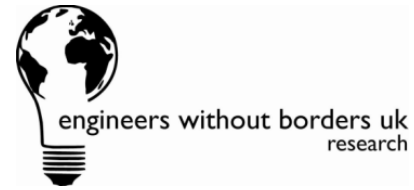


EWB-UK Research Projects Available from April 2008



EWB-UK's Research Initiative helps to provide a bridge between university students and NGOs (Non Governmental Organisations) that have current engineering issues. This is done through creating partnerships with university departments and NGOs, as well as through students and academic staff championing the projects. The EWB-UK Research Projects are all aimed at university-level students.

The EWB-UK Research Programme brings current development engineering based problems into the UK to be addressed by a selected student. This student will be supported by his or her university in terms of financing the project, supervision and assistance in the UK. However, support is also provided by EWB-UK through small research grants, relevant technical assistance, training opportunities, and support with project implementation (please see www.ewb-uk.org/research for more information).

The main aims of the Research Programme are therefore to:

- Provide students opportunities to study development related issues as part of their university degree
- Provide valuable public insight to current engineering related development issues
- Provide possible solutions to such problems

The most common way to undertake an EWB-UK Research Project is as a final year student in any engineering discipline. However as these project proposals are generally very open-ended, we are also encouraging students to take up these project proposals as:

- Projects undertaken in any year of the student's degree which give opportunity for development engineering-related study
- Projects for students at EWB university branches. Individuals or groups of students are welcome to take up project proposals in conjunction with EWB-UK Research, outside of their degree studies
- Projects for PhDs or graduate study

If you have any queries as to which level of study a particular project may be most suitable, please contact the EWB-UK Research Team.

This list outlines the proposals which are currently available. Unless indicated otherwise, more information on any specific proposal can be found at www.ewb-uk.org/research/projects. All the projects given below are currently available to all students, although only a limited number of students can undertake each project. The student must find a supervisor at their university who is happy to supervise the project before a project can begin. All of these projects have a contact from the partner organisation who will support the student in their project work. To express an interest in a project, or if you have any further questions, please send an email to: research@ewb-uk.org.

Projects List

Research Projects Suitability for Specific Engineering Disciplines	3
Projects List.....	6
Alternatives to Batteries.....	6
Assessing the Suitability of Well Sites	6
Bamboo as a Structural Component.....	6
Biodiesel	7
Biogas Generator	7
Candle Filters Press Design.....	7
Ceramic Water Filter Design	8
Clay Mixer Design	8
Cooler Housing in Hot Climates	8
Dirt Road Maintenance in Rural Ghana	9
Education Software	9
Honey Production and Bottling in Ghana.....	9
Human Waste Disposal	10
Lighting During Power Cuts	10
Limiting the Use of Detergents.....	10
Microbial Inactivation in Water Filtration.....	11
Natural Water Heating on Roofs	11
Oil Mill Optimisation.....	11
Organic Printer Ink	12
Rain Water Harvesting	12
Retrofitting of Cracking Buildings	12
Sewerage and Sanitation.....	13
Sewing Machine Adaptation	13
Simplified Computer	14
Soil Testing Kit.....	14
Structural Analysis on Geodesic Dome	14
Temporary School Buildings.....	14
Waste Management.....	15
Waste Processing and Economies	15
Water Testing	15
Water Treatment.....	16

Research Projects Suitability for Specific Engineering Disciplines

The Research Projects are grouped into EWB-UK's Communities of Practice:



However it is also important for students to be able to see where the Research Projects fit into their own engineering disciplines. In the table below we have indicated which projects may be suitable for specific engineering disciplines. However please bear in mind that these categories are only able to provide an indication of the project content – for example, a mechanical student may see a mechanical engineering solution to a project that we have specified as “civil”. Please contact the Research Team with any queries.

Research Proposal	Engineering Discipline								
	Business / Management	Civil	Chemical	Comp. Sci / Software	Electrical/ Electronic	Manufacturing / Industry	Mathematical	Mechanical	Other
Alternatives to Batteries			X		X			X	
Assessing the Suitability of Well Sites		X						X	
Bamboo as a Structural Component		X					X	X	
Biodiesel			X					X	
Biogas Generator					X			X	
Candle Water Filters Production	X					X		X	
Ceramic Water Filter Design						X		X	
Clay Mixer Design						X		X	
Cooler Housing in Hot Climates		X						X	
Dirt Road Maintenance		X							
Education Software				X					
Honey Production and Bottling in Ghana	X					X		X	
Human Waste Disposal			X					X	
Lighting During Power Cuts					X			X	
Limiting the Use of Detergents	X		X					X	
Microbial Inactivation in Water Filtration			X					X	

Research Proposal	Engineering Discipline								
	Business / Management	Civil	Chemical	Comp. Sci / Software	Electrical/ Electronic	Manufacturing / Industry	Mathematical	Mechanical	Other
Natural Water Heating on Roofs		X			X		X	X	
Oil Mill Optimisation	X					X		X	
Printer Ink			X					X	
Rain Water Harvesting		X						X	
Retrofitting of Cracking Buildings		X						X	
Sewerage and Sanitation		X				X		X	X
Sewing Machine Adaptation						X		X	
Short Term Food Preservation						X		X	X
Simplified Computer				X	X				
Soil Testing Kit			X			X		X	
Structural Analysis on Geodesic Dome		X					X	X	
Temporary School Buildings		X						X	
Waste Management	X		X			X		X	
Waste Processing and Economies						X		X	X
Water Testing		X						X	X
Water Treatment						X		X	

Projects List



Alternatives to Batteries

This project investigates two areas: 1) a cheaper method of supplying electrical energy during power cuts and 2) a method of increasing the life of lead acid batteries.

There are two daily power cuts of four hours each in Pabal and the surrounding villages. Many of Pabal's inhabitants use 12 volt batteries to supply their energy needs during power cuts. These batteries are expensive and often only last one year. Once batteries have ceased to hold enough charge they must be replaced, which is expensive, and although they are often passed on to someone with a lower charge requirement, they are still eventually thrown away. This project was instigated from a study carried out in Pabal, a small village in India, and extensive information is available.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Assessing the Suitability of Well Sites

This project looks at creating a system for assessing the suitability of well sites for well construction in rural areas. The system should provide approximations of the depth required to dig and any other insightful and relevant information. The solution should also be portable, low-cost, and simple to operate. It should also be possible to manufacture the solution using locally available materials and tools.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Bamboo as a Structural Component

Many people cannot afford concrete and steel to construct their homes and the use of bamboo as a structural replacement for steel has been highlighted as having the potential to lower the price of a new house. However, the properties of bamboo vary. It would be beneficial to identify the ideal species of bamboo for use as a building material, how to cultivate it in Pabal or India in general and most importantly, a method for assessing the strength of the bamboo. Also, an investigation into the lifespan of the bamboo and any methods of expanding it if necessary would be of interest; a lifespan approaching 50 years is desired.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Biodiesel

This project looks at the potential design for a small-scale plant capable of producing biodiesel from locally-produced crops. This project has been proposed with support from a village in India, where a biodiesel plant could be setup to provide biodiesel at a low cost to the local area, running off locally produced crops, such as the common 'weed' Jatropha. This production plant should be able to run on locally produced biomass and/or waste. The aim is to design a plant that would continuously produce biodiesel throughout the year.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Biogas Generator

This project looks at the development of a small-scale biogas generator which could run on different forms of biomass and serve a household in a localised situation. A small generator would be the most sustainable solution, as less power and energy would be wasted than if a community-based, larger generator was designed. The localised small biogas generator would limit any losses from electricity and/or biogas distribution.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Candle Filters Press Design

This project was proposed by an international NGO who offer assistance to craftspeople in the developing world. The project involves designing a press to produce "candle" shaped water filters, along with corresponding faster production methods. This project would also include finding a Chinese firm that can produce the most appropriate "plastic" nipple to connect to the ceramics and a safe adhesive to unite the two.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals

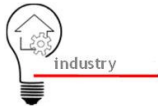


Ceramic Water Filter Design

This project was proposed by an international NGO which offers assistance to craftspeople in the developing world. The project looks at improving the design of ceramic water filters, and has several lines of investigation:

- Obtaining a very small pore size in ceramic water filters by designing a method to create small, but regular, sized burn out material for the firing process. This would aid the removal of dirt and microbes in the water and could potentially have significant impacts on the health of the community.
- Look at the current method of pressing the filters to determine the loading on the mould which creates uneven stresses in the clay and hence an uneven distribution of pore sizes.
- Improving the flow of the filter by using a hand vacuum pump

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Clay Mixer Design

This project was proposed by an international NGO which offers assistance to craftspeople in the developing world. This project looks at improving the design of existing clay mixers to make them more portable and more economically viable for small batch sizes to enable local production of ceramic water filters in the village or area where they will be used. The NGO are also interested in designing a low-cost mixer (40rpm) that can be manufactured locally in mechanic workshops. This design can be based on existing mortar mixers or industrial dough mixers.

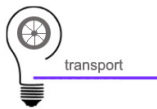
There is no further information online for this project, please contact research@ewb-uk.org for further information and contact details.



Cooler Housing in Hot Climates

It would be useful to adapt the design of concrete housing structures so that they are cooler in high temperatures than they are at present, preferably without resorting to the use of electricity. The design should be low-cost, sustainable and utilise locally available materials and skills. The new design should not reduce the functionality of the existing structure or increase its cost greatly, and the potential for application to similar designs of structures should also be investigated.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Dirt Road Maintenance in Rural Ghana

This project looks at methods to maintain dirt roads in rural Ghana, based on a case-study connecting a village, Adaklu, to the local town, Ho. The single track dirt road connecting Adaklu to Ho is an essential resource for the local communities. However, the road is often in a terrible state and a way to maintain it locally is needed. The road provides the only connection between the village and the nearby town, Ho, and provides an important connection to the Ho market, post office, hospital and other essentials none of which are located within the communities. In the rainy season, the road is often reduced to mud and reaching Ho becomes very difficult. Tro-tros (the local vehicles which are the only form of transport for most local people) often get stuck in the road and passengers must get out and push. In the dry season, people have to travel to Ho regularly to purchase drinking water.

The road is very dusty and cars travelling along it create a large dust cloud blinding and choking bystanders. The road is largely ignored by local government and therefore suffers from a large number of pot holes and ripples. Tro-tros charge high rates due to the road condition and taxis are often reluctant to travel to Adaklu. The condition of the road also detracts from outside investment.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Education Software

There is currently no software available that is targeted at rural students learning science and mathematics. Innovative software that provides hands-on learning of science and mathematical concepts without having a dependence on language or computer literacy would allow these students to get more familiar with computers and solidify lessons learned in school. Because physical models and experiments are expensive and difficult to coordinate in large lectures, computer models that can be manipulated by individual students for do-it-yourself learning are ideal.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Honey Production and Bottling in Ghana

Honey production is an important source of supplementary income for people in the Adaklu communities, in Ghana. Hives are made from hollow hardwood logs. However it takes 3 to 4 years before the centre of the log can be removed. An alternative, quicker way of creating hives would be appreciated, enabling local honey producers to increase production over a smaller period of time. Currently honey producers only distribute their honey to local communities and Ho. They would like to sell their honey to the tourist market in Accra. However a cost effective way of bottling and sealing the bottles is also needed.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Human Waste Disposal

This project looks into investigating the possible application of a composting toilet system that can convert human waste into useable compost and/or biogas, for use in rural areas.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Lighting During Power Cuts

It would be useful to invent a self-sufficient lighting technology appropriate to rural communities in developing countries. One possible approach to this challenge could be to find more efficient battery powered lanterns using materials that are currently available. Another possibility would be to design a light with a self-sufficient, environmentally friendly, and inexpensive power source. There is also the possibility of non-electrical solutions with greater light output and/or fuel efficiency. This project is instigated from a study in Pabal, a small village in India, and extensive information is available.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Limiting the Use of Detergents

This project is instigated from a study of Pabal, a small village in India. As there is no organized sewage system in Pabal, used silage is poured onto the street, which affects the local ecosystems. This detergent then percolates through the relatively thin top soil to the underlying igneous rocks. As the impermeable rocks have a poor carrying capacity of water, the area consequently hosts a very low water table. The detergents are therefore retained in the water table and are present in the village's well water supply. This can be very damaging to the local population's health.

Therefore the development of a biodegradable or natural detergent, or perhaps a detergent-free washing method would protect the local ecosystem and would improve the community's water supply.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Microbial Inactivation in Water Filtration

This project investigates the effective use of silver as a means of microbial inactivation in water filtration. The project is based around the use of silver to enhance the water purification process used in ceramic water filters. The project should assess the intrinsic efficacy and other performances of the various colloidal silver (CS) filters, then go on to look at the change in microbial inactivation by silver in contaminated water flowing through a filter as a function of its concentration, pore size, porosity, tortuosity and wall thickness, in two situations: the one with an incremental "fouling" level of the affluent water and the other with an incremental exposure time. Other things to be investigated include:

- A way to measure how much colloidal silver actually stays in the filtering element once it is rinsed out.
- A foolproof way of keeping the filtered water clean in the receiving tank
- Chemical removal (pesticides, herbicides, a.o.)

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Natural Water Heating on Roofs

This project is instigated from a study of Pabal, a small village in India. Approximately 90% of the community uses hot water for showers and/or laundry each day. To heat the water the population uses natural gas or kerosene heaters. This creates an unnecessary cost for the community in buying fuel and natural resources. As Pabal is in a particularly dry area of Maharashtra, there is sunshine for the majority of the year. This natural, free resource for heating water is currently unharnessed. Water could be easily heated on roof space using solar radiation and then stored in an insulated tank for future use, thereby preventing/limiting the need for electrical or natural gas heating.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Oil Mill Optimisation

This project is instigated from a study of Pabal, a small village in India. The oil mill employs 45 people directly in Pabal and perhaps many more indirectly (transportation etc.); in fact a hostel is provided for the workers to stay in. The optimisation of the oil mill would increase the profit that the mill would collect and hence increase property in the area. The oil mill could, as a result, grow and process other oils full time, providing more jobs in Pabal and increasing the money coming into the village.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Organic Printer Ink

This project investigates the feasibility of using locally-developed organic inks in commercially produced computer printers. A computer printer in a developing community can be invaluable, but the cost of the branded ink cartridges is very high, and developing organic inks could have a huge impact on the affordability of computer printers. The final product would have to be of the correct consistency and particle size to pass through the ink jet nozzles, and have a reasonable drying time.

This project was proposed by a community in Pabal, India. Currently an organisation in the community, Vigyan Ashram, uses a Hewlett Packard printer (model Officejet 6110 All-In-One) and acquires its ink cartridges by post from MIT free of charge. This arrangement is not sustainable in the long term, and if it was to acquire cartridges from the nearby town it would be both expensive and troublesome.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Rain Water Harvesting

A method of rainwater collection and storage for home or community use can help to alleviate water shortage problems in small communities. Ideally the water would be conserved for the dry season. The solution must be low-cost, sustainable and utilise locally available materials and skills. This project is instigated from a study of Pabal, a small village in India, and extensive information is available.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Retrofitting of Cracking Buildings

Many areas in the world use re-enforced mud, adobe, stone, or a combination of basic materials as a construction method for housing. Projects in both Ghana and Ecuador have highlighted the need for better construction techniques using the local methods of construction. The major problems include rapid degradation of housing, increased use of community/ public money on community buildings and psychological effects on people.

The project student will need to analyse the direct and indirect effects and causes of building degradation, and also look at different variations on the same types of construction in different parts of the world. Any solution will have to be appropriate and use a minimum number of outside sources for materials. Such a project could analyse a particular country, or countries.

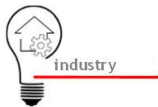
The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Sewerage and Sanitation

A major international development NGO, Practical Action, is interested in low cost sewerage and treatment. They are also interested in sanitation in high water table areas, moving population and rocky soils. They are also interested in monitoring and impact assessment methodologies of water, sanitation and hygiene programmes. Another emerging area of work, is the link between relief and development in water, sanitation and hygiene.

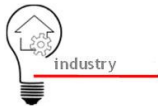
There is no further information online for this project, please contact research@ewb-uk.org for further information and contact details.



Sewing Machine Adaptation

In a rural community in Ghana, currently tailors and seamstresses can buy either a hand operated sewing machine or a more advanced and more costly model with a treadle. An easy way to convert a hand operated machine into a treadle one would allow more efficient production of garments, as well as improved quality of production. It may also help to bring the down the overall cost of ownership of a full sewing machine. At the moment all sewing machines are imported, mainly from China. Again this makes purchasing very expensive for villagers.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Short Term Food Preservation

In a small village in India, the farmers use the weekly local or nearby Pune city markets to sell their produce (i.e. fruit and vegetables). If a farmer has produce remaining, because of low sales or a high yield, he will travel to a larger market. Farmers often find that their produce becomes less saleable because it deteriorates in storage and transit. During the dry season in particular, the temperatures can exceed 45°C leading to fast spoilage. A technique is required to preserve farm crops for up to one week in order to match timings of the market. The target internal temperature is 20°C; external highs in the 40's are not uncommon, and thus 20-25°C cooling would be necessary. Consideration must also be made to the effects of humidity both on the crop being stored and on the system's ability to cool.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Simplified Computer

A small village in India, Pabal, experiences approximately eight hours of power cuts per day. It is not known when there will be a steady and reliable power supply to the village. The lack of electricity inhibits the use of computers in the village, and even the thirteen computers in the local junior college computer lab sit idle for much of the day. Batteries are used in the lab, but only to prevent work from being lost; a battery can support a computer system for a mere 20 minutes after the power has been cut. One solution to this problem is a way of storing more charge than these batteries, but in conjunction a computer system that runs on minimal power and yet still performs the basic requirements of the people is needed. Such a computer system will be able to run on battery power for a significant amount of time.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Soil Testing Kit

This project looks at designing a low-cost method of soil testing for nitrogen, phosphorus, potassium and other minerals, in order to help farmers know the right amount of fertiliser to use. This project is instigated from a study of Pabal, a small village in India, and extensive information is available.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Structural Analysis on Geodesic Dome

A project to house 40 families in the Maharashtra region which began in January 2005 has been halted due to concerns over the loading applied to a series of geodesic domes which form a large portion of the whole complex. The domes have soil packed over them which was not anticipated in the original design. There is a need for a method to model the structural response of the geodesic dome. An assessment of the loading on the domes should be carried out and recommendations for alterations to the design should be made in order to accommodate the expected loading. Any modifications to the original design should be as unobtrusive as possible.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals

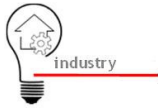


Temporary School Buildings

Temporary school structures are being put to permanent use in the Adaklu communities, Ghana, due to lack of alternative buildings. These buildings have little protection from environmental and weather conditions and are at risk of collapse. A way of adapting temporary structures for long-term use is

required. This project could also look at applying the technologies considered to a more general application.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Waste Management

This project looks into practical solutions for reducing, reusing, or recycling plastic waste. This project is based on a study from a community in rural India, where paper and cardboard waste decomposes quickly due to the wet climate, but plastic waste is more of a problem. The waste most commonly found is plastic packaging from snacks, cookies, or biscuits. An optimal solution would have benefits beyond just cleanliness of the village. The solution must be low-cost, sustainable and utilise locally available materials and skills. This project is instigated from a study of Pabal, a small village in India, and extensive information is available.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Waste Processing and Economies

A major international development NGO, Practical Action, is interested in good projects on the sustainability, scaling up, demand and marketing of community compost systems. The informal economies of waste are another area of interest – particularly looking into their potential integration in the 'modern cities'. They are also interested in small scale technologies for waste processing, compaction, shredding, collection and final disposal.

There is no further information online for this project, please contact research@ewb-uk.org for further information and contact details.



Water Testing

An NGO based in Pabal, called Vigyan Ashram, currently offers water testing to the local community and as part of its curriculum. Vigyan Ashram uses a system in which potentially polluted water is mixed with a sterile nutrient broth solution (prepared from Mac Conkey Broth powder) and incubated for 48 hours in a water bath at 37°C. The broth is initially pink in colour; if by the end of the procedure it is yellow the broth has been digested and so harmful micro organisms must be present. If no change in the colour of the broth is noted then the water is considered to be safe for drinking. In Pabal there are 4-hour-long power cuts twice a day, which means that the water bath cannot be kept at a constant 37°C without resorting to the use of expensive batteries. Two potential projects have been identified:

1) To develop or modify an existing water testing system. The new system should, as much as possible, use the apparatus already available at Vigyan Ashram.

2) To design an incubator that does not rely on electricity and can be manufactured by Vigyan Ashram. The local community should eventually learn how to make and use the incubator, thereby becoming self-reliant and having the capacity to design water testing systems themselves in the future.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals



Water Treatment

This project is instigated from a study of Pabal, a small village in India, and extensive information is available. According to local doctors, Pabal residents primarily suffer from diarrhoea and gastrointestinal diseases. Local pharmacists confirm that they sell more drugs for diarrhoea than for any other ailment, especially during the rainy season, when they say rainwater washes pathogens into wells. According to Dr. Yogesh Kulkarni (head of Vigyan Ashram) residents of Pabal spend 40-50% of their income on medical treatment. A cost-efficient method of water treatment would considerably reduce medical costs and loss of income due to ill health.

The full project proposal can be downloaded from www.ewb-uk.org/research/fullproposals