

# Architectural Research into Environmental Performance

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**ABSTRACT:** The AA School's Environments, Ecologies & Sustainability (EES) Research Cluster investigates the current understanding of EES within the design, research and pedagogical communities in universities and beyond in the professional world in order to become a forum for discussion of EES in design and pedagogy.

With an initial survey in form of an open competition the EES Research Cluster asks students, architects, researchers and the wider scientific and design communities the simple question: What could be areas of potential research for EES design? The collected data are presented in an open exhibition and discussed by a panel of invited jurors in order to determine whether the perceived and currently communicated ideas of EES are addressing important or only peripheral issues. In response to the results of the survey the Cluster is developing into an open forum for EES design research addressing the issues identified.

This approach intends to foster the vitality and interdisciplinary growth of the Cluster by ensuring its activities match the interest and needs of the design community.

Keywords: education, environmental design, research

## 1. INTRODUCTION

The widespread effects of global warming and the sustained uncertainty of conventional energy supply are causing an ever increasing demand for sustainable development around the world. The raised environmental awareness of the general public partially also caused by changing financial incentives in favour of more environmentally friendly solutions are transforming our society since several years. Previously avant-garde movements and institutions focusing on sustainable development issues are now in good company of the mainstream.

However despite much publicity and media attention on sustainability the UK government reports it will most likely not be able to meet its ambitious self imposed target of 20% CO<sub>2</sub> reduction by 2010 [1], which would have gone beyond the commitment under the Kyoto Protocol. The combined efforts of government, industry and general public are not yet yielding enough carbon savings to suggest that enough actions have been taken.

With buildings being the place where about 50% of all energy is consumed architecture is often seen as a prime discipline to address the struggle against the seemingly inevitable increase of CO<sub>2</sub> emissions. Professional bodies such as the RIBA in the UK pledge to put architects at the forefront of the fight against climate change [2]. In its study 'Constructive Change' the RIBA highlights the importance of social, environmental and economic sustainability along with skills and training of architects as key drivers for future change in the construction industry [3]. But it also highlights a profession wide lack of training and

research activities and the importance of being able to

"...focus on delivering provable performance outcomes for society." [3]

Subsequently, practices and schools respond to the challenge and claim to create more sustainable architecture today than ever before.

In an attempt to facilitate a platform for discussion of these changes and challenges to architecture the Architectural Association (AA), School of Architecture, formed a new entity: the Environments, Ecologies and Sustainability (EES) Research Cluster. Its primary purpose is to identify areas of potential research that address architectural challenges imposed by changing environments and that could be undertaken at the AA in the future.

The Research Cluster has been carefully designed not to become another enclosed entity in order to facilitate a truly vibrant discussion within the AA as well as reaching out to other schools and to professional practices. It is believed duplication of one of the many units or programmes of the school can be avoided by initially not having a set agenda of projects and research activities. Hence the Research Cluster, being in its initial year, has so far focused on formulating a methodology for identifying research interests. This paper introduces the rationale behind the steps taken so far.

## 2. THE "RIGHT RESEARCH QUESTION"

The curators of the Research Cluster believe that it is already a major research task in itself to identify

valid research questions, which the Cluster in its mature state might eventually actively address. For the Cluster to become a self motivating and vibrant forum it is important to match the interests of the design community consisting of student body, teaching staff and practitioners with scientifically valid objectives rather than just offering research projects that will attract certain groups within the design community. The wide ranging debate of environmental and sustainability issues within the design community and its many different interpretations pose the challenge of categorising different parallel strands of discussion.

### 2.1 EES within the AA

An initial opportunity to survey the differing approaches and interpretations of sustainability and environmental performance just within the AA School was given during the Open Jury Days in February 2006. Each teaching unit and programme of the AA was given the opportunity to nominate a selected student project addressing EES issues for school wide presentation and debate. Overall 7 representative student projects were discussed. During the preparations for the debate Cluster curators and teaching staff of the units agreed on categorising the projects from various backgrounds into 3 groups (Fig. 1).



**Figure 1:** Presentations within the EES Cluster during the AA Open Jury days.

The first group included 3 teaching units/programmes presenting their work addressing one or multiple environmental influences by responding to them, which limited the outcomes of the projects to re-interpretations or fine tuning of existing knowledge. The work presented focused on:

(i) the study of lighting in art galleries and the subsequent development of daylighting geometries, (ii) the study of natural disasters and their mitigation through macro-scale infrastructural interventions, and (iii) the study of botany and the translation into environmentally performing facades and socially performing buildings.

The second group encompassed 2 teaching units. Both units produced unique architectural approaches through the very personal interpretation of subjective environmental influences and experiences. The

environment was used to create and produce an essentially new product. The projects addressed:

(iv) the relation between the static aspect of architectural projects and time - represented by the sequential succession of meteorological events influencing and transforming the project's context, and (v) analysis of ephemeral influences such as light and shadow or former uses that dictated the nature of new structures.

The third group of further 2 teaching units produced work which at times subordinated itself to the methodical approach without questioning the logic behind the approach, leaving ambiguous interpretations of environmental performance and context. The subjects were:

(vi) Construction and building systems developed based on material properties and manufacturing processes, and (vii) construction and building systems organised by environmental and contextual external influences.

The concluding discussion of the Open Jury Day left the panel with the overriding question of environmental performance. All units/programmes used different measures of performance within differing frameworks of definition of 'environment'. However, different levels of scientific debate were observed and in most projects the definition of environment and performance was lacking clarity or understanding, questioning or reasoning. This problem has led in many cases to mismatching definitions of environment and performances and as such essentially to contradicting proposals.

### 2.2 EES outside the AA

The above described multifaceted approach to the challenges associated with EES is hard to find outside the educational realm. The mainstream of current architectural practice and debate concerning environmental performance has been portrayed by Lowe as

“...triumph of appearance of performance over substance of performance.” [4]

Illustrating this, repeated studies over the past 2 years by the AA's Environment & Energy Master's Programme into the environmental performance of much acclaimed buildings in the UK revealed many shortcomings of the building structures as well as a lack of knowledge of those who designed and/or implemented them. In discussions with designers their ill informed understanding of cause and effect for environmental performance was often exposed by more knowledgeable students.

In fact the introduction of mainly performance based legislation arguably increases the tension between the need for innovative design and the lack of understanding for EES design fundamentals. Although Gann et al. found that performance based legislation combined with reasonably achievable performance goals fosters innovation in construction [5] it must be questioned where the role of architecture lies within this context. The increased

complexity of performance evaluation added in the latest update of the building regulations by introducing plant and equipment to the building's 'system performance' can potentially lead to abandonment of environmental design principles and handing over the responsibility of 'making it work' to the building services engineer.

Could architecture loose or give up its responsibility to perform? Is there no longer environmental achievement '*per form*' but only '*per system*'?

One example of this scenario is already in planning for the Thames Gateway. The experience from one of the UK's most celebrated 'sustainable' developments where architecture was used as a starting point for facilitating sustainability disappointed the ambitious developer. The at times restrictive and limiting architectural features did not yield substantial carbon savings compared to other on site initiatives such as a car share scheme and the local food shop. In an altered approach to facilitate sustainable lifestyles the developer now concentrates on embedded efficiency and low and zero carbon technologies (LZC) in physical as well as services infrastructure of the new project.

### 2.3 Dialogue

The above examples have shown that many interpretations of environment and performance are possible. These range from sometimes abstract interpretations removed from pressures of reality in educational settings to the inadequate but often pragmatic interpretations of the professional realm.

The EES Research Cluster's ambition is to harness each group's engagement, knowledge and enthusiasm for research into EES Design. In order not to be biased the curators set out to develop a methodology that would allow identifying research topics that address issues of interest to the design community but are also of scientific relevance. Such a methodology ensures the interpretation of 'environment' matches the scale at which its performance is measured against. The steps taken to ensure the success of the EES Cluster are described in the next section.

## 3. CLUSTER ACTIVITY

### 3.1 Projects Competition

In order to gain an overview of current thinking the Cluster organises an open competition for architects, planners, students as well as anyone interested in sustainability and the built environment.

The competition calls for entries of built or fictitious projects that address the challenges of EES in relation to the built environment. No specific subject or categories have been defined by the organising committee allowing the entrants to judge themselves whether their work addresses the above described challenges. The submitted projects will therefore document the self assessment of our profession's ability to respond to environmental, ecological and sustainability related challenges. Of particular interest

are the definitions of 'environment' and 'performance' of the individual entries.

A technical jury will assess all entries and group them according to the subjects and levels of debate of the submitted projects.

### 3.2 Survey

A survey questionnaire complements the call for projects competition and is required to be submitted along with the project. The survey is intended to deliver additional data in supplementing the design proposals of the projects.

The questionnaire asks entrants about (i) their status and experience, (ii) the motivation for the project and support they received, (iii) the tools they used to evaluate the proposals performance, (iv) the scale and issue the project is supposed to address, and (v) their personal views on what research should be undertaken and who should be the facilitator of it.

From the results of the survey it will be possible to identify the proliferation of knowledge of EES design principles within the design community. The statistical analysis of the responses will create a dataset that informs about generally perceived problems and ways in which these problems are addressed. The dataset will also become a benchmark against which individual projects can be evaluated.

### 3.3 Roundtable Discussions

During the academic year the EES Research Cluster also facilitates open and informal round table discussions with actors of all parties involved in the creation of the built environment. The aim of the discussion events is to communicate the different stakeholders' views on performance related to EES. Participants range from investors and developers, architects and engineers, planners and government officials, scientists and educators, to students of all levels.

The complexity for the designer to address multiple and often contradicting demands of performance is highlighted by the contrasting stakeholders present at each discussion event.

### 3.4 Symposium and Exhibition

The outcome of the project competition and survey will be presented in a symposium taking place at the AA. It is planned that the jurors and the members of the discussion panels will publicly elaborate on the submissions of the competition.

The symposium will identify the major strands of discussion within the design community and analyse the reasoning and approach to problem solving. The validity and importance of differing strands are examined and during the symposium recommendations will be made for future research activities. The winning and shortlisted entries are exhibited in the school.

## 4. CONCLUSION

This paper described the current and planned activities of the EES Research Cluster at the AA. In the work of the Cluster already carried out it has been

found that the term 'environment' is used very vaguely and is not defined as rigorously as it would be necessary in order to evaluate design performance.

The intention of the Research Cluster to identify areas of research addressing environmental, ecological and sustainability issues were presented along with the methodology employed. The Research Cluster seeks to explore current thinking of the architectural community. Based on this study it is hoped to stimulate an ongoing discussion involving a wide audience beyond the educational setting.

Although identifying research activities is the main subject of the EES Cluster's work it is believed that the way in which these activities are identified is a research project in its own right. This first year of the Cluster will be providing exciting insights into the current thinking of the architectural design community within and beyond the Architectural Association.

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