



**ENGINEERING,
THE ENVIRONMENT AND
EXTREME EVENTS:
WILL TECHNOLOGY & INNOVATION BE ENOUGH?**



COLLABORATIVE FIELD COURSE

January 3rd to 20th, 2012



Harvard University
School of Engineering &
Applied Sciences (SEAS)



Universidade de São Paulo
Escola Politécnica
(Poli-USP)



DRCLAS
HARVARD UNIVERSITY

Harvard University
David Rockefeller Center for
Latin American Studies
(DRCLAS)

Participating Schools at Harvard

- ❖ Graduate School of Design (GSD)
- ❖ Harvard Kennedy School (HKS)
- ❖ Harvard Medical School (HMS)
- ❖ Harvard School of Public Health (HSPH)
- ❖ Harvard Innovation Lab (cross-University initiative)

Field Site Visits

- ❖ Madico, Inc
- ❖ Cambridge Drinking Water Facility
- ❖ Deer Island Sewage Treatment Plant
- ❖ U.S. Army Corps of Engineers: Vicksburg District, New Orleans District & Engineer Research and Development Center (ERDC)
- ❖ Odebrecht S.A.

Support

In addition to the support of the academic host institutions, this collaborative course was made possible thanks to the generosity of Harvard University's President's Innovation Funds, the Fundação Centro Tecnológico de Hidráulica (FCTH), Claudio Haddad, the Lemann family, and Odebrecht S.A.

<http://www.drclas.harvard.edu/brazil/seas-poli-usp-2012>

Dear Participants (Caros Participantes),

Welcome! For the first time, we begin this collaborative environmental engineering field course in the United States. As the third edition of a January program created by Harvard University's School of Engineering and Applied Sciences (SEAS), the Universidade de São Paulo's Escola Politécnica (Poli-USP), and the Brazil Studies Program of Harvard's David Rockefeller Center for Latin American Studies (DRCLAS), we are excited to be exploring cooler northern environments this year and to be building on the foundation of warm friendships forged in Brazil. We are encouraged by the momentum created through past years of the course, including long-term research exchanges at the faculty and student levels. We intend to continue to foster research and teaching collaborations and sustainable internationalization through this initiative. Our goal going forward is to have the course in Brazil and in the U.S. in alternate years.

The talented students in this year's course, 11 from Harvard and 10 from the Poli-USP, come from Australia, Brazil, Canada, China, Guatemala, Nigeria and the United States. We look forward to seeing Harvard students, whether from Atlanta, GA; Detroit, MI; Miami, FL; Millburn, NJ; Pasadena, CA or abroad, and their Brazilian counterparts from Campinas, SP; Curitiba, PR; São Paulo, SP and Ribeirão Preto, SP taking full advantage of site visits and faculty presentations as well as informal meals, bus trips and airport conversations.

During our first week together, we will frequently cross bridges between Cambridge, Boston and Allston. We will reach out across Harvard's Schools and academic disciplines with visits to labs at SEAS, the Harvard School of Public Health and the Harvard Medical School. We will also engage in lively discussions at the Harvard Kennedy School, the Graduate School of Design and at the new Harvard Innovation Lab. Off campus, we will visit public drinking water and sewage treatment facilities in the Boston area as well as a private company that manufactures highly engineered, multilayer films for energy, safety, security, and architectural applications.

In week two of the program, we will travel to Vicksburg, Mississippi and New Orleans, Louisiana, for a series of visits organized by the U.S. Army Corps of Engineers (USACE). USACE is making possible site visits to a ship simulator, the DoD high performance computer center, a mat sinking unit and more. Throughout the program, we will mix Harvard and Brazilian students at field sites, in the classroom and at hotels. In Vicksburg, a group of five Harvard students doing research on the Mississippi basin as part of a global water security initiative will join us. They are part of a research initiative that includes Harvard students doing work on Brazil's São Francisco river basin.

We are fortunate to have a distinguished group of guest speakers, including current and former Deans and leaders of private companies and public utilities. Please accept our "muito obrigado" (deep thanks) for sharing your knowledge and time with us. We would like to thank Harvard University's President's Innovation Funds, the Fundação Centro Tecnológico de Hidráulica (FCTH), Claudio Haddad, the Lemann family, Odebrecht, SEAS and DRCLAS for their generous support. Without your vision and trust, our adventure together would not be possible.

Warmest regards,



Monica Porto

Full Professor and Chair, Department of Hydraulic and Sanitary Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP)



Scot T. Martin

Gordon McKay Professor of Environmental Chemistry Harvard School of Engineering and Applied Sciences



Jason Dyett

Program Director, Brazil Office Harvard University David Rockefeller Center for Latin American Studies (DRCLAS)

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ACADEMIC HOST INSTITUTIONS

HARVARD'S SCHOOL OF ENGINEERING AND APPLIED SCIENCES

Harvard University's School of Engineering and Applied Sciences (SEAS) serves as the connector and integrator of the University's teaching and research efforts in engineering, applied sciences, and technology. Its core tenets are educating broad-minded students; interdisciplinary research; integration across disciplines; and balancing theory, experimentation, and practice. SEAS offers undergraduate concentrations in Applied Mathematics (A.B.), Computer Science (A.B.), and Engineering Sciences (A.B. and an ABET-Accredited S.B. degree) and graduate programs (S.M., M.E., and Ph.D.). Graduate students may work towards a Master's of Science (S.M.), Master's of Engineering (M.E.), and Doctor of Philosophy (Ph.D.) degree in one of four subjects – Applied Mathematics, Applied Physics, Computer Science, and Engineering Sciences – or graduate with a Ph.D. in the Information, Technology and Management program (with Harvard Business School). Faculty number approximately eighty (83 FTEs) who have particularly close ties with the departments of Physics, Earth and Planetary Science, and Chemistry and Chemical Biology. The school is ranked as # 1 in Mechanical Engineering and in Biotechnology & Applied Microbiology (*Science Watch*, most recent data). For additional information, please see: www.seas.harvard.edu

UNIVERSIDADE DE SÃO PAULO'S ESCOLA POLITÉCNICA

The Universidade de São Paulo (USP) is the largest institution dedicated to higher education and research in Brazil, with nearly 90,000 students. It is highly acclaimed around the world, especially in Latin America, and is responsible for training a large part of Brazilian academics working in colleges, universities and research institutes. USP is a public university, free of charge and with open access for students selected by the *vestibular* (Brazilian admissions exam for universities). It is composed of 40 educational and research units, five hospitals, five museums, five specialized institutes, multiple experimental laboratories as well as scientific and cultural centers spread across seven campus locations. The primary campus in metropolitan São Paulo houses the Escola Politécnica (Poli-USP), which has more than a dozen departments; the Institute of Astronomy, Geophysics and Atmospheric Science; the Institute of Physics; the Institute of Mathematics and Statistics; and the Chemistry Institute. Founded in 1893, the Poli was incorporated into the Universidade de São Paulo in 1934. Poli-USP has 336 full time faculty and 457 professors. At Poli, there are 4,557 students taking undergraduate courses and 2,437 students pursuing masters, doctoral, and special program degrees. For additional information, please see: www.poli.usp.br

HARVARD'S DAVID ROCKEFELLER CENTER FOR LATIN AMERICAN STUDIES

The David Rockefeller Center for Latin American Studies (DRCLAS) is one of 11 inter-faculty initiatives at Harvard University and is overseen by the Office of the University Provost, with an administrative home in the Faculty of Arts and Sciences (FAS). DRCLAS was founded in 1994 as an initiative to promote high-quality teaching and research on Latin America and related fields at Harvard University. The mission of the DRCLAS Brazil Office in São Paulo and Brazil Studies Program in Cambridge is to enhance collaborative research among Harvard faculty and their Brazilian counterparts; encourage faculty engagement with Brazil and student participation in language programs, internships and research projects in Brazil; and provide a hospitable environment for Brazilians at Harvard and for Harvard scholars in Brazil. In the nearly five years since the launch of the Brazil Office in June 2006, more than four hundred Harvard faculty and students have engaged in and with the country across a range of disciplines with support or involvement of the Office. For additional information, please see: www.drclas.harvard.edu/brazil

COURSE SCHEDULE – JANUARY 2012

Tuesday, January 3rd – Cambridge

- Morning** **Poli-USP students arrive from Brazil.**
Continental Flight 30/1418
Departs São Paulo: 11:00 pm on January 2nd (connection in Newark, NJ)
Arrives Boston: 8:45 am on January 3rd
- Afternoon** **Hotel check-in.**
(Brazilian and Harvard students will be paired in double occupancy rooms).
The Inn at Harvard
1201 Massachusetts Avenue
Harvard Square, Cambridge, MA
+1 (617) 491-2222
+1 (617) 520-3711
<http://www.hotelsinharvardsquare.com/>
- 7:30 pm** **Welcome dinner and Presentation: Science & Technology and Innovation Institutions of the 21st Century** with Prof. Venkatesh Narayanamurti, Professor of Physics, Benjamin Peirce Professor of Technology and Public Policy, SEAS, HKS, Harvard University.
Location: Henrietta's Table
One Bennett St, Cambridge, MA.

Wednesday, January 4th – Cambridge

- 8:30 am** **Meet in hotel lobby.**
- 9:00 – 11:00 am** **Welcome and Collaborative Course Introductions and Overview.**
Cherry Murray, Dean, John A. and Elizabeth S. Armstrong Professor of Engineering and Applied Sciences, SEAS, Harvard University; Each student briefly introduces herself/himself; Jason Dyett provides overview of what to expect in the next three weeks. Professor Monica Porto and Senior Lecturer Marie Dahleh briefly explain teaching and learning objectives for the course.
Location: SEAS MD G 125 - 33 Oxford Street, Cambridge, MA.
- 11:00 am – 12:00 pm** **Visit to SEAS Labs** (walking tour).
Lab presentation by Dr. Anas Chalah, Director of SEAS Teaching Labs.
- 12:00 – 1:00 pm** **Harvard College Campus Orientation and Tour.** Group will be organized in four sub-groups, each of which will be led by SEAS students. This tour will focus on general orientation to Cambridge.
- 1:15 – 2:15 pm** **Group lunch** at MD Lobby.
- 2:15 – 3:00 pm** **Travel from SEAS to Woburn, Mass.**
- 3:00 – 5:30 pm** **Site Visit: Madico, Inc.** Leading manufacturer of laminating and coating solutions using multilayer films engineered to exceed industry standards.

- 5:30 pm **Return** to hotel.
- Evening **Free.** Students encouraged to get to know other members of their groups.

Thursday, January 5th – Cambridge

- 8:30 am **Meet in hotel lobby.**
- 9:00 am Travel to Harvard School of Public Health (HSPH).
Location: FXB Bldg I, Room 1302 - 665 Huntington Avenue, Boston, MA.
- 9:45 – 11:00 am **Lecture & Discussions: Environment and the Atmosphere.** Steven Wofsy, Abbott Lawrence Rotch Professor of Atmospheric and Environmental Sciences, SEAS, Harvard University. (30-45 minute lecture followed by group questions and discussion).
- 11:15 am – 12:30 pm **Overview of Ongoing Laboratory Research Collaboration: Cardiopulmonary Effects of Air Pollution.** John Godleski, Associate Professor in the Department of Environmental Health, HSPH; Associate Professor of Pathology, HMS, Harvard University.
- 12:30 – 2:00 pm **Lunch.**
- 2:00 – 5:00 pm **Round Table and Labs Visit:** USP Medical School students completing one-year research experiences at Harvard in January 2012 will present their research at HSPH and HMS labs. Tour of HSPH labs will be guided by USP Medical School students and their Harvard faculty hosts.
- Evening **Possible Cultural Outing.**

Friday, January 6th – Cambridge

- 8:30 am **Meet in hotel lobby.**
- 9:00 – 10:00 am **Introduction to the Harvard Innovation Lab.** Join Gordon Jones, Harvard i-Lab Director, for a dialogue on the new Harvard Innovation Lab. Harvard i-Lab brings together resources to enable students to take their innovative and entrepreneurial ideas as “far as they can go” and deepens interactions among students, faculty, entrepreneurs, and members of the Allston and Greater Boston community.
Location: 125 Western Ave, Allston, MA.
- 10:00 – 11:00 am **Entrepreneurship – Experiences from the U.S. and Brazil.** What does it mean to be an entrepreneur? What are shared challenges in the U.S. and Brazil? What’s different?
- 11:00 am – 12:00 pm **Tour of Harvard i-Lab and Informal Networking.**
- 12:15 – 1:45 pm **Group lunch** at Harvard i-Lab.

- 2:00 – 3:30 pm** **Lecture & Discussion: Water Security and What it Means for the Mississippi and Brazil.** John Briscoe, Gordon McKay Professor of the Practice of Environmental Engineering, SEAS; Professor of the Practice of Environmental Health, HSPH; Adjunct Faculty, HKS, Harvard University.
Location: HKS Belfer B-Bell, 5th Floor - 79 JFK Street, Cambridge, MA
- 3:45 – 5:00 pm** **Lecture and Discussion: The BP Deepwater Horizon Oil Spill and Offshore.** Cherry Murray, Dean, John A. and Elizabeth S. Armstrong Professor of Engineering and Applied Sciences, SEAS, Harvard University.
Location: MD G 125.
- Evening** **Free.** Participants are encouraged to engage in informal activities.

Saturday, January 7th – Cambridge

- 10:00 – 11:30 am** **1st Discussion of group research themes** for each of the five student Working Groups. Course faculty will provide information to help students progress in their thinking over the course of the program.
Location: MD 119.
- Afternoon** **Group lunch.**

Possible Cultural Outing.
- Evening** **Free.**

Sunday, January 8th – Cambridge

- All Day** **Free.**

Monday, January 9th – Cambridge

- 8:30 – 10:30 am** **Lecture & Discussion: Advanced Water and Wastewater Technologies.** Chad Vecitis, Assistant Professor of Environmental Engineering, SEAS, Harvard University. **Comparative Overview of Brazil's Solutions for Water and Wastewater Technologies.** José Carlos Mierzwa, Associate Professor of Environmental Engineering and Water Treatment, Poli, Universidade de São Paulo. (30-45 minute lecture followed by group questions and discussion).
Location: MD G 125.
- 10:30 am** **Depart** to Fresh Pond Drinking Water Facility in Cambridge.
- 11:00 am – 1:30 pm** **Site Visit: Fresh Pond Drinking Water Facility in Cambridge. (indoors).** Fresh Pond Reservation consists of 162 acres of open space surrounding and protecting the 155 acre Fresh Pond Reservoir. Water from the drinking water supply system is purified at the Walter J. Sullivan Water Treatment Facility adjacent to Fresh Pond Reservoir, and pumped to Payson Park Reservoir in Belmont. From there it flows back to the city by gravity, providing drinking water to residents and businesses of Cambridge.
- 1:30 – 3:15 pm** **Return to SEAS and lunch** at MD Lobby.

3:30 – 5:00 pm **Lecture & Discussion: Urban Water Resource Use and Management.**
Monica Porto, Full Professor and Department Chair, Hydraulic and Sanitary Engineering, Poli, Universidade de São Paulo. (30-45 minute lecture followed by group questions and discussion).
Location: MD G 125.

Evening **Free.**

Tuesday, January 10th – Cambridge & Vicksburg

8:45 – 10:15 am **Breakfast and Hotel Check-out.** Participants should pack and take luggage to the bus for afternoon trip to Vicksburg, MS.

10:15 – 11:00 am **Depart** to Deer Island Sewage Treatment Plant.

11:00 am – 1:30 pm **Site Visit: Deer Island Sewage Treatment Plant.** (*outdoors*).
MWRA's Deer Island Sewage Treatment Plant is the centerpiece of MWRA's \$3.8 billion program to protect Boston Harbor against pollution from Metropolitan Boston's sewer systems. The plant removes human, household, business and industrial pollutants from wastewater that originates in homes and businesses in 43 greater Boston communities.

Late afternoon & Evening **Participants travel to Vicksburg, MS**
Delta Flight 3093/3027
Boston, MA – Jackson, MS (connection in Washington, DC)
Departs: 4:05 pm
Arrives: 9:36 pm

Bus trip from Jackson to Vicksburg, MS (approx. 1h05).

Hotel check-in.
(*Brazilian and Harvard students will be paired in double occupancy rooms*).
Comfort Suites
100 Berryman Road
Vicksburg, MS
+1 (601) 638-2290 - Phone
+1 (601) 638-2275 - Fax
<http://www.comfortsuites.com/>

Wednesday, January 11th – Vicksburg

8:00 am **Depart** to USACE Engineer Research and Development Center (ERDC).

8:35 – 9:35 am **Welcome and ERDC Overview.**
Location: Auditorium, Bldg 1006.

9:35 – 10:00 am **Lake Borgne (New Orleans, LA) Physical Model.** Mr. Howard Park
Location: Bldg 3281.

10:05 – 10:30 am **System-Wide Water Resources Program.** Mr. Steve Ashby.
Location: Coastal and Hydraulics Lab, Bldg. 3200, Room.

10:30 – 10:55 am **2011 Mississippi River Flood.** Mr. Ronnie Heath.

10:55 – 11:20 am	Rapid Repair Levee Breach/PLUG. Mr. Stan Boc.
11:20 – 11:30 am	Break.
11:30 – 11:50 am	Numerical Modeling. Mr. Bruce Ebersole.
11:50 am – 12:10 pm	Ship Simulator. Mr. Dennis Webb.
12:15 – 1:15 pm	Lunch.
1:15 – 1:45 pm	Engineering with Nature. Dr. Todd Bridges. Location: Environmental Laboratory, Bldg. 3270.
1:45 – 2:10 pm	Risks Associated with Sea Level Rise. Ms. Kelly Burks-Copes.
2:10 – 2:20 pm	Break.
2:25 – 2:55 pm	Birds Point – New Madrid Floodway Activation Processes and Effort. Mr. Bart Durst. Location: Geotechnical and Structures Laboratory, Centrifuge Research Center.
2:55 – 3:20 pm	Vegetation on Levees Research.
3:30 – 3:55 pm	Decision Support and Mobile Computing Technology. Dr. Robert Wallace. Location: Information Technology Laboratory, Bldg. 8000.
3:55 – 4:15 pm	DoD High Performance Computing Center.
4:15 pm	Return to hotel.

Thursday, January 12th – Vicksburg

8:30 am	Depart to USACE Engineer Research and Development Center (ERDC).
9:05 – 9:30 am	Assessment of Ecosystem Services. Location: Aquatic Ecosystems R&D Center, Bldg. 5036.
09:30 – 10:10 am	Invasive Species - Threatened and Endangered Species and Rescues during 2011 Flood.
10:10 – 10:20 am	Break.
10:20 – 10:55 am	Aquatic Plant Control Research.
11:00 am	Depart ERDC for lunch.
11:30 am – 1:00 pm	Lunch.
Afternoon	Site Visit: Vicksburg Districts and Extreme Events. Addendum itinerary will be provided.

Friday, January 13th – Vicksburg

Morning	Site Visit: Vicksburg Districts and Extreme Events. Addendum itinerary will be provided.
1:00 – 1:15 pm	Arrival at U. S. Army Corps of Engineers’ Vicksburg District Office. Sign in at guard’s desk and proceed to Executive Conference Room.
1:15 – 2:00 pm	Welcome and Vicksburg District Overview. Major John T. Tucker III.
2:15 – 2:35 pm	Tour of Headquarters Building.
2:35 – 2:50 pm	Travel to Mat Sinking Unit and Harbor Facilities.
2:50 – 3:30 pm	Tour of Mat Sinking Unit.
3:30 pm	Return to hotel. Participants should pack for trip to New Orleans, LA.

Saturday, January 14th – Vicksburg & New Orleans

Morning	Breakfast and Hotel Check-out.
Late morning	Participants travel to New Orleans, LA. Bus trip from Vicksburg, MS to New Orleans, LA (approx. 4h05). Hotel check-in. <i>(Brazilian and Harvard students will be paired in double occupancy rooms).</i> Dauphine Orleans Hotel 415 Dauphine Street New Orleans, LA +1 (504) 586-1800 – Phone +1 (504) 586-1409 – Fax http://www.dauphineorleans.com
Evening	Possible Cultural Outing.

Sunday, January 15th – New Orleans

All Day	Site Visit: Odebrecht LPV-9.2 or LPV 3.2 Flood Protection Facilities. Addendum itinerary will be provided.
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Monday, January 16th – New Orleans

All Day	Site Visit: New Orleans Districts and Extreme Events. Addendum itinerary will be provided.
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Tuesday, January 17th – New Orleans

All Day	Site Visit: New Orleans Districts and Extreme Events. Addendum itinerary will be provided.
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Wednesday, January 18th – New Orleans & Cambridge

- Morning** **Lecture & Discussion: Comparative Overview of U.S. and Brazil's Solutions for Extreme Events.** Prof. José Rodolfo Scarati Martins, Assistant Professor of Civil and Environmental Engineering, Poli, Universidade de São Paulo.
- Afternoon & Evening** **Lunch and Hotel Check-out.**
- Participants travel to Cambridge, MA.**
Delta Flight 1293/1100
New Orleans, LA – Boston, MA (connection in Atlanta, GA)
Departs: 4:30 pm
Arrives: 10:11 pm
- Hotel check-in.**
(Brazilian and Harvard students will be paired in double occupancy rooms).
The Inn at Harvard
1201 Massachusetts Avenue
Harvard Square, Cambridge, MA
+1 (617) 491-2222
+1 (617) 520-3711
<http://www.hotelsinharvardsquare.com/>

Thursday, January 19th – Cambridge

- 10:00 – 11:00 am** **Lecture & Discussion: International Research Collaborations in the Field.** Scot Martin, Gordon McKay Professor of Environmental Chemistry, SEAS, Harvard University.
Location: MD G 125.
- 11:15 am – 12:30 pm** **Lecture & Discussion. Urban Planning: Challenges of Mega-cities and Mega-events.** Judith Grant Long, Associate Professor of Urban Planning, Graduate School of Design (GSD), Harvard University.
Location: GSD Room 508, 48 Quincy, Cambridge, MA.
- 12:30 – 2:00 pm** **Lunch.**
- 2:15 – 3:30 pm** **Tour of the Graduate School of Design (GSD)** led by GSD students.
- 3:45 – 5:00 pm** **2nd Discussion of group research themes** for each of the five student Working Groups. Course faculty will provide information to help students progress in their thinking on the program.
- Evening** **Free.**

Friday, January 20th – Cambridge

- 8:00 – 9:00 am** **Breakfast and Hotel Check-out.**
- 9:00 – 10:30 am** **Online course evaluation.**

10:45 am – 12:45 pm **Group presentations.**

Location: MD G 125.

1:00 – 2:30 pm **Closing lunch.**

Location: MD Lobby.

Evening

Departure of Harvard students to Cambridge. Brazilian students return to Brazil.

Continental Flight 1238/31

Boston, MA – São Paulo, SP (connection in Newark, NJ)

Departs: 6:45 pm on January 20th

Arrives: 10:40 am on January 21st

NAMES & FACES

CORE COURSE FACULTY AND GUEST LECTURERS

(Alphabetical by last name)

From Harvard



Scot T. MARTIN
Gordon McKay Professor of Environmental Chemistry, Harvard School of Engineering and Applied Sciences (SEAS)



Marie DAHLEH
Assistant Dean for Academic Programs and Senior Lecturer on Engineering Sciences, School of Engineering and Applied Sciences (SEAS)



John BRISCOE
Gordon McKay Professor of the Practice of Environmental Engineering, Harvard School of Engineering and Applied Sciences (SEAS)



Anas CHALAH
Director of the Undergraduate Teaching Labs, School of Engineering and Applied Sciences (SEAS); Lecturer in Engineering Sciences, Harvard University



John GODLESKI
Associate Professor in the Department of Environmental Health, Harvard School of Public Health (HSPH)



Gordon S. JONES
Director, Innovation Lab, Harvard University

From Poli-USP and USACE



Monica F. A. PORTO
Full Professor and Chair, Department of Hydraulic and Sanitary Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP)



José Rodolfo Scarati MARTINS
Assistant Professor of Civil and Environmental Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP)



José Carlos MIERZWA
Associate Professor of Environmental Engineering and Water Treatment, Escola Politécnica da Universidade de São Paulo (Poli-USP)



Rubem La Laina PORTO
Professor, Department of Hydraulic and Sanitary Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP)



Marcello Z. SALLES
Liaison Officer to U.S. Southern Command (SOUTHCOM), U.S. Army Corps of Engineers (USACE)



Judith Grant LONG
Associate Professor of
Urban Planning, Graduate
School of Design (GSD)



Cherry A. MURRAY
Dean; John A. and Elizabeth S.
Armstrong Professorship of
Engineering and Applied
Sciences, School of Engineering
and Applied Sciences (SEAS)



Venkatesh NARAYANAMURTI
Benjamin Peirce Professor of
Technology and Public Policy;
Professor of Physics; Director,
Science, Technology, and Public
Policy Program, Harvard
Kennedy School (HKS)



Chad VECITIS
Assistant Professor of
Environmental Engineering,
School of Engineering and
Applied Sciences (SEAS)



Steve WOFSY
Abbott Lawrence Rotch
Professor of Atmospheric and
Environmental Science, Harvard
School of Engineering and
Applied Sciences (SEAS)

STUDENTS

(Alphabetical by last name)

Students from Harvard



John AZUBUIKE
Harvard College, Class of 2013
A.B. in Engineering Sciences



Maria Elena BENDANA
Harvard College, Class of 2014
S.B. in Mechanical and Materials
Science and Engineering



Julianna BRUNINI
Harvard College, Class of 2014
A.B. in Earth and Planetary
Sciences



Christopher COEY
Harvard College, Class of 2013
A.B. in Applied Mathematics in
Economics and Computer
Science



Nicolas (Nico) HAWLEY-WELD
Harvard College, Class of 2012
A.B. in Environmental
Engineering



Plas (Terry) JAMES
Harvard College, Class of 2013
A.B. in Applied Mathematics



Christopher LEE
Harvard College, Class of 2013
A.B. in Applied Mathematics



Stephen LEE
Harvard College, Class of 2013
A.B. in Biomedical Engineering
and Computer Science

Students from Brazil



Marcus Vinicius BERGOZINI DO PRADO
Poli-USP, 5th-year undergraduate
student in Environmental
Engineering



Pedro Ludovico BOZZINI
Poli-USP, 4th-year undergraduate
student in Environmental
Engineering



Mariana Pereira GUIMARÃES
Poli-USP and FAU-USP, 5th-year
undergraduate student in Civil
Engineering and Architecture and
Urbanism



Gabriela González LOUREIRO
Poli-USP, 4th-year undergraduate
student in Environmental
Engineering



Danilo MARTELETO
Poli-USP, 3rd-year undergraduate
student in Environmental
Engineering



Luciana Capuano MASCARENHAS
Poli-USP, 4th-year undergraduate
student in Environmental
Engineering



Mario Henrique MEIRELES
Poli-USP, 5th-year undergraduate
student in Environmental
Engineering



Felipe Moschem de NADAI
Poli-USP, 3rd-year undergraduate
student in Civil Engineering



Ling LIN
Harvard College, Class of 2012
A.B. in Environmental Science
and Public Policy



Bruno ERLINGER DE OLIVEIRA
Poli-USP, 5th-year undergraduate
student in Environmental
Engineering



Kayla SHELTON
Harvard College, Class of 2013
A.B. in Mechanical Engineering



Bárbara VITAL
Poli-USP, 5th-year undergraduate
student in Environmental
Engineering



Jessica WU
Harvard College, Class of 2014
S.B. in Mechanical and Materials
Engineering

STUDENTS FROM HARVARD WATER SECURITY INITIATIVE (Vicksburg, MS only)



Jonathan BAKER
Harvard Kennedy School,
Doctoral candidate in
Environmental and Resource
Economics



Laila KASURI
Harvard College, Class of 2013
A.B. in Environmental Engineering



Sarah KATZ
Harvard Law School, Doctoral
candidate



William NIEBLING
Harvard Law School, Doctoral
candidate



Kim SMET
School of Engineering and
Applied Sciences (SEAS), Ph.D.
candidate in Environmental
Engineering

ORGANIZERS



Jason DYETT
Program Director, Brazil Office
of Harvard University's David
Rockefeller Center for Latin
American Studies (DRCLAS)



Manoel Carlos PEREIRA NETO
Program Analyst, Brazil Office
of Harvard University's David
Rockefeller Center for Latin
American Studies (DRCLAS)

COURSE LOCATIONS

Harvard University (Cambridge, Boston and Allston)

Established in 1636, Harvard is the oldest institution of higher education in the United States. The University, which is based in Cambridge and Boston, Massachusetts, has an enrollment of over 20,000 degree candidates, including undergraduate, graduate, and professional students. Harvard has more than 360,000 alumni around the world.

Vicksburg, MS

Vicksburg is a city in the state of Mississippi, located 234 miles (377 km) northwest of New Orleans on the Mississippi and Yazoo rivers, and 40 miles (64 km) due west of Jackson, the state capital. In 1900, 14,834 people lived in Vicksburg; and at the 2000 census, the population was 26,407. According to the *United States Census Bureau*, the city has a total area of 35.3 square miles (91 km²), of which 32.9 square miles (85.2 km²) is land and 2.4 square miles (6.2 km²) (6.78%) is water.

New Orleans, LA

New Orleans is a major U.S. port and the largest city in the state of Louisiana. The city is named after Philippe d'Orléans, Duke of Orléans, Regent of France, and is well known for its distinct French Creole architecture, as well as its cross cultural and multilingual heritage. New Orleans is located in southeastern Louisiana, straddling the Mississippi River.



Cambridge, MA



SITE VISITS

An Important Note of Thanks to our Field Site Hosts:

On behalf of all collaborative course participants, the course organizers would like to thank the tremendous generosity, openness and hard work of the institutions and many individuals who have made the following field site visits possible. Unfortunately, we are certain to miss many of you in this brief note of acknowledgement. Please know that, despite our omissions in the listing below, we appreciate your contributions and recognize that you are integral to this collaborative course's existence and success.



SITE VISIT

Madico, Inc.

Cambridge Drinking Water Facility

Deer Island Sewage Plant

U.S. Army Corps of Engineers

Odebrecht

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MADICO, INC.

Based in Woburn, MA, Madico, Inc. produces highly engineered, multilayer films for energy, safety, security, and architectural applications. The company is over 100 years old. Its production facility is designed for 100 % capture of process emissions and is equipped with a Regenerative Thermal Oxidizer (MEGTEC CleanSwitch) that performs with greater than 99% destruction efficiency of Volatile Organic Compounds utilized in the manufacturing processes. This system also functions as a heat recovery system with 95% thermal efficiency. The heat is captured and re-used in their manufacturing process. In addition to its manufacturing facility in Woburn, MA, Madico has factories in St. Petersburg, FL; Doi, Japan; Chiba, Japan and Michigan.

Source: <http://www.madico.com/>

FRESH POND DRINKING WATER FACILITY



The retreating Laurentide Glacier sculpted Fresh Pond and the surrounding hills about 15,000 years ago. Native Americans found an abundance of fish in the ponds and streams of this area, and plentiful wildlife in the woods and marshes. The rich environment also attracted European settlers. The Charles River, in contrast, was inter-tidal and was not a source of fresh water. In the mid 1800s the Pond privately owned and the site of a flourishing ice industry, its clean water producing high quality ice that was shipped as far away as Europe, China and India. The Pond became the City's drinking water supply in 1856. By 1889 the Massachusetts Legislature granted the right of eminent domain to acquire all the land that is currently part of the Reservation from private owners and the Town of Belmont in the interest of protecting the purity of the water. The small ponds we call Black's Nook and Little Fresh Pond were created from shallow coves in the larger Pond by gravel dikes, which were built to help prevent pollution and to serve as a bed for the road that encircled the Pond. Today Fresh Pond is a favorite place for many people who enjoy walking, running, bike riding, and roller-blading on the 2¼ mile perimeter road.

At Fresh Pond, the Walter J. Sullivan Water Treatment Facility produces drinking water from the raw water of Cambridge reservoir system. The drinking water from the plant is provided to the City of Cambridge. The staff includes a Production Manager, an Instrumentation and Maintenance Manager, and eight fully licensed Drinking Water Operators classified as Team Leaders and Plant Operators.

The plant includes various intake structures and aeration equipment that extend into the pond. The rest of the treatment process is contained inside the Walter J. Sullivan Water Treatment Facility. The raw water is treated to State and Federal drinking water standards. The processes that accomplish this include:

Aeration: The bubbling of air from the bottom of the pond keeps the waters of Fresh Pond mixed, preventing stratification by temperature. The mixing prevents and controls the release of manganese into the water.

Pre-treatment: This includes the pre-oxidation, rapid mix, coagulation and dissolved air flotation (DAF). These processes with the application of ozone and a coagulant chemical, alum, remove: manganese, natural color, particles, algae, protozoa, viruses and bacteria from the water.

Intermediate Ozone: In this step fine bubbles of ozone are dissolved into the water and disinfect the water by killing bacteria, viruses, and protozoa. The ozone is generated in the plant and introduced into the water in a series of chambers that allow contact and mixing of the ozone with the water. At the end of this process all the ozone introduced is removed from the water.

Granular Activated Carbon (GAC) Filtration: This step follows the ozone application to help remove any organic compounds that may have been rendered biologically active or useable by the ozone step. The filters further polish the water by removing additional particles, color and protozoa from the water.

Chlorination: The chlorination after the filters kills bacteria that may develop during the normal operation of the filters. The chlorination step also provides a level of redundancy in the overall disinfection process.

Post Treatment Chemical Addition: This includes the adjustment of pH for corrosion control, the addition of fluoride for dental health, and chloramination to provide disinfection residual in the distribution system.

Source: http://www2.cambridgema.gov/CWD/wat_fp_geninfo.cfm

DEER ISLAND SEWAGE TREATMENT PLANT



Massachusetts Water Resources Authority's (MWRA) Deer Island Sewage Treatment Plant is the centerpiece of MWRA's \$3.8 billion program to protect Boston Harbor against pollution from Metropolitan Boston's sewer systems. The plant removes human, household, business and industrial pollutants from wastewater that originates in homes and businesses in 43 greater Boston communities. In compliance with all federal and state environmental standards and subject to the precedent-setting discharge permit issued for the plant by EPA and DEP, its treated wastewater can be released to the marine environment. Below are the major components of the plant.

Pumping: Wastewater "influent" from MWRA customer communities arrives at the plant through four underground tunnels. Pumps then lift the influent about 150 feet to the head of the plant. There are three main pump stations. The North System is served by the North Main Pump Station and the Winthrop Terminal Headworks, containing ten 3,500 hp pumps and six 600 hp pumps. The capacity for the North System is 910 mgd. The Lydia Goodhue Pump Station for the South System can handle an additional 360 mgd of flow, and contains eight 1,250 hp pumps. The pumping capacity at the new Deer Island plant has dramatically increased the volume of wastewater that can be taken into the plant from the conveyance tunnels. This reduces back-ups and overflows throughout the system when wet weather causes peaking of system flows.

Primary Treatment: After pumping, flows pass through grit chambers that remove grit for disposal in an off-island landfill. Next, flows are routed to primary treatment clarifiers that remove about half of the pollutants brought to the plant in typical wastewater (50-60% of total suspended solids and up to 50% of pathogens and toxic contaminants are removed). In this step, gravity separates sludge and scum from the wastewater. The plant uses 48 primary clarifiers that are 186 feet long by 41 feet wide by 24 feet deep. The clarifiers have a “stacked” settling surface at mid-depth to double the settling capacity of the tanks that are squeezed into the tight space confines of Deer Island.

Secondary Treatment: Secondary treatment mixers, reactors and clarifiers remove non-settleable solids through biological and gravity treatment. The biological process is a pure oxygen-activated sludge system, using microorganisms to consume organic matter that remains in the wastewater flow. Secondary treatment raises the level of pollution removal to over 85%. Three “batteries” of secondary treatment were completed in 1997, 1998 and 2001, respectively. Over one hundred tons of pure oxygen are manufactured each day at Deer Island’s cryogenic facility to support the biological treatment process. The Deer Island Treatment Plant generates 130-220 tons of pure oxygen per day to support the secondary treatment process.

Sludge Digestion: Sludge and scum from primary treatment are thickened in gravity thickeners. Sludge and scum from secondary treatment are thickened in centrifuges. Polymer is added in the secondary thickening process to increase its efficiency. Digestion then occurs in 12 distinctive egg-shaped anaerobic digesters, each 90 feet in diameter and approximately 130 feet tall. Mimicking the stomach’s natural digestion process, microorganisms naturally present in the sludge work to break sludge and scum down into methane gas, carbon dioxide, solid organic byproducts, and water. Digestion significantly reduces sludge quantity. The byproduct of the digestion process is 70 percent methane gas, which is captured and piped to boilers that generate enough heat to warm the buildings on the site as well as for the heat-dependent treatment processes. The steam from those boilers is sent through a steam turbine generator (STG) producing an average of approximately 3 megawatts of electricity. Digested sludge leaves Deer Island is transported through the Inter-Island Tunnel to MWRA’s pelletizing facility at Fore River, where it is further processed into a fertilizer product.

Odor Control: Air scrubbers and carbon adsorbers remove odors and volatile organic compounds from treatment process “off-gases”. Odor control is used for primary and secondary treatment process facilities, as well as the sludge processing, plant pumping, and grit removal facilities. Odor control performance is constantly monitored and is governed by a special DEP air quality permit.

Disinfection: After passing through primary and secondary treatment, wastewater is disinfected with sodium hypochlorite to kill bacteria. There are two disinfection basins, each approximately 500 feet long with a capacity of 4 million gallons, in which the effluent is mixed with sodium hypochlorite. Finally, sodium bisulfite is added to dechlorinate the water, so that chlorine levels in the ultimate discharge will not threaten marine organisms. After disinfection and dechlorination, the effluent is ready to be discharged.

Effluent Discharge: A 9.5-mile 24-foot-diameter outfall tunnel transports effluent into the 100-foot deep waters of Massachusetts Bay. Effluent is discharged through more than 50 individual diffuser pipes, each with eight small ports, so that rapid and thorough mixing into surrounding water is achieved and water quality standards are not compromised by the discharge. Extensive environmental monitoring ensures that the environment is properly protected.

Laboratory Services: A central laboratory at Deer Island performs more than 100,000 analyses per year to support process control and ensure that wastewater discharges meet the restrictions contained in the plant’s permit.

Operation and Maintenance: The Deer Island plant was built with computerized systems to assist operations and maintenance management. The computerized operations systems include the Process Information Control System (PICS) and the Operation Management System (OMS). PICS provides real-time operations data from systems throughout the plant (including system status, flow, etc.) while OMS correlates PICS data with laboratory analysis to track and analyze plant process performance with regard to the plant's discharge permit from EPA and DEP and with respect to cost effective operation. Maximo is the computerized maintenance management system used at Deer Island. The long-term maintenance strategy for the plant is being refined to assure that plant assets are maintained, serviced and replaced when necessary. Major commitments to personnel training have allowed MWRA to match staff resources with the opportunities for efficiency provided by modern computer based systems.

Measuring Plant Performance: MWRA continually compiles information on how the Deer Island Sewage Treatment Plant is performing on key measurements, including the measures that are contained in the discharge permit.

Source: <http://www.mwra.state.ma.us/>

U.S. ARMY CORPS OF ENGINEERS

The United States Army Corps of Engineers (USACE) is a federal agency and a major Army command made up of some 38,000 civilian and military personnel, making it the world's largest public engineering, design and construction management agency. USACE is involved in a wide range of public works support to the nation and the Department of Defense throughout the world. The Corps of Engineers provides outdoor recreation opportunities to the public, and provides 24% of U.S. hydropower capacity. The Corps' mission is to provide vital public engineering services in peace and war to strengthen the nation's security, energize the economy, and reduce risks from disasters.

Their most visible missions include: Planning, designing, building, and operating locks and dams; flood control, beach nourishment, and dredging for waterway navigation; design and construction of flood protection systems; design and construction management of military facilities for the Army, Air Force, Army Reserve and Air Force Reserve and other Defense and Federal agencies; environmental regulation and ecosystem restoration.

Source: Wikipedia - http://en.wikipedia.org/wiki/United_States_Army_Corps_of_Engineers

ODEBRECHT

Odebrecht is a diversified Brazilian conglomerate with a strong tradition in large-scale civil construction projects at home and abroad. Among the organization's international projects in the United States are LPV-9.2 and LPV 3.2.



LPV-9.2 is located in greater New Orleans, Louisiana, between the cities of Metairie and Kenner. The company's work on this project consists of constructing a continuous line of hurricane flood protection across the discharge basins at Pumping Stations No. 1 thru 4, as well as, modifications to the 2 existing breakwaters at Pumping Stations No. 2 and 3. This protection will incorporate pile founded reinforced concrete T-walls, L-walls, swing gate and gatebay type monoliths. Site work will include reconstruction of an access road bridge, modifications to existing pumping station utilities, dewatering systems, construction of temporary retaining structures with work platforms, miscellaneous excavation, clearing and grubbing. Miscellaneous mechanical and electrical work will also be performed. The pump stations are of varying sizes, capacities and arrangements, but are similar in function and design.

The LVP 3.2 West Return Floodwall Project is located in the city of Kenner, which is part of greater New Orleans, Louisiana. It consists of the construction of a new 3-mile long concrete T-wall on the floodside of the existing floodwall, which will be demolished. Travelling north to south along the Jefferson Parish line, the new T-wall will reduce the risk of flooding in from a storm surge in Lake Pontchartrain and LaBranche wetlands. The work consists of clearing and grubbing, driving H-Piles and sheet piles, excavation, embankment, demolition of existing floodwall, construction of new floodwall, modification of existing pump station discharge pipes, asphaltic pavement, turf establishment and maintenance and any incidental works.

Source: Odebrecht

WORKING GROUPS & FINAL PRESENTATIONS

The following four questions are designed to guide the discussion and learning of students in each of the course's five sub-groups (*see student assignments in the chart below*): 1. **Conventional Water Technologies: Advantages and Disadvantages**, 2. **Innovation in Water Technologies**, 3. **Extreme events: Floods**, 4. **Extreme events: Hurricanes** and 5. **Extreme events: Forecasting and Preparedness**. Each group of students will briefly present its answers to these questions at a closing ceremony (8-10 min per group).

1. *What did you learn in this course? Provide a concise, organized summary.*
2. *Discuss Engineering solutions in this subject. Identify one key point that attracted your attention and explain why.*
3. *How does the key point that your group selected in #2 above tie in to the broader focus of this course on Engineering, the Environment and Extreme Events: Will Technology and Innovation be Enough?*
4. *Considering what you have learned about the subject matter and the characteristics of an engineering education at Poli-USP in Brazil and at Harvard's SEAS in the United States, what areas do you think are most promising to pursue for further collaboration?*

<u>Name</u>	<u>Group</u>	<u>Country</u>	<u>School</u>
Barbara Vital	1	Brazil	Poli-USP
Christopher Coey	1	Australia	Harvard College
Danilo Fumagalli Marteleto	1	Brazil	Poli-USP
Julianna Brunini	1	USA & UK	Harvard College
Bruno Oliveira	2	Brazil	Poli-USP
Kayla Shelton	2	USA	Harvard College
Mariana Pereira Guimarães	2	Brazil	Poli-USP & FAU-USP
Nicolas Hawley-Weld	2	USA & Costa Rica	Harvard College
Christopher Lee	3	USA	Harvard College
Gabriela González Loureiro	3	Brazil & Spain	Poli-USP
Jessica Wu	3	USA & China	Harvard College
Mario Henrique Meireles	3	Brazil	Poli-USP
Luciana Capuano Mascarenhas	4	Brazil	Poli-USP
Marcus Vinicius Bergonzini do Prado	4	Brazil	Poli-USP
Maria Elena Bendana	4	Guatemala	Harvard College
Stephen Lee	4	USA	Harvard College
Felipe Moschem de Nadai	5	Brazil & Italy	Poli-USP
John Azubuike	5	Nigeria	Harvard College
Ling Lin	5	USA & China	Harvard College
Plas Terrence James	5	USA	Harvard College
Pedro Ludovico Bozzini	5	Brazil	Poli-USP

GROUP 1:



Barbara Vital; Christopher Coey; Danilo Fumagalli Marteleto; Julianna Brunini

GROUP 2:



Bruno Oliveira; Kayla Shelton; Mariana Pereira Guimarães; Nicolas Hawley-Weld

GROUP 3:



Christopher Lee; Gabriela González Loureiro; Jessica Wu; Mario Henrique Meireles

GROUP 4:



Luciana C. Mascarenhas; Marcus Vinicius B. do Prado; Maria Elena Bendana; Stephen Lee

GROUP 5:



Felipe M. de Nadai; John Azubuike; Ling Lin; Plas Terrence James; Pedro Ludovico Bozzini

PARTICIPANT BIOGRAPHIES

(Alphabetical by last name)



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John Azubuike is a third-year undergraduate at Harvard College concentrating in Engineering Sciences. He was born in Aba, Nigeria and was raised in the Bronx, New York. His academic interests include neurobiology, medical devices, and systems engineering. In his time with the Harvard-USP Field Course, John aims to learn about the different factors and stakeholders in the environmental development process and about the evaluation of risks and rewards in large scale building projects. He is the Vice-President of the Consent, Assault-Awareness, and Relationship Educators (CAARE) as well as the Secretary of the Harvard Society of Black Scientists and Engineers (HSBSE). His laboratory experiences include developing low-cost diagnostics equipment in George Whitesides Group and serving as the intern for the Harvard Center for Nanoscale Systems. John has spent his summers working in finance, teaching history and study skills to middle school students, and teaching math and science to high school students. He is an avid fan of American football.



Jonathan BAKER

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candidate in Environmental and
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Jonathan Baker is a first year doctoral student at the Kennedy School. He is interested in investigating economic institutions for sustainable water use and the interrelationships between economic institutions, social institutions, technical systems, the hydrologic system, and climate change. Jonathan's academic background includes an undergraduate degree in physics and a masters in mechanical engineering, in which he studied fluid power. He recently completed a second masters in technology and policy, focusing on water resources within the context of large scale (CGE) economic models.



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Maria Bendana is a sophomore at Harvard College from Guatemala City, Guatemala. She has lived in Miami, the U.S. Virgin Islands, and Guam in addition to Guatemala. She is a Mechanical Engineering concentrator at the College. Her primary academic interests are in the sciences, such as space exploration and space science and in engineering, mechanical and aerospace. Maria currently works at the Harvard Micro-robotics Laboratory building and designing micro-thrusters for robotic

insects. She is also a part of the Engineers Without Borders Harvard Chapter, the Rocketry Club, and she is on the board of Harvard Organization for Latin Americans. In her free time, Maria enjoys running, traveling, listening to music, hiking, socializing and scuba-diving.



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Marcus Vinicius was born in Mogi das Cruzes, a midsize city near São Paulo. He is a fifth-year undergraduate student at Poli-USP concentrating in Environmental Engineering. His academic interest lies in comprehending soil and groundwater contamination, as well as technologies to remediate these global problems. Marcus was the student body representative at the Commission for Environmental Engineering Course Organization at Poli-USP during two consecutive years and he participated in a Sustainability Business Plan Competition in London. He loves reading and discussing a wide range of subjects, including Politics, Philosophy, Science, and Cinema. Marcus is currently applying to a Master's Degree program.



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Pedro Ludovico Bozzini is a fourth-year undergraduate student concentrating in Environmental Engineering at the Poli-USP. He was born and raised in São Paulo, where his interest in problems of large urban centers began. Pedro recently took part in an undergraduate research project on hydrology using stochastic modeling. In this collaborative field course, he looks forward to learning more about the management of areas affected by extreme events. He enjoys music, games, and movies.



John BRISCOE

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John Briscoe's career has focused on the issues of water and economic development. He has worked as an engineer in the water agencies of South Africa and Mozambique; as an epidemiologist at the Cholera Research Center in Bangladesh; as a professor of water resources at the University of North Carolina; and, for the past 20 years in a variety of policy and operational positions in the World Bank. Most recently he has served as the Bank's Senior Water Advisor and the Country Director for Brazil. Briscoe joined the faculty at Harvard in 2009 and is directing the Harvard Water Security Initiative, a research program which draws together a wide range of disciplines relevant to water management, and which is developing cooperative research programs with a number of countries, initially including Australia, Brazil, Pakistan and the United States. In addition to the United States, Briscoe has lived in his native South Africa, Bangladesh, Mozambique, India and Brazil. Briscoe has served on the Water Science and Technology Board of the National Academy of Sciences and was a founding member of the major global water partnerships, including the World

Water Council, the Global Water Partnership, and the World Commission on Dams. He currently serves on the Global Agenda Council of the World Economic Forum; is a member of the Council of Distinguished Water Professionals of the International Water Association; and will be the first Natural Resource Fellow of the Council on Foreign Relations. He has published extensively in economic, finance, environmental, health and engineering journals. Recently he authored *Water Sector Strategy*, *India's Water Economy: Bracing for a Turbulent Future*, and *Pakistan's Water Economy: Running Dry*. He received his Ph.D. in Environmental Engineering at Harvard University in 1976 and his B.Sc. in Civil Engineering at the University of Cape Town, South Africa in 1969.



Julianna BRUNINI

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A sophomore at Harvard University, Julianna Brunini is studying Earth and Planetary Sciences. She is curious about all processes that shape our planet, from plate tectonics to urban planning. During school, she works at the Mukhopadhyay Lab and plays violin in the Bach Society Orchestra, and this past summer she researched soil respiration at The Harvard Forest. In her free time she loves exploring Boston and Cambridge by foot, catching up on television, and drawing.



Anas CHALAH

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Anas Chalah is the director of the undergraduate teaching labs at the School of Engineering and Applied Sciences (SEAS) and lecturer in engineering sciences at Harvard University. He leads the team of support teaching staff and partners with faculty to create an environment conducive to hands-on engineering education. Chalah also develops new labs using the best pedagogical methods, assists with strategic planning, and supports SEAS' growing presence in bioengineering. Chalah has also served as the lab senior director of the undergraduate chemistry department at UMass Amherst, where he directed six labs and supervised several teaching assistants and undergraduate students. He also worked as a manager at OMO/Unilever International. Chalah received his Ph.D. in chemistry from the University of Massachusetts, Amherst. His postdoctoral research at Harvard Medical School and Beth Israel Deaconess Medical Center focused on understanding the switching mechanism between the cellular survival pathway and the programmed death pathway.



Christopher COEY

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Chris Coey lived his first 18 years in North Queensland, Australia. He is now a Junior at Harvard, studying Applied Mathematics in Economics and CS, with a secondary in Government. Chris' interests lie primarily in development, at the intersection of economics, environment, and political science. He has explored these interests in the field during his summers, working with a microfinance bank in Rwanda, traveling to the Haitian-Dominican border to help construct a very

deep well, and spending time in Nicaragua and India learning about NGOs and the challenges of development. Recently, Chris has been working on a project to model flows through water distribution networks (from resources to households) using operations research techniques. The target application is decision support for the operations of governments and aid organizations following natural disasters or water infrastructure failures. This project will likely take Chris and his Professor, Ozlem Ergun, to Lima in early 2012. Chris is also interested in writing his thesis on water issues, environmental economics, or operations research.



Marie DAHLEH

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Marie Dahleh is the Assistant Dean for Academic Programs in the Harvard School of Engineering and Applied Sciences (SEAS). She has been in this position since August 2004, and in July 2009 was also appointed Senior Lecturer on Engineering Sciences. As part of her duties, she oversees the SEAS Student Affairs Office, which handles graduate admissions and financial aid, and graduate and undergraduate academic program administration. She serves as an advisor for the Graduate Student Life Committee, the Harvard College Engineering Society, and Harvard College Engineers without Borders. She also teaches Introduction to Applied Math and coordinates the sophomore forum for engineering. Prior to joining Harvard, Dr. Dahleh spent 10 years at the University of California Santa Barbara, first in the Department of Mechanical Engineering and later in the College of Engineering dean's office. Her enthusiasm resulted in her selection in 1998 as one of that university's "ten most terrific teachers". Prior to UCSB, she was at UCLA in the Mathematics Department with a partial appointment at the National Center for Atmospheric Research in Colorado. Dr. Dahleh is the coauthor of an undergraduate text book on mechanical vibration. She received a bachelor's degree (1985) in Mathematics from Mount Holyoke College and an M.A. (1987) and Ph.D. (1990) in Applied and Computational Mathematics from Princeton University.



Jason DYETT

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Jason Dyett manages the activities and operations of the Brazil Office of Harvard's David Rockefeller Center for Latin American Studies (DRCLAS). He first moved to São Paulo in 1996, after two and a half years at the DRCLAS in Cambridge during the Center's launch. From 1997 to 2002, he established the Brazil office of the Economist Intelligence Unit's telecommunications research division and went on to gain experience growing technology companies backed by local and international investors. Jason rejoined DRCLAS from the Corporate Executive Board, a Washington, DC-based organization that provides executive education to public and private companies. Since the creation the DRCLAS Brazil Office in 2006, he and the Brazil-based team have worked to develop and strengthen opportunities for Harvard student and faculty engagement with Brazil in close collaboration with the Brazil Studies Program at Harvard University. He has a Master's of Business Administration (MBA) in Finance from the University of Chicago Graduate School of Business (2004) and graduated Phi Beta Kappa with a B.A. in Political Science and Spanish from the University of Vermont (1994).



John GODLESKI

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John Godleski is Associate Professor in the Department of Environmental Health at the Harvard School of Public Health (HSPH) and Senior Pulmonary Pathologist at Brigham and Women’s Hospital in Boston. Dr. Godleski’s research focuses on the pulmonary and systemic responses to inhaled ambient air particles. His studies use cardiac and pulmonary mechanical measurements as well as cell and molecular biologic approaches with inhalation exposure to concentrated ambient air particles. The overall hypothesis being tested in his laboratory is: Ambient urban air particles are complex mixtures with intrinsic toxicity; particulate exposure results in stimulation of lung receptors, release of reactive oxygen species, and induction of pro-inflammatory mediators that lead to local and systemic effects especially on the cardiovascular system, which ultimately account for epidemiologic associations between adverse health effects and particulate air pollution.



Mariana Pereira GUIMARÃES

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Mariana Guimarães was born in Ilha Solteira, a small city on the coast of São Paulo state, and raised in the city of Campinas. She currently lives in São Paulo, where she has studied Architecture for four years at the University of São Paulo’s Architecture and Urbanism school (FAU-USP). She is now completing the two-year double-degree program in Civil Engineering between the FAU-USP and the Poli-USP. Urban Planning and Landscape design are her primary fields of interest at FAU-USP. In Civil Engineering, she is primarily interested in Hydrology. She is developing a research project on both the damage caused by flooding in dense urban areas and measures for its control. She believes in the alliance between ecological design and the technical knowledge provided by Engineering as a solution to create a more sustainable world. She loves to travel as a way to learn more about different cultures, people and architecture. Mariana is a big fan of movies and indie rock music, which occupy most of her free time.



Nicolas (Nico) HAWLEY-WELD

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Nico Hawley-Weld is a senior at Harvard College from Vancouver Island, Canada. As a freshman he worked briefly with Engineers Without Borders and has since been a regular face in the Applied Mathematics Lab at Harvard, where he has been learning how to ask good questions and make connections across physics, biology, decision-making and the natural world. Nico is very interested in infrastructure and the built environment, having taken classes on water and foreign policy, agriculture, urban planning, and world literature related to the environment. At the moment Nico is particularly interested in biomass and organics management, and he is interested in how this fits in to our national infrastructure. Nico is a trip leader for Harvard’s First-Year Outdoor Program and he lives in the Dudley Co-operative Society where he is learning how to cook great food. He enjoys being outside, moving to music, playing soccer, and watching the Harvard Basketball team.



Plas (Terry) JAMES
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Plas James was born in New Orleans, Louisiana and raised in Atlanta, Georgia. As a third-year student at Harvard College, he is an Applied Mathematics concentrator with interests in systems biology and the environment. Plas spent the summer of 2011 in Tokyo, Japan where in addition to studying Japanese learned about efforts to ameliorate environmental damage following the 2011 Tohoku earthquake. Through this course, he looks forward to understanding more about projects aimed at reducing the effects of environmental damage. Outside of his coursework, Plas is a teaching fellow for Applied Mathematics 21a, an introductory course in multivariate calculus. In addition, he enjoys traveling, playing piano, and bboying.



Gordon S. JONES
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Jones has a long history of entrepreneurial activity. Having participated in the new product development of over 12 products and providing consulting services to small and large companies, he has extensive experience working with entrepreneurs, investors, partner organizations, and other key stakeholders. He currently serves as a business advisor to numerous startups, providing them with strategic and tactical marketing and sales direction. He has also been awarded two U.S. patents. Earlier in his career, Jones was an equity partner and head of marketing and sales for the privately-held Universal Pest Solutions. He has also served as the senior vice president of marketing and sales for American Biophysics Corporation, and has ten years of experience working with The Gillette Company in a variety of marketing, new product development, and business development positions. Jones also brings a deep understanding of the world of education at both the undergraduate and graduate levels and, most importantly, a proven commitment to mentoring the next generation of thought leaders. Since 2008, he has served as an Adjunct Lecturer at Bentley University, teaching marketing to MBA and undergraduate students. Since 2007, he has worked with the Admissions Office at Harvard Business School in evaluating applicants for admission to the MBA program. He graduated from Brown University (BA) and earned an MBA from the Stanford University Graduate School of Business.



Laila KASURI
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Laila Kasuri as a junior at Harvard college concentrating in Environmental Engineering. She hails from Lahore, Pakistan and is also doing a secondary in East Asian Studies, with a focus on Japanese studies. Laila is an Environmental Science and Engineering Representative and involved in promoting a community among the Environmental Science and Engineering students and planning events for undergraduate engineering students.



Sarah KATZ

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Sarah Katz grew up in Berkeley then went to Washington University in St. Louis where she majored in biochemistry and minored in math. After college she worked for a year at the Health Effects Institute, which funds, evaluates, and publishes air pollution research. In law school, Sarah has been at various points been involved with Advocates, the National Security Journal, and the Environmental Law Review.



Christopher LEE

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A.B. in Applied Mathematics

Christopher K. Lee is a junior at Harvard College where he studies Applied Math with a focus in Computer Science. He is interested in the growing application of computation to the sciences, and has done coursework in climate modeling, evolutionary dynamics, and artificial intelligence. While growing up near Pasadena, CA, he had the opportunity to participate on a solar car team and conduct fuel cell research at Caltech. At Harvard, he is co-president of Harvard College Venture Partners and is a member of the Harvard Varsity Sailing Team. He has taken time off to travel abroad, and is interested in learning about the infrastructure challenges facing developed and emerging countries. In his free time, Christopher enjoys histories and Saturday Night Live.



Stephen LEE

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A.B. in Biomedical Engineering and
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Stephen Lee, from Albany, California, is a third-year undergraduate student at Harvard College studying biomedical engineering and computer science. After college he plans to enter the rapidly developing field of biotechnology. He wants this course to provide exposure to other engineering problems and solutions outside of biotech and looks forward to studying with the Brazil team and learning Portuguese. He is a calculus teaching fellow at the Harvard Extension School. He enjoys playing guitar, travelling and hopes to one day go to space.



Ling LIN

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A.B. in Environmental Science and
Public Policy

Ling Lin is a senior, studying Environmental Science and Public Policy at Harvard College. She participated in the USP-Harvard Brazil Trip in January of 2011, and fell in love with Brazil. This interest in Brazil led her to take a course called Innovation and Entrepreneurship, where she worked with Bessemer Venture Partners, a venture capital firm, in looking at Internet opportunities

in Brazil; she also pursues various projects related to Brazil in her academics and extracurricular activities. Previously, Ling has taught English in Ecuador to 5th through 9th grade students; she has worked at a wind energy company called Second Wind Inc., and as a business analyst at Sears Holdings Corporation. On campus, she is Co-Chair of Quincy House Committee, Co-President of Harvard Council on Business and the Environment, (a student-run environmental consulting group,) and Director of Staff Development of The Design Board on The Harvard Crimson (the nation's oldest continuously published daily college newspaper, founded in 1873.). She also started a shoe company called Jutta Shoes, which imports beaded leather flats from New Delhi, India. They are currently on sale at ALO, a boutique in Harvard Square, and can also be purchased directly from Ling herself.



Aaron LITVIN
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Aaron Litvin is the Brazil Studies Program Manager at DRCLAS in Cambridge. To this role, he brings his experience in advising students, organizing conferences, and planning exchange programs for non-profit education organizations. After graduating from Harvard College with a degree in Latin American Studies, Litvin was a Fulbright Scholar in Brazil and obtained a Master of Sciences in Sociology at the University of São Paulo. For his thesis, entitled “The Social and Economic Adaptation of Brazilian Migrants in Japan”, he did fieldwork in Japan as a Japanese Government Scholar. Litvin also produced and directed the documentary From Brazil to Japan, which was screened as part of the 2010 DRCLAS Brazilian Film Series.



Judith Grant LONG
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Judith Grant Long is Associate Professor of Urban Planning at the Harvard University Graduate School of Design where she is also the Director of the Master in Urban Planning Degree Program. She co-ordinates and teaches in the first semester core urban planning studio, teaches a two-semester sequence on methods for urban planning, and offers a seminar on planning for the Olympic Games. Dr. Long's research investigates the relationship between infrastructure and urbanism. She is a nationally-recognized expert in the planning, finance, and development of sports and tourism facilities. Her recent publications include “Full Count: Inside Public-Private Partnerships for Major League Sports Facilities”, “Facility Finance: Measurement, Trends, and Analysis,” and “Ballpark Design and Rent-Seeking Behavior: 1890 to 2010”. She has testified before the U.S. Congressional Oversight and Government Reform Committee on infrastructure finance, and her research has been quoted in major newspapers and periodicals worldwide. Dr. Long's newest book project, “Olympic Infrastructure”, examines the legacies of facilities built for the summer and winter Olympics, calling for a more affordable, green, and just games. A certified professional planner, Dr. Long has practiced extensively at the local level of government in the Toronto area, managing innovative strategies for downtown redevelopment and historic preservation. Dr. Long served as Assistant Professor of Urban Planning at Rutgers University from 2002 to 2005, and as Design Critic at the GSD during 2005-2006. She received her BA (Economics) from Huron College at the University of Western Ontario, Canada; her BAA (Urban and Regional Planning) from Ryerson Polytechnic University, Canada; her MDesS from the GSD; and her Ph.D. (Urban Planning) from the Harvard Graduate School of Arts and Sciences.



Gabriela González LOUREIRO

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Gabriela was born and raised in São Paulo. She is a third-year undergraduate student at Poli-USP concentrating in Environmental Engineering. Gabriela is interested in anything that involves the environment and its effects on human beings. After graduation, she plans to work in water resource management. She likes to learn different languages and study foreign cultures. When not at school, Gabriela enjoys watching movies and listening to music, as well as spending time with friends and family.



Danilo MARTELETO

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Danilo Marteleto grew up in Ribeirão Preto, a city in the interior of the state of São Paulo. He is a third-year undergraduate student at the Poli-USP with a strong interest in sustainable development and technology innovation and how they will influence our future. Danilo has participated as a volunteer in several social projects, such as “Um teto para meu país”(literally, A Roof for My Country), a program that builds emergency housing for people in extreme poverty, and “Líder Solidário” (Supportive Leader), a program in which he visited day care centers, hospitals and nursing homes with his Brazilian army troop. He was also one of the six Poli-USP students who represented the Universidade de São Paulo in the 2011 C40 summit, an event that gathers the biggest 40 cities around the world to discuss sustainability, energy efficiency model projects, and how these cities have the power to change the world. In his free time, he likes to play soccer and go out with his friends.



Scot T. MARTIN

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Scot Martin is Gordon McKay Professor of Environmental Chemistry at Harvard University’s School of Engineering and Applied Sciences (SEAS). His research focuses are oceans, atmospheres, geophysics, atmospheric chemistry, climate modeling, and environmental chemistry. Since 2007, he has held a joint appointment with the Department of Earth and Planetary Sciences in the Faculty of Arts and Sciences (FAS) at Harvard. He is a Faculty Associate at the Harvard Origins of Life Initiative and chaired the 2008 Amazonian Aerosols International Workshop (Rio Negro/Manaus, Amazonas). Prior to joining Harvard in 2000 as an Associate Professor of Environmental Chemistry, Martin was Assistant Professor of Aquatic and Atmospheric Chemistry in the Department of Environmental Sciences and Engineering at the University of North Carolina at Chapel Hill (1997-2000) and a Postdoctoral Fellow in Atmospheric Chemistry at the Massachusetts Institute of Technology (1995-1997). Prof. Martin received his B.S. in Chemistry from Georgetown University and his Ph.D. in Physical Chemistry from the California Institute of Technology. Courses he teaches at Harvard include: Environmental Science and Technology; Aerosol Science and Technology; Environmental Chemical Kinetics. He is currently chair of the Brazil Studies Program’s Steering Group.



José Rodolfo Scarati MARTINS

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José Rodolfo Scarati Martins is currently an Assistant Professor at the Escola Politécnica da Universidade de São Paulo (Poli-USP) where he teaches courses on civil engineering, environmental engineering and architecture. He specializes in the areas of hydraulics, applied hydraulics, and water resources, with a particular focus on urban water drainage, water supply, mathematical modeling applied to hydraulics and flood control, including research on hydraulic transients for calibration and leak detection purposes. He is a coordinator at the Brazilian Association of Technical Standards (ABNT-Associação Brasileira de Normas Técnicas) and in 2005 was president of the Fundação Centro Tecnológico de Hidráulica (FCTH). Prof. Scarati Martins earned a bachelor's degree (1981) in Civil Engineering and a master's degree (1989) and doctorate (2002) in Hydraulic Engineering from the Escola Politécnica da Universidade de São Paulo (Poli-USP).



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Luciana Capuano Mascarenhas is a fourth-year undergraduate student concentrating in Environmental Engineering at the Poli-USP. She has lived her entire life in São Paulo, but loves to travel to new places and encounter foreign cultures. Luciana is very interested in the environment, especially the ocean. She desires to learn more about biodiversity conservation, urban technologies such as sanitation and solid waste, pollution treatment, and climate change. Recently, she participated in a seminar called “São Paulo - Compact city” and welcomed Saudi Arabian students for a conference on shanty town urbanization. Outside school, Luciana likes to practice sports, such as volleyball and scuba diving.



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Mario Henrique Meireles is a fifth-year Environmental Engineering undergraduate student at the Poli-USP. He works on research projects of urban drainage and sanitary sewage system as an intern at the FCTH, the Poli-USP's center for Hydraulics and Technology. Mario worked for several years as a salesman and has become a coach for salespeople, training thousands all over Brazil. He dreams of changing the world by changing people's minds. He is focused on achieving this goal through sustainable technology and knowledge innovation. Outside of school he plays the guitar, writes a blog, studies foreign languages, and plays with his young son Rafael, the love of his life.



José Carlos MIERZWA

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José Carlos Mierzwa is an Associate Professor of Environmental Engineering and Water Treatment at the Escola Politécnica da Universidade de São Paulo (Poli-USP). His area of primary expertise is in Sanitary Engineering, with a focus on Environmental Engineering, particularly in terms of water, waste water treatment, conservation, planning, management and environmental quality, and cleaner production. He has developed a number of research projects on water treatment systems (including direct drinking water treatment by spiral wound ultrafiltration membranes), waste stream management, industrial processes, and water conservation and reuse. In 1997 he participated in the International Extension Program at the University of California, Riverside, and in 1993 spent time at the International Atomic Energy Agency working on management of radioactive waste from nuclear power. Since 2007 he has been a reviewer in the Brazilian Higher Education National Evaluation System. Prof. Mierzwa earned a bachelor's degree (1989) in Chemical Engineering from the Universidade de Mogi das Cruzes and a Master's in Nuclear Technology (1996) as well as a doctorate in Civil Engineering (2002) from the Universidade de São Paulo (USP). In 2011 he will be on leave from Poli-USP as a visiting researcher at Harvard's SEAS in Cambridge.



Cherry A. MURRAY

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Cherry A. Murray, who has led some of the nation's most brilliant scientists and engineers as an executive at Bell Laboratories and the Lawrence Livermore National Laboratory, was appointed dean of Harvard University's School of Engineering and Applied Sciences (SEAS), on July 1, 2009. She also holds the John A. and Elizabeth S. Armstrong Professorship of Engineering and Applied Sciences and is a Professor of Physics. Murray served as principal associate director for science and technology at Lawrence Livermore National Laboratory in Livermore, California from 2004-2009, and as president of the American Physical Society (APS) during 2009. Before joining Lawrence Livermore, Murray had a long and distinguished career at the famed Bell Laboratories, starting in 1978 as a staff scientist and culminating in her position as senior vice president for physical sciences and wireless research. A celebrated experimentalist, Murray is well-known for her scientific accomplishments using light scattering, an experimental technique where photons are fired at a target of interest. In 2002, Discover Magazine named her one of the "50 Most Important Women in Science." Born in Fort Riley, Kan., and the daughter of a diplomat, Murray lived in the United States, Japan, Pakistan, South Korea, and Indonesia as a child. She received her B.S. in 1973 and her Ph.D. in physics in 1978 from the Massachusetts Institute of Technology. She has published more than 70 papers in peer-reviewed journals and holds two patents in near-field optical data storage and optical display technology.



Felipe Moschem de NADAI

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Felipe Moschem de Nadai is a third-year undergraduate student at the Poli-USP, concentrating in Civil Engineering. He was born in Foz do Iguaçu, a southern Brazilian city in the state of Paraná. After moving with his family to the state capital, Curitiba, he continued to pursue new academic opportunities and challenges at the university in São Paulo. Felipe has a strong interest in economics, mainly related to infrastructure, its viability and its real impact in people's day-to-day lives. Since he was a child, Felipe has engaged in social and cultural movements, such as scouting and NGOs. Felipe is fascinated by geography and different cultures. He is currently studying Italian. Felipe is very outgoing and loves meeting and interacting with new people. During his free time, he chats with friends, surfs the Internet and plays soccer.



Venkatesh NARAYANAMURTI

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Venkatesh Narayanamurti is the Director of the Science, Technology and Public Policy Program at the Belfer Center for Science and International Affairs at the Harvard Kennedy School (HKS). He is also the Benjamin Peirce Professor of Technology and Public Policy and a Professor of Physics at Harvard. For ten years he was the John L. Armstrong Professor and Dean of the School of Engineering and Applied Sciences and Dean of Physical Sciences at Harvard. Previously he served as the Richard A. Auhll Professor and Dean of Engineering at the University of California at Santa Barbara. Prior to that he was Vice President of Research at Sandia National Laboratories and Director of Solid State Electronics Research at Bell Labs. He is an elected member of the American Academy of Arts and Sciences, the National Academy of Engineering and the Royal Swedish Academy of Engineering Sciences, and a Fellow of the American Physical Society, the American Association for the Advancement of Science, the IEEE, and the Indian Academy of Sciences. He has served on numerous advisory boards of the federal government, research universities and industry. He is the author of more than 200 scientific papers in different areas of condensed matter and applied physics. He lectures widely on solid state, computer, and communication technologies, and on the management of science, technology and public policy. He obtained his Ph.D. in Physics from Cornell University and has an Honorary Doctorate from Tohoku University.



William NIEBLING

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William Niebling is a second year student at Harvard Law School. A native Californian, William grew up hearing how the history of the American West is the history of water. Before coming to law school he spent four years working in the United States Senate on environmental and economic issues, including water policy. Now he is excited to learn more about the river that drains such a large part of the United States, the Mississippi.



Bruno Erlinger de OLIVEIRA

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Bruno Erlinger de Oliveira is a fifth-year undergraduate student in Environmental Engineering at the Poli-USP. His primary interests relate to waste management and renewable energy. He was born and raised in São Paulo, an upbringing that has spurred him to explore engineering solutions for sustainability in an increasingly crowded world. Bruno spends much of his free time teaching Math, Physics and Chemistry to high school students. He has been abroad several times and loves meeting people from different cultures. In addition to travel, his personal interests include movies, soccer, American football and gourmet cooking. Bruno wants to use this field course to enrich his educational background so that he can contribute to positive development through sustainability and profitability.



Manoel Carlos PEREIRA NETO

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Manoel Carlos Pereira Neto first joined the Brazil Office of Harvard University's David Rockefeller Center for Latin American Studies in March 2009 as an intern. In 2008, he was selected by the U.S. Embassy in Brazil to become a Youth Ambassador in a program that targets students with leadership skills, positive attitude, proven social consciousness and academic excellence. During the program's two-week trip to the United States, he met with public and private sector organizations and visited schools and social projects. Prior to moving to São Paulo, Manoel lived for two years in Curitiba, a city in the south Brazil, where he worked as an administrative assistant and coordinator for a web commerce company. In 2002, Manoel was awarded a Microsoft National Talents award for distinguished leadership in social entrepreneurship for volunteer work developed at his school's computer lab, when he was twelve. As a Program Analyst at the Brazil Office, Manoel is responsible for the coordination of events, programs and collaborative courses. He provides support for Harvard students, staff, and faculty as well as for overall office administration. Manoel is a senior at the Pontifícia Universidade Católica de São Paulo (PUC-SP), where he is earning an A.B in Business Administration.



Monica PORTO

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Monica F. A. Porto is a Full Professor and current Chair of the Department of Hydraulic and Sanitary Engineering (PHD) at the Escola Politécnica of the Universidade de São Paulo (Poli-USP), where she has taught since 1984. She is also President of the Fundação Centro Tecnológico de Hidráulica (FCTH), and previously was president of the Brazilian Association of Water Resources (ABRH). She has been an active member of a number of major water organizations including the Global Water Partnership (GWP), the Stockholm International Water Institute (SIWI), and the International Water Resources Association (IWRA). She is a researcher of the Brazilian National Council for Scientific and Technological Development (CNPq) in urban water quality. Her areas of

expertise include water quality and water management of reservoirs and rivers. Courses taught at USP include “Introduction to Environmental Engineering”, “Natural Resource Management,” and “Urban Water Systems”. Prof. Porto earned a bachelor’s degree (1978), a Master’s (1983), and a Ph.D. (1993) in Civil Engineering from the Universidade de São Paulo (USP), and carried out post-doctoral research in 1994 and 1995 at Colorado State University (CSU).



Rubem La Laina PORTO

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Rubem La Laina Porto is a Professor in the Department of Hydraulic and Sanitary Engineering (PHD) at the Escola Politécnica da Universidade de São Paulo (Poli-USP), where he has taught since 1985. His primary area of expertise is on Hydraulic Engineering, with a focus on Applied Hydraulics, Water Management, Urban Water, Drainage, and management of institutions active in teaching, research and development on water resources. A recent publication (2008) in partnership with Columbia University” International Research Institute for Climate and Society and the Federal University of Ceará, in Fortaleza, focused on the role of price and effective water rights enforcement in water allocation, with insights from game theory. Prof. Porto earned a bachelor’s degree (1966) and a master’s degree (1976) in Civil Engineering and a doctorate (1985) in Hydraulic and Sanitary Engineering from the Universidade de São Paulo (USP), and carried out post-doctoral research (1989, 1995) at Colorado State University (CSU).



Kayla SHELTON

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A.B. in Mechanical Engineering

Kayla Shelton was born and raised in Detroit, MI. She is currently a junior at Harvard College, concentrating in Engineering Sciences with a track in Mechanical Engineering. Her other academic interests are Math, Anthropology, and Romantic Languages. Over the past two summers and a portion of her sophomore January Term, Kayla has been an intern at DTE Energy, a utilities company that distributes gas and electricity to residents in Michigan. There, she worked in the power plants as well as in gas pipeline integrity. Kayla hopes to learn more about the process of water treatment and other environmental issues while taking this course. She is also a member of the Winthrop House Committee, Black Christian Fellowship, and the Harvard Society of Black Scientists and Engineers.



Kim SMET

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Kim Smet is a first year Ph.D. student in Environmental Engineering in the School of Engineering and Applied Sciences (SEAS) at Harvard University. She was born and grew up in Zimbabwe and previously lived in Vancouver, Canada, where she studied Environmental Science, specializing in hydrology at the University of British Columbia. Upon graduation, she worked as a contaminated sites consultant to the petroleum industry in British Columbia for two years. Kim hopes to become deeply involved in interdisciplinary water research during her time at Harvard.



Marcello Z. SALLES
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Marcelo Salles became the USACE Liaison Officer to SOUTHCOM in 2004, covering mainly the Central and South American regions. He joined the USACE Middle East Division office in 1983 in Riyadh, Saudi Arabia, through the University of Maryland's Engineering Co-op Program. Mr. Salles was lead mechanical engineer in the MED's forward office in Dhahran, Saudi Arabia during Operation Desert Shield /Storm, where he designed and constructed mechanical systems for temporary base camps. He has served in Estonia (1993) and Kuwait (1994; 1998). In 2002, Mr. Salles was assigned to the Pentagon's Assistant Chief of Staff for Installation Management (ACSIM) office, where he assisted in preparing the FY04 Budget Estimate Submission to Congress for the Army's Military Construction program. In 2005, he volunteered to go to Iraq for a six months tours to serve as the Area Engineer for the 3rd Infantry Division Area Office with the US Army Corps of Engineers Gulf Region Division – Central District in Baghdad. He was in charge of six Resident Offices staffed with 43 US personnel (mostly engineers and engineer techs) and over 31 Iraqi engineers. His Resident Offices provided construction oversight to over 300 projects within the Baghdad area with a contract value of more than \$700 million. Since 2006, Mr. Salles has supported both USSOUTHCOM and US Army South with the planning, coordination and execution of major Theater Security Cooperation engineering events with the Brazilian Army engineers and some Brazilian Ministries. His awards include an International medal from the Brazilian Army - Medal of the Peacemaker; the Global War on Terrorism Medal; the Joint Civilian Service Commendation Award; two Superior Civilian Service Medals; two Achievement Medals for Civilian Service; and the Southwest Asia medal for his participation in Desert Shield / Storm. Salles holds a Bachelor's Degree in Mechanical Engineering from the University of Maryland; and Master's Degrees in Strategic Studies from the US Army War College at Carlisle, PA and in Public Administration from Shippensburg University. He is fluent in Portuguese and has a working knowledge of Spanish.



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Chad D. Vecitis is Assistant Professor of Environmental Engineering at Harvard's School of Engineering and Applied Sciences. Research in the Vecitis Lab focuses on the environmental implications and applications of emerging technology through investigations of the fundamental physical chemical processes behind these technologies. One area of his research interests is environmental nanotechnology with a focus on carbon nanomaterials such as fullerenes and carbon nanotubes (CNTs). Environmental implications of large-scale CNT use on aquatic chemistry and ecosystems will be investigated through examining their antimicrobial mechanism and aquatic photochemistry. Environmental applications of CNTs as electrochemically-active water treatment membranes for pathogen inactivation, pollutant oxidation, and in situ fouling reduction is also being investigated. Another area of research interest is environmental chemistry occurring at aqueous interfaces with a focus on the air-water interface. Interfacial reaction mechanisms and kinetics are often at variance with homogeneous chemistry due to mass transfer, molecular orientation, and catalytic effects. The air-water interface is important for advanced water treatment processes such as ozonolysis and sonolysis and the reactions of gaseous atmospheric oxidants with aerosols. Prior to joining Harvard, Vecitis was a Yale Institute of Biospheric Sciences Postdoctoral Fellow working with Professor Menachem Elimelech. Professor Vecitis holds a B.S. in Chemistry from Johns Hopkins University and a Ph.D. in Environmental Physical Chemistry from the California Institute of Technology.



Bárbara VITAL

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in Environmental Engineering

Bárbara Vital was born in Curitiba, Brazil, and is currently living in São Paulo as she completes her studies at the Poli-USP. She is a fifth-year undergraduate concentrating in Environmental Engineering, and she loves to spend time in nature and open places. She also likes to use science in a way that helps other people, so she is engaged in a social project for building emergency houses for the homeless. She participated in the second edition of this collaborative field course in Brazil, and is now looking forward to learn about American culture in the US and meeting new people who share the same interests. She is also looking to learn a lot about sustainability projects and how to make economic development less dangerous for the environment. In her free time, Bárbara enjoys traveling, watching films and series, getting together with her friends, doing yoga and playing volleyball.



Steve WOFSY

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Steven Wofsy was born in New York City in 1946 and is currently Abbott Lawrence Rotch Professor of Atmospheric and Environmental Chemistry at Harvard University, Division of Engineering and Applied Science and Department of Earth and Planetary Sciences. He studied chemical physics at University of Chicago (BS, 1966) and Harvard (PhD 1971), shifting to atmospheric chemistry in 1971. His work has focused on changes in the composition of the stratosphere and troposphere, at first in theory and modeling and later in field and laboratory studies. His current research emphasizes the effects of terrestrial ecosystems on the global carbon cycle, and the impacts of climate change and land use on ecosystems and atmospheric composition. Several projects focus on quantitative measurements of ecosystem carbon fluxes, for time scales spanning instantaneous to decadal and spatial scales from meters to thousands of kilometers, combining physical, chemical and biological methods. His awards include AGU's McIlwaine prize and NASA's Distinguished Public Service Medal.



Jessica WU

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Jessica Wu was born in Duanfen, China and was raised in Boston, Massachusetts. She is currently a sophomore in Leverett House pursuing a degree in Mechanical and Materials Engineering. With hopes of becoming a practicing Civil Engineering after college, she is most interested in studying the infrastructure at the sites visited during this course. She spent this past summer researching robotic navigation. Jessica has an affinity for languages – she has attempted Chinese, French, Italian, Latin, Japanese, and Bengali – and would like to learn some Portuguese. Jessica enjoys volunteering, playing competitive table tennis, and embroidering in her spare time.

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