

Ecuador Placement



Archie Lodge

I am an Engineering student who has been working with the Eco House Initiative student society in Cambridge for two years, initially in charge of a team working to improve ventilation, thermal comfort, and liveability in emergency-style wooden houses built in Brazilian favelas; and subsequently on the committee and responsible for a team of architects and engineers working on a permanent house design for Ecuador, which would be low cost, seismically resilient, environmentally sustainable and socially acceptable. This summer, I travelled to Quito, the capital city of Ecuador, to continue work on both designs, as well as to conduct research, build relationships with our partners and help put into place some new projects for the next few years.

About the EcoHouse Initiative



- The EcoHouse Initiative is a student society and charity in Cambridge that works throughout the academic year to design innovative products which enhance the quality of life of communities in Latin America.
- The Initiative consists of a student society, academic cluster, and an external charity. The student society receives support from the academics and alumni who join the charity. The charity assists us in forming partnerships.
- Each year, we send one team of 5-7 people to Ecuador, and another to Brazil, to continue the research we've done during the rest of the year and build relationships with our partner, TECHO, who build sustainable transitional housing and undertake social work in these countries.

Some Context

Our relationship with TECHO

The EcoHouse Initiative has been working with, and sending students to, TECHO for five years. TECHO is a youth-led Latin American NGO that works throughout the continent to improve the lives of slum-dwellers who live in extreme poverty. They build basic wooden housing for them, which provides shelter, security and a healthier living environment. They place a strong emphasis on the social impact of their work, both within communities, and on the national scale. The occupants of the houses pay a nominal price for them to give them a sense of ownership, and TECHO work with the communities before and after construction to try to bring them together. The construction itself happens in a weekend and involves the whole community, as well as volunteers from local universities. They try to show these privileged students how little money and effort it takes to change families' lives. Over the past few years, we have been helping TECHO improve their housing designs. In Ecuador, we helped them make improvements to the house structure, without affecting cost; and in Brazil we completely redesigned their house to allow it to fit in a smaller plot – adding a sleeping platform to maintain floor space. We have had other smaller projects, both with them and independently.



The slums in Ecuador

The team went on a TECHO construction in Montechristi, where they spoke to locals and identified some of their most pressing needs, both to do with housing and otherwise. I was unable to make this due to illness, but I had the chance to visit some other communities nearer Quito. The families live in small houses that they build themselves. They are very different depending on the local conditions – in the warm coast, many were wooden and well ventilated, whereas in the cooler mountains they were more often made from bricks, concrete and an adobe-like mud and straw composite. There were often animals such as chickens running free in the houses, and although they sometimes had basic televisions or other luxuries, most



possessions and clothing were basic and old. The houses had no heating and became cold at night in the mountains. Cooking was mainly done on gas stoves (the government subsidises many fuels.)

The families often owned the land and had legitimate electricity and water connections, although this was not always the case. Sewerage was often poor or non-existent and the pit toilets were a source of embarrassment (and illness) for the residents. Invariably, the land would be inaccessible and difficult to reach by road. We interviewed an elderly lady who had broken her arm and described the difficulty in getting to hospital – she had to walk down a steep valley and out the other side again. Even our four-wheel-drive struggled to make it up the hill to her house. We will use this interview to construct a ‘profile’ of this lady, to help students in Cambridge understand the local needs.

Permanent housing

Where locals had enough money to build better homes, these tended to still be informal brick houses. There was a lot of stigma attached to wooden panels in houses, as they are easier to break in to, despite being cheaper and safer in an earthquake. The project I led last year was to provide a viable alternative to block structures, which have very poor seismic resilience. While we were in Quito, two earthquakes struck the city, collapsing a road and a mine, and killing three people. We visited our prototype that was constructed by local builders during the year, and observed that the homeowner had modified the house – removing the few wooden panels and replacing them with blocks.

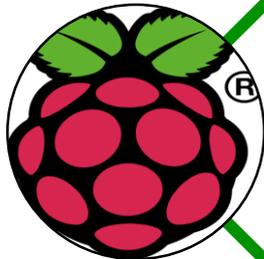
The Problems

Our main objective for the placement was to set up the society to work effectively next year on relevant problems, and to give them the information and tools to do this. We identified four main areas to work on:



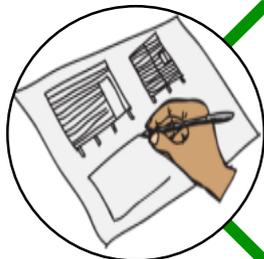
El Oriente house

TECHO's low cost wooden homes are not suitable for construction in the eastern, jungle areas of the country, as the high temperature and humidity cause them to degrade rapidly. We had meetings with TECHO, local architects and bamboo experts about suitable materials and techniques, and identified areas to work on to provide a complete house design next year. This design would be useful for TECHO in other countries as well.



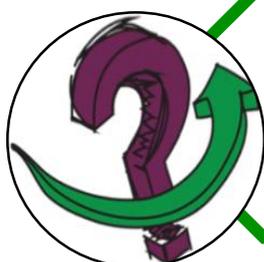
Raspberry Pi Education Project

We have been working in international development for three years, and we keep hearing about the importance of education from all our contacts and partners. The Ecuadorian government, in particular, is concerned about low levels of general education, English skills and computer literacy. We had several meetings with officials and discussed the possibility of using the low cost Raspberry Pi computer as a platform for educational resources.



Small projects and the permanent house

Some areas (both in the jungle and outside,) are vulnerable to extreme weather events, in particular flooding or land movement. TECHO asked us to look at smaller projects like these. We also had several meetings regarding the permanent housing prototype we built and the next steps for that. Much of this would best be done externally, but we defined areas where we could make a useful contribution to what started out as mainly our project.



Processes and design tools

EcoHouse is still a young society and has not established standardised design process and tools - often there has been too much actual work to do! As I have a personal interest in this, I started to put some of these into place for the start of next term. This will be a continual process over the next year, but will allow improved design quality and documentation, with less duplication, as well as making it easier for those who will be doing the work.

Design work

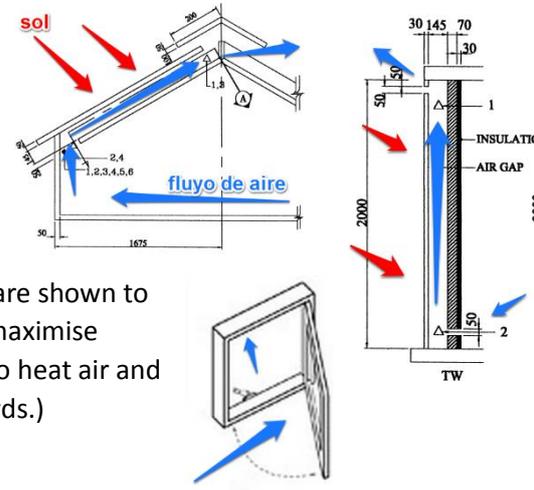
Our main focus this placement was on facilitating the design work that will happen in the coming year, however to make progress, we started some work ourselves – this was also useful to strengthen our relationship with TECHO.

El Oriente house

We identified six main areas of focus, and came up with preliminary directions for each:

- Foundations (currently wooden piles which deteriorate rapidly)
- Panels (currently wooden boards)
- Floors (currently thick plywood)
- Construction method (needs to be built in 2 days)
- Ventilation (to cope with the moist, still jungle conditions)
- Rainwater protection (to prevent damage during heavy rain)

As an example, I investigated several ways to improve ventilation – three are shown to the right (blue arrows represent airflow, and red solar gain.) They aim to maximise cross-ventilation (from the wind,) while also using the hot roof and walls to heat air and force airflow without requiring wind (like a tall chimney drawing air upwards.)



Raspberry Pi

I was in charge of the technical development of a prototype education system for the Raspberry Pi to demonstrate to the government and test with local children. We set it up to connect to any monitor or TV that was plugged in (so donated or existing ones could be used) and boot to a login screen. Each user has their own account, which allows them to keep track of their individual progress on installed applications. We intend to put Khan Academy (a complete collection of educational videos and lessons,) Scratch (a programming game,) and resources such as an offline Wikipedia and textbooks on the internal memory, and the prototype had a basic version of these. There are various extensions to the project, which we will investigate in much more detail and test next term.

Moving forward

I am looking forward to continuing this work (and that which originates from Brazil) next year, as well as implementing processes to improve our efficiency and quality of operation in the longer term. I am glad that we are building relationships here, and that we have to opportunity to contribute usefully during the year as well.



From top left:
Local adobe (mud/straw) construction, and animals around the houses.

Pit toilet at the same house, next to water supply.

Our permanent house prototype, showing user modification to remove the wooden panel, which is seen as insecure.



Two Raspberry Pi computers.

The current TECHO Ecuador house design being assembled by volunteers, including some from EcoHouse.