COLLABORATIVE FIELD COURSE IN BRAZIL

ENGINEERING AND THE URBAN ENVIRONMENT

January 4th to 21st, 2011

Academic Host Institutions

Harvard University
School of Engineering & Applied Sciences (SEAS)

Universidade de São Paulo
Escola Politécnica
(Poli-USP)

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

Collaborating Academic Institutions

- Harvard Graduate School of Design (GSD)
- Escola Politécnica, Universidade Federal do Rio de Janeiro (Poli-UFRJ)
- Arquitetura e Urbanismo, Pontifícia Universidade Católica do Rio de Janeiro (PUC-RJ)

Field Sites

- EMAE – Billings Reservoir & Henry Borden
- Sabesp – ETA-Guaraú
- Natura – Water Re-use Facility
- Comunidade Vila Autódromo
- Maracanã Stadium & Surrounding Area
- Ipanema Metro & Complexo Rubem Braga

Support

In addition to the support of the academic host institutions, this collaborative course was made possible thanks to the generosity of Brazil's CNPq, the Lemann Family Endowment at Harvard University, Claudio Haddad, Fundação Centro Tecnológico de Hidráulica (FCTH), Pedro Conde Filho, Oivind Lorentzen, and Odebrecht S.A.

http://www.drclas.harvard.edu/brazil/seas-poli-usp-2011

Caros Participantes (Dear Participants),

Sejam bem-vindos! We are delighted to welcome you to this collaborative field course on Engineering and the Urban Environment. This initiative is a joint effort of 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). The 2011 course, which builds on our successful experience of January 2010, includes students and faculty from SEAS and Poli-USP as well as from the Harvard Graduate School of Design (GSD) and the Escola Politécnica of the Universidade Federal do Rio de Janeiro (Poli-UFRJ).

The talented group of 29 students participating in this field course comes from Brazil, China, Costa Rica, Nigeria, Peru and the United States. Half are students from Harvard and half from Brazil. While the majority of students are in the final year(s) of their undergraduate programs, the program includes three Ph.D. candidates and two Master's students. The 14 Poli-USP participants are studying Hydraulic and Sanitary Engineering and Environmental Engineering. Harvard students are pursuing degrees in Electrical Engineering and Computer Science, Neurobiology, Biomedical Engineering, Mechanical and Materials Science, Landscape Architecture, Environmental Sciences, Environmental Science and Public Policy, and Applied Math in Urban Planning.

Core faculty come from the Poli-USP, Harvard's Schools of Engineering and Design, Poli-UFRJ and PUC-RJ. Collectively they bring decades of experience in areas ranging from water treatment and advanced water technologies to urban planning, informal settlements and Olympic legacies.

Students and professors will have the opportunity to learn in the field from skilled practitioners and their organizations in a rich set of site visits in metropolitan São Paulo (population 19 million) and greater Rio de Janeiro (population 11 million). We will visit Sabesp's ETA Guaraú, the primary drinking water treatment facility for São Paulo; the external and subterranean areas of EMAE's Henry Borden hydroelectric power plant; informal settlements in Rio de Janeiro and São Paulo with populations larger than Boston's; Maracanã stadium in Rio, host to World Cup games in 2014 and the opening and closing of the 2016 Olympics; the ongoing project to extend Rio's metro system in Ipanema; and much more.

We intend for the impact of the collaborative course and the relationships established through it to be measured in years not days or weeks. The fact that Poli-USP Professor José Carlos Mierzwa, who helped lead the course in 2010 and is doing so again this year, will move to Cambridge to spend next year as a Visiting Scholar at Harvard is very encouraging, as was seeing two Harvard students who participated in last year's course return to Brazil for academic pursuits during this past Cambridge summer. We hope that participants will develop a thirst for continued engagement with the subject matter and with fellow students and faculty and that the course serves as a catalyst for strengthening networks and enabling follow-on research and learning.

This initiative would not have been possible without the vision, engagement and support of many individuals and institutions in Brazil and in the United States. To all those who contributed to the creation and execution of this collaborative field course, please know that we are deeply grateful.

Grande abraço,

Monica Porto

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

Marie Dahleh

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

Jason Dyett

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 seventy (73 FTEs) who have particularly close ties with the departments of Physics, Earth and Planetary Science, and Chemistry and Chemical Biology. Over the past decade, undergraduate enrollments in Applied Mathematics, Computer Science, and Engineering Sciences have ranged from 300 to 400. For additional information, please see: www.seas.harvard.edu

UNIVERSIDADE DE SÃO PAULO'S ESCOLA POLITÉCNICA

The University of 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 327 full time faculty and 434 professors. It offers undergraduate (4,524 students), graduate (1,312 Master's and 827 Doctoral students), and continuing education (7,777 students) courses and 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 2011

Tuesday, January 4th – São Paulo

Morning	**International student arrivals –** *Harvard's David Rockefeller Center for Latin American Studies (DRCLAS) Brazil Office staff will await you at the São Paulo – Guarulhos International Airport (GRU) Arrivals area.*
Afternoon	**Hotel check-in for all students**. Rest and free time.
7:30 pm	**Informal welcome dinner** *(meet in hotel lobby at 7:15 pm).*

Wednesday, January 5th – São Paulo

8:45 am	**Depart** hotel.
9:00 – 10:30 am	**Driving tour of Cidade Universitária**, USP's main campus.
10:30 – 11:00 am	**Walking tour of USP Engineering School** (Poli-USP). Tour in four sub-groups, which will be led by Poli students.
11:00 am – 12:15 pm	**Welcome and Collaborative Course Overview**. Professors José Roberto Castilho Piqueira, Poli-USP Deputy Dean, and Mario Thadeu Leme de Barros, Director of the Hydraulic and Environmental Engineering Department, welcome students. Each student briefly introduces herself/himself. Jason Dyett provides overview of what to expect in the next two weeks. Professors Monica Porto and Chad Vecitis briefly explain teaching and learning objectives for the course.
12:30 – 2:00 pm	**Group lunch**
2:15 pm – 4:00 pm	**Lecture & Discussion:** **Urban Water Resource Use and Management in São Paulo**. Monica Porto, Full Professor and Department Chair, Hydraulic and Sanitary Engineering, Poli-USP (30-45 minute lecture followed by group questions and discussion).
4:00 pm – 5:30 pm	**Visit to USP Labs** (walking tour).

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

Thursday, January 6th – São Paulo

8:30 am	**Depart** hotel.
9:00 am – 12:00 pm	**Field Site Visit: SABESP**. Visit to São Paulo's largest water treatment station, Estação de Tratamento de Água do Guaraú (ETA Guaraú).
12:30 pm	**Lunch** (brown-bag lunch will be provided).
2:30 – 5:30 pm	**Lecture & Discussion: Overview of Water Scarcity in Urbanized Areas & Advanced Water and Wastewater Technologies**. José Carlos Mierzwa, Associate Professor of Environmental Engineering and Water Treatment, Poli-USP; Chad Vecitis, Assistant Professor of Environmental Engineering, SEAS, Harvard University.
Evening	**Free**. Possible cultural outing.

Friday, January 7th – São Paulo

8:30 am	**Depart** hotel.
Morning	**Field Site Visit: Natura – Water Re-use Facility**.
Afternoon	**Visit to Harvard's DRCLAS Brazil Office.**
Evening	**Free**. Optional outing to Vila Madalena (bohemian neighborhood).

Saturday, January 8th – São Paulo

10:30 am – 12:30 pm	**Visit to downtown historic São Paulo (Centro)**.
Lunch	**Group lunch**.
Afternoon	**Visit to Ibirapuera park**.
Evening	**Free**.

Sunday, January 9th – São Paulo

11:30 am – 12:45 pm	**Optional visit to soccer stadium and museum** at Estádio Municipal Paulo Machado de Carvalho (São Paulo Pacaembu municipal soccer stadium). Meet at museum ticket office.
1:00 pm – 4:00 pm	***Churrasco*** (Brazilian BBQ) at private home organized by Harvard-DRCLAS Brazil Office. Hosts: Eric Ballinger & Joy Bar.

Monday, January 10th – São Paulo

8:30 am	**Depart** hotel.
Morning	**Discussion of group research themes** for each of the five student Working Groups (Informal Settlements, Sanitation, Transportation, Urban Flooding & Water Supply) – see page 28). Course faculty will provide information to help students progress in their thinking over the course of the program.
12:30 pm	**Lunch**.
2:00 – 3:15 pm	**Lecture & Discussion: Civil Engineering and Housing in São Paulo**. Alex Abiko, Professor of Civil Engineering, Poli-USP (30-45 minute lecture followed by group questions and discussion).
3:30 – 4:45 pm	**Lecture & Discussion: Informal Settlements in São Paulo**. Fernando de Mello, MMBB Architecture Firm Partner and Professor of Architecture and Urbanism, Universidade São Judas Tadeu (30-45 minute lecture followed by group questions and discussion).
Evening	**Free**.

Tuesday, January 11th – São Paulo

All Day	**Field Site Visit: Cantinho do Céu** (half of students); **Billings Reservoir boat trip and visit to Henry Borden power plan** (half of students). Empresa Metropolitana de Águas e Energia S.A. (EMAE).

Wednesday, January 12th – São Paulo

All Day	**Field Site Visit: Cantinho do Céu** (half of students); **Billings Reservoir boat trip and visit to Henry Borden power plan** (half of students). Empresa Metropolitana de Águas e Energia S.A. (EMAE).

Thursday, January 13th – São Paulo

8:30 am	**Depart** hotel for Poli-USP.
9:00 – 11:00 am	**Group Discussion: Urban Development**. Students will discuss urban development in a conversation headed by Ricardo Toledo, Professor of Architecture Technology, School of Architecure and Urbanism, Universidade de São Paulo (FAU-USP).
11:00 am – 12:30 pm	**Group work time**.
12:30 – 1:30 pm	**Lunch**.
Afternoon	**Group work time**.
Evening	**Free**. Possible cultural outing.

Friday, January 14th – São Paulo & Paraty

Morning	**Lecture & Discussion: Public Policy Perspective**. Miguel Bucalem, Secretary of Urban Development for the City of São Paulo and Full Professor, Poli-USP.* - *To be confirmed.*
Late morning & afternoon	**Travel to Paraty, Rio de Janeiro**. Group bus. Approximately five hours. Free. Students from Harvard & Brazil encouraged to have joint informal activities/outings.
Evening	**Hotel check-in**. Rest and free time.

Saturday, January 15th – Paraty

Free	Students from Harvard & Brazil encouraged to have joint informal activities/outings.

Sunday, January 16th – Paraty, Rio de Janeiro

Morning	**Free**.
12:30 pm	**Lunch**.
1:30 pm	**Depart for Rio de Janeiro**.
Evening	**Hotel check-in**. Rest & free time.

Monday, January 17th – Rio de Janeiro

8:30 am	**Depart** hotel for Universidade Federal do Rio de Janeiro (UFRJ).
9:15 am – 10:00 am	**Tour of Universidade Federal do Rio de Janeiro (UFRJ)**.
10:00 – 10:30 am	**Welcome:** Ericksson Rocha e Almendra, Director of Engineering, UFRJ, and Ricardo Manfredi Naveiro, International Relations Coordinator, Engineering-UFRJ.
10:30 am – 12:30 pm	**Lecture & Discussion: Urban Evolution and Housing**. Gabriella Rossi, Adjunct Professor of Urban Engineering and Graphic Expression, UFRJ; Jorge Luiz de Souza Arraes, President, Company for Urban Development of the Port Region of Rio de Janeiro (CDURP).
12:30 – 1:30 pm	**Lunch**.
1:30 – 2:45 pm	**Driving tour of Rio de Janeiro en route to field site visit**. Projeto Porto Maravilha, downtown, Lagoa Rodrigo de Freitas & Barra da Tijuca.
3:00 – 5:00 pm	**Field Site Visit: Vila Autódromo**. Engage with local community through visit facilitated by Theresa Williamson, Founder and Executive Director of Catalytic Communities, and Tiago Donato, Social Media specialist.

Evening	**Group dinner with Harvard alumni and special guests**. Guest speaker: Marilene Ramos, Secretary of the Environment for the State of Rio de Janeiro.* – *To be confirmed.*

Tuesday, January 18th – Rio de Janeiro

8:30 am	**Depart** hotel.
Morning	**Field Site Visit: Mangueira**. Informal settlement/*favela* neighborhood in northern metropolitan Rio de Janeiro.
12:30 – 1:30 pm	**Lunch**.
2:00 – 3:30 pm	**Lecture & Discussion: Informal Settlements and Morar Carioca**, Municipal Plan for Integrated Informal Settlements. Christian Werthmann, Associate Professor and Program Director in Landscape Architecture, Harvard Graduate School of Design (GSD); Gabriel Duarte, Assistant Professor, Department of Architecture, Pontifícia Universidade Católica do Rio de Janeiro (PUC-RJ); Carlos Krykhtine and Luis Valverde, Secretariat of Housing for the City of Rio de Janeiro; Paul Nakazawa, Lecturer in Architecture, Department of Architecture, GSD.
3:45 – 5:15 pm	**Lecture & Discussion: Olympic Legacies – Past and Future**. Judith Grant Long, Associate Professor, Department of Urban Planning and Director, Master in Urban Planning Degree Program, GSD; Roberto Ainbinder, Director, Instituto Rio 2016; Paul Nakazawa, Lecturer in Architecture, Department of Architecture, GSD.
Evening	**Free**.

Wednesday, January 19th – Rio de Janeiro, São Paulo

8:30 am	**Depart** hotel.
Morning	**Field Site Visit: Maracanã Stadium & Surrounding Area**.
12:30 – 1:30 pm	**Lunch**.
Afternoon	**Field Site Visit: Ipanema Subway Station (Metrô) and Complexo Rubem Braga**.
Evening	**Optional** Samba outing in Lapa neighborhood.

Thursday, January 20th – São Paulo

Morning	**Group work in preparation for final day presentations**.
12:00 – 1:30 pm	**Lunch**.
Afternoon	**Travel from Rio de Janeiro to São Paulo** (by bus).
Evening	**Free**. Time to finish group presentations.

Friday, January 21st – São Paulo

8:30 am	**Depart hotel** for Poli-USP.
9:00 – 10:30 am	**Online course evaluation**.
10:45 am – 12:45 pm	**Group presentations**.
1:00 pm – 2:30 pm	**Closing lunch**.

FACEBOOK

CORE COURSE FACULTY

Faculty from Harvard

Marie Dahleh
Assistant Dean for Academic Programs and Senior Lecturer on Engineering Sciences, School of Engineering and Applied Sciences (SEAS)
** Harvard faculty leader for course.*

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

Christian Werthmann
Associate Professor and Program Director, Department of Landscape Architecture, Graduate School of Design (GSD)

Judith Grant Long
Associate Professor and Program Director, Department of Urban Planning & Design, Graduate School of Design (GSD)

Paul Nakazawa
Lecturer in Architecture, Department of Architecture, Graduate School of Design (GSD)

Faculty from Brazil

Monica F. A. Porto
Full Professor and Chair, Department of Hydraulic and Sanitary Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP)
** USP faculty leader for course.*

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

Gabriel Duarte
Assistant Professor, Department of Architecture, Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio)

Gabriella Rossi
Adjunct Professor, Department of Graphic Expression and Graduate Program in Urban Engineering, Escola Politécnica da Universidade Federal do Rio de Janeiro (Poli-UFRJ)

STUDENTS

(Alphabetical by first name)

Students from Harvard

Alex Dolginow
Harvard College, Class of 2011, A.B. (Bachelor of Arts) candidate in Neurobiology

Charlie Howe
Graduate School of Design, Master's in Landscape Architecture candidate, 2011 *(Teaching Fellow for Course)*

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

Hilton H. Augustine, III
Harvard College, Class of 2013, A.B. (Bachelor of Arts) candidate in Engineering Sciences

Isabella Amalia Wechsler
Harvard College, Class of 2013, A.B. (Bachelor of Arts) candidate in Environmental Science and Public Policy

James Chan Winter
Harvard College, Class of 2011, A.B. (Bachelor of Arts) candidate in Applied Mathematics

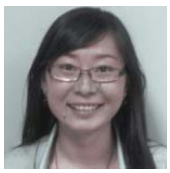
Ling Lin
Harvard College, Class of 2012, A.B. (Bachelor of Arts) candidate in Environmental Science and Public Policy

Marianna Francesca Verlage
Harvard College, Class of 2013, A.B. (Bachelor of Arts) candidate in Environmental Engineering

Students from Brazil

Ana Carolina Daniel Morihama
Poli-USP, Ph.D. Candidate in Sanitary Engineering (*Teaching Assistant for Course*)

Bárbara Vital
Poli-USP, 4th-year undergraduate student in Environmental Engineering



Elizabete Harumi Hamaguchi
Poli-USP, 3rd-year undergraduate student in Environmental Engineering

Felipe Ferreira Dias
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Felipe Souza Lima (Tim)
Poli-USP, 5th-year undergraduate student in Environmental Engineering (*Teaching Assistant for Course*)

Fernanda Dias Radesca
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Lucas Meyer de Freitas
Poli-UFRJ, 2nd-year undergraduate student in Civil Engineering

Luiz Gustavo de Souza Carvalho
Poli-USP, 4th-year undergraduate student in Environmental Engineering

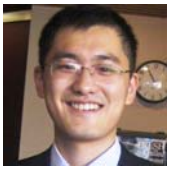
Oluwadamilola Akinfenwa (Dammy)
Harvard College, Class of 2012, A.B. (Bachelor of Arts) candidate in Bioengineering

Riju Agrawal
Harvard College, Class of 2013, S.B. (Bachelor of Science) candidate in Mechanical Engineering

Tatiana Peralta-Quiros (Tati)
Harvard College, Class of 2011, S.B. (Bachelor of Science) candidate in Applied Mathematics in Urban Planning

Tiziana Smith
Harvard College, Class of 2011, A.B. (Bachelor of Arts) candidate in Environmental Science and Public Policy

William Marks
Harvard College, Class of 2012, S.B. (Bachelor of Science) candidate in Biomedical Engineering



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

Natália Takahashi Margarido
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Patrícia Silva Aguiar
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Rachel Jardim Medeiros da Silva
Poli-USP, 4th-year undergraduate student in Environmental Engineering

Rauan Thome Pinto e Souza
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Renata de Campos Isaac
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Simony Yaginuma Sakamoto
Poli-USP, 5th-year undergraduate student in Environmental Engineering

Yara Formigoni
Poli-USP, Master's candidate in Water Resourses Management
(*Teaching Assistant for Course*)

ORGANIZERS

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

Tomás Amorim
Program Officer, Brazil Office of Harvard University's David Rockefeller Center for Latin American Studies (DRCLAS)

Manoel Carlos Pereira Neto
Intern, Brazil Office of Harvard University's David Rockefeller Center for Latin American Studies (DRCLAS)

Aaron Litvin
Brazil Studies Program Manager, DRCLAS, Harvard University.
(*Cambridge-based support*)
litvin@fas.harvard.edu

COURSE LOCATIONS

Brazil

With a population of over 190 million people, Brazil is the fifth most populous country in the world and the fourth largest democracy. After decades of military rule (1964-1985), Brazil now sustains a vibrant open society, with a lively media and a large participatory civil society and middle class, and has developed strong macroeconomic stability over the past decade. It is currently the tenth-largest economy in the world, and as *The Economist* wrote in a cover article titled "Brazil Takes Off" (November 12, 2009): "Forecasts vary, but sometime in the decade after 2014 … Brazil is likely to become the world's fifth-largest economy, overtaking Britain and France. By 2025 São Paulo will be its fifth-wealthiest city, according to PwC, a consultancy."

Brazil is the world's largest exporter of iron ore and soya; it will soon be the largest exporter of frozen meat. Brazilian industry produces more cars than Mexico and more steel than Italy. Thanks to the development of offshore fields, the nation is self-sufficient in oil and on the verge of becoming a major exporter. It has the world's largest reserves of tropical forest, freshwater and of bio-diversity, and is the country outside the G8 with the best science base, as measured by the frequency its scientific papers are quoted. Brazil plays an active role in international negotiations on climate change and has been hugely active in building partnerships on biofuels.

Brazil is a key player on the world stage. It is at the forefront of efforts to deepen Latin American integration and the country founded, and plays, a co-ordinating role in the G20 group of nations in WTO negotiations. It is an active and influential member of the United Nations, and has for several years led the UN peacekeeping force in Haiti (it was the first country to contribute to the Haiti Reconstruction Fund). Under outgoing President Lula, Brazil has been very active in its engagement with other emerging powers, particularly India, South Africa, China and Russia. Through its role as a leader within Latin America, Brazil has encouraged closer co-operation between the region and the Middle East. Africa has also been a stated priority of President Lula's administration.

Brazil weathered the global financial downturn with relatively minor impacts. The country was one of the last to fall into recession in 2008 and among the first to resume growth in 2009. Brazil is expected to grow approximately 7% in 2010, and Brazilians have been benefiting from stable economic growth, low inflation rates and improvements in social well-being. In the words of a recent World Bank report:

> Brazil has left behind many of its more basic social and economic challenges, common to many countries. It has universalized basic education, secured the fiscal foundations for growth, investment and job generation, and has reduced poverty by the tens of millions. These are great achievements. But Brazil now faces a more complex agenda going forward, with different, and in many cases tougher, development challenges, uniquely related to the country. Central to this agenda is Brazil's unequal progress over the years in several key areas, which has left gaps in development that loom increasingly large over that country's future prospects.
> For example, now that almost all children attend basic school, the need for greater access and quality in secondary education has become urgent and crucial. There is an evident service gap between basic education and university that needs to be bridged to empower tomorrow's generation to go beyond the achievements of this one. The same is true about job training, health services – where the population has little access to life-saving intermediary care and in issues such as formal development, pensions and regional and social inequality – where Brazil remains very much divided between the rich and the poor.

The country is larger than the continental United States and is the largest in South America. Sharing borders with nine countries, it is comprised of 26 states and the Federal District where the capital Brasília is based (see map below). States have considerable autonomy, being responsible for such issues as security and education. The majority of people live in the south-central area, which includes the cities of São Paulo, Rio de Janeiro, and Belo Horizonte. The country is framed by two of the world's largest river systems: the Amazon in the North, and the Paraná river in the South. The Amazon basin covers some 60% of Brazil's surface, and holds 20% of the world's fresh water supply. Brazil has the world's largest rain forest but also includes savannah and wetlands.

São Paulo, São Paulo

The field course will spend its first two weeks in the city of São Paulo, the most populous city in the southern hemisphere and capital of the state of São Paulo. While São Paulo's core population is approximately 11 million, the greater metropolitan area is home to almost 20 million inhabitants, making it one of the most populous cities in the world. Metropolitan São Paulo has a GDP of approximately US$146 billion (12% of Brazil's GDP) and is home of the Bovespa, the largest stock exchange in Latin America. The diversified and complex economy of the State of São Paulo is the major supplier of consumption goods, capital goods, consumption materials and technical services to the other States, to other regions of Brazil and to foreign countries. In 2008, the State of São Paulo produced approximately 33% of the Brazilian GDP, much above the other States and greater than Chile's GDP. The second and third places were the States of Rio de Janeiro and Minas Gerais. The wealth produced by the State of São Paulo amounted to more than US$548 billion (greater than the GDPs of Chile and Argentina combined), the equivalent of nearly US$13 thousand per capita.

Forged from a melting pot of nationalities, cultures, beliefs, philosophies and ideals, the huge and pioneering metropolis of São Paulo is truly cosmopolitan by vocation and choice. It is Italian, German, Jewish, Portuguese, Japanese, Chinese, French, African, Arab, Spanish, Latino, Brazilian and Paulistano. These and so many other facets are reflected in the architecture of the buildings, the streets, the refined tastes of the city's culinary delights and in the styles and mannerisms of its people. The city brings together many cultures, with 3 million people of Portuguese descent, 3 million of Italian descent, 1.5 million of African descent, 1 million of German descent, 850 thousand of Lebanese descent and more than 1 million people of Japanese descent (largest Japanese city outside Japan).

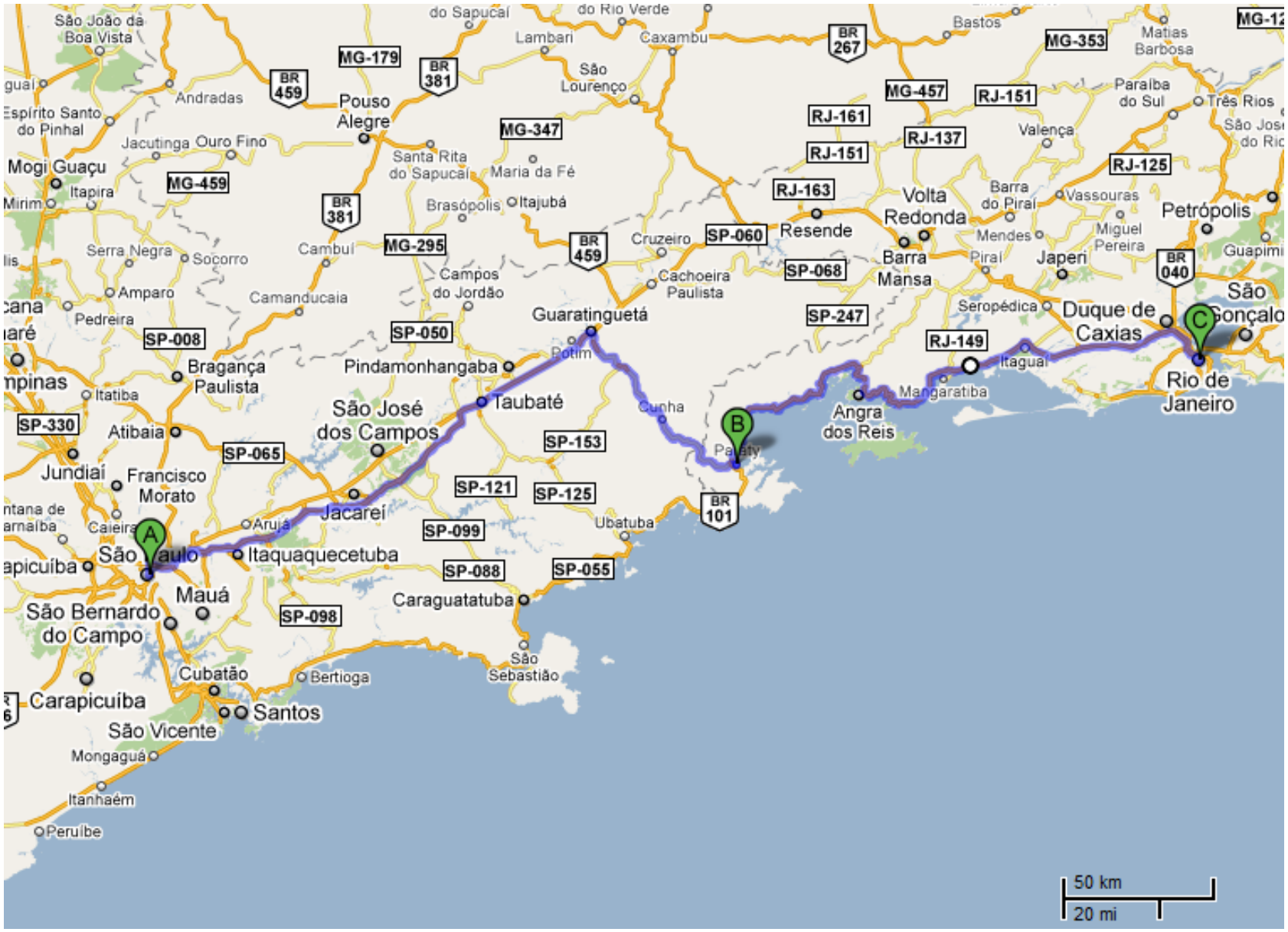
The final two days of the course will also take place in the city of São Paulo.

Paraty, Rio de Janeiro

In the words of Lucio Costa, the influential architect and urban planner who designed Brasília, "Paraty is a town where the sea and land paths meet, or rather, intertwine." This geography was the reason for its importance and richness, when its port was the outlet of commodities which came down through the trail in the mountains to be shipped to Portugal: the Minas Gerais gold and Paraíba Valley coffee, as well as the best *cachaça* (sugar cane spirit) produced in its 150 distilleries. The outcome of this commerce is its urban ensemble of unquestionable beauty and relevance.

With the discovery of gold in Minas Gerais at the end of the 17th century, the village of Paraty became the entry door for the thousands who wanted to make a fortune in the Brazilian "Eldorado". From its port, gold and precious stones were embarked for Rio de Janeiro, to be sent from there to Lisbon. A great amount of gold and riches came through the village, protected by its many fortifications and its troops. Its port was busy with the arrival of fabrics, tools, food supplies and slaves for the mines and São Paulo. In the beginning of the 19th century, the coffee plantations in the Paraíba Valley brought a new impulse to Paraty as a commerce centre, its port being from where coffee was exported, and where European manufactured goods arrived to go the interior, including luxury items for the coffee barons. The urban centre was enlarged and its streets improved; new buildings appeared, more elegant; one-storey houses were transformed in two-storey houses; and in 1844 the village was elevated to the condition of town.

We will spend a weekend in this beautiful colonial city, which is considered a National Historical Monument that preserves until today its countless natural and architectural charms. By exploring Paraty's downtown on foot, the participants will have the chance to travel back in time, where walking has to be done in a leisurely pace due to the irregular rounded cobblestone pavement of its streets.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Pindamonhangaba
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Jacareí
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Mauá
São Bernardo do Campo
Santos
Cubatão
Caraguatatuba
Ubatuba
Angra dos Reis
Resende
Volta Redonda
Barra Mansa
Petrópolis
Duque de Caxias
Pouso Alegre
Campos do Jordão
Itajubá
Mogi Guaçu
Atibaia
Jundiaí
Bragança Paulista
Itaguaí
Mangaratiba
Cunha
Paraty
Cachoeira Paulista
Cruzeiro
Lambari
Caxambu
São Lourenço
Santa Rita do Sapucaí
Maria da Fé
Brasópolis
Cambuí
Camanducaia
Socorro
Serra Negra
Amparo
Pedreira
Itatiba
Francisco Morato
Caieiras
Arujá
Andradas
Jacutinga
Ouro Fino
Itapira
Espírito Santo do Pinhal
Bertioga
São Sebastião
Carapicuíba
São Vicente
Mongaguá
Itanhaém
Peruíbe
Valença
Barra do Piraí
Vassouras
Mendes
Piraí
Japeri
Seropédica
Itaguaí
Paraíba do Sul
Três Rios
Matias Barbosa
Bastos
Miguel Pereira
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50 km
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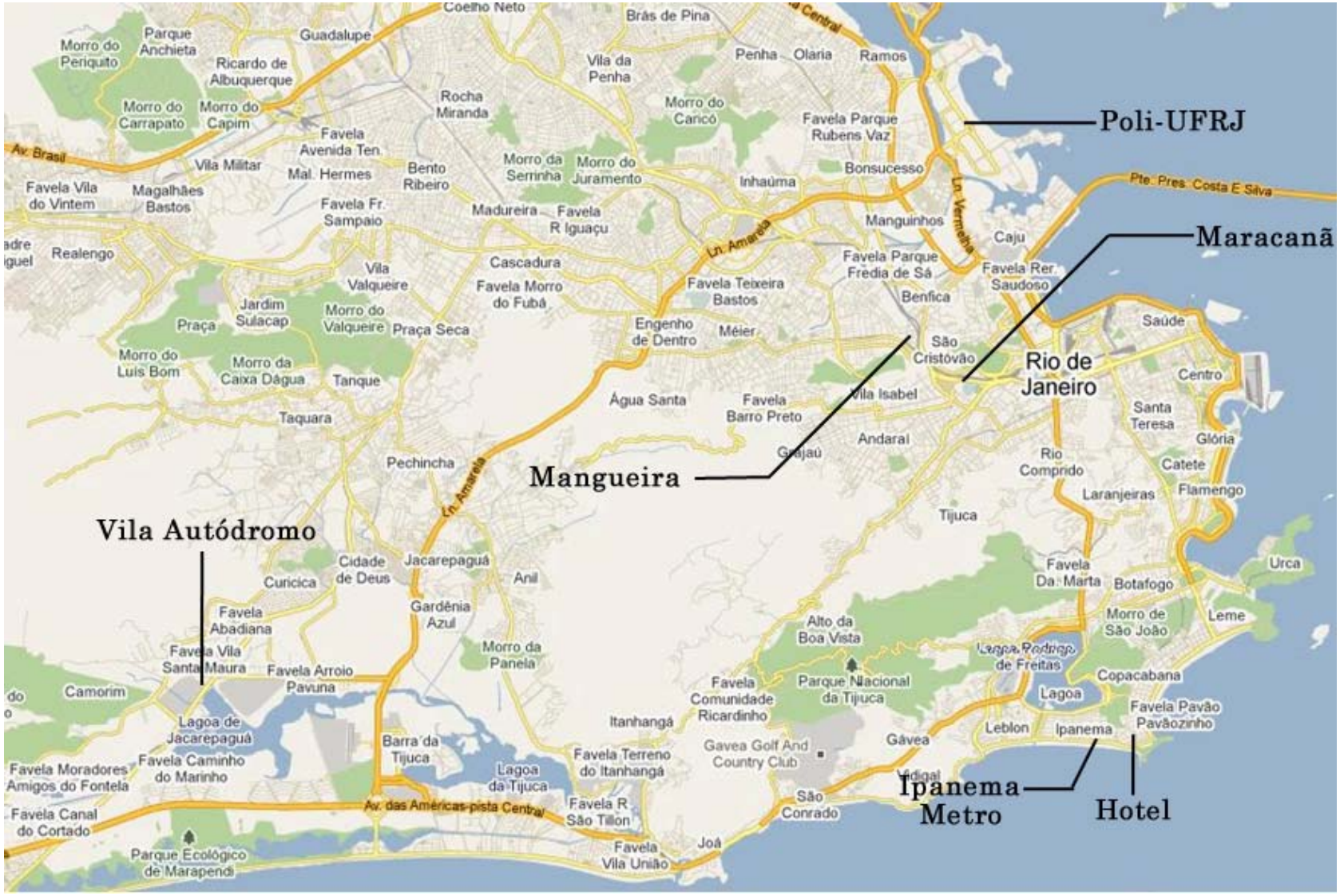
Rio de Janeiro, Rio de Janeiro

We will spend four days based in Rio de Janeiro, known as the "Cidade Maravilhosa" (Marvelous City) for its natural beauty. The second largest city in Brazil, Rio was the country's capital for nearly two centuries until the capital moved to Brasília in 1960. The state of Rio also has the largest and second largest urban forests in the world, and will host the 2016 Summer Olympics.



SITE VISITS

An Important Note of Thanks to our Field Site Hosts:

On behalf of all its participants, the course organizers would like to thank the tremendous generosity, openness and hard work of the many institutions and 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.

Sabesp – ETA Guaraú	❖ Cláudia Mota dos Santos Pereira
EMAE – Cantinho do Céu, Billings Reservoir, and Henry Borden power plan	❖ Antônio Bolognesi ❖ Mario Luiz do Nascimento Oliveira
Natura – Water Re-use Facility	❖ Sebastião Sampaio Alves
Catalytic Communities – Comunidade Vila Autódromo	❖ Theresa Williamson ❖ Tiago Donato
Odebrecht – Maracanã Stadium; Metrô Ipanema & Complexo Rubem Braga	❖ Alexandre Moreira Baltar ❖ Ana Carolina Martins ❖ Dante Venturini de Barros ❖ Luiz Gabriel Azevedo ❖ Sérgio França Leão

SABESP ETA GUARAÚ – DRINKING WATER TREATMENT

Sabesp is the largest water and wastewater company in Latin America, based on the number of customers and net revenues. It operates in 366 municipalities, including the city of São Paulo, providing services to more than 26 million people.

In 1973, with the implementation of the National Sanitation Plan, the state sanitation companies were created. In the State of São Paulo, as a result of the fusion of the companies and the autarchies that until then managed the water services and the sewage collection services in the cities, Sabesp was created. The Government of São Paulo is Sabesp's main shareholder. The company's shares are openly traded on the New York and São Paulo Stock Exchanges.

Today, Sabesp supplies 60% of the State's population, providing services to 365 out of the 645 cities and treated water to six others that take care of their own distribution. Sabesp plans, executes and operates water, sewage and industrial wastewater systems, preserving the environment and improving the life conditions of a population that is twice as large as the population of Belgium.

Since 2007, Sabesp has been allowed to geographically expand the scope of its business and to add new types of services related to environmental sanitation and energy. To provide quality services, it has a gigantic structure and in the last 5 years it has invested nearly US$3 billion in a capital expenditure program designed to meet growing demand for potable water, increase the percentage of households connected to its sewage system, increase sewage treatment, improve overall operating efficiency and reduce water losses.

Sabesp currently provides water services to 100 percent of the population in its concession area, 78 percent with sewage collection and 63 percent with wastewater treatment. The company aims to maintain and improve these levels going forward, with an emphasis on increasing wastewater treatment. From 2009 to 2013 Sabesp will invest nearly US$5 billion to continue providing water to the entire population of the cities that Sabesp supplies, as well as widening the sewage collection and treatment rates. Its goals for 2013 are to provide: 100% of treated water; 90% of collected sewage; and 88% of treated sewage.

The Guaraú Water Treatment Plant is responsible for treating water of the Cantareira System, one of the largest in the world. With a capacity of more than 36 cubic meters per second of water being treated, it is the largest drinking water plant in South America. Only the Chicago Drinking Water Plant is as large as Guaraú. Its capacity is equivalent to 720 million gallons per day. The Guaraú Treatment Plant uses alum to coagulate and flocculate particles, which are then removed by settling and filtration. Chlorine is added to kill any bacteria and fluoride is added for the prevention of tooth decay.

EMAE – SÃO PAULO METROPOLITAN WATER AND ENERGY COMPANY

EMAE's principal activity is the generation and marketing of electric energy. It is proprietor and operator of the hydraulic and electric energy generation system located in the metropolitan area of São Paulo, Medium Tietê and Paraíba do Sul River Valley. The Company deals with the planning, construction and maintenance of production systems, storage, preservation and marketing of energy and water dams. It has five hydroelectric and two thermoelectric plants in Brazil, and nearly 800 employees. Its hydraulic and electric energy generation system consists of reservoirs, channels, power plants and associated structures, whose main characteristic is to demand an operation focused on the rational use of surface waters, on the several hydraulic resources available, providing the generation of energy on sites strategically scattered in charge centers, on the flood management in the Metropolitan Area of São Paulo, and on the preservation of the water supply for the public in general. Its origins date back to the British "São Paulo Railway, Light and Power Company Limited", founded in Brazil in 1899. Light's first hydroelectric power plant, the Parnaíba Power Plant, started operating in 1901.

Billings Reservoir: Located on the highlands, the Billings Reservoir encompasses areas of the Municipalities of São Paulo, Santo André, São Bernardo do Campo, Diadema, Ribeirão Pires and Rio Grande da Serra. With approximately 1.1 billion cubic meters of water (35 billion cubic feet, or more than 264 billion gallons), it is EMAE's largest accumulation volume reservoir. It was built in 1937 with the objective of receiving the waters from the Tietê and Pinheiros Rivers, by means of pumping action of the Traição and Pedreira step-up plants, in addition to the waters of its own basin, for the electric energy generation at Henry Borden Power Plant in Cubatão. In 1981 the reservoir was divided by means of the construction of the Anchieta Dam, at Riacho Grande, next to the Anchieta Highway, resulting in two compartments: the Pedreira and the Rio Grande. The objective of this division was to preserve the quality of the water of the Rio Grande compartment, from which Sabesp collects water for general public supply. In a multi-use conception, the waters of this reservoir are used for the generation of electric energy, water supply to the public, sanitation, flood management and leisure.

Henry Borden Hydroelectric Power Plant

The Henry Borden complex in Cubatão encompasses two high fall (720 meters; nearly 2,400 feet) power plants with 14 groups of generators. It has a total installed capacity of 889 MW at a flow rate of 157 cubic meters/second (5,545 cubic feet/second). The External Power Plant encompasses eight penstock, and a conventional power house. The first unit was inaugurated in 1926, and the others were installed by 1950, totaling eight generation groups, with an installed capacity of 469 MW. Each generator is powered by two Pelton type turbines, activated by the waters driven from the Rio das Pedras Reservoir, which reach the Valves' Housing where, after passing through two butterfly valves by means of penstock, go down the hillside reaching their respective turbines, completing an approximate distance of 1,500 meters (nearly 5,000 feet). The Underground Power Plant encompasses six generation groups, installed inside the rocky

mass of the Serra do Mar, in a cave 120 meters long (394 feet), 21 meters wide (69 feet) and 39 meters (128 feet) high, with 420MW of installed capacity. The first generation group started operating in 1956. Each generator is powered by one Pelton turbine, activated by four water jets.

NATURA WATER RE-USE FACILITY

Founded in 1969, Natura is the industry leader in the cosmetics, fragrances and personal hygiene market in Brazil. It is also a leader in direct sales, surpassing even Avon, the giant U.S. company. Natura offers a full range of products with solutions for consumers' various needs, including products for the face and body, hair care and treatment products, make-up, fragrances, bath products, sun protection products, oral hygiene products and product lines for children.

Natura is credited for having a business model that embraces sustainability and commits to using natural ingredients in its formulas. Natura's eco-friendly, socially responsible business strategy was in place long before current advertising trends made it popular. Under the slogan "Well-Being-Well," Natura has always focused on social responsibility and the environment. Its green marketing is more than a strategy, it is a philosophy.

Natura's concern for the environment is directly translated into its products. During the production of product mixes, Natura does not test on animals and respects all international security standards. In 1983, it began to produce and market refills, whose average mass is almost 54 percent less than the mass of regular packaging. This revolutionary project resulted in a significant decrease in the disposal of solid waste in the environment. In 2005, Natura was cited in a UN report, "Talk the Walk," as one of the pioneers in green marketing. In 2007, the company put into practice the Carbon Neutral Program, designed to reduce and offset all emissions of greenhouse gases (GHG), and in 2009 it became the first Brazilian company to join the World Wildlife Fund's (WWF) Climate Savers Program.

This site visit will examine how one of Natura's water re-use facilities operates. Water use reduction is a major goal for the company, with annual targets. Techniques for conserving and reusing water in the manufacturing sector of the cosmetics industry will be discussed during this visit.

> Water is an essential resource for the manufacturing of personal care products and cosmetics, when account is taken of the amount and quality required for carrying out these production processes. The water scarcity, due to the population growth and expansion of industrial activities, are leading the authorities to draw up laws and regulations to restrict the use of water, raise the costs of its supply and impose greater control over its treatment and the discharge of effluents. Thus, conservation techniques and water reuse are becoming distinct factors in the results of the companies which employ this technology, besides the fact that there are evident benefits to the society and the environment. There are a number of challenges and restrictions on water conservation and reuse and its current quality and sanitation requirements, but there are still opportunities for reducing the level of consumption of this resource. This includes changes in the way tanks and reactors are cleaned, better control of water loss, cutting waste in water operations, and ensuring that a proper training is given to the operators so that they are made aware of the problems. These measures can also lead to substantial savings, which, it was estimated, reached a level of 80% in some processes investigated.
> *Excerpt from a 2009 Poli-USP Master's dissertation on "Water Conservation and Reuse in the Cosmetics Industry: A Case Study of Natura Cosméticos" by Sebastião Sampaio Alves, advised by Prof. José Carlos Mierzwa.*

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO – UFRJ

The Federal University of Rio de Janeiro – UFRJ, as it is known today, was created by the union of three traditional schools: The Medical School (1808), the Polytechnic (Politécnica) School (1810), and the Law School (1891). The university's existence is closely linked to the history of education in Brazil. Since its origins, the UFRJ's work, dedication and efforts have been making a difference in the social, scientific and technological development of the country through the graduation of outstanding professionals, the existence of research centers of excellence, and the investment in relevant community projects.

Recognized in Brazil and internationally for the high quality of teaching and for its commitment to research, the UFRJ distinguishes itself in several fields of study. UFRJ places among the top ten Latin American Universities. Currently, the university offers 162 undergraduate programs, 116 master's programs, 75 doctorate programs, 116 extension projects, and 281 lato sensu post-graduate courses. The UFRJ has 44,000 students (32,000 undergraduate students, 9,000 master's and doctorate students, 2,000 lato sensu post-graduate students, and 1,000 e-learning students), 3,613 professors and researchers, and 8,500 technical-administrative staff.

The UFRJ is a key partner in numerous technical, scientific, cultural and social projects and collaborations. For example, the largest research and development center for Petrobras, Brazil's oil and energy giant, is located in the UFRJ's Cidade Universitária (University City). The majority of the top candidates hired by Petrobras in the recent years were UFRJ students. The UFRJ also plays a significant role in the scope of social, human, and biomedical sciences. It invests in community projects that seek to improve the population's access to health, education, culture and leisure activities and to fostering the sense of community and participation on the part of students for the transformation of society.

Escola Politécnica: Ranked among Brazil's leading engineering programs, UFRJ's Escola Politécnica has its trajectory tightly linked to Brazil's scientific, cultural and technological development. Its origins date back to 1792, being the first regular course of Engineering of the Americas. Many outstanding Poli-UFRJ students complete double degree programs with institutions in Europe. Escola Politécnica alumni work in leading companies in Brazil and abroad, such as Petrobras, Renault, VW, Embraer, Michelin, Alstom, BHP Billiton, and Accenture. These companies have signed cooperation agreements with Escola Politécnica and sponsor students and engineering projects developed in the School.

Degree programs include: Civil Engineering; Computer and Information Engineering; Control and Automation Engineering; Electrical Engineering; Electronic and Computer Engineering; Industrial Engineering; Environmental Engineering; Materials Science Engineering; Mechanical Engineering; Metallurgical Engineering; Naval Engineering; Nuclear Engineering; and Petroleum Engineering. Escola Politécnica is located in an island in the Guanabara Bay called Ilha do Fundão. Escola Politécnica is very close to the International Airport of Rio de Janeiro, where public transportation is available to the whole of the city. The UFRJ is committed to being a public, plural, modern and democratic university.

COMUNIDADE VILA AUTÓDROMO – *FAVELA* NEIGHBORHOOD

The following article, written by a student correspondent, focuses on urban planning issues in Vila Autódromo.

Brazil Olympics may send poor families packing
Thousands of squatters live in a community that may be razed for the Olympic media center.

GlobalPost News
By Alison Coffey (Tufts University) Student Correspondent Corps
May 27, 2010 in Study Abroad Dispatches

RIO DE JANEIRO, Brazil — Ana Cristina da Silva feels lucky to live in what she believes is one of the few communities in Rio de Janeiro largely free from the notorious violence that permeates the city's deceptively beautiful landscape. But the tranquility that residents enjoy in Vila Autódromo, a favela (squatter settlement) in the west zone of Rio, is now threatened because the community sits too close to a venue for the 2016 Olympic Games. Just 16 years ago, the state government promised to protect Vila Autódromo's right to exist for 40 years.

"We don't want to be removed. Why? Because here we have peace," said da Silva. "I lost a cousin a short time ago to the famous urban violence of Rio de Janeiro. It isn't worth it to move to a pretty house somewhere else without having peace. I don't want to leave for work in the morning and worry about whether my son, at home alone, will be hit by a stray bullet."

She said that Vila Autódromo, where a strong sense of community has kept out the violence of the drug traffic affecting many of Rio's favelas, should be praised, not demolished. But on a small triangle of land nestled between Jacarepaguá Lake and an old Formula 1 racetrack, Vila Autódromo will be demolished to make way for new Olympic facilities and a security perimeter. The city says there just isn't room for the families and will forcibly evict the nearly 2,000 people who call Vila Autódromo home.

The prospect of eviction is nothing new for Altair Guimarães, President of the Vila Autódromo Resident's Association. First uprooted from Rio's beachfront south zone during the slum removal efforts of the military dictatorship, Guimarães was resettled only to be removed again to make room for a new highway. Guimarães came to Vila Autódromo, where he faces eviction for a third time. Today he is the community's leading voice in the fight against removal and what he describes as the hypocrisy of the government.

"In 1994, Governor Leonel Brizola gave the community title with the right to use the land for 40 years," explained Guimarães. "But [Mayor] Eduardo Paes, who at the time was deputy mayor, and today has the power of the pen, says that we can't stay because the organizers of the 2016 Games don't accept the community here when this project (the Olympics) can bring great results to the city. I don't understand how evicting part of its people can bring great results to Rio de Janeiro."

The city assures residents that they will benefit from a new social housing program, Minha *Casa, Minha Vida* ("My House, My Life"), which offers subsidized housing units of around 150 square feet to the city's low-income population. But for Guimarães, this is an illusory benefit for displaced residents. In his

experience, removal means being transferred far from jobs and schools and losing a close-knit sense of community. He said that the housing units they would receive are actually smaller than many of their current houses in Vila Autódromo.

While eviction in low-income, informal areas has become a not-uncommon consequence of mega-event planning worldwide, housing rights violations have reached significant proportions during recent Olympics. According to the Center on Housing Rights and Evictions, 1.25 million people were forcibly evicted in Beijing leading up to the 2008 Games.

By comparison, the displacement of 2,000 people from Vila Autódromo might seem an insignificant number. But other removals in the name of the Olympics and urban revitalization are occurring throughout Rio as well. The Secretary of Housing recently announced the planned demolition of homes in Mangueira and Morro da Providência, two favelas in the vicinity of important Olympic sites. These favelas must make way for urbanization projects and cable car lines that will connect tourist attractions with the famous Maracanã soccer stadium and transport hubs. Between the two communities, an expected 1,800 families will be resettled, bringing estimates of the total number of displaced individuals close to 10,000.

Theresa Williamson, Executive Director of Catalytic Communities, a Rio-based NGO working as an incubator for community solutions born within favelas, argues that this is an opportunity for Rio to create a best practice in Olympic planning. "If you just had some creative planning, there's no reason that Vila Autódromo can't be integrated into the fabric of the Olympics," Williamson said. She suggested solutions might include urbanizing the community, employing residents in the Olympic venues, and ensuring that infrastructure projects be given a social use to directly benefit the community after the Games.

But for Williamson, the issue goes beyond Vila Autódromo to what she calls insufficient and segregationist housing policies: "How does the city want these communities to be developed? If they are going to urbanize, upgrade, or resettle favelas in areas free from environmental risk in the future, they need a model. Why not make Vila Autódromo that model? Why just box them into public housing when the city could engage in a process with the community and do something really bold?"

Despite the sense of safety that residents enjoy, a lack of paved roads and many urban services leave Vila Autódromo a far cry from an oasis. But residents are resolute in their fight to remain. "It doesn't matter if you have a two- or three-story house, or if you have a shack on the edge of the lake like I have," says da Silva. "It's mine, and this is where I want to stay."

http://www.globalpost.com/dispatch/study-abroad/100519/brazil-olympics-rio-favelas

MARACANÃ & SURROUNDING AREAS

The Estádio do Maracanã, officially the Estádio Jornalista Mário Filho, is an open-air stadium in Rio de Janeiro, Brazil. Owned by the Rio de Janeiro State Government, it is named after the Maracanã neighborhood in Rio de Janeiro. Built using reinforced concrete, it has an oval shape and consists of two tiers divided by medium-sized open boxes. A cantilevered roof spanning 30m covers 34 rows at the rear of the stadium. It was opened in 1950 to host the FIFA World Cup, and in the final game Brazil was (sadly) beaten 2-1 by Uruguay. Since then, it has mainly been used for soccer matches between the major football clubs in Rio de Janeiro. It has also hosted a number of concerts (Frank Sinatra, Paul McCartney, Rolling Stones, etc.) and other sporting events.

The paid attendance at the final game of the 1950 FIFA World Cup was 199,854, but the official attendance record was set in 1969, with 183,341 spectators. Until recently, the stadium has very often filled to capacity and beyond with more than 100,000 people.

On July 19, 1992, an upper stand in the stadium collapsed, leading to three deaths and more than 50 injured spectators. Following the unfortunate disaster, the stadium's capacity was greatly reduced as it was converted to an all-seater stadium in the late 1990s. Despite this, the ground was classified as national landmark in 1998, meaning that it could not be demolished. After several subsequent modernization renovations—including most recently its adaptation to be the main venue of the 2007 Pan American Games—the stadium sat 82,238 spectators, still maintaining it as the largest stadium in Brazil and South America.

The Maracanã stadium is currently closed for renovations and upgrades to become FIFA-compliant for the 2014 World Cup, and will reach a total capacity of around 85,000 spectators. Its reopening is scheduled for early 2013, in time for the 2013 FIFA Confederations Cup. The stadium will be the location of the final match of the 2014 World Cup.

The renovation project involves an expansion of the stadium roof, which will cover all seats, unlike the current design. In addition, the current lower tier with blue seats will be demolished, giving way to a new lower tier, possibly with a single level of luxury boxes. The boxes which were installed above the stands will also be demolished and replaced with regular seating.

The renovation work—budgeted for over US$400 million—began in August of 2010, and as of mid-December the process of demolishing the stadium's lower tier has been virtually completed by the companies responsible for the renovation, with work on the upper tier having already begun. The current state of proceedings is the reason why tons of concrete and twisted iron are strewn around every corner of the stadium.

The same project also will also prepare the stadium to host the opening and closing ceremonies of the 2016 Summer Olympics.

METRÔ IPANEMA & COMPLEXO RUBEM BRAGA

Ipanema Subway (Metrô) Station at Praça General Osório

In the heart of Ipanema, one of the best-known and oft-sung districts of Rio de Janeiro, the Rio Metro officially opened General Osório Station on December 21, 2009, exactly 30 years after the first subway train rolled through the city's underground. The ceremony was held in the presence of Brazilian President Luiz Inácio Lula da Silva, Rio de Janeiro Governor Sergio Cabral Filho, State Transportation Secretary Júlio Lopes, and other officials, including federal, state and municipal lawmakers.

The project was highly complex due to the need for underground excavation in a densely populated area full of large buildings. It thus has unique features that set it apart from the Rio Metro's other stations, particularly the fact that it is the largest urban cavern carved out of rock in Brazil. It has four entrances: one on the plaza that gives it its name, another on Jangadeiros St., a third on Sá Ferreira St., which also links it to the neighboring district of Copacabana, and the fourth on Teixeira de Melo St. This station is the last stop on the subway line that connects downtown Rio to Ipanema. With an area of 20,000 square meters and 23 meters underground, approximately 30,000 passengers use the station daily. Several works of art, including simillations of pre-historic cave paintings, adorn the station.

Complexo Rubem Braga

The "Rubem Braga Complex" consists of two towers, with two panoramic elevators each, that connect the Ipanema metro station to the *favelas* of Cantagalo and Pavão-Pavãozinho. Before the construction of the Complex, the residents of the hilltop informal settlements had to climb up hundreds of steps in steep stairways and muddy inclines bordering cliff drops to get to their houses.

The complex, constructed by Odebrecht Infraestrutura, consists of a tunnel extending 260 meters dug through the rock that connects the General Osório station to the two towers (64 m and 31 m high) with elevators that have the capacity to transport up to 100 people per trip. The Mirante da Paz ("Peace Outlook") was constructed at the top of the highest tower and public service centers will also be installed, such as Rio Poupa Tempo ("Rio Saves Time"), allowing for the urban reorganization of the entire area near the station.

Nowadays, besides the residents, the elevators take visitors up to see the scenic views of Southside Rio from a new angle. They also allow visitors to glimpse into the reality of *favela* dwellers. Odebrecht is also building a civic service center for the community, whose services will include issuing vital documents such as birth certificates, ID cards and work papers. The project is possible thanks to a program of the Office of Public Security of the State of Rio de Janeiro called UPPs or Peaceful Police Units in loose translation. They consist of police units that are set up in *favela* neighborhoods that were previously controlled by druglords. The first UPP was built in the Santa Marta Favela in November 2008. Since then 13 UPPs have been set up in underprivileged communities around the city, including the Cantagalo and Pavão-Pavãozinho *favelas*. Overall public opinion is very favorable towards the implementation of UPPs but critics of the program argue that the majority of UPPs are in *favelas* located near the richest areas of the city, and are therefore a way to reduce crime in the most privileged neighborhoods and not necessarily the most dangerous.

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*): **informal settlements, sanitation, transportation, urban flooding** and **water supply**. At the conclusion of this collaborative course, each group of students will briefly present (8-10 min per group) its answers to these questions at a closing ceremony.

1. *What did you learn in this course? Provide a concise, organized summary.*
2. *How would you compare Brazil and the United States in your group's subject area? 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 and the Urban Environment?*
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?*

Name	Group	Citizenship	School	Group Area
Alex Dolginow	1	USA	Harvard - College	Informal Settlements
Charlie Howe	1	USA	Harvard - GSD (TF)	Informal Settlements
Felipe Ferreira Dias	1	Brazil	Poli-USP	Informal Settlements
Fernanda Dias Radesca	1	Brazil	Poli-USP	Informal Settlements
James Winter	1	USA	Harvard - College	Informal Settlements
Luiz Gustavo de Souza Carvalho	1	Brazil	Poli-USP	Informal Settlements
Ana Carolina Morihama	2	Brazil	Poli-USP (TA)	Sanitation
Elizabete Hamaguchi	2	Brazil	Poli-USP	Sanitation
Marianna Verlage	2	USA	Harvard - College	Sanitation
Oluwadamilola Akinfenwa (Dammy)	2	Nigeria	Harvard - College	Sanitation
Rachel Jardim da Silva	2	Brazil	Poli-USP	Sanitation
William Marks	2	USA	Harvard - College	Sanitation
Bárbara Vital	3	Brazil	Poli-USP	Transportation
Hilton H. Augustine, III	3	USA	Harvard - College	Transportation
Lucas Meyer	3	Brazil	Poli-UFRJ	Transportation
Renata de Campos Isaac	3	Brazil	Poli-USP	Transportation
Tatiana Peralta (Tati)	3	Costa Rica	Harvard - College	Transportation
Yue Zhang	3	China	Harvard - SEAS	Transportation
Felipe Souza Lima (Tim)	4	Brazil	Poli-USP (TA)	Urban Flooding
Ling Lin	4	USA	Harvard - College	Urban Flooding
Patrícia Silva Aguiar	4	Brazil	Poli-USP	Urban Flooding
Rauan Pinto e Souza	4	Brazil	Poli-USP	Urban Flooding
Tiziana Smith	4	USA	Harvard - College	Urban Flooding
Hannah Lee	5	USA	Harvard - SEAS	Water Supply
Isabella Wechsler	5	USA	Harvard - College	Water Supply
Natália Margarido	5	Brazil	Poli-USP	Water Supply
Riju Agrawal	5	USA	Harvard - College	Water Supply
Simony Sakamoto	5	Peru	Poli-USP	Water Supply
Yara Formigoni	5	Brazil	Poli-USP (TA)	Water Supply

PARTICIPANT BIOGRAPHIES

(Alphabetical by first name)

Alex Dolginow
Harvard College, Class of 2011, A.B. (Bachelor of Arts) candidate in Neurobiology
adolginow@gmail.com

Alex Dolginow is a senior at Harvard College from Potomac, Maryland. He is a Neurobiology concentrator who is interested in the environment, design, engineering, and global health. Alex spent the summer of 2010 working in the Hensch Lab, studying cross-modal brain plasticity in mice, and interning at the global health non-profit Omni Med. He also traveled to China, where he taught a class on green cities to Chinese high school students as part of the Harvard Summit for Young Leaders in China. At Harvard, he participates in and mentors for Harvard Model Congress and serves on the board of Harvard College Engineers without Borders. Alex is excited by the interdisciplinary nature of the Brazil field course and the chance to experience the vibrant culture of the country.

Ana Carolina Daniel Morihama
Poli-USP, Ph.D. candidate in Sanitary Engineering (*Teaching Assistant for Course*)
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Ana Carolina Daniel Morihama participated in a double-degree exchange program, which resulted in her undergraduate Chemical Engineering degree at the Escola Politécnica da Universidade de São Paulo and her Master's degree in Chemical Engineering at the Politecnico di Torino (POLITO, Italy). Ana is currently pursuing a Master's in Sanitary Engineering at the Poli-USP. Concurrently, she is working as a researcher at the Hydraulic Technology Center Foundation, which is affiliated with the Hydraulic and Sanitary Engineering Department of Poli-USP. Ana's research focuses on membrane systems, sanitary systems, water quality and integrated urban water management. In her free time, she enjoys watching movies, traveling and spending time with family and friends.

Bárbara Vital
Poli-USP, 4th-year undergraduate student in Environmental Engineering
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Bárbara Vital was born in Curitiba in the state of Paraná and is currently living in São Paulo where she is a student at Poli-USP. She is a fourth-year undergraduate student in the Environmental Engineering program and loves to be in contact with nature and open places. She also likes to integrate these with science in a way that could help other people, and that is why she chose to apply to this course. She is looking forward to learning more about American culture and to meet new people who share the same interests. She is also looking forward to learning a lot about sustainability projects and how to reduce the negative impacts of economic development on the environment. In her free time, Bárbara enjoys traveling, watching films and TV series, getting together with her friends and playing volleyball.

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

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.

Charlie Howe
Graduate School of Desing, Master's in Landscape Architecture candidate, 2011
(Teaching Fellow for Course)
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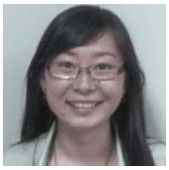
Charlie Howe is a landscape architecture student at Harvard Graduate School of Design (GSD). He sees in landscape architecture the opportunity for ecology and hydrology to direct urban design and believes the professional services offered by engineers and designers will become increasingly entwined in future firms. Charlie grew up in rural Pennsylvania and attended Allegheny College where he received a degree in Environmental Science and Biology in 2005. Prior to attending design school he worked in wetland construction in the Eastern United States and agro-forestry in Paraguay. Last summer Charlie collaborated with urban designers Arquitectura911 of Mexico City to create a toolkit of landscape components that the firm employs in their architecture and planning projects.

Christian Werthmann
Associate Professor and Program Director, Department of Landscape Architecture, Graduate School of Design (GSD)

Christian Werthmann, Associate Professor of Landscape Architecture, teaches in the landscape architecture core design studio sequence where he is also Director of the Master in Landscape Architecture Degree Programs. Recent courses include "Green Infrastructure in the Non-formal City, Sustainability for Planning and Design," "The Landscapes of Castilla-La Mancha," "Contested Waters: The Tajo River in Spain" and "A Place in Heaven a Place in Hell: Tactical Operations in

São Paulo's Informal Sector." Werthamnn was recently selected as teacher of the year in landscape architecture. He received his Master's of Landscape Architecture degree with a specialization in urban design at the University of Kassel in Germany. Werthmann studies landscape and infrastructure in heavily urbanized areas. Portions of his research resulted in the book *Green Roof: A Case Study*, published by Princeton Architectural Press (2007) and in the founding of the GSD Green Roof Initiative that installed an experimental green roof at the Graduate School of Design. As a co-founder of the interdisciplinary research group TransUrban, he critically examines built experiments of sustainable urbanism and issues reports in regular intervals. Werthmann co-founded with John Beardsley the research initiative *Dirty Work* which studies landscape as the primary agent for improvement in poor urban areas, and in 2008 they staged a major exhibition titled *Dirty Work. Transforming the Landscape of Nonformal Cities in the Americas* showcasing landscape based projects in the non-formal sector of seven Latin American cities. A book publication on the same topic will follow from Princeton Architectural Press (2010).



Elizabete Harumi Hamaguchi
Poli-USP, 3rd-year undergraduate student in Environmental Engineering
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Elizabete Hamaguchi is majoring in environmental engineering at Escola Politécnica da Universidade de São Paulo (Poli-USP). Since 2008, she has been part of PoliCidadã, a group inside Poli that aims to use engineering for social objectives. In January 2009 she was part of the PoliCidadã team that worked 10 days with a D-Lab MIT team focusing on developing appropriate technologies for a community in the countryside of Brazil. Some of the villagers on that region face the problem of having iron in their well water, so in that same year she began a one-year scientific research trying to design a simple technology to solve that problem. She is currently working with naval management at the Centro de Estudos em Gestão Naval (CEGN) at Poli-USP's Department of Naval Architecture and Ocean Engineering. She also spent two years working with Engineers Without Borders's Brazil chapter and was part of Poli-USP's recyclable waste management program commission in 2010. She is interested in ecodesign, transportation systems and social entrepreneurship. In her free time she likes to read, watch movies and spend time with her family and friends.

Felipe Ferreira Dias
Poli-USP, 5th-year undergraduate student in Environmental Engineering
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Felipe Dias is an Environmental Engineering undergraduate student at the Escola Politécnica da Universidade de São Paulo (Poli-USP) and has a strong interest in social development. He was a co-founder and former president of the Engineers Without Borders Brazil chapter. He also took part in a research program which studied floodable areas in the northeastern part of the state of São Paulo. Having studied at Universidade do Porto in Portugal for a semester during a student exchange program, he faced how different engineering can be studied when approached by different cultures and how interesting these interactions can actually be. Teaching has been a great passion in Felipe's life and he has taught both English and Numeric Calculus for the last five years. He also enjoys visual arts, mostly theater and movies. He was once part of the theater group of the Escola Politécnica and has acted in four plays.

Felipe (Tim) Souza Lima
Poli-USP, 5th-year undergraduate student in Environmental Engineering (*Teaching Assistant for Course*)
felipelima@usp.br

Felipe Tadeu de Souza Lima is a fifth-year undergraduate student in Environmental Engineering at the Escola Politécnica of the Universidade de São Paulo (Poli-USP). He participated in the 3rd Entrepreneurship Marathon at Poli-USP's Minerva Entrepreneurship Center. Felipe completed an internship at Accenture Supply Chain Management Service Line where he engaged in several projects related to sustainability and logistics in leading multinationals, mostly in retail and consumer goods. Currently, he is conducting research on intelligent transport systems for São Paulo and Campinas at Poli-USP's Department of Transportation. Felipe was born and raised in São Paulo and has strong interest in topics related to water treatment, alternative energy and sustainable practices and technologies. He enjoys movies, music and sports in general, although his main passions the rugby and handball college teams and the Dave Matthews Band. He was a participant in the January 2010 pioneering Harvard-Poli-USP collaborative field course on "Water, Energy and the Environment".

Fernanda Dias Radesca
Poli-USP, 5th-year undergraduate student in Environmental Engineering
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Fernanda Dias Radesca, from São Paulo, is a fifth-year undergraduate student at the Escola Politécnica da Universidade de São Paulo (Poli-USP). In this field course she is interested in urban planning and its impact on the natural resources of a city and its population, especially the most vulnerable. In 2008, she worked as a volunteer in one of the Wild at Heart Foundation programs in Kenya. During 2010, she worked in public schools teaching personal economy to high school students, as part of a Junior Achievement Foundation program. She also was part of a scientific research in soil-tire fibers mixtures for landfill cover. In her free time she likes to run, read, and go to the movies and restaurants.

Gabriel Duarte
Assistant Professor, Department of Architecture, Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio)
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Gabriel Duarte is a founding partner in CAMPO aud-Arquitetura Urbanismo Design, an architecture and urban design office in Rio de Janeiro, and an Assistant Professor at the Department of Architecture of the Catholic University of Rio de Janeiro (PUC-Rio), where he runs a design studio that investigates the intermediate scales between landscape and architecture. He has lectured extensively in both Brazil and abroad, having been a Visiting Professor at London's Architectural Association School of Architecture (AA School) and at the Massachusetts Institute of Technology (MIT), in Cambridge. Having received several international awards throughout his career, such as the Wolf Tochtermann Prize, from UNESCO and UIA (International Union of Architects), and the Takashi Inuye Award, from IFHP (International Federtion from Housing and Planning), he has recently won a national competition to develop urban renewal projects for *favelas* in Rio de Janeiro. In combination with his professional life, Prof. Duarte is working on a Ph.D. dissertation on urban uncertainty and vagueness at the Graduate Program in Urbanism of the Federal University of Rio de Janeiro (PROURB-UFRJ). Since 2007, he has been a member of the

Pool of Reviewers of the European Science Foundation (ESF) Humanities Department. Prof. Duarte was educated as an architect at the School of Architecture of the Federal University of Rio de Janeiro (FAU-UFRJ) and at the Delft University of Technology (Netherlands), with a scholarship from the Dutch Ministry of Foreign Affairs.

Gabriella Rossi
Adjunct Professor, Department of Graphic Expression and Graduate Program in Urban Engineering, Escola Politécnica da Universidade Federal do Rio de Janeiro (UFRJ)

Gabriella Rossi is an Adjunct Professor in the Department of Graphic Expression and in the Graduate Program in Urban Engineering of the Escola Politécnica da Universidade Federal do Rio de Janeiro (UFRJ). She holds a bachelor's degree in Architecture and Urbanism (1982) from the Universidade Gama Filho, a Master's in Architecture (1992) from UFRJ's School of Architecture and Urbanism (FAU-UFRJ) and a Ph.D. in Product Engineering (1999) from COPPE-Universidade Federal do Rio de Janeiro. Rossi also carried out doctoral research at Urban Planning Institute of the University of Stuttgart in Germany on a two-and-a-half-year DAAD/CAPES scholarship, and post-doctoral research at the Universidad Politécnica de Madrid in Spain, with support from CNPq, the Brazilian National Council for Scientific and Technological Development. She is currently one of the coordinators of the LABURB Research Group, which focuses on sustainable urban areas and housing.

Hannah Lee
School of Engineering and Applied Sciences (SEAS), Ph.D. candidate in Environmental Sciences and Engineering
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Hannah Lee is a first-year Ph.D. candidate at Harvard's School of Engineering and Applied Sciences, in the Environmental Sciences and Engineering program. She is from Cupertino in California and graduated in 2009 from Columbia University with a B.A. in Environmental Engineering with a concentration in sustainable energy technologies. Her senior thesis looked at the possibility of storing CO2 under the seafloor and the the stored carbon's interaction with methane hydrates. In college she was involved in Engineers without Borders and traveled to Ghana twice to implement projects, and co-founded *Consilience: the Journal for Sustainable Development* – a student-run journal for students' scholarly articles, field notes, opinions and short essays about cross-disciplinary topics in development. Before beginning her graduate studies, she worked for the U.S. Department of Energy and for environmental organizing campaigns.

Hilton H. Augustine, III
Harvard College, Class of 2013, A.B. (Bachelor of Arts) candidate in Engineering Sciences
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Hilton Augustine, III is a sophomore at Harvard College from Rockville, Maryland. He is an Electrical Sciences concentrator in the field of Electrical Engineering and Computer Science, and is also pursuing a degree in Applied Mathematics. Hilton is interested in applications of engineering and mathematical thinking within the fields of renewable energy, electronics, and entrepreneurship. Last summer he conducted research in electron-beam lithography with the National Nanotechnology Infrastructure Network in a lab at Howard University in Washington,

DC. In his free time Hilton enjoys watching Judd Apatow comedies and playing basketball, soccer, and Halo with friends.

Isabella Amalia Wechsler
Harvard College, Class of 2013, izwechsler@gmail.com
A.B. (Bachelor of Arts) candidate in
Environmental Science and Public Policy

Isabella Wechsler is a sophomore at Harvard College from Mount Laurel, New Jersey. She is an Environmental Science and Public Policy (ESPP) concentrator especially interested in examining the influence of climate change on global health and international security. She is looking forward to this course and its application of modern engineering and technology to problems like the growing scarcity of drinking water worldwide. Isabella particularly enjoys volunteering and worked in a state orphanage for special-needs children in China this past summer, assisting in physical therapy care for the children and teaching English. At Harvard she is the Cabot House representative for the Resource Efficiency Program, which directs competitions and educational campaigns for students on environmental issues. She also enjoys editing for Snowflake Stories, an organization that publishes storybooks for international orphanages, and she competes on Harvard's club swimming team. In her spare time she likes to write fiction, draw, and travel.

James Chan Winter
Harvard College, Class of 2011, jcwinter@fas.harvard.edu
A.B. (Bachelor of Arts) candidate in
Applied Mathematics

James Winter is a senior at Harvard College from Ridgefield, Connecticut. He is an Applied Math concentrator interested in applications to engineering, the environment, and global health. James has spent the past two summers working at a food bank just outside Buenos Aires, Argentina, and working in the STOP-Tuberculosis department of the World Health Organization (WHO). He hopes to use this experience to learn more about alternative energy on a large scale and to see the impacts it has on industry, the environment, and public health. At Harvard he is a cellist and the Vice President emeritus of the Harvard Radcliffe Orchestra, an instructor at the Harvard Bouldering Wall, and an avid user of his house's woodshop. He is also researching the plausibility of using remote sensing to accurately assess the volume change and shifting terminus point of mountain glaciers with Professor Peter Huybers of the Earth and Planetary Sciences Department.

Jason Dyett
Program Director, Brazil Office of jdyett@fas.harvard.edu
Harvard University's David Rockefeller
Center for Latin American Studies

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

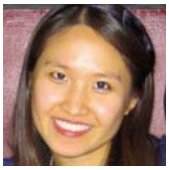
with Brazil in close collaboration with the Brazil Studies Program at Harvard University. He has a Master's of Business Administration (MBA) in Finance from the University of Chicago Graduate School of Business (2004) and graduated Phi Beta Kappa with a B.A. in Political Science and Spanish from the University of Vermont (1994).

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

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.

Judith Grant Long
Associate Professor and Program Director, Department of Urban Planning & Design, Graduate School of Design (GSD)

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.



Ling Lin
Harvard College, Class of 2012, A.B. (Bachelor of Arts) candidate in Environmental Science and Public Policy
linglin4@gmail.com

Ling Lin is from Boston, Massachusetts, and she is a third-year undergraduate student at Harvard College concentrating in environmental science and public policy. She hopes to pursue a career in alternative energy development by fusing her interests in business and science. Ling is involved in *The Harvard Crimson*, the United States' oldest continuously published daily college newspaper, where she is on the Business and Design Boards and is Design Board Comp Director. She is also Project Manager for Harvard Council on Business and the Environment and Co-Chair of Quincy House Committee. Ling has worked in marketing at Second Wind Inc., as an English teacher in Ecuador, and as a Park Ranger at the Boston Harbor Islands National Park and Recreation Area. She enjoys exercise, music, and trying vegan desserts!

Lucas Meyer de Freitas
Poli-UFRJ, 2nd-year undergraduate student in Civil Engineering
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Lucas Meyer de Freitas was born and raised in Rio de Janeiro and is currently a sophomore civil engineering student at the Universidade Federal do Rio de Janeiro (UFRJ). He is interested in providing engineering solutions to the growing problems of modern society. With this concern, Lucas has been working with a research group on solid waste at the Geotechnics Lab for the past year and was in a group that organized an event about urban development at his university. Lucas is also interested in acquiring international experience. He spent a semester in Germany when he was in high school and is looking forward to an academic year abroad. When not studying, Lucas enjoys reading, going out with his friends and to practice sports, especially running at the beach. In his vacations he is particularly interested in travelling and getting to know new places.

Luiz Gustavo de Souza Carvalho
Poli-USP, 4th-year undergraduate student in Environmental Engineering
luiz.carvalho.11@usp.br

Luiz Gustavo was born and raised in São Paulo. He is a fourth-year undergraduate student at Poli-USP concentrating in Environmental Engineering and his particular academic interest lies in the development of new technologies for the construction of a better urban space. Along his life, Luiz has participated as a volunteer in some social projects and worked in the development of a field report about efficient buildings in São Paulo. He is very interested in languages and foreign culture as well as meeting people from distant places. Playing the guitar and playing soccer are his favorite activities which make music and sports in general important parts of his personal life.

Manoel Carlos Pereira Neto
Intern, Brazil Office of Harvard University's David Rockefeller Center for Latin American Studies
manoelcarlossv@gmail.com

Manoel Carlos Pereira Neto is an intern since March 2009 at the Brazil Office of Harvard

University's David Rockefeller Center for Latin American Studies. 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, positive attitude, proven social consciousness and academic excellence for a two-week trip to the United States to meet with public and private sector organizations and to visit schools and social projects. Prior to moving to São Paulo, this Brazilian citizen lived for two years in Curitiba, south of 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 the volunteer work developed at his school's computer lab, when he was twelve. At the Brazil Office, Manoel is responsible for the coordination of logistics for events, programs and collaborative courses, admistrative tasks, and also provides general support for Harvard students, staff, and faculty. He is now a junior at the Pontificia Católica Universidade de São Paulo (PUC-SP), earning an A.B in Business Administration.

Marianna Francesca Verlage
Harvard College, Class of 2013,
A.B. (Bachelor of Arts) candidate in
Environmental Engineering
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Marianna Verlage is a sophomore at Harvard College from Dallas, Texas. She is an Environmental Sciences and Engineering concentrator with a specific interest in renewable energy. The summer after her freshman year, Marianna interned with an architecture and construction firm in Dallas and worked with their sustainability team on a number of different projects. At Harvard, Marianna works in a lab in the Earth and Planetary Sciences department and is involved in a non-profit women's organization called The Seneca. Marianna grew up in Mexico, so in this course she is very interested in learning more about the environmental problems that arise with urban development especially those that are unique to Latin American countries.

Marie Dahleh
Assistant Dean for Academic Programs
and Senior Lecturer on Engineering
Sciences, School of Engineering and
Applied Sciences (SEAS)
** Harvard faculty leader for course.*

Marie Dillon 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.

Monica Porto
Full Professor and Chair, Department of Hydraulic and Sanitary Engineering, Escola Politécnica da Universidade de São Paulo (Poli-USP)
** USP faculty leader for course.*

Monica F. A. Porto is a Full Professor (Professora Titular) 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 Tecnólogico 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 Enginnering," "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).

Natália Takahashi Margarido
Poli-USP, 5th-year undergraduate student in Environmental Engineering
nat.t.margarido@gmail.com

Natália is a fifth-year Environmental Engineering undergraduate student at Escola Politécnica of the Universidade de São Paulo. Her interests are specially the urban areas and its contemporary problems, as the ones related with energy, water and waste management. Now she's developing a scientific research project that analyzes the variability of electrical energy's cost in Brazil by correlating electricity demands and economic variables. Natália, who was born in São Paulo, lived for almost 10 years in Santos. Besides English and Portuguese, she also speaks French and Spanish, and likes to study new languages. She enjoys swimming, reading, cooking, listening to music, watching movies and spending time with family and friends.

Oluwadamilola (Dammy) Akinfenwa
Harvard College, Class of 2012, A.B. (Bachelor of Arts) candidate in Bioengineering
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Dammy Akinfenwa was born in Lagos, Nigeria and raised in Houston, Texas. He is a junior at Harvard College concentrating in Bioengineering, with a secondary in Computer Science and living in Cabot House. His primary academic interests have always been in the sciences, but his other interests include technology, finance, and religion, specifically at Harvard. Through the Harvard Society of Black Scientist and Engineers, of which Dammy is currently president, he has been able to involve himself in science-focused community service initiatives aimed at the youth in some of Boston's largely-minority communities. In this course, he is especially excited to explore the engineering challenges and opportunities the urban metropolis has to offer as well as to better understand the intersection of the environment and economics. In his free time, Dammy enjoys playing basketball and pool, comedy and watching new films and plays.

Patrícia Silva Aguiar
Poli-USP, 5th-year undergraduate student in Environmental Engineering
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Patrícia Silva Aguiar is a 5th-year undergraduate student in Environmental Engineering at Poli-USP. This collaborative course meets her interests in Urban Management, especially using field situations to study the application of engineering tools to enhance quality of life and environment conservation. Since 2007, she works as a volunteer helping the NGO "Um Teto para meu país" (A roof for my country) to build emergency wood houses in underprivileged neighborhoods in São Paulo. Patricia participated of an exchange program at Texas Tech University (TTU), studying Environmental Engineering throughout the first semester of 2009. As an exchange student she joined the TTU group in charge of designing and pouring a canoe made of concrete, to compete at the regional Concrete Canoe Competition. In 2009, she was chosen to be one of the students to represent the University of São Paulo at the Technology and Management International Business Plan competition, held in London in January 2010. Patricia is also member of the Poli-USP Women's Basketball Team.

Paul Nakazawa
Lecturer in Architecture,
Department of Architecture, Graduate School of Design (GSD)

Paul Nakazawa teaches courses in professional practice and the development of design-based enterprises. He works internationally as a practice and business strategist to leading firms in architecture, landscape architecture, urban design and other allied professions. His expertise encompasses strategic planning, organizational development, practice management, marketing, finance, mergers and acquisitions, and large-scale project mobilization. Nakazawa is a registered architect with significant planning and building experience. He received his BA and MBA from the University of Chicago, and MArch from the GSD. Nakazawa has also been a member of the architectural faculties of the Southern California Institute of Architecture and University of North Carolina and currently serves as one of two Harvard board members of the Massachusetts Technology Collaborative, the Commonwealth's agency for renewable energy and innovation economy. He has taught at the GSD since 1996, and this past Fall 2010 taught a Rio Studio which focused on Rio de Janeiro's challenges and potentials with the imminent investments for the 2014 World Cup and the subsequent 2016 Olympic Games and their potential to catalyze long term improvements for the large local population rather than merely servicing the temporary needs of the global tourists and the world press.

Rachel Jardim Medeiros da Silva
Poli-USP, 4th-year undergraduate student in Environmental Engineering
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Rachel Jardim was born in Rio de Janeiro, the second-largest city in Brazil. She moved to São Paulo to study at the University of São Paulo. She is currently in her fourth year of Environmental Engineering. She has participated in different research projects. In 2008, she worked on the development of a "Wetlands" system for greywater treatment. In 2009, she was awarded a scholarship to study for one year at the Uni Stuttgart. In Germany, she worked as translator in a

Brazil-Germany cooperation project. Furthermore, she has attended lectures on urban planning, renewable energy and waste management. After the exchange program, she joined the renewable energy team in the Electrical Engineering Department to study the environmental impacts of wind energy and the permitting process for wind farms in Brazil. Besides German and English, she has studied Italian while she lived in Rio de Janeiro and is now attending Spanish classes. Rachel sees environmental engineering as a global profession, believing in cooperation and respect between different countries. Rachel is an easygoing person, who enjoys watching films, playing the viola and travelling in her free time.

Rauan Thome Pinto e Souza
Poli-USP, 5th-year undergraduate student in Environmental Engineering
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Rauan, from São Paulo, is currently a fifth-year student in Environmental Engineering at the Escola Politécnica da Universidade de São Paulo. He believes that sustainable development is a very important concept to achieve, especially in a developing country like Brazil. Rauan wants to insert this concern in any project he participates by trying to mitigate the impacts in the environment. The urban environment requires many studies in order to make its development sustainable. In 2008, he interned in a project that studied the tractability of a river in São Paulo for water supply. In 2009, Rauan received a one-year scholarship to study in France, where he studied aspects about urban environment in a course on "Water, Atmosphere and Urban Environment". This Brazilian citizen is now working in a project on ballast water which aims to monitor this water and propose a viable solution for the bio invasion problem. Other interests of him lie in learning other languages and watching films, swimming and dancing.

Renata de Campos Isaac
Poli-USP, 5th-year undergraduate student in Environmental Engineering
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Renata Isaac is a fifth-year undergraduate student in Environmental Engineering at Escola Politécnica, Universidade de São Paulo (Poli-USP). Her interests are mainly focused on water resource management, sustainable living ways and also engineering solutions that enable the conciliation between urban development and environmental preservation, so that life quality can be provided to people and natural resources are better exploited. Renata has completed an internship at an environmental management consultancy company in which she learned more about industrial practices, waste disposal and legal compliance with environmental laws. She was born and raised in São Paulo, where she lives with her parents, and enjoys traveling, learning languages, watching movies and TV series and going out with her friends.

Riju Agrawal
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Riju is a second-year undergraduate at Harvard College from Houston, Texas. He is pursuing an S.B. in Engineering Sciences, with a focus in Mechanical Engineering and Materials Science. His professional and academic interests are primarily geared towards entrepreneurship and alternative energy development, especially in India, China, and Brazil. During the summer after his freshman

year, Riju spent eight weeks interning with an oil and gas company in Houston, seeing firsthand the response to the crisis in the Gulf of Mexico. Riju is also actively involved in the Harvard community as the Publicity Chair for the Harvard South Asian Association and the International Projects Chair for the Harvard Global Energy Initiative. He is also a part-time course development consultant for Testmasters Educational Services in Houston. In his free time, Riju enjoys watching movies, listening to music, reading, and hanging out with friends.

Simony Yaginuma Sakamoto
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Simony Yumi Yaginuma Sakamoto was born in Lima, Peru but her home country is Brazil. She is a fifth-year undergraduate environmental engineering student at the Escola Politécnica da Universidade de São Paulo. In this field course she has a real interest in questions related to water management and treatment. In 2008 she interned and had a scientific initiation on water management in urban areas studying the influence of diffuse pollution in a wetland. Later on, in 2009 she spent a year studying at the École Centrale de Nantes in France learning about the interactions of different cultures and making friends with many interesting people. In her free time, Simony loves to read, to travel at every opportunity, and to watch films and TV series.

Tatiana (Tati) Peralta-Quiros
Harvard College, Class of 2011,
S.B. (Bachelor of Science) candidate in Applied Mathematics in Urban Planning
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Tati Peralta-Quiros is a senior at Harvard form Costa Rica. She is an Applied Math concentrator with a special application field in urban planning. She is also working on a secondary field in Visual and Environmental studies. Tati's main interests are in sustainable public transportation in Latin America, energy and the distribution of other public services. In this course she is interested to see how the infrastructure that will be created for the Fifa World Cup and the Olympics in Rio will be integrated to serve the local population. She will spend the spring semester continuing this studies in an independent study. Tati has spent her summers working in transportation NGOs and architecture firms in Latin America studying the urban environments of Latin cities. After graduation, she is planning on attending graduate school for a master's degree in transportation engineering. In her free time, Tati enjoys running, dancing, taking photographs, watching sports and exploring new places.

Tiziana Smith
Harvard College, Class of 2011,
A.B. (Bachelor of Arts) candidate in Environmental Science and Public Policy
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Tiziana is a fourth-year student (senior) at Harvard College studying Environmental Science and Public Policy. Raised in San Antonio, Texas, Tiziana was born in Los Angeles to Mexican parents. Fluent in Spanish and French, Tiziana has also been studying Portuguese for one semester and is very excited to practice speaking in Brazil! Tiziana is interested in the intersection of development and environmental sustainability, especially in urban water management. Currently, most of her time is consumed writing her senior thesis on wastewater reuse. Her extracurricular activities at Harvard have focused on sustainable development and international relations. She is passionate about traveling, trying new foods, and yoga.

Tomás Amorim
Program Officer, Brazil Office of Harvard University's David Rockefeller Center for Latin American Studies
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Tomás Amorim is the Program Officer at the Brazil Office of Harvard's David Rockefeller Center for Latin American Studies (DRCLAS), serving as the faculty liaison, among other duties. After two years managing Brazil-related activities at DRCLAS in Cambridge, Tomás moved to São Paulo in 2006, where he then designed and led the physical set-up of the new Brazil Office. A Brazilian citizen, he is the former Director of Western Hemisphere Affairs at the Council on Foreign Relations (CFR) in New York, where he was responsible for the development of working relationships and annual symposia with counterpart organizations in Argentina, Brazil, Canada, Chile and Mexico. Previously he was Research Associate of the CFR's Latin America Studies Program and served as staff director for various initiatives, including the distinguished Task Force on Brazil, the White Oak Meeting on Crises in Latin America, and a major conference on reforms in Latin America. Prior to joining the CFR in 1999, Tomás worked in the Reference and Collection Development department of Firestone Library at Princeton University, where he earned a bachelor's degree in Sociology with a certificate in Latin American Studies and was the recipient of the Spirit of Princeton Award.

William Marks
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William Marks is a junior at Harvard College from South Florida. He is a concentrator in Biomedical Engineering (SB) with a secondary in Computer Science interested in applications in engineering to biotech, the environment and public health. In Brazil, he hopes to learn more about the development of large-scale engineering projects and how they affect the surrounding community, environment, and industry. William has spent significant time in China where he had the opportunity to learn about large scale industrial and engineering projects and hopes to be able to draw on that experience in Brazil. At Harvard, he serves on the boards of the Harvard College Engineering Society (HCES) and the Harvard College Entrepreneurship Forum (HCEF), among others. He is also the Project Manager of the Hydrovolts and Woods Hole Oceanographic Institution turbine project to develop a turbine for WHOI's underwater energy needs.

Yara Formigoni
Poli-USP, Master's candidate in Water Resourses Management (Teaching Assistant for Course)
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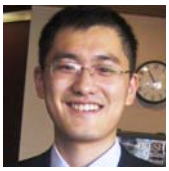
Yara was born in São Paulo. She moved to Piracicaba, a small town in the interior of the state of São Paulo, in order to carry out her undergraduate course in Environmental Management at ESALQ-USP (Universidade de São Paulo's Luiz de Queiroz College of Agriculture). Founded in 1901, ESALQ is one of the most important institution in science, technology, teaching and extension in Brazilian agriculture with undergraduate programs on Agriculture, Forestry, Biological Sciences, Economics, Environmental Management and Food Sciences. Yara is currently a Master's degree student in Water Resources Management at the Universidade de São Paulo's Escola

Politécnica (Poli-USP) and her research focuses on instruments of water resources national politics and water quality. When she isn't working, she enjoys reading, riding her bike and chatting with friends.



Yue Zhang
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Yue Zhang is a first-year graduate student in Environmental Sciences and Engineering. He received his Bachelor of Science in the field of Environmental Sciences from Peking University in China and currently pursues a Ph.D. at Harvard. Yue focuses on the atmospheric environment, including issues such as air pollution emissions, aerosol formation and reaction chemistry, global warming as well as public health issues. He attended the Chinese University of Hong Kong as an exchange student in 2007 and then carried out volunteering work during the 2008 Olympic Games in Beijing. At Harvard, he was a representative of the Harvard Graduate Council and co-organized the Harvard Leadership Conference this fall. Yue is easy-going and he is looking forward to making friends with everyone during the Brazil trip. In his leisure time, he likes jogging, hiking, badminton, and swimming.

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