GeoDesign: Engineering Solutions for Clean Energy and Water

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In the few months preceding summer break there is a seasonal scramble among college students to find a decent job or secure an internship that does not involve menial tasks. Every college student spends most of the academic year practicing and refining their skill sets, but summer offers a three-month trial version of real-life work experience. “That’s exactly what we do,” he said over the phone, “we do nothing but hands-on work.” I had just gotten off the phone with Peter Meisen – President of the Global Energy Network Institute (GENI.org) - and to my delight, it seemed I had found an internship of meaningful work.

GeoDesign – a term that would define my work and that of twelve other interns at GENI. GeoDesign utilizes data sets overlaid on maps to create strategies to address the needs and constraints of a region. The goal for the summer was to assess the best technical solutions to foster sustainable energy and water supply in San Diego County, Northern Baja, and Brazil. Northern Baja and San Diego are neighbors separated by a national boundary, so it makes sense to tackle issues in both regions simultaneously, but how does Brazil fit in? The global “G” in GENI is no exaggeration. Interns and independent student researchers from all over the world find their way into the *SIM*Center in San Diego where we worked. The 2015 Geodesign Series included seven students from Brazil who researched and presented the current energy, water, and infrastructure challenges in their home country.

The GeoDesign series was broken down into five presentations every two weeks. The first identified basic features of each region; population and economic data, natural resources, as well as specific water and energy needs. Then we presented data on environmental conditions and evaluated risks associated with wildfires, floods, poverty, and others. The third presentation featured some original geographical information system (GIS) mapping of wind and solar energy potential data.

The Geodesign team generated maps that identified the best areas for solar and wind generation facilities. This information is invaluable when choosing the preferred sites in a region. We found that there is a mountainous area near Rumorosa, Mexico that has consistently high wind speeds making it ideal for a wind generators. The final two presentations focused on best practices and recommendations for water and energy moving forward.

The San Diego Geodesign team found that wind and solar are both competitive renewable energy options. It is important to install wind turbines where the potential is the greatest, such as along the mountain ranges of Northern Baja and uninhabited portions of the Sierra California Mountain Range. Additionally, there remains enough solar potential in the eastern region of San Diego County and Imperial Valley to power all of southern California and northern Baja. Cooperation between these regions would be mutually beneficial. Northern Baja has undeveloped land and policies which expedite the installment of plants. There are monetary incentives for renewable projects in California. Small-scale energy solutions include rooftop solar for the San Diego region, easily constructed solar water heaters for Northern Baja.

Do-it-yourself household improvements such as upgraded insulation and grey water systems are possible in both regions.

Wastewater recycling is the most economical long-term solution for water challenged regions. There are also smaller recycling methods such as shared local grey water recycling that can reduce water use in residential and commercial buildings. One of the most promising, albeit expensive sources of fresh water is desalination.

Each Geodesign presentation was recorded and edited by the *SIM*Center production team and can be found at www.wrsc.org/presentation-all when you create your free account on the site.

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