their research for publication to a peer-review journal.**

Eligibility: Students must be an IGERT fellow or associate at UPR-RP and not be expected to graduate for at least 6 months.

Deadlines: Proposals will be read and reviewed by the IGERT Steering Committee on a rolling basis. Applicants will be notified within 30 days of submitting a proposal. All trainees should remember that disbursement of funds follows all UPR-RP protocols for purchase of equipment, materials, travel and stipends. Budget MUST coincided with actual purchase, if changes are made a letter of justification signed by the students advisor needs to give in with ample time.

### Proposal contents:

Cover page should contain: project title, your name, department, email, phone number, academic advisor, email of academic advisor, total amount requested.

The body of the proposal must have a maximum of 3 pages, single spaced, 12-point Times New Roman, 1" margins (figures, equations and references are included in this limit; however the budget and cover page are not).

Proposal content must include:

1. Project overview, introduction (must include the importance of the project and the main research question)
2. Research objectives and hypothesis
3. Methods (general description of study site)
4. Relationship to IGERT themes and approaches
5. Deliverables (what will be the educational outreach activity, plan for publication)
6. Timeline
7. Max 1 page budget table (use template found on IGERT webpage- FORMS page) and 1 page budget narrative and justification (maximum \$5,000)
8. Literature Cited

## **APPENDIX E: MANAGEMENT**

Our goal is an academically and financially efficient program responsive to changing needs and participant feedback. Budget decisions will be transparent to all IGERT participants, and most of the budget will go to student support.

The main elements to be managed include curriculum, graduate students, resources and equipment, development, relationships to other programs, and evaluation. The management structure will consist of the PI as Program Director (PD), a Program Coordinator managing operations, a Steering Committee locally overseeing program implementation, an External Advisory Board to provide outside input, a Committee on External Collaboration to coordinate with international and local cooperators, and the IGERT Council composed of all participating faculty, students, and staff.

### **The PI/PD will:**

- Chair the IGERT Steering Committee
- Maintain contact with NSF
- Consult with university deans and department chairs
- Coordinate curricular issues with participating departments' deans and chairs
- Have final voice on program policies and procedures, and curriculum and activities.
- Provide budget oversight and quarterly budget reports to the Steering Committee
- Report to the IGERT Council, UPR-RP, and NSF
- Announce the annual IGERT fellowship competition

### **The IGERT Co-director will:**

- Lead program management
- Develop and maintain relationships with and with other programs and departments within UPR and with external partners (NGOs, agencies, business, community groups)  
Coordinate student, faculty member, and staff activity
- Maintain University relations (including development)
- Help search for additional external funding
- Assist in the design and development of core courses, special seminars and workshops related to the IGERT program themes and approaches
- Verify curriculum requirements for IGERT trainees in different departments
- Assist in coordinating curricular issues
- Assist with budget oversight
- Assign to each student a mentor upon arrival at UPR-RP, in addition to the major advisor
- Monitor student progress and retention
- Collect questions from external collaborators to be addressed in the two semester *Integrative Core* sequence.
- Assist in reporting

**Program Coordinator.** This will be a full-time staff person. The Program Coordinator will:

- \* Write up and submit all documents related to professor compensation, credit payment, reimbursement and travel (domestic and internationally) related to the IGERT Program
- \* Write up and submit all documents related to AMEX payment, services requested to third parties and special activities that require funding
- \* Write up first draft of letters for all activities, services or compensations to be signed by the IGERT Program Director
- \* Develop documents needed for purchase of material and equipment for the program. Submit documents to director and associate director for approval and purchase
- \* Organize and maintain the financial records of the program for both the participants support cost section and administration section
- \* Coordinate IGERT Steering Committee Meetings by preparing agendas, calling the meetings, taking notes and finalize objectives discussed
- \* Coordinate student Brown Bag Seminars by reserving rooms, gathering equipment needed, and aiding students in getting speakers or articles to present
- \* Aid Integrative Core Courses by scheduling times, classrooms and equipment needed by professor. Also when needed make copies of documents and video tape courses for future viewing by students
- \* Assist in the design and development of special seminars and workshops related to the IGERT program themes and approaches
- \* Coordinate questionnaires for UPR-RP IGERT evaluation (External evaluator will design appropriate questions). Coordinate collection and compilation of related data.
- \* Create and update the programs webpage as well as the IGERT.org project profile page
- \* Develop the announcement of the annual IGERT fellowship competition
- \* Answer information requests
- \* Design and develop recruitment material such as brochures, posters and promotional material
- \* Recruit trainees through online chat, webinars, promotion and personal emails
- \* Arrange for applicant interviews

**Steering Committee.** The IGERT Steering Committee will be composed of the Director (as Chair), four IGERT faculty (two from natural sciences and two from social sciences or other disciplines, currently the Co-PIs), and two IGERT students (as voting members selected as discussed below), and Program Coordinator. The Committee will meet at least monthly. The Steering Committee will:

- Develop and review program policies and procedures
- Develop and review curriculum and activities
- Develop and maintain relationships with and with other programs and departments within UPR and with external partners (NGOs, agencies, business, community groups) Build more collaborations if students not using existing ones

- Provide guidance on the budget, resources and equipment, development, evaluation, and IGERT student affairs
- Approve the announcement of the annual IGERT fellowship competition
- Receive and evaluate applications
- Select and admit fellowship recipients
- Evaluate recipients' progress for funding renewal
- Oversee faculty and collaborator participation
- Name replacement members to the Steering Committee from the standing group of participating faculty when necessary, after consulting with other IGERT Faculty
- Accept new faculty participants and collaborators via an open process that includes nominations from participating faculty and students, and removing non-participating faculty if necessary.

Members (2010):

Rafael Rios, PI

Sheila Ward, Associate Director

Jess Zimmerman, Co-PI

Nick Brokaw, Co-PI

Maritza Barreto, Co-PI

Yogani Govender, Post-Doc

Norberto Quiñones Vilches, fellow

Nilda Luhring Gonzalez, fellow

- Collect questions from external collaborators to be addressed in the two semester *Integrative Core* sequence.

**The IGERT External Advisory Board** will be composed of 8-10 persons from governmental agencies, NGOs, industry, and other academic institutions from inside and outside (2) of Puerto Rico. Meeting every two years, the Advisory Board will be the action point for our specific goal of involving other entities in the success of the IGERT. This committee will provide a breadth of perspective from outside UPR-RP and will help to maintain forward momentum in the improvement of the graduate programs in Environmental Science. The report of this committee will be made public, including on the website, and be included in the reports to NSF. The Advisory Board will:

- Evaluate the program every two years via interviews with faculty, staff, and students
- Review self-assessment documents,
- Review student and faculty publications in the relevant subject areas
- In their report, make concrete recommendations for changes.

**IGERT Council.** All participating faculty members, graduate students, and staff involved will meet annually to discuss program progress, and suggest changes to be implemented by the executive committee. The meeting will be held in conjunction with the annual Orientation Week. New ideas for seminars, speakers, collaborative workshops, and program administration will be reviewed at this time. Students will also attend these meetings and contribute to the evolution of the IGERT. The IGERT Council may form ad hoc committees to refine aspects of the program, such as curriculum.

**IGERT Faculty.** IGERT faculty members are committed to participate in the program in various roles such as instructors, mentors, research advisors, and organizers of seminars. Furthermore, alumni will be able to continue consulting with faculty mentors.

**IGERT students.** Students will be active participants in IGERT management, creating a sense of ownership of the program, and increasing their leadership and management skills. Students will elect the two representatives to the Steering Committee, and to the Committee on External Collaboration. Both IGERT Fellows and Associates are eligible for these positions and to vote for them. See above list for the main student responsibilities. The student representatives for the Steering Committee will:

- Organize student meetings and relay student input on curriculum and other programmatic elements.

In addition, IGERT students will:

- Coordinate the IGERT Seminar series for visiting and in-house speakers
- Assist in collecting questions from Collaborators to be addressed in the *Integrative Core*

*Role of other participating institutions.* Student research and training in the IGERT program will benefit from established program connections with government, NGOs, and industry. All these agencies and organizations will:

- Collaborate with student dissertation research on interactions between human and natural systems,
- Help with the laboratory training in courses C1 and C4 described above.
- Depending on the organization, provide data, field sites, help with logistics, mentoring from knowledgeable personnel, connections to other groups, and laboratory or computing facilities.

Special, but not all, resources of each organization are:

- U.S. Geological Survey (data, field sites, logistics),
- USDA International Institute of Tropical Forestry (expertise, chemistry lab, GIS facilities, library, databases),
- Puerto Rican Department of Natural and Environmental Resources (mentors, data, field sites),
- Caribbean Alliance for Sustainable Tourism (international sites, data),
- San Juan Bay Partnership (data, field sites),
- Puerto Rico Aqueduct and Sewers Authority (data), and
- Biotechnical Processes International, Ltd. (data, industrial sites, international sites),
- El Yunque National Forest (a U.S. National Forest, forest history, management),
- Puerto Rico Health Department (mentors, data, field sites), and the
- U.S. National Weather Service (data, mentors).

## **APPENDIX F. RECRUITMENT**

**Recruitment.** We will seek excellent students with an interest in interdisciplinary approaches to solving environmental problems. The program will especially seek women applicants as well as individuals with disabilities to apply for the fellowships. Students will largely come from the under-represented Hispanic group of U.S. citizens but will be able to build connections to the Caribbean and Latin America. We will make concerted efforts to broaden the diversity of students participating in IGERT. UPR-RP is fully committed to a policy of non-discrimination. Two campus programs focus on serving students with disabilities.

Recruitment vehicles:

At UPR-RP:

- Honors program
- NSF-funded REU
- UMEB
- CREST CATEC
- NIH-MARC (Minority Access to Research Careers) program
- RISE program
- UPR-RP SEEDs chapter associated with the Ecological Society of America

UPR system:

- Alliance for Graduate Education and the Professorate Program (AGEP)
- PRLSAMP

Puerto Rico and the U.S:

- Associated training programs and other sources at other institutions
- Association of Black Biologists
- Association of Black Engineers and Scientists
- Hispanic Association of Colleges and Universities (HACU)
- Society for Advancement of Chicanos and Native Americans in Science (SACNAS)
- Outreach at national and local meetings attended by qualified graduate and undergraduate students
- Via established links with local agencies

### **Recruitment instruments:**

Recruitment instruments will list characteristics of desired students, eligibility rules, and application procedures. The website will be kept up-to-date with student activities and research, in order to stimulate the interest of potential applicants. When students inquire, they will receive a communication indicating the nature of the program and its requirements.

- IGERT website
- Announcements in key professional journals
- Organization newsletters

- Listservs
- Ecological Society of America
- Puerto Rico Ecolsla
- Posters and brochures sent to institutions with which we have established ties or are seeking collaborations
- Targeting IGERT Associate students internationally via the network of institutions that have participated in graduate programs at UPR-RP
- Network of collaborators of participating faculty;
- University of the Virgin Islands
- University of New Mexico
- University of Texas at El Paso.
- We will also make use of UPR communications such as those
- from the Dean for Graduate Studies and Research, and
- *Diálogo*, the UPR-sponsored monthly newspaper which is distributed island-wide.
- With funding from AGEP, the announcement will also be distributed during visits of professors and senior graduate students at undergraduate institutions across the island to promote the graduate programs.
- Graduates from and current undergraduates in the UPRRP undergraduate Environmental Science Program will also be notified personally about the IGERT program and encouraged to participate.
- The announcement will also be sent to selected undergraduate and Master's programs in environmental studies for posting.

## APPENDIX G- PERFORMANCE ASSESSMENT / PROJECT EVALUATION

**Program goals:** Success of the IGERT will be compared to conventional Ph.D. programs in the College of Natural Sciences and to national statistics. The broad goals of the IGERT program are to:

- prepare Ph.D.s with interdisciplinary training in environmental sciences and other disciplines
- to serve as change agents in society
- to create a sustainable culture of interdisciplinarity between environmental science and other disciplines at UPR-RP
- and to develop solutions to environmental problems in Puerto Rico and beyond

**Evaluation questions:** The indicators corresponding to these goals that will be evaluated include:

For women, underrepresented minorities, persons with disabilities, and total in each:

*Ph.D. preparation* (to be assessed annually)

- Number of inquiries, applications, from different recruitment sources,
- Number of students accepted as IGERT Fellows and Associates
- GPA, GRE, previous research experience, other qualifications of applying and incoming students
- Number remaining and leaving program in each year, graduation, time to degree completion
- Indications of productivity such as presentations, publications
- Participation in on-campus activities (see list under Education and Training Section)
- Participation in international research experience
- Student presentations at meetings, publications
- Time to complete courses, qualifying exams, research, PhD degree
- Eventual postdoctoral and employment experience
- Follow-up interview to determine relevance of IGERT training to professional placement

Student evaluation of their experience of:

- On campus activities and faculty and peer mentoring experiences (by semester)
- *Integrative Core*, IGERT seminar, brown bag reading group (by semester)
- Mentors, major professors, and committees (annual)
- International experience (at end of experience)
- Collaborators on dissertation (by semester)
- Exit interviews with trainees (at end of PhD).
- Student progress after graduation

*Mentor and advisor evaluation of (by semester):*

- Frequency and content of meetings with students (by semester),
- Student progress,
- Skill development,
- Achievement,
- Career preparation.

*Culture of interdisciplinary (to be assessed annually)*

By students:

- Topics incorporated into dissertation,

By participating faculty:

- Interdisciplinary collaborations (between natural and social sciences) established,
- compared to all collaborations,
- Grants,
- Publications with
  - Interdisciplinary nature,
  - Coauthored between faculty from natural and social sciences,
- Compared to all grants and publications,
- Interdisciplinary courses and experiences established between natural and social sciences, Enrollment in those courses,
- Influence of program on research and teaching,

For institution:

- Across-department support for interdisciplinary teaching (release time; dedicated space, financial support),
- Recognition of interdisciplinary teaching in promotion,
- Division of “teaching credit hours” within interdisciplinary efforts involving multiple departments and colleges,
- Acceptance of multi-departmental thesis co-chairs (#s)

*Development of solutions (to be assessed annually)*

By external cooperators:

- Evaluation of solutions proposed to identified problems,
- Evaluation of interaction with student on dissertation, final product,
- Agency actions, collaborations undertaken as a result of interaction with IGERT,

- Outreach presentations to external groups,
- Inquiries about students available for employment, eventual placements.

### **Evaluation mechanisms**

- Create a database of all recent graduates, current graduate students, and IGERT participants
- Compare the progress of IGERT students with other students to determine if IGERT students are fulfilling course and other requirements in a more timely manner than are non-scholarship recipients.
- Monitor progress of all graduates from the graduate program in Environmental Science in subsequent graduate studies and employment.
- Track the impact of the program on participants of different racial and ethnic backgrounds, genders, and ages and on persons with disabilities, based on the profiles of the fellowship recipients.
- Use Institutional Review Board procedures for long-term record keeping of student information
- Design questionnaires with the assistance of an evaluator from the UPR-RP College of Education (Dr. Sandra Macksoud)
- Distribute questionnaires to student and mentors to be completed by the end of each semester (IGERT coordinator).
- Create a protocol for receiving confidential evaluations.
- Summarize student questionnaires and mentor reports at the end of each semester (IGERT coordinator)
- Use questionnaire summary to evaluate students' progress and project success to determine program adjustments (end-of-semester meeting of the Steering Committee).
- Contact DEGI, PRLSAMP, and AGEP every semester to do follow-up on student participation (IGERT coordinator).
- Review assessment results annually (IGERT evaluator).
- Review student progress and accomplishments based on their records, semesterly course and activity evaluations, student questionnaires on program satisfaction, mentor reports of student progress and programmatic issues, to determine necessary programmatic revision (end of academic year meeting of the Steering Committee )
- Use information from annual review to make improvements in the structure and content of the program.
- Make annual report to NSF at least 90 days before the end of the current budget period, indicating "project success in fostering trainee growth, academic and professional training features, institutional impacts, and assessment and evaluation activities" (PI)
- Distribute annual report to the UPR-RP administration and to the IGERT Council at the August gathering. These reports and the conceptual maps will form the basis for reflection and recommendation by the Council.
- Provide annual reports of the impacts of the IGERT project for discussion at the meetings of the Advisory Board in Year 2 and 4 to review the program.

## APPENDIX H. NON-COMPLIANCE WITH IGERT REQUIREMENTS

The IGERT Program expects Fellows to comply with the terms and conditions of their contract, especially clauses 4 and 6, which state:

“4. Attend punctually departmental and group seminars. Take the 12 credits for the IGERT Integrative Core Courses. (Asistir puntualmente a los seminarios departamentales y de grupo. Tomar los doce créditos del IGERT Integrative Core.)

“6. Attend meetings and other activities related to the training program which do not conflict with the [student's] academic program. (Asistir a reuniones y otras actividades relacionadas con el programa de adiestramiento siempre que no confluyan con su programa académico.”)

If a trainee does not comply with these clauses or any other terms of the contract he/she is jeopardizing the Program and his/her status as an IGERT Fellow together with the financial support that the program provides.

Should there be noncompliance, the following steps will be followed to resolve the issue. The trainee will be notified of the reasons why he/she is believed to be in noncompliance and he/she will be afforded an opportunity to present his/her case to the IGERT Steering Committee (hereinafter referred to as “the Committee”) at a meeting to be held as soon as possible after the notification. The Committee will determine the trainee's continued participation on the Program and any conditions for such participation, or if your participation should be suspended. Should he/she not appear at the meeting without a justifiable reason (as defined in UPRRP regulations for being absent from an examination), it will be assumed that he/she do not wish to contest the noncompliance allegation(s) and appropriate action will be taken based on the known facts. If the Committee decides to suspend the trainee's participation in the Program, he/she will be notified by email (followed by a letter by certified mail to his/her last known address in the UPRRP Registrar's records) and his/her stipend and any other financial support will be terminated on the last day of the month in which the meeting is held. Should the trainee wish to do so, the Committee will entertain his/her petition to be reinstated in the Program after six months from the date of the notification email have elapsed and the noncompliance has been removed and appropriate assurances (to the satisfaction of the Committee) are given that the matter will not be repeated. A second suspension will be permanent.