HUMANITARIAN INNOVATION FUND
Final Report

Organisation Name	Edinburgh University

Project Title	Innovation in Post- Conflict Water Supply Projects in Sierra Leone
Problem Addressed / Thematic Focus	Water supply responses by NGOs in humanitarian relief
Location	Sierra Leone
Start Date	19 January 2012
Duration	5 months
Total Funding Requested	**£17,164**

Partner(s)	Concern Worldwide
Total Funding	Total HIF and other contributions to this project

Innovation Stage	1) Recognition of innovation
Type of Innovation	Product or service / process / paradigm
Project Impact Summary	The project was successful in achieving the objective of understanding water supply failure in Sierra Leone. It has also provided a system of grading technical, social and socio-technical failure. These findings have, so far, been successful in being introduced into new strategies of a major NGO, and have a huge potential in future, outside of Sierra Leone and with other organisations.

Reporting Period	August 2012
Total Spent	**£16,887.53**

ACTIVITIES CARRIED OUT

The activities for preparation were carried out in the first three weeks (Jan-Feb). These activities are as listed below:

- Recruited, hired and trained two local staff on interviewing techniques, basic GPS monitoring, unique interviewing methods and all surveys.
- Procured all major capital items (i.e. bikes, GPS equipment, materials)
- Developed criteria and forms for community surveys, water point monitoring, household KAP surveys and focus group discussions.
- Carried out pre-survey monitoring, adjusting and altering original versions of the forms to suit the findings
- Performed additional support for the surveys such as: creating access database for each of the surveys, printing and distributing survey forms, providing additional logistical support for vehicle access and developing a photograph library to store information.

The surveys, the main part of the project, were carried out in three phases:

Phase 1 - (February-April): This period included the pre-survey analysis, but also included the most in-depth survey period of the project. Each village was given a full days attention in order to develop a more detailed understanding of the problems, and receive the maximum amount of information possible. All village unimproved water points were visited and photographed. Similarly all areas of focus were monitored by GPS tracking. The total number of questionnaires completed was: 50 community surveys, 150 household Knowledge, Attitudes and Practice (KAP) surveys, 122 well observations. The phase 1 period also included Focus Group Discussions (FGDs) that focused on three areas: Water User Committees (WUCs), water user groups and pump technicians. In total 31 FGDs were completed. These discussions also included separating different groups by gender to allow for different roles and opinions to be discussed.

Phase 2 - (April - June) - The second phase of the project depended on results and assessment carried out in phase one. Using the findings from the initial stage, the questionnaires were revisited, to develop a more specific focus on a grading system of failure. Doing so allowed more information to be gathered specific to the updated project objectives. This also enabled more villages to be surveyed in a single field visit. Staff had to re-trained, and two new staff had to be hired and field tested. Additional work had to be carried out to redevelop the databases. In total 100 Community graded surveys, 189 graded hand-dug wells and 566 household water quantity surveys were completed.

Phase 3 - (June) - The final phase of the project involved collating all the associated data into a format which would allow the data to be analysed. This period also included correcting any errors in the previous surveys, to allow for more precise data results. By this stage over 6000 pictures were taken to document the project. The final phase also focused on developing a case study

of a single village that could indicate how the results from other areas were not random. All of this villages 30 households received KAP surveys, water quantity surveys and all of their unimproved sources were monitored with GPS. Additionally this village had a four focus group discussion with different groups. These were separated by both age and gender.

Additional activities, outside the survey period, was focused on brining some of the more crucial and urgent ideas to the attention of Concern. Several meetings and presentations were made to senior programme staff. It also involved incorporating lessons learned into their water and sanitation strategies for the next few years.

ACHIEVEMENTS

The original objective was to understand the high rates of failure of the water supply systems in Sierra Leone. There is enough gathered evidence to indicate how, but also why, such failure has occurred. Therefore the project has achieved its original purpose. Though each of the outputs displayed here will take a much longer explanation, which will be forthcoming in future publications, the summary of each of the outputs can be shown below:

Achievement 1: *Understanding technical failure:* This was the most straightforward, as it involved developing a technical understanding for the problems with the water supplies. However, the method used for understanding this failure is both unique and innovative. It can be shown, using the information that was gathered, that the water supply systems can be compared to each other. By developing a fair, balanced and accurate grading scheme, water points can potentially be marked for their successes and failures. There are a number of potential implications for doing so such as; influencing government policies, developing a technical support structure, re-organising community tariff systems, and gaining a crucial insight into the true nature of water supply systems that are provided as a response to humanitarian disasters. Additionally, one of the more important achievements is that it could potentially offer a way in which humanitarian agencies could be assessed in their responses to water supply problems after a disaster. Using the grading system could indicate which practices are successful and which are causing long term problems to communities, after the main phase the disaster has finished. Adopting this research could potentially make NGOs more aware of the impact of their water supply projects, and possibly their other technical interventions, after the donor money has been spent. Making this data available to the wider community could also encourage NGOs to enhance their practices, and reserve more money for training and research, as the results of future projects could potentially be graded and therefore either publically praised or criticised.

Achievement 2: *Understanding social failure:* This is an important output for engineers involved in humanitarian assistance. It was understood from the beginning of the placement that technical failure was not the only source of problems with water supplies. This ensured that a large part of research was focused on areas outside the technical. This proved vital as many of the questionnaires, surveys and discussions indicated that the social support systems that were originally put in place were inadequate to deal with even the most basic water supply failures. However the innovation here is in developing a

similar grading system to that of technical failure, which allows for different projects to be compared. This allows different social support strategies to be contrasted and analysed against each other. The grading system encompasses the majority of social problems, such as access to technical support, spare parts and tools as well as committee formation and function. Both the social and technical grading systems work in synergy to give a dynamic approach to understanding failure.

Achievement 3: *Understanding Socio-technical failure:* Probably the most important output on this project. This was developed from understanding both aspects of social and technical failure. The pre-survey analysis indicated that the communities were not approaching the water supplies in ways that were originally expected. This encouraged a different method of gathering data, which involved household water supply quantity surveys. These were redeveloped in the second phase of the project to being proportional to the number of houses in each village. Though linked to the social component of the graded survey, it remains an area that has, to date, received little attention - and can be shown to radically change impressions both from NGOs and donors about of how water supply systems are perceived by their beneficiaries. Socio-technical failure is also linked to how communities, households and individuals view 'safe water' (classed as a sub-group - socio-scientific failure). This, like their perceptions of technology, are shown to be dramatically different from the assumptions of the strategies which provided them with a supply of safe drinking water.

Achievement 4: *Making others understand the failure systems:* There was very significant success in making the grading systems understood, not only by Concern, but also by local government officials in Sierra Leone. Concern actively encouraged the output of the studies to be included in their water strategy in Sierra Leone for the next three years. This included repurposing their largest grant in water and sanitation to suit the outcomes of this project. Furthermore, the grading system made logical sense to them as it offered a platform for discussions. The local government, who were involved in the process, were also able to understand the grading system. This allowed for conversations, particularly regarding the required recruitment and training of technicians, to be effective. This provided a degree of confidence on the research's potential to be understood, and used by government officials.

METHODOLOGY

The methodology developed was appropriate for achieving the project goals. Having staff with individual skills in both the technical and in the social areas allowed for a dynamic and fluid analysis of results. It was also particularly important to have two review periods for which allowed a repurposing of project goals. The first review period allowed for the development of a new system for grading, allowing the interviews to be more quantitative, instead of being content just to have a better understanding of failure. It was only possible to have this review period because of the access databases which allowed data to be continually updated. The second review period allowed for mistakes to be corrected. This was ideal, because small mistakes and errors in the original village visits, which could skew data, were able to be dealt with.

However, with more resources, it would have been possible to carry out household KAP surveys proportional to the amount of houses in each village. Instead the methodology and resources only allowed for three houses per village. This allowed for triangulation of results, but would not have been representative of every household. This is not anticipated to have a significant impact on final results as the graded system developed a different strategy, for the responses that were dependent on proportional representation, for accuracy.

MAJOR OBSTACLES

The most significant obstacle to the project was the geographically distances between villages. It was originally planned that only villages within a 20-25 mile radius would be visited. Therefore access could be carried out by bike or walking, as the majority of site locations would be closer than the 25 mile barrier. Unfortunately for the research purposes there was a new intervention of piped reservoir water supplies in Magburaka, provided partly because of the new mining developments in the area. This meant that the majority of areas close to Magburaka (where the team was based) were either not provided with a water supply, anticipating using this system, or already had and used this piped system. This was not the focus of the research. To overcome this obstacle various deals were made to arrange local transport that allowed ease of access to the targeted areas. This originally involved using local motorbikes, though this proved risky and slow. Later efforts focused on paying fuel costs for vehicles. The final part included renting a 4x4 vehicle to afford more control over the timing of placements, but also to deal with the rains which affected the road. Money was appropriated from using medical insurance, as extensive travel insurance had already been developed and it was considered surplus.

Many of the minor problems with the surveys were quickly identified and dealt with. The only issue that had significant problems was making use of the Case Based Reasoning (CBR) program to understand the data. This was originally planned to be one of the central achievements of this project. However, a combination of problems developed. The fact that CBR can only make use of quantitative data, when a lot of the information was qualitative, ensured that the model became increasingly erratic at predicting and rationalising information. This was compounded by the need to tailor the program to suit unique conditions (involving in-depth understanding of some of the more complex parts of excel). Additionally the genetic algorithms, which are required to run the program, can take up to a day for a single iteration when running on the speed of computers available in a developing country (and many runs are required). Though neither of these factors are a problem for developing a UK based desk study of the data, but it makes it considerably harder to pass the completed system on to NGOs or local government as a tool to use. Though it is possible to develop, independent to this research, a desk study using the information it was dropped from the project focus given its extensive requirements. However the process of developing the tools for analysing data gave rise to the grading system. Therefore the original targets still provided benefits, though of a different nature.

BENEFICIARIES/HUMANITARIAN INTERVENTIONS IMPACTED

As this project was focused on the identification of an innovation, direct benefits to the beneficiaries will take time to come to fruition. However, the impact that the

work has already had on the water supply strategies of a major NGO has been great. The discussions about the socio-technical (and socio-scientific) failings of systems highlighted the need for a radical change in strategies regarding water supplies. This has resulted in Concern introducing more dynamic approaches to their systems. They also understand the need for further research and staff training, in the critical areas which are causing problems. Though changes have been made to their strategy, and their focus for funding, these developments have only been recent. If the donor, in this case Charity Water, can approve the funding then there will have been an immediate short term benefit to the research. Long term benefits will come from the impact of the publications linked to this placement.

PARTNERSHIPS AND COLLABORATION

The partnership between Concern and Edinburgh University was strengthened by the project. This was mostly because of Concern Sierra Leones open approach to understanding the problems with their post-war interventions. Concern also provided the project lead with a further placement, two weeks after finishing the HIF project, to come back to Sierra Leone and introduce some of the findings into their proposals for their future funding for water supply. This placement was completed at the end of July.

DISSEMINATION

This project was always intended to be part of PhD research into water supplies in Sierra Leone. It is intended that the thesis results will be widely available, with as much open access as possible, at a later stage.[1] However there are a number of unique opportunities for publishing several aspects of this project. Given the usual academic delays while papers are peer assessed, this could take up to six months, or more, to achieve its final result. It is anticipated, given the uniqueness in the data and innovations taken in the approach, that this process will not result in any problems. It is also anticipated that the quality of the publications will increase by taking this course of action. The downside is that unique ideas cannot immediately be made publically available, until they are presented as a paper. However, it is intended that after these publications are made available then extensive efforts can be made to highlight the importance of the research to as wide a group as possible. It would then be possible to use the large amount of data and media that was taken during the placement to blog about the results.

TRANSFERABILITY

It would be possible to use this project in a number of ways. The grading system could potentially be used in other areas, particularly post-war environments, to develop an understanding of failure in other contexts. It could also be carried out on a larger scale in Sierra Leone - to better understand the impacts, but also to provide more accurate information for influencing government policies on the issue. However the most important aspect is how this information can be brought forward, given its potential, into water supply strategies of other major NGOs. Similarly it would be crucial to know of the impacts of the innovations, in a practical case study, in a humanitarian context in the aftermath of a disaster.

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[1] See http://www.epsrc.ac.uk/about/infoaccess/Pages/roaccess.aspx for more information. The PhD will seek to be as open as possible in publication.