PERSONAL STATEMENT

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I became fascinated with engineering for water supply while I was in Paraguay working with the Fundación Paraguaya, a local non-governmental development organization. My internship, which involved visiting 19 rural communities across the country, gave me a close-up look at the greatest barriers to water provision for small, remote communities. Although I was prepared to see funding and organizational challenges, I was surprised to see that failing mechanical systems – faulty electrical connections, over-tasked pumps, and bursting pipes – affected every community that I visited. I also saw the tragic consequences to health resulting from inadequate water treatment.

These experiences motivated me to declare a major in Mechanical Engineering as I sought to examine the role of technology in water supply systems. I joined a materials science research group and interned at DEKA, a private-sector design-and-build firm, to work on the Slingshot purification technology. Even though I developed many new skills, I came away from these experiences wanting more. Hot-rolling expensive metals and conducting failure analysis couldn't answer the questions that continued to nag me: what if there isn't enough water to purify in the first place?

As one of the leaders of the Yale Chapter of Engineers Without Borders I also felt challenged to question the value of working in the context of a single village. While our project has created substantial and positive change for our partner community, it is also abundantly clear that depending on American students and engineers is not a scalable solution to address water supply needs across the world. Even in the region where we work, our partnership with two communities has done little for the dozens more that continue to lack reliable and safe water supplies, and our efforts are too localized to build meaningful regional capacity.

In contrast with these experiences, my research last summer at the Federal University of Ceará in Fortaleza, Brazil gave me a chance to accomplish work that I felt made a meaningful impact. Working with a team of professors and graduate students to develop accurate models of rainwater capture systems and

small reservoirs allowed me to combine field work, which I love, with models extending far beyond a single community. What most excited me was examining recent changes in Brazilian policy towards water provision in rural areas from a quantitative and scientific perspective. We worked with planners and regional institutions to improve their ability to universalize water access, but we did so from a sufficient distance that we could be critical. This collaboration ensured that while I spent most days on a computer reading papers and writing code, I never lost focus on the end goals of our research.

My experiences in academic, private sector, and non-profit environments have given me a broad perspective on the issues surrounding water supply. In all this work, a recurring theme has been the vulnerability of communities to adapt to unpredictable and extreme water availability conditions. This is partly a challenge of politics and management, and partly a scientific challenge: advances in climate, hydrology, and other earth sciences are needed. However, I believe that addressing water stress is fundamentally an engineering challenge because society desperately needs solutions, lack of information notwithstanding.

I hope to build off work at the Columbia Water Center and the International Research Institute for Climate and Society to use climate forecasts, statistical risk analyses, and hydrological models to inform design of water supply programs in the developing world. I know that this work will be demanding, but I have prepared myself by consistently pushing my limits. My academic preparation has allowed me not only to meet graduation requirements for mechanical engineering but also take upper-level courses in environmental engineering; to work with environmental management students in Yale's graduate school of Forestry and Environmental Science; to learn fundamentals of social science thinking; and to gain fluency in Spanish and Portuguese. This gives me confidence that I can engage intellectually with the abstract concepts that govern water, climate, and environmental processes, as well as the broader framework into which these questions fit. My work in Brazil, which I have continued this semester, has confirmed that I have the motivation to work on projects with long time scales.

Columbia's Earth and Environmental Engineering M.S./Ph.D. program is perfect for my goals. Through the M.S. degree, I will be able to build a firm foundation in applied sciences, numerical methods, and decision-making techniques. As a doctoral candidate, I will have access to the unparalleled scientific resources offered by IRI and the Earth Observatory. I hope to conduct my research with Professor Upmanu Lall and the Columbia Water Center so that I can not only understand this science but effectively integrate it into developing solutions that have direct applications for society. Columbia's EEE M.S./Ph.D. program offers unique opportunities that will support my learning, growth, and research. For this reason, it is my first choice program.