

# Journeyman International: Virunga Coffee Co-Op in Rwanda, Africa

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This project-based senior project is an interdisciplinary collaboration between students from the College of Architecture and Environmental Design at Cal Poly San Luis Obispo and a non-profit organization, Journeyman International. The goal of this collaborative effort is to build a coffee cooperative per the request of Empowering Villages, an organization with the mission of empowering rural parts of eastern Africa with socio-economic development solutions. The project will include a community center, restroom, warehouse, and welcome center. The students from the Architecture, Architectural Engineering, and Construction Management programs designed the project and created its associated preconstruction package. The preconstruction package includes the following: scope analysis, conceptual estimate, construction schedule, phasing plan, site logistics plan, hazard and risk mitigation plan, safety plan, stormwater pollution prevention plan, soil analysis, site utilities analysis, and feasibility analysis.

**Key Words:** Journeyman International, Humanitarian Construction, Coffee Cooperative, Rwanda

## How Project Came About

I decided to do a Journeyman International project after Daniel Wiens, the founder of Journeyman International, spoke to our Senior Project Methodology class about the organization. I have always been interested in humanitarian work and I believed that this organization would be a great way to get involved with a project in a developing country. After the presentation, I reached out to Daniel to let him know that I was very interested in the possibility of working with Journeyman International. By the end of the week, I was assigned to a project in Rwanda, Africa. I would be a part of an interdisciplinary team of students from the College of Architecture and Environmental Design at Cal Poly. The team consisted of one architecture student, Dayna Lake; two architectural engineers, Anugrah Gupta and Caleb Azevedo; and one construction management student, myself, Tanner Frkovich.

## Process

The owner of this project is Afritech Energy, a company that aims to be the leading energy development company in Rwanda. Their goal is to provide accessible, affordable energy to rural areas of Rwanda. They are currently in the construction phase of building a 2.7 MW hydropower plant along the Mukungwa River in the Musanze area of Rwanda. However, their goal is not only to be an energy provider, but to help build communities around their power plants. To make this happen, Afritech Energy has teamed up with Empowering Villages, a nonprofit organization with the mission of empowering rural parts of eastern Africa with socio-economic development solutions. These organizations then reached out to Journeyman International to help accomplish these goals.

After communicating with Afritech Energy and Empowering Villages for a few months, the architect was able to determine that the most beneficial project concept for this community would be a coffee cooperative. Rwanda, along with many other parts of Africa, has fertile soil and the ideal climate for growing coffee beans. The proposed project site is directly adjacent to the Rwaza Hydropower Plant that is currently under construction. The idea is that this hydropower plant will provide accessible energy to the area and will result in additional people and jobs coming to the area. With the influx of people in the area, the coffee cooperative will hopefully become a hub for the community, both socially and economically.

In order to become a social and economic hub for the community, the project must have a few key aspects. First, it must have an area that people can gather and learn. That being said, the architect designed a community center that

contains a gathering/reading space, a classroom, and a café. Then the second-most important building for this cooperative is a restroom. To address the economic need of the project, a warehouse was deemed vital for this cooperative to be successful. The warehouse building will contain the warehouse itself, storage space, offices, conference room, and an outdoor covered breakroom. The last proposed structure for this project is a welcome center. This will be the first point of contact for people when visiting the cooperative and for those wanting to learn more about the coffee growing process.

Once the architect finalized the design, she handed the project over to the architectural engineers. However, it is important to note that the architect, architectural engineers, and myself as the construction management student were in constant communication during the design process. We regularly met up during the schematic design and design development phases to offer constructability input, material suggestions, and ideas that may simplify the building process. Once the project was out of the design phase, the architectural engineers were tasked with calculating the building loads on the project. Unfortunately, the size and scope of the project grew a lot since its conception so the engineers were unable to provide structural documents for all of the buildings. But as mentioned earlier, the community center was the highest priority of the project so the architectural engineers performed calculations on this building to determine its structural requirements.

Once the architectural engineers finished their structural analysis of the community center and created its corresponding structural documents, it was my turn as the construction manager to produce the preconstruction package for the proposed project. However, producing these documents was more difficult than it normally would have been due to the location of the project in a developing nation. Information about building practices in Rwanda are somewhat limited online but I did my best to find the correct information, or at least make a reasonable assumption based upon my research. Daniel Wiens was a huge help in providing more information on specific Rwanda building questions I had throughout the year. Dayna, the architect, was another great resource for me because she personally visited the site before she began her design. She provided me with a lot of photos and information about the site, which really helped me create site-specific documents for our proposed project.

## **Deliverables**

The construction management deliverables that were specifically requested by Journeyman International were the following: scope analysis, conceptual estimate, material take-offs, construction schedule, phasing plan, site logistics plan, stormwater pollution prevention plan, hazard and risk mitigation plan, safety plan, soil analysis, site utilities analysis, and feasibility analysis. I was given a Journeyman International handbook, which outlined what was the most pertinent information to include for each of the deliverables. Using this handbook, the knowledge and experience of Daniel Wiens, and my own construction knowledge and research, I completed all of these deliverables with the goal of providing as thorough project analysis as possible so that these preconstruction documents can one day be used to build this coffee cooperative in Rwanda.

### *Scope Analysis*

The scope analysis was the final document I produced and it is intended to provide a general overview of the project and its various components. It outlined the project's purpose, size, phasing, and composition. If a reader only had time to read one of the deliverables to get a good picture of the project, it would be the scope analysis.

### *Conceptual Estimate*

The estimate that I created for this project was a conceptual estimate. The reason I was asked to perform a conceptual estimate is because getting accurate material prices from across the world is very difficult, or at least difficult to get in a timely matter. This conceptual estimate was based off of percentages that were awarded to each of the 16 CSI Divisions. Daniel Wiens walked me through a typical cost breakdown for Journeyman International projects. From there, I customized the project estimate based upon my material takeoffs.

### *Material Takeoffs*

The material takeoffs, or quantity takeoffs, were done building by building. The primary building materials for this project are concrete, reinforcing bar, rammed earth, bamboo framed screens, metal beams, and metal roofs. The footings and foundation slab will be reinforced concrete. The walls will be reinforced rammed earth. The earth used for these walls will be soil excavated from the site, both during site grading and excavation during construction. Windows will be made of bamboo. The metal roof system will be supported by the rammed earth walls, metal columns, and metal beams. However, as previously mentioned, structural documents were only produced for the community center so the current material takeoff does not include all of the materials that will be needed to construct the rest of the buildings. An additional comprehensive quantity takeoff will need to be performed once the structural documents have been created for the rest of the buildings.

### *Construction Schedule*

The schedule was largely based upon the quantity takeoffs I performed. The tasks that weren't explicitly a material quantity were placed in the schedule based upon what I have learned during my time as a construction management student. However, this construction schedule was much simpler than schedules I have seen or made for other classes. It is a simpler schedule because there are currently no utilities defined in the scope of the project. This significantly reduces the complexity of the construction tasks. Even though this project is not overly complex, there is still some uncertainty with the quality of the schedule because of my unfamiliarity with production rates in rural Rwanda.

### *Phasing Plan*

The phasing plan for Virunga Coffee Co-Op consists of three distinct phases. After consulting with Daniel Wiens and Carly Althoff, the project director for Journeyman International, it was made clear that the community center and restroom were the priorities of the project. With this in mind, phase one of the project consists of site grading for all of the future buildings, construction of the community center, and construction of the restroom. Phase two consists of construction of the warehouse, which will be the biggest building on site. The third and final stage of the project will be construction of the welcome center.

### *Site Logistics Plan*

The site logistics plan was created for the purpose of highlighting some of the important locations on the construction site. These locations include the equipment storage area, material laydown area, jobsite office, and temporary restrooms. The site logistics plan also denotes areas where stormwater pollution prevention measures will be placed as well as the temporary fencing that will surround the project.

### *Stormwater Pollution Prevention Plan*

The purpose of the stormwater pollution prevention plan (SWPPP) is to prevent the discharge of harmful pollutants from the jobsite into the adjacent Mukungwa River. The plan identifies possible sources of pollution and then offers recommendations to prevent any pollution of the Mukungwa River. These best management practices, or BMPs, mostly consist of placing silt fences along the eastern side of the site to prevent discharge into the river, placing straw wattles along the perimeter of the site, and regularly removing trash and recyclable material from the project site.

### *Hazard and Risk Mitigation Plan*

The hazard and risk mitigation plan outlined the most probable hazards and risks that would be encountered during the course of the project and then offered ways of mitigating those hazards and risks. The biggest regional risk for the Virunga Coffee Co-Op will be flooding. It is directly adjacent to the Mukungwa River, a river that is subject to flooding during heavy rains. The biggest construction risk will be the safety of the workers. Worker safety is always the most important thing to consider on any project so additional information on how to mitigate safety accidents is provided in the safety plan.

### *Safety Plan*

The safety plan is intended to provide a general overview of good safety practices and procedures to implement during construction of the coffee cooperative. However, it was clearly noted that the safety plan does not intend to outline every necessary safety precaution that should be taken on the project. It is meant to serve as a foundation for a more detailed safety plan that the safety coordinator creates prior to beginning construction.

### *Soil Analysis*

The soil analysis was based off of the Environmental Impact Report that was completed for the neighboring Rwaza Hydropower Plan. The biggest takeaway of the report was that the Musanze area of Rwanda has volcanic ash soils with lava predominant stones. However, I made sure to clarify that this was not a soils report for the proposed project site, just an analysis of an adjacent site with some soil conditions that may be found. I recommended that an independent geotechnical report should be conducted to provide site-specific information on subsurface soil, rock, and water conditions.

### *Site Utilities Analysis*

Currently, the designed project will not utilize any electrical utilities, or any other utilities for that matter. However, it is very likely that the project site may receive electricity from the power plant within the next few years due to its close proximity to the plant. Should the project site receive electricity in the future, the design of the buildings allows for ample space to make electrical connections where necessary. Since the project site will not be connected to a fresh water utility system, a rainwater catchment system will be installed to catch and retain water for the proposed buildings. This water can be used in a greywater system, purified into drinking water, or used for coffee bean production.

### *Feasibility Analysis*

The feasibility analysis for the project was a series of question and answers regarding the likelihood of the project being completed. As a whole, I believe that it is a well-thought-out project that would vitalize the area of Musanze. However, the project grew a lot in scope and size so the biggest barrier to its completion will be funding.

## **Lessons Learned**

This Journeyman International project was a great choice for a senior project. I believe that the required deliverables were an accumulation of the curriculum taught in the Construction Management department and served as a great opportunity to showcase what I learned over the course of my four years. The project also presented a unique opportunity to work with different building professionals to showcase all of the different facets of what we do. That being said, most of the lessons learned through this process relate to the interdisciplinary aspect of the senior project.

Nearly every class I took within the department stressed the importance of communication amongst the designers, engineers, and construction team. We were all very excited to be involved with the Journeyman International project in the beginning but, as the months wore on during the design phase, we did not check in as regularly as we should have. This lack of communication resulted in many deadlines not being met throughout the course of the year. The design of the building was intended to be done by the end of March so that the engineers would have around a month to complete their calculations before passing it on to me to complete the preconstruction package. These missed deadlines resulted in the engineers only having enough time to create the structural documents for the community center. By the time the engineers finalized the structural documents, I only had a few weeks left of the school year to complete all of my deliverables. However, I expected this would happen because of the many classes that have emphasized the duration of the design phase almost always goes longer than originally stated. With this in mind, I completed all of my deliverables that weren't completely dependent on construction documents during the time the designer and engineers were completing their portions of work.

Even though we could have done a better job communicating, our project team still produced an excellent project that I am proud to have been a part of. This project really reinforced how important it is to effectively communicate

throughout the entire duration of a project, not just in the beginning when everyone is excited about the project and at the end when it's crunch time. The other biggest takeaway was the importance of looking at a project from another's perspective. As a construction management student, it's easy to solely look at a project from a construction perspective without considering all of the decisions that were made in order to get the project to the building phase. Overall, this project gave me a better appreciation for the work that architects and engineers do to make the work of construction managers possible.