

El Salvador Project 2017

Project Report



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Executive Summary

This report gives a description of the expedition undertaken by the El Salvador Project in the academic year of 2016/17. The El Salvador Project worked for the year towards sending a team of 6 members to El Salvador to construct latrines for the indigent community of San José Villanueva. With the help of our affiliations; REDES, Engage for Development and Imperial College London, we were able to construct 6 latrines in a project costing approximately £9,0000. R&D has been a continued part of our project, and has benefitted greatly from the 2017 expedition. Further R&D will be carried out in the academic year of 2017/18 to make improvements to the design of the latrines, as well as to improve the overall success of the project.

Project Introduction



Figure 1: Expedition team with beneficiary families

The El Salvador project is a student-led volunteering project based at Imperial College London within the Civil and Environmental Engineering Department, supported by the UK charity 'Engage for Development'. The project was established in response to the devastating earthquake which hit El Salvador in 2001. Every summer since, teams of students have worked with the Salvadorian Non-Governmental Organisation, named 'Fundación Salvadoreña para la Reconstrucción y el Desarrollo' (REDES), on a variety of projects ranging from the construction of earthquake resistant housing and retrofitting of existing homes for earthquake resistance, to the implementation of sanitation systems.

The country has been prone to a very complicated socioeconomic situation in the last few years starting with a state of civil war from 1980 to 1992 between the right-wing military government and a coalition of guerrilla fighters – the Farabundo Marti National Liberation Front (FMNL). Peace agreements eventually brought an end to the fighting, but twelve years of conflict left the country in poverty, killed 80,000 and 500,000 fled as refugees.

Just under ten years later in 2001, El Salvador was struck by two earthquakes, the first in January of magnitude 7.7 MW and the second in February of magnitude 6.6 MW. Between the two quakes, there were officially reported to be 1,159 deaths and over 8,100 injured. Along with economic damage, the main long-term problem was homelessness of 23% of the 6.5 million population. Since then, the country managed to rebuild itself and sanitation systems have now become a priority.

Therefore, the focus in 2017 has been on sanitation. In the summer of 2017, a team of six students from Imperial College London spent four weeks in the small municipality of San José Villanueva for the third consecutive year. The team constructed six different latrines, which are basic toilets as well as two showers. The team also informed and educated the locals of the importance of sanitation practices, how to use and maintain their new latrines, and involved them in construction process.

The El Salvador Project 2017 followed on from the sanitation systems project in 2015, which evaluated the sanitation situation in several rural communities and enabled effective preparation for the 2016 and the 2017 projects.

The El Salvador Project strives to provide simple and sustainable engineering solutions to rural communities in El Salvador, but also educate the locals regarding infrastructure maintenance, construction techniques and sanitation practices in the interest of sustainability.

Team Members

The team members (Figure 1) were carefully selected from a large pool of applicants in the early months of 2017. The team were primarily chosen for their attitude and previous experience, and all the team members are studying Civil and Environmental Engineering at Imperial College London.

Originally, the team was to comprise of seven students. Unfortunately, it became apparent that the seventh member, Cristina Vidal Amian, was unable to attend. This presented a logistical problem, due to the fact that Cristina was the teams main Spanish speaker and was to act as translator during the expedition. REDES were kind enough to present us with a solution. Leonel Segovia, a member of the host villages community and an employee of REDES, was available to assist us in a similar capacity as Cristina. We agreed to pay Leonel by providing him with food for the entirety of the trip, which fit in nicely with our budget, which accounted for this expenditure for Cristina.



Figure 2: From left to right; Leonel Segovia (REDES), Minnie Lou (1st year), Richard Glas (3rd year), Freddie Lewis (3rd year), Alexis de Germay (1st year), Foucault Gesp (1st year), Florian Roquette (1st year).

The team was split into two groups of three members, based on Spanish speaking ability. Group 1 consisted of Richard Glas, Foucault Gesp and Alexis de Germay. Whilst group 2 consisted of Frederick Lewis, Florian Roquette and Minnie Lou.

Affiliations

The El Salvador Project collaborates with several organisations to ensure our work is delivered as effectively as possible. Our main partners are Engage for Development, Imperial College Union and REDES.

Engage for Development is a UK based charity that focuses on facilitating and providing engineering expertise for our project. This organisation was founded by a group of Imperial College London & El Salvador Project alumni, to facilitate the El Salvador Project and other initiatives at Imperial. Engage for Development also supports Raincatcher, another student led initiative from Imperial College that operates with similar objectives to the El Salvador Project in different regions of the world.

The Imperial College Union is a large not-for-profit organisation that represents the student body of Imperial College London. The El Salvador Project is a part of the Union, and as such, appropriate agreements are made with the Union such that the El Salvador Project can operate as part of Imperial College London. The Union has been a continued supporter of the Project and also assists with the planning stage.

The vast majority of the work in El Salvador was undertaken with REDES. They are a Non-governmental organisation that is dedicated to the redevelopment of El Salvador. Formed shortly after the civil war ended, their work was initially focused on restoring peoples housing that had been destroyed during the war. REDES were one of the main partners in the formation of the El Salvador Project in 2002. They collaborated with Imperial College London and Arup to develop earthquake proof housing in the wake of the 2001 earthquake. For twelve years REDES worked closely with the El Salvador Project, further developing the housing. In the past three years, their focus has grown to include infrastructure projects such as the facilitation of sanitation. This year, REDES has assisted in the design of the latrines, planning of the project and the acquisition and transportation of materials. Leonel Segovia was our primary contact with REDES. He acted as a guide and assisted us in obtaining food and water. He also cared for our security and safety, advising us on implementing a curfew and travelling with us whenever we left our accommodation. Being an inhabitant of the village, the beneficiary families felt comfortable in working with Leonel, making our integration with and acceptance by the community easier.

Project Description

The El Salvador Project 2017 was carried out in San José Villanueva (Figure 3), a small town just outside the capital, San Salvador. The houses where the latrines were being constructed were within walking distance from one another so it was easy to move from one family to the next, always accompanied by Leonel Segovia.

In London, the El Salvador Project 2017 committee and team were in charge of fundraising and coordinating the project with REDES. The latter included negotiating the terms, selecting the beneficiaries and deciding on the best engineering design for the sanitation systems. This

part of the project was completed by June, before leaving for El Salvador, where we arrived on the 1st of July.



Figure 3: Map showing location of project

The project in El Salvador lasted four weeks from 1st of July to the 27th of July. Once the team had congregated in El Salvador, we met with Carlos Melendez and the lead-builder, both from REDES. Together, the schedule for the upcoming weeks and the organisation, including health and safety measures in and outside the construction site, were discussed. On the 3rd of July, the team left early in the morning to the community in San José Villanueva, 40 minutes by car from San Salvador. There was a welcoming ceremony where the team was introduced to the leader of the community and the beneficiary families. Following the ceremony, the team headed to two different houses, splitting into two teams and commenced the work.

The construction process of the latrines started with setting out, where the lead-builder outlined using a stick, the construction site and where the latrine was going to be built. From there, the team started digging and levelling to prepare the site for construction. In the first week of construction, the team familiarised with themselves with the community and spoke to the families, developing trust and friendship.

An important part of the project is involving the families actively in the construction of the latrines. The families were readily willing to assist in the digging of the latrine pits and the team greatly enjoyed working with the families in this respect. The generational differences of the locals were obvious from their mentality and attitude towards us. For the El Salvador Project 2017, it was crucial to involve all the families, no matter the age and gender, in the construction process in order to guarantee that they understand the construction and the importance of sanitation for the development and progress of their country. Having them involved in the construction process created a bond between them and the team members, and allowed them to take ownership of the latrines. This would ensure the proper use and maintenance of the latrines.

Table 1: Table of beneficiary families

Beneficiary	Composting latrine	VIP latrine
Jorge Alberto Mejia Tejada		1
Ana Deisy Pineda Alvarenga		1
Martin Gomez Rivera		1
Blanca del pilar Lemus Rodriguez	1	
George Antonio Castillo		1
Wilfredo Melara Rodriguez	1	

Health and Safety

San José Villanueva is one of the most dangerous villages in the country, heavily affected by the presence of gangs and drug cartels. It is located near the border between two major gangs, leading to constant violence and terror in the communities. Thus, the presence of Leonel was crucial to the success of the project and safety of its members. A curfew was imposed allowing us to work only between the hours of 8am to 4pm, always accompanied between sites by a local worker or a REDES employee.

In preparation, we had a Health and Safety talk given by a former project leader, Elizabeth Lui. This covered common issues that had occurred in the past (for example stomach bugs, being bitten by an animal, dehydration) so that we could be more aware and proactive in avoiding the same problems. The appointed health and safety officer also had forms from all participating members concerning medical and health history, allergies and immunisations in case of an emergency.

Two members of the team (including the health and safety officer) were certified in Outdoor Activities First Aid (from Marlin Training) after a 16-hour course. Everyone was advised to bring their own personal first aid kits, including personal medications. Two large and one small first aid kits from the Imperial Union stores were taken, with all recommended supplies for outdoor work.

Only two incidents of illness were recorded. Minnie Lou had to take a day of rest due to stomach irritation. In order to ensure her recovery, we also arranged an appointment with the village doctor, who assured us that it was not serious and provided medicine. Frederick Lewis also had to take a day of rest, due to a twisted ankle sustained in an evening of recreational

football. Other minor incidents included blisters, small cuts and some muscle strain, which were largely unavoidable but not debilitating by any stretch.

Everyone wore sturdy, steel toe capped working boots since we were working with heavy supplies (bricks, cement bags) and sharp tools (shovels, pick-axes). When working with cement or concrete, cementing gloves were used, and any exposed skin that came into contact with cement was rinsed off as soon as possible. Hard-hats were worn where it deemed appropriate due to a risk of objects falling on heads.

The weather was consistently around 34°C, so light clothes and sun hats were worn to avoid overheating, as well as maintaining a drinking water supply on-site at all times.

Whilst building the latrines, it would have been dangerous and a liability for us to dig the depth of hole required (3 meters) without support structures, so only 0.6 metres was dug by the team, with the local workers and family willingly digging the rest. This was still not ideal, however, as the exposure to danger was only transferred to them instead of eliminated, but no other solution could be reached.

By employing practical levels of caution and enforcing H&S standards normal construction in the UK resulted in no major injuries or incidents.

Preparation

Preparation began at the beginning of term in October. This work was carried out by the committee, who organised fundraising events, planning of the expedition and recruitment of the team for the expedition. Research was also carried out into adjustments that could be made to the latrines in favour of sustainability and comfort. It was planned that these adjustments could be made for the 2017 expedition, however, the research was not completed in time and adjustments are postponed for the 2018 expedition.

Once the expedition team was decided, they were engaged in assisting in fundraising and planning of the expedition. A number of bake sales and a fun run were organised and implemented by the team, adding to the funds that had been raised through sponsorship.

Numerous training sessions were held in order to sufficiently prepare the team for the expedition.

These included:

- 2 training sessions where the team were able to go over the drawings and discuss constructability.
- Team building exercises.
- A health and safety talk given by project alumnus Elizabeth Lui.
- A cultural awareness talk given by project alumnus Saskia de Longvilliers .

Not all of the training sessions that were planned were undertaken due to time constraints and logistical issues. This is an area that we are looking to improve for the next year.

Latrines

Over the course of the four weeks, the team was able to construct six latrines of two different types: composting latrines and VIP latrines. Composting latrines require a much greater financial investment than VIP but have the advantage of lasting longer on condition that they are properly treated and emptied on a regular basis. VIP latrines are cheaper, however do not have the same advantage of being re-usable. VIP latrines can be improved by building a natural filter in the pit to make them last longer, however they will not last as long as the composting latrine. The decision was made to construct two composting latrines and four VIP latrines. This compromised between the need for sustainability and the need to positively impact more families.

Table 2: Comparison of latrine designs

Type of latrine	Composting	VIP
Number constructed	2	4
Operating Life	30 years	5 years
Construction time	5 days	2-3 days
Space required	3.78 m ²	1.3m ²
Material Costs	707,91 \$	424 \$

VIP latrine

VIP latrines store the human waste in a 3m deep pit in the ground. The waste can be removed once filled, however this is rarely carried out in practice due to the difficulty involved. There is a vertical black pipe that is installed in the latrine that helps to remove odours from the pit, as well as trap flies. These latrines are cheaper and easier to construct than composting latrines however, once filled with waste, a new latrine needs to be constructed.

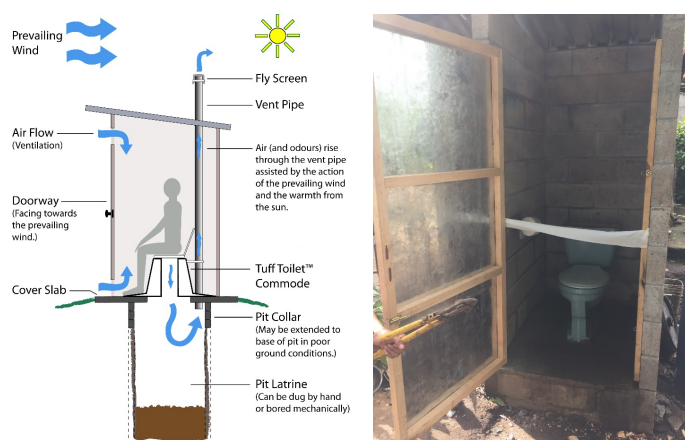


Figure 4: Schematic of VIP latrine (left). Photo taken of VIP latrine constructed by team (right).

Composting Latrine

The composting latrines feature two chambers that store human waste. The chambers are filled in turn and once filled, the waste is allowed to decompose into compost. The structure is all above ground, which allows access to the compost in the chambers for emptying. This is a more beneficial and sustainable sanitation system, as the latrines can easily be reused and the compost helps the family's agriculture, however it is more expensive than a VIP latrine.



Figure 5: Schematic of composting latrine (left). Photo of composting latrine constructed (right).

Project Outcomes

The families chosen to receive the latrines were carefully selected by REDES and, as such, there was an agreement that they would regularly keep the latrines sanitary and in operational conditions by following the specific maintenance guidelines outlined to them by REDES. This was done through multiple meetings between an employee of REDES and the beneficiary families, where instructions for maintaining the latrines were given. It would have been ideal if we were able to govern these meetings, however, as we no longer had a native Spanish speaker, it was decided that it would be more effective to let an employee of REDES lead the meetings.

All families were very willing to observe and aid during the construction process. REDES is aligned with us in insisting in the involvement of the families as they want to inspire the people to work and improve their quality of life. Involving the families in the construction process also gave them further incentive to properly maintain the latrines as they directly contributed to its construction and thus would be more encouraged to ensure its sustainability.

The families were grateful of everything we built, as they were in need of a renovation of their current facilities. They also valued the interaction with people from other cultures, as they were able to gain a different perspective on life and learn from our cultural differences. The experience also had a profound impact on the students involved. It allowed a deeper understanding of importance and functionality of sustainable infrastructure in rural communities, as well as an understanding of the challenges faced by people living in impoverished communities around the world. In addition, they were immersed in a different culture and way of living where they were able to directly make an impact on people's lives.

They also gained practical experience in engineering techniques. As impactful as the experience was for the local families, it was as gratifying for the students.

Recommendations

The 2016 project report gave various recommendations that were taken into account for this years planning and expedition.

The first recommendation was in the construction schedule. The 2016 project differed as wash basins were also to be constructed for each family, however, the point was made that the workers were only paid once the latrine was constructed. This was an issue as all the latrines were constructed at the same time, so the workers were only payed at the end of the six week period. This led to strike days, during which the workers refused to work as they felt that they were not being rewarded for their work in a timely manner. As such, this year the project concentrated on re-organising the payment of the workers alternatively to changing the construction schedule as was recommended by the 2016 report. The workers were payed half of the total that they would receive after two weeks of work. The remainder was payed only on the completion of all the latrines, two weeks later.

Another recommendation was having teams of two people working on a latrine at any one time. Unfortunately, due to financial constraints, we could not adopt this recommendation and instead worked in teams of three. It became evident that one team member was not able to work efficiently due to space constraints on site, and it would have been preferable to have two people per team.

Despite having notable trouble finding a native Spanish speaker to join the expedition this year, the team managed to communicate surprisingly well with the natives. Almost all the team members have had previous experience in speaking Spanish, and enjoyed having the opportunity to speak and practice.

The last recommendation referred to the type of latrine constructed. This year, due to financial constraints, we were forced to construct more VIP latrines than was ideal. However, plans are in place to raise more funds for the team that they can build more composting latrines for next year. As well as this, further R&D will be carried out into improvements that we were looking at this year.

Project Team Experience

The team was accommodated in a primary school during the weekdays, in the east part of the town. We had flushing toilets and electricity, but no running water. We bought mattresses and mosquito nets in order to ensure a good nights sleep. Despite the intended use of the building as a school, it was found to be comfortable and provided a private and secure location for the team to relax. Food was provided by a local restaurant at reasonable rates,

with breakfast delivered at 8 am and dinner at 6 pm everyday to our accommodation. One of the beneficiary families welcomed us for lunch at noon.

A typical day's food would be for breakfast, pancakes and fruit, for lunch, chicken with vegetables and rice, and for dinner, the El Salvadorian special, pupusas (stuffed rice or corn flour tortillas).

The team easily adapted to life in El Salvador, despite it contrasting so greatly with life in London. Despite the inevitable language barriers, the local community had really become a second home during our brief time there. Their perpetually happy attitude and dreams, despite their daily troubles and having so comparatively little, are things we will all try to remember for ourselves in future.

Weekends

We only worked during the week, so made the most of our time and followed the trend of past teams by travelling around El Salvador on weekends, seeing more of the local culture as well as some lovely natural sites.

Due to the intensity of work during the week, we felt that we needed some relaxation during the weekends. Therefore, a typical weekend included a touristic experience as well as some well-deserved rest. The latter took place most of the time in El Tunco, the surfer-hotspot of El Salvador.

On the first week-end we went to Santa Ana (Cerro Verde.), a national park and home to some of the country's largest volcanoes. It is one of the preferred school trip destinations for Salvadorian pupils. The weather was slightly colder than in San José, as the Cerro Verde national park is located at 2381 meters above sea level. We enjoyed the hiking and some gorgeous views of the valleys below.

We once had the opportunity to climb La Puerta del Diablo! This unique geological formation consists of two high peaks which allow the clouds to pass between them, an amazing sight.

On the last week-end we wanted to learn more about the country's history, the colonial era and the cold war legacy, so we went around the local worship places and markets of La Ruta de Las Flores. We also visited a Maya Museum and walked by the millenary Pyramids present in the surroundings. In addition, one of the villages was located close to some gorgeous natural waterfalls where we went for a swim.

Financial Report

Budget

A budget was created for this year's project that accounted for the expected costs of sustaining the expedition team and the expected cost of construction. The cost of sustaining the team (Table 3) was calculated by considering the expenditure of the previous year's project in US dollars and applying the exchange rate at the time of creation of 0.81. The cost of construction (Table 4) as provided by REDES, includes the cost of construction materials and hiring of skilled workers and an engineer. REDES applied an exchange rate of 0.79. The total expected cost of the project was £9473.2.

Table 3: Expected Cost of Sustaining the Team

Item	Cost per person per week (£)	Total Cost ^[1] (£)
Food & water	32.44	907.2
Accommodation	45.36	1,270.08
Transport within El Salvador		204.12
Contingency		1,227.86
	Total	3,609.26

[1] The total cost has been calculated by multiplying the cost per person per week by the expected number of team members (7) and the expected number of weeks (4).

Table 4: Cost of construction

Item	Cost (£)
Construction materials for 1 composting latrine	528.12
Construction materials for 5 VIP latrines	2,337.05
Construction of 1 wash basin	266.96
Skilled construction workers	751.97
Subtotal	3884.10
Equipment and Supplies	338.58
Engineers	2,094.49
REDES Administration	774.63
Total	7,091.80

It was agreed that the cost of flights, vaccinations and visas required by the team members to travel to El Salvador would be covered by the team members themselves, hence these costs are excluded from the budget presented here.

The budget was created in May/June, after which the details of the project were re-negotiated with REDES to construct an extra composting latrine in place of one of the VIP latrines. This change did not lead to an exceedance of the final expected cost as presented.

Funds

The primary source of funding came in the form of donations and sponsorship from various educational bodies, industry supporters and the public. These are outlined in Table 5.

Table 5: Funds raised through donations and sponsorship

Organisation	Amount Raised (£)
Department of Civil and Environmental Engineering, Imperial College London	1,400
Kenneth Watson Travel Award, Quest, Institute of Civil Engineering	3,000
Old Centralians' Trust, CGCA	2,310
ICU Trust	3,000
ICU Grant	1,549.28
Expedition Engineering	250
Public donations	1,077
Total	12,586

Expenditure

In the last week running up to the expedition, it was found that there was an accommodation on offer that would not require being paid for, except utility bills. This helped greatly decrease the living costs for the team.

Having found a native who would help us in translations and who cared for our well-being whilst in San Jose Villanueva, we agreed as payment in exchange for his services that we would pay for his food, water and transport that he was required to undertake on behalf of the project. This did not change the expected expenditure as this fit in with the amount budgeted for Cristina, who was accounted for in the budget but could not make it on the trip.

Table 6: Living costs of the expedition team

Item	Cost (£)
Food	890.59
Water	30.35
Transport	157.48
Accommodation	210.87
Supplies	14.17
Total	1,303.46

Notes:

- Food was provided by a local restaurant which provided good food at below market prices due to the nature of the work we work conducting. We were billed for the food on a weekly basis and payed at the end of the week.
- Accommodation for the first weekend was in a hostel in San Salvador, which required paying for. The rest of the expedition, we stayed in a local school, free of charge. The only costs to this was the purchase of mattresses and the payment of the electricity bill for the entirety of our stay.
- Transport costs include the subsidy for transport of the team to and from weekend accommodation.
- Minimal supplies were required during the trip.

Management of Funds

It was decided that a minimal amount of cash was to be carried by the members of the expedition due to safety concerns. A Revolut card would be carried by the expedition leader which would allow the team to withdraw money from ATM's at an interest rate of 1.27. The cash amount carried to El Salvador for the first few days of the trip totalled £218.11, with a further \$493.73 carried on the Revolut card and £1549.28 in the personal bank account of the expedition leader which was transferred to the Revolut card as and when money needed to be withdrawn.

Before the expedition commenced £5109.5 was transferred to REDES for construction costs. Only part of the total cost of construction was provided as we were still waiting for various sources of confirmed funding to come through. The funding did not come through until after the expedition had been completed. In order to prevent a disruption to the construction, the team agreed to send the £1549.28 that had been reserved for team costs to REDES, as well as £350.72 of their own personal money. Any team costs that would not be covered by the remaining team funds would be met by the team. The team will then be reimbursed once the funding has come through.

Acknowledgements

We would like to thank all the sponsors who support the El Salvador Project, and all the individuals and organisations who helped the project team prepare and complete the project this year.

We would like to particularly thank Leonel Segovia, working for the REDES foundation, for the help and support he provided us with on site during the entire project, and without whom the project would not have been possible.

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ICU Trust



Imperial College Union



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Imperial College Alumni

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Affiliations

Engage for Development



REDES

