

Investigation of Biogas as a Source of Cooking Fuel in Rural Communities

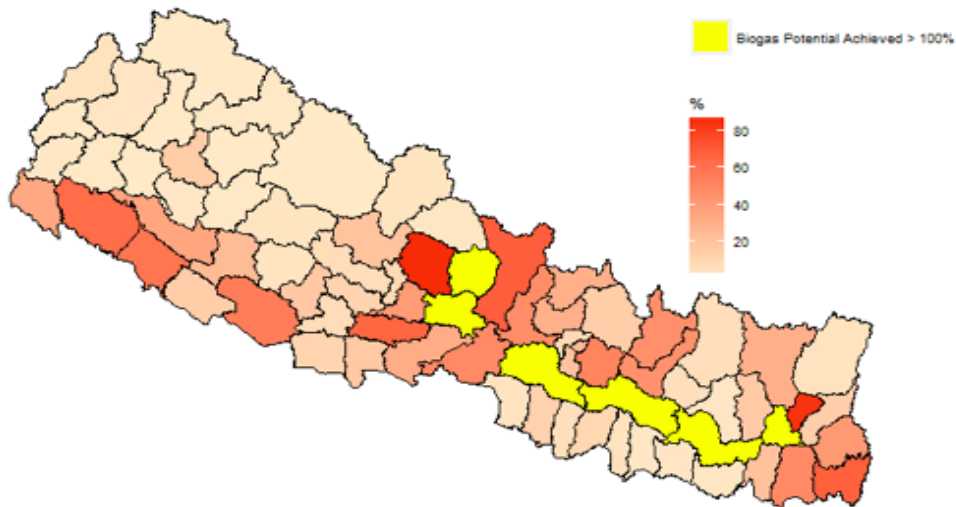
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I spent 8 weeks at the University of São Paulo, Brazil, with two other interns from the Oxford Physics Department. We wrote a research paper as a group of three, which our supervisor is currently editing before submitting to the journal Energy Policy.

We spent the first week of the internship reading a wide range of current literature on the topic of biogas in order to choose a research title. We decided to use the language skills of the other two interns and focus our research on China and Nepal. China has a well-established biogas scheme, organised and funded by the government for around 50 years, meaning that there are more than 40 million biogas digesters installed, providing cooking fuel for rural farming families. In Nepal, a similar scheme has been running for 20 years, and almost 300,000 digesters are installed. However, Nepal faces a number of problems in terms of biogas; a cold climate and high altitude in some regions, lack of funding from the government, very low average income, and high risk of earthquakes, to name just a few. We therefore investigated, to what extent can the Chinese model of biogas be beneficial to the Nepalese biogas scheme.

In answering our research question, we had to consider a number of different factors. We did look at technical issues, such as the design of the biogas digester and the optimum temperature for anaerobic digestion, but the majority of the work was based around policy, economic, and social factors. However, they were rooted in numerical analysis, which I found to be an interesting way to apply the skills I normally use in physics to a 'real-life' problem. For example, one of the most interesting results of our study is shown in the graph below. It is a map of Nepal, showing the percentage of biogas potential already achieved, using census and NGO data. We found that in some regions, more biogas digesters have been installed than there is technical potential for. This means that digesters are not being used, either because there is not enough feedstock, or they have broken and not been repaired. This graph became a strong focus of our research, and a lot of the policy measures we discussed were developed with the aim of preventing this happening. If this continues, it leads rural communities back to traditional biomass, which is damaging to health, the environment, and individuals' quality of life.

Percentage of Biogas Potential Achieved



Our research found that the Chinese model of biogas would not be effective if implemented in Nepal for a number of reasons. The same technology would be inefficient due to lower average temperatures, as well as being too expensive, with a typical Chinese digester costing more than the average annual income of a rural landowner in Nepal. There are also social issues, such as lack of literacy and access to media, making training on the maintenance of digesters more difficult and costly in Nepal than in China; the best way for information to be disseminated effectively is directly by mouth, rather than by advertising and books, as it is in China. Finally, since the funding for biogas in Nepal comes from NGOs, the Nepalese scheme would have to plan a slower rate of growth than China, due to the comparatively low levels of funding, and the inherent instability of funding that comes from external organisations.

This experience was valuable in my academic development in a number of ways. Although the topic of the paper was somewhat different to what I normally study in my degree, the process of writing an academic paper will definitely be useful when I move into my 4th year and do an extended research project. For example, I learnt to write in an academic way, I now understand how to do a literature review, and I have experienced the steps it takes to publish a paper. I also attended two large, international conferences, which was a rare opportunity to practice networking in an academic setting. The experience of group work is something I also feel was important, as the work I do for my degree is always independent; the ability to defend and explain my ideas, as well as listen and compromise with others, is a skill that will be vital in any line of work.

Overall this was a very valuable and enjoyable research project. I found it highly rewarding to see how my skills from physics can be transferred to a different topic, but equally I have developed new skills that will be useful later in my degree. This was a unique opportunity and I am very grateful that due to the help from the Rokos Internship Funding it was one I was able to make the most of.