



engineers without borders
warwick branch

Eco-Centre Building Proposal



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1.0 Project Background

Project Co-ordinator: Ying Cen Tee

Project Founder: Jenny Wai

Number of Project Members: ~10

Completion Date: June 2016

1.1 Introduction

We are proposing to build an eco-centre on central campus over the next year (2016), which will be used to highlight different renewable energy technologies and other approaches used in international development. This innovative student project will raise the profile of the University's sustainability efforts. It will demonstrate the feasibility of low cost, small carbon footprint constructions. As a collaborative project between the university, local community and the students, the centre provides a communal space that can be used by anyone. There will be a display/exhibition hub, rooms for meetings and workshops, as well as a small storage space.

1.2. History

The initial idea for an eco-centre was developed after the EWB-Warwick student society visited the Centre of Alternative Technologies (CAT) in Wales on a tour. The accommodation and facilities were all off-grid, and incorporated renewable energy generation like wind turbines and photovoltaic panels. The buildings were cleverly designed from rammed earth to keep in the heat. As a growing society, our equipment supply and workshops have been increasing and so it was decided that we could build a storage and workshop space, inspired by what we had seen at CAT.

As talks of an eco-shed continued, we found that Warwick Estates were looking to build an eco-centre, to highlight the sustainability and zero carbon work done by the University. A report was written up by Bernadette McCullagh (Sustainability Coordinator – WM Housing Group) on the possibilities of building an eco-centre, however Estates had not yet decided on what form this would take.

A meeting was held between EWB-Warwick and Estates, and a partnership between the two was formed. The idea of a straw bale building was raised, and Derrick Knight from Sparks SLC was introduced to the project. From there, the project has progressed to where it is now. A regularly updated blog of the project's progress can be found on the EWB-Warwick website: <http://ewb-warwick.org/category/projects/eco-centre/>

1.3 Stakeholders

- **EWB- Warwick Society Members:** Gain understanding, practical experience and technical skills. Acquire storage, workshop and meeting space.
- **University of Warwick:** Supporting this project offers the opportunity to raise the University's profile in the renewable energy sector through increased publicity and engagement with the local community and businesses. Warwick university students will be able to participate in the development of the University landscape.
- **Estates:** Responsible for planning permission, building regulations and compliance, use of grounds
 - **Joel Cardinal:** Head of Energy and Sustainability
 - **David Chapman and Judith Kilgallon:** Sustainability Champions
- **Derrick Knight:** Construction manager - SPARKS Sustainable Living Centre. Able to offer advice and contacts with many relevant and interested/experienced parties, for example, architects, building control engineers etc.
- **EWB - UK:** Other EWB branches and members within other universities or companies may want to get involved and support the project. For example, EWB's company supporters, **ARUP** and **Mott McDonald** have offered technical help.
- **SU:** Support student initiatives. Involved with funding, health and safety and approving projects. Other societies are also likely to be interested in using the meeting spaces.
- **Engineering Dept.:** Gain departmental publicity for new students, schools, investors, partners and companies. Sustainability research opportunities
 - **Dr. Stan Shire:** International development and renewable energy lecturer
 - **Dr. Colin Oram:** International development and renewable energy lecturer
- **Other Academics:** have expressed personal and/or research interest in this project. These include Prof. Pickering (Psychology Dept.) and Prof. Burton (Engineering and Medical School).
- **Energy GRP:** Possible research interest opportunity in the project

2.0 Project Aims

2.1 Purpose

- **Educate and raise awareness** about sustainability throughout the University community and stimulate further discussion.
- Develop capabilities for cutting edge **research opportunities** in sustainability and engineering for Warwick University.
- Provide an **educational visitor space** to display the University's work on sustainability. The open plan classrooms/seminar space is suitable for use on open days or other small visiting educational groups.
- Contain a **workshop space** for EWB-Warwick society to host and organise workshops.
- Act as a **multifunctional area**, which will be available to other student societies for general use (dance, talks etc.)
- Provide EWB-Warwick with **storage space** for society equipment
- Provide the opportunity for **ongoing projects** for at least the next three years after completion, allowing development connecting different technologies and functions into the space - for example a wind turbine, pico-hydro system, solar panels, wood stove etc.
- Invest in EWB members by widening practical experience and skills and create opportunities for future **international projects** like the current Member Led Partnership (MLP). University of Warwick students need a global perspective - we believe that we should only do things elsewhere if we already do things close to home.
- Provide a starting point for **future collaboration** and work between the stakeholders.

2.2 Straw Construction

Initial ideas on the design of the eco-centre included rammed earth and re-using wooden pallets. In the end, it was decided that an eco-centre made from straw would be best.

Straw bales are made from the waste product of grain. Straw is a low-cost, renewable material that can be locally sourced. Straw bales also have excellent thermal and sound insulation qualities of straw. As is a lightweight material, it would reduce the load on foundations and hence the need for materials with high-embodied energy (e.g. concrete). It has also been proved that straw buildings are more fire retardant than wooden constructions. The construction process is simple, only basic building skills and tooling are needed for construction. This makes straw building suitable for self-build and group projects.

The idea of using straw bales was coincidentally the same conclusion drawn from the study done by Warwick Estates Energy and Sustainability Department. The study investigated the suitability of building a straw eco-centre with Derrick Knight from SPARKS SLC.

3.0 Project Plan

3.1 Project Timeline

- Oct 2014: Gathering of project team, idea development and focusing of project objectives.
Started collaborations and discussing project with Estates.
- Nov 2014: First EWB meeting with Derek
- Dec 2014: EWB trip to straw house studio
- Mar 2015: Project ideas collated and compiled into formal proposal
- Sept 2015: Project launch with possible sponsors and interested parties
- Oct 2015: Warwick's 50th anniversary display
- Apr 2016: Start of construction.
- Jun 2016: Construction completion

3.2 Location

Roger Boxall from Estates had suggested that the area near the allotment society behind Arthur Vick would be suitable for EWB-Warwick, as it is near central campus, but is slightly hidden away. The site is on a floodplain near a stream, which runs along the back. There is a footpath by the front, which runs alongside the tree line. The nearest utilities are by Arthur Vick, however a small moat exists between there and the tree line. See Figure 1 below.

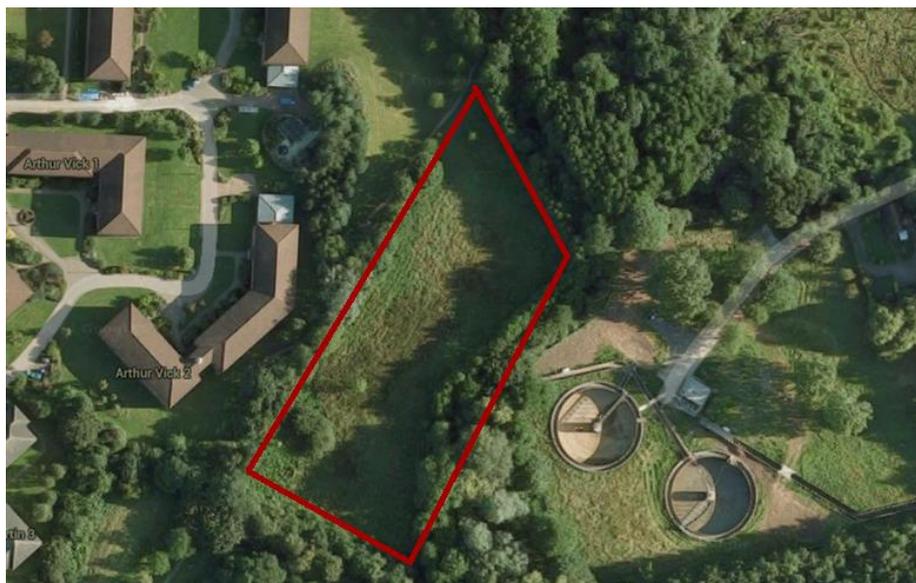


Figure 1 Aerial View of Potential Site Location

3.3 Initial Design

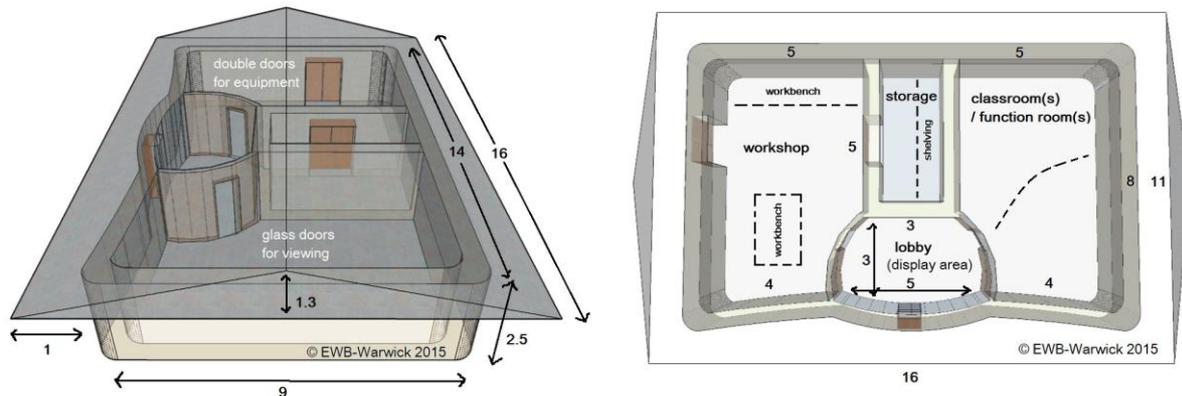


Figure 2 Initial Eco Centre Designs

Figure 2 above shows the initial design for the building, which has features incorporated from a number of different team member's ideas. The size of the building was based off existing spare roof trusses owned by Derek. The walls are made up of approximately half a metre thick straw bales. The roof has a half-metre overhang because the lime-rendered straw bale walls need to be kept dry. The foundations will be constructed from re-used car tyres filled with compact earth. This will elevate the structure, providing flood protection. A local source has already offered to provide tyres to us, free of charge. The corners of the building are rounded off and the front of the building is slightly curved for an ergonomic appeal, whilst also demonstrating the possibilities of non-modular straw bale construction. The building is split into four main areas: a lobby, a workshop, a multi-purpose classroom and a central storage room.

The lobby is sized comfortably, accommodating up to 15 people who will be able to view displays and peer into the workshop and classroom. The idea is that this space will be open to anyone. This space also provides the connection between the classroom and the workshop, so people need to be able to pass through this area easily.

On the left side of the building is where the EWB workshop activities and training sessions will be run. It should be spacious enough to accommodate large equipment, workbenches and tools. There is also access to the storage room for here. The workshop has an extra external access to aid movement of large equipment in and out of the building and perhaps to open up the area during the summer. As it is designed to be a functioning workshop area, this space will not be open to the public without prior arrangements.

The classroom is situated at the other side of the building and is a similar size to the workshop. The classroom does not have direct access to the storage room, as it was felt that this would be unnecessary and noise in the workshop would disturb classroom

activities. Instead, appropriate furniture will provide sufficient storage if needed. The classroom is large enough to allow separators to divide the space into smaller meeting or seminar spaces. Many other student societies have already expressed an interest in using this multifunctional space.

The storage room lies between the workshop and the classroom. It has access from the workshop via double doors. The storage room also provides further sound insulation between the workshop and the classroom, allowing two separate events to be held in the building simultaneously with minimum disturbance.

The placement and size of windows and doors is to be confirmed in later designs. It is important to maximise light entering the building but also to maximise useable wall space and minimise heat loss. Currently, the plan is to obtain re-used windows to reduce costs and enhance sustainability, and the sizes of these will determine their placement within the walls. Doors should be wide enough to allow disabled access, as well as serve as fire exits. There is also the possibility of adding roof lighting. Arrangements would also have to be made for future electrification of the building. It is expected that an investigation into electrification options would take place after the construction as a separate project.

3.4 Health and Safety

As part of the international charity, Engineers Without Borders (EWB) and its subsidiary, Engineers Without Borders – UK (EWB-UK), society members can apply to be covered by the comprehensive EWB insurance policies. In addition, as a student society our members are covered by the Students Union's (SU) insurance. For the safety and well-being of all stakeholders, only EWB members will be allowed to help with the construction.

The relevant forms and policies from EWB and the SU will be completed and observed. EWB-Warwick has a health and safety officer, who will help ensure all the paperwork has been done, and the relevant health and safety procedures are observed and in place. Many society members are also SU trained first aiders who will be on-site at all times.

SPARKS-SLC will be responsible for the construction, with Derrick Knight as the construction manager. Other engineering companies and professionals will take responsibility for the safety of the building's design and construction.

After construction, we hope that the building will be managed by EWB.

4.0 Finances

4.1 Costs

The estimated cost of the Eco-Centre is about £30,000. This estimate was calculated from the costs required for a similar straw-bale house construction in Norfolk. Members of the team visited this site and discussed the costs of the project with the owner. These can be seen in Table 1 on the next page.

The Norfolk house was reported to cost approx. £20,000 in total, with some costs not recorded in the table. These are not included as they are not applicable, for example, money spent housing construction volunteers. Saw hire, scaffolding and digger rental are fixed overhead costs. The other items e.g. straw bales are modelled to cost 70% more due to the increased size. Aside from an outdoor composting toilet, there are no plans for utilities. Ease of integration for future utility instalment will be factored into the design, but is considered unnecessary initially. The cost for project management from Derrick has not been set, but has been agreed that as a joint-project with Warwick Estates, Estates will pay for this section of costs.

Taking all of this into account, it is sensible to assume that £30,000 is likely an upper bound for the project. It is more likely, that the cost of the project will come in closer to £25,000.

Table 1 Estimated Cost Breakdown

Costs	Norfolk House	EWB Warwick Eco-Centre
Tooling bits	£1,871.21	£3,181.06
Cladding	£242.27	£411.86
Digger rent	£295.00	£501.50
Electrics	£156.50	£266.05
Gutters	468.21	£795.96
Hot water	£185.84	£315.93
Lime	£1,206.72	£2,051.42
Paint	£192	£326.40
Pea shingle	£121.20	£206.04
Roofing Sheets	£663.82	£1,128.49
Rush matting	£391.98	£666.37
Saw hire	£554.96	£943.43
Scaffold	2390	£4,063.00
Screws and nails	652.52	£1,109.28
Straw bales	£150.00	£255.00
Tarp	£400.18	£680.31
Timber	£3,480.97	£5,917.65
Windows	£640.00	£1,088.00
TOTAL	£14,063.38	£23,907.75

4.2 Funding

As part of the larger EWB-UK charity, 'Engineers Without Borders – Warwick' as a society are limited from receiving funding from certain companies. This may be because they already support the charity nationally, or because they do not fit in line with the aims and ideals of EWB-UK. However, not all contributions to the project have to be financial. In-kind support of products or services, advice, labour and recycling schemes will all help to reduce the cost of the project.

The list below is the means of funding we are currently investigating and is not a complete, extensive list. We hope to invite many more to a launch event early next academic year, promoting the project to potential sponsors.

Potential Sponsors and funding opportunities:

Engineering department/WMG

University of Warwick

Vice Chancellors Fund

Opportunity Fund

Energy GRP

E.On

Project Fund

Mott McDonald

Coventry University

Schneider Electric

URSS

EWB-UK

5.0 Wider Impact

5.1 Other societies

It is intentional that this project may have a positive impact on other societies in Warwick. The centre offers as a new space to carry out activities, store equipment and hold events. In order to gauge interest, we distributed our survey in the weekly Societies newsletter to the exec members of all the societies. The email and survey are attached in Appendix A and B respectively. The results from the responses are shown in the table below:

Table 2 Survey Responses

Responses	7			
Active student body in society	1-25	26-50	51+	100+
	3	2	1	1
Existing regular meeting space	Yes	No		
	1	6		
Use	Storage	Multifunction Room		
	3	5		
Other facilities	Projectors and Sound System	Tables and Chairs	Whiteboards/ Flipcharts	Display Space
	3	3	1	1
Frequency of use	Once a week	2-3 times a week	Once a month	A few times a month
	1	2	2	2
Willing to volunteer?	Yes	No		
	6	1		
Willing to donate?	Yes	No		
	3	4		

Other comments:

Duke of Edinburgh's Award society have said that "many of our members are looking for volunteering schemes and this would present an excellent opportunity for them to volunteer while at the same time contributing towards building a facility they can use afterwards."

Warwick Think Tank has also shown interest in collaborating with us on promoting sustainable housing policy through their society.

6.0 Appendices

Appendix A

E-mail sent to all the student society committees

Dear Presidents/Exec of <>

“Engineers Without Borders - Warwick” would like to welcome your opinion and help on our upcoming project. We are a charitable society which holds international development and sustainability as our key values. In partnership with Warwick Estates and in conjunction with our university’s 50th anniversary, we are looking to construct an eco-centre from straw bales over the next academic year.

The eco-centre will consist of a workshop and a small storage space, as well as a 8x4.5m multi-functional space (~20-person open classroom) which your society can use for a range of activities. Due to the noise isolating properties of straw, it is also well sound-proofed! However, electricity and other services may be limited. We are currently looking to locate the building behind Arthur Vick along from the allotment site, in the more undisturbed areas of campus.

We hope that you can take a few moments to fill in our survey by following this link so we can gauge your interest in utilising the project, helping out, or even any suggestions that you may have.

If you have any further questions please do not hesitate to get in contact with us. To keep up to date with our progress, please visit our blog: <http://ewb-warwick.org/category/projects/eco-centre/>

Thank you.

Best Regards,

Engineers Without Borders -Warwick

Appendix B

Questionnaire sent to societies (prior to rebranding as Eco-Centre)

1. What is the name of your society?
2. How many students are currently active members of your society?
3. Do you currently have a regular space for your society to meet and carry out your activities in?
4. Would you be interested in using the eco-house space? (Tick all that apply)
5. If the answer to question 4 is yes, what kind of activities would you be using the space for and what kind of facilities would you require in the space (example speakers, projectors, tables and chairs, water, etc.)?
6. If the answer to question 4 is yes, how often would you potentially want to use the room?
7. Would you be interested in helping this cause by asking your society's members to volunteer in the Eco-House construction process?
8. Would you be willing to donate any funds to the Eco-House Project?
9. Would you and the members of your society be willing to help in the fund raising process for the project?
10. If you have any suggestions regarding what you may like to see in the Eco-House, please feel free to leave comments below