Environmental Sustainable Design and Energy Efficiency in Architecture Education in East Africa

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Abstract

The inclusion of Environmental Sustainable Design (ESD) in architectural education is an important paradigmatic shift for contemporary architecture education, in view of growing concerns for Energy Efficiency (EE) and Green House Gas (GHG) emissions attributed to the building industry. Schools of architecture across the world have undertaken to incorporate ESD as components of programmes: in specific course units; as electives; or in some cases transformed entire programmes to place ESD at the core of the curriculum. For architecture schools seeking recognition and validation through the CAA for instance, it is now essential that they demonstrate inclusion, or at the very least show a move towards incorporating ESD into the curriculum.

This paper reports on a study carried out on architectural education in East Africa. It took in all schools of architecture in the region: Kenya (Nairobi University & Jomo Kenyatta University of Agriculture and Technology); Rwanda (Kigali Institute of Science and Technology); Tanzania (Ardhi University), and; Uganda (Makerere University & Uganda Martyrs University). The study sought to review the state of architectural education in the region in order to appreciate how architecture education is responding to the contemporary challenges and opportunities related to ESD and EE in the education of architects. With architectural education viewed as a primary conduit for the transmission of architectural culture, how is architecture education in East Africa responding to these challenges and opportunities?

Keywords: Architecture education, Curriculum, Energy efficiency, Sustainability, East Africa

1. Introduction

A *New York Times* article by Barbara Whitaker published in May 2006stated'Architects are a lagging indicator for sustainable design'. This provocative title got me thinking about the nature of sustainability in architecture and architecture education in particular. In the article Whitaker suggests that the lack of sustainability in architecture practice could in part be related to limited, or a lack of sustainability in architecture education. With buildings accounting for about half of global energy consumption: for construction, operation and decommissioning, and making a major contribution to greenhouse gas emissions, it is essential that this be acknowledged as a key part of architecture practice and education. Discourse on environmental design and sustainability in architecture education is not new and according to Edwards (2004) the environmental agenda has been a part of architecture since Vitruvius, but not always to the same degree or to a consistent set of issues. For the purpose of this paper, Sustainability or Environmental Sustainable Design is defined as "the use of design principles and strategies which help reduce the ecological impact of buildings" (Fawcett, Palich & Nervegna, 2006). A common theme cited in publication on the topic, suggest a direct relationship between the application of environmental design and sustainability principles in contemporary architecture practice and exposure to the same as part of architecture education. For many however, this is only introduced at post-graduate level.

In East Africa, however, there is only limited discourse about ESD and EE in Architecture Education, with discourse largely based around the fit-for-practice debate, and what schools of architecture should teach to ensure graduates fit into existing practice settings. Indeed, the landmark 2008 Oxford Conference, which sought to challenge the idea of what the future of architecture education ought to be, had poor representation from Africa, with only eight (8) participants from across the continent: and only one from East Africa. Further, a 2012 report by the African Association of Universities (AAU) on sustainability in university education in the region, indicated penetration of sustainability in engineering and allied professional programmes at less than 8% (Association of African Universities, 2011).It is also clear that implementation and penetration of environmental design in East Africa is rather low, with limited examples of the application of green building and sustainable building practices. Where they exist, architects based, or educated outside the region, clients with international exposure or both, have driven these initiatives. These include: the Management Science Building at Strathmore University in Kenya, which achieved a LEED Gold design rating, and; a multi-use development at Mchikichini in Ilala District, Tanzania, among the few projects leading the drive towards environmental sustainability and energy efficiency in the region.

It was determined that a review of exiting curricula across the region was needed to determine the penetration of ESD and EE in architecture curricula. It is widely acknowledged that there is a needed for more to be done by both practice and academia to address the issues of ESD in design (Olweny, 2006, 2008). However it appears that there have been limited efforts to integrate ESD and EE into architecture curricula. This paper investigates the penetration of ESD in schools of architecture in East Africa. This study was carried out through a two-tiered approach: looking initially at the nature of the programmes themselves, through an assessment of published information about the programmes, followed by interviews with students and faculty in the schools through Focus Group Discussions.

2. Sustainability and Environmental Design Curricula

An objective of architectural education is to educate professionals capable of creating meaningful environments (Salama, 2002). What we regard as meaningful designed environments has been subject to various interpretations over the years, however, recent developments suggest that there is a shift towards a more holistic view, related to environmental responsibility. This transition, since the 1980s and 1990s, acknowledging some long held beliefs and assumptions about human interaction with the natural

environment was no longer appropriate. For Cortese (2003), these were: "Humans are the dominant species and separate from the rest of nature; Resources are free and inexhaustible; Earth's ecosystems can assimilate all human impacts; Technology will solve most of society's problems; All human needs and wants can be met through material means, and; Individual success is independent of the health and well-being of communities, cultures and the life support system" (p.17). It is evident that architects could and should take a leadership role in the custodianship of the environment, with architectural education taking a leading role in this transformation (Boyer and Mitgang, 1996; Groat and Ahrentzen, 1997).

There has been a concerted effort to align curricula in architecture programmes with ESD principles, with Wright (2003) identifying three methods schools have taken in this quest:

- Sustainability is a fundamental component of architecture and therefore should be integral to the curriculum. As such, there is no need to address it outside the normal theory and practice;
- Environmental Design and Sustainability are part of existing environmental control courses, with faculty taking these courses incorporating them into these courses;
- Introducing sustainable design into architecture programmes through a complete review and revision to the curriculum to incorporate sustainability into all aspects of the curriculum.

There are a number of challenges associated with these approaches, particularly related to the latter two. Wright (2003) suggests that the incorporation of ESD as part of existing environmental courses, for instance, does not guarantee that it will be integrated into the design studio, this is because faculty responsible for teaching ESD and EE as support courses, generally do not participate in design studio teaching. Further, having a complete review of a curriculum would require the entire faculty to be on-board in order to ensure that sustainability is properly integrated into the curriculum and the design studio. For this to happen there needs to be a strong desire for change from faculty, as well as a strong leadership to drive that change.

3. Architecture Education in East Africa

For this study, East Africa is defined as the geo-political region encompassing Burundi, Kenya, Rwanda, Tanzania and Uganda, the five countries that make up the East African Community (EAC). This region covers an area of 1.8 million square kilometres and has a population of about 152 million (2011 estimates). Within East Africa are six schools of architecture: two in Kenya; University of Nairobi (UoN) and Jomo Kenyatta University of Science and Technology (JKUAT); one in Tanzania – Ardhi University (AU); one in Rwanda – Kigali Institute of Science and Technology (KIST); and two in Uganda – Makerere University (MU) and Uganda Martyrs University (UMU). Two of the schools offer a split programme: UoN and UMU, while the rest offer a straight five or six-year B.Arch. degree programme. Currently only UMU offers a Master of Architecture (Professional) programme, although both UoN and JKUAT are transitioning to M.Arch. (Prof.) programmes in 2013/14. A number of other institutions are also in the early stages of developing professional programmes in architecture, including: Kyambogo University and International University of East Africa both in Uganda, University of Dodoma in Tanzania and Kenya Polytechnic in Kenya. Currently, there are close to 1,000 students of architecture in the region.

We do acknowledge that the role of architecture education in this context is two fold: first, to educate individuals in a particular discipline – as a vocation; and second, to help students identify with the issues that they will be faced with in their chosen careers –the education of professionals who can engage in critical discourse related to the future of the profession in which they will be working (Olweny and Olweny, 2010). Significant effort has often paid to the pragmatics of the former, regarded as the primary purpose of architecture education, however this narrow view of the role of architecture education unravels in light of global challenges

related to contemporary practice challenges, in this case, ESD and EE. In East Africa, constant power black outs and brown outs are reminders of the lack of adequate energy to run buildings that are designed to use cheap energy that is no longer available. What then is our responsibility as educators in this changing paradigm? Is it to accept the status quo and ignore the impending crisis that is being created, or can we begin to make adjustments to ensure graduates are able to spearhead the necessary changes that are already upon us?

In this review, I undertake to establish the state-of-affairs related to the penetration of ESD and EE in architecture education in East Africa. Give the global challenges associated with global climate change, dwindling resources, and increasing populations; it is evident that there is a need for architecture schools to address these challenges as part of the architecture curriculum. This initial review sought to establish the courses that referenced ESD and EE, at a broad level related to the titles of the programmes, and then more specifically related to the course content, looking at the curriculum. Finally, discussions with faculty and students was undertaken to assess the level of engagement and exploration of sustainability issues within the courses and programmes.

4. Sustainability in Architecture Education in East Africa

The review exposed disparaging efforts at sustainability within the different curricula(See Table 1). Programmes did engage students with basic courses related to climate, comfort, and building/material performance. How this translated into architecture as sustainable design solutions however, was not explicitly evident. Courses were what could be described as 'Support' or 'Lecture' based courses independent of the 'Design Studio'. One school, UMU, did showcase an attempt at integrating ESD and EE into the design studio. UMU described its programme as following an "… integrated teaching approach, that integrates design with the techniques and practices of construction, structures, materials and building services, all within a theoretical and historical context, keeping in mind human needs (social, physiological and cultural)" (Uganda Martyrs University, 2012).This has translated into integrated studio based courses that explore ESD and EE not only as theoretical issues, but also through design exploration.

Table 1: Courses with Sustainability and Environmental Design in the Title

UoN	Part II	Level I	Sustainable Design (L)
JKUAT	Part I	Level I	Environmental Behaviour Study (L)
	Part II	Level I	Environmental Impact Assessment & Environmental Audit (L)
KIST	Part I	Level III	Sustainable Design Methodologies (L)
		Level V	Advanced Sustainable Design (L)
UMU	Part I	Level II	Buildings and the Environment (St)
		Level III	Sustainable Built Environments (St)
	Part II	Level I	Architecture Studio A (Environmental Design) (St)
MU	Part II	Level I	Environment and Development (E/L)

L = Lecture Based St = Studio Based E=Elective

Further investigation of curricula content revealed engagement with ESD beyond mere mention in course titles. Of particular interest is the inclusion of Landscape Architecture in all programmes, an acknowledgement of the importance and value of the external environment as part of the development of ESD in architecture. All programmes included at least one landscape architecture course, although in some cases this was only as an elective (see Table 2).Encouragingly, all programmes did include ESD courses as part of the curricula, with most courses compulsory, although two schools (MU and AU) only offered their primary ESD courses as electives.

Table 2: Additional Courses having Sustainability Content

JKUAT	Part I	Level III	Landscape Design (L)
	Part II	Level I	Architectural Design VIII (St)
UoN	Part I	Level III	Landscape Design I (L)
		Level IV	Architectural Design 7 (Landscape Architecture) (E/L)
KIST	Part I	Level III	Architectural Design III (St)
			Human Settlements (L)
	Part II	Level IV	Architectural Design V (St)
		Level V	Rural Resource Analysis (L)
AU	Part I	Level III	Building Technology VI (L)
		Level IV	Landscape Design (E/L)
			Architectural Science (E/L)
UMU	Part I	Level I	Natural and Built Environment Systems I (Se)
			Natural and Built Environment Systems II (Se)
	Part II	Level I	Landscape Architecture/Urban Design Studio (St)
MU	Part I	Level II	Environmental Building Science II (L)
		Level III	Environmental Building Science III (L)
	Part II	Level I	Landscape Design (L)

L = Lecture Based St = Studio Based E=Elective Se=Seminar

While there is an awareness of the need for ESD and EE in architecture education indicated by the existence of courses that reference the same, perceptions of faculty and students to ESD and EE in general and as it relates to architecture education was also investigated. Information from faculty websites and published documents was not clear on this, with limited information as to how content from support courses is included in design studio. It is acknowledge that this depends entirely on the nature of the projects and more so on studio instructors and tutors. If design tutors are not familiar with the content or do not believe that it is important, it is often neglected, preferring [D]esign above all else (Morrow, 2000).

Further investigation of the inclusion of ESD and EE was carried out as part of a broader student of architecture education through Focus Group Discussions with faculty and students. Discussions have thus far been carried out in all universities apart from KIST (Not yet had a graduating class). The Focus Group Discussions covered a diverse range of issues, to gain a better understanding of the state of architecture education in the region. Discussions related to the design studio, faculty-student relations and ESD revealed intriguing information about the nature of ESD in architecture and architecture education in East Africa.

For one instructor engaging in teaching ESD, it was a frustrating experience due to a lack of support from the faculty administration and studio instructors: **"**ZERO! Ok, Zero in the sense that, even when I want, ok, even when the students what, sometimes the academic, fellow academic staff can be the obstacle, ok. So in this case, well […] these people are not interested in sustainable building design" (FG9_3). The lack of integration was also a concern for students, with one student stating: "Well there's the studio project, and then we have theory, yea. The theory is ah, the supporting subjects for our studio …." The student however goes on to add: "How do they relate back to the studio? How they are supposed to relate back to the studio?" (FG6_2)Such statements, among many others, indicate deficiencies in transforming ESD from being something you study about, to something you actually engage in as part of the design development process.

The low uptake of sustainability into architecture education may also be linked to the current discourse within architecture practice, with the fit-for-practice debate dominating architecture education dialogue in the region. With architecture education perceived to be the preparation of graduates to participate in the production of architecture – as it exists today – moves towards new paradigms in architecture education are unlikely to take hold. Although it is accepted that ESD is important, it is regarded as a future desire, not for architecture today, as it is not demanded by clients: "I think practice, yea that is more of it, for example if like in this sustainability thing, when you talk about green materials, green way of doing things, you know

there is also the risk of will my plans be approved, or will the client welcome these ideas … " (FG1_2).This begs the question of the role of architects: are they advocates for change, or merely responding the current society demands? Further, is architecture education only about producing graduates fit to work in the current professional milieu, or does architecture education have a wider mandate, to engage with the future realities and opportunities of architecture practice through the education of students who are able to engage with an unpredictable future?

5. Discussion

It is evident that schools of architecture in the region have made steps towards incorporating ESD as part of their curriculum, with at least one course in the programmes touching on it. For the most part, however, ESD related courses are still 'support' courses, with only a few examples where students are engaged with these issues as core design challenges. This was most overt in the case of UMU and to a lesser extent in KIST and JKUAT, which also indicated that they did engage students in ESD within some design studios. With its integrated programme, UMU was better able to implemented as a core component of the design studio.The lack of integration of ESD within the architecture curriculum was also of concern for recent CAA Validation panels to the region in 2010/11, which recommended greater effort be made to integrate ESD into programmes where this was not already the case.

Certainly there is an effort to engage with ESD in architecture programmes, however, there was far less effort to engagement with EE. Across the various schools, there were only two mentions of "Energy Efficiency" in the curricula (KIST and UMU). This suggests a low priority is afforded to EE as part of architecture design and architecture education, ironic given the desperate and disparate state of energy availability in the region. The established approach, with the separation of the design studio (the main-stay of the curriculum and where students express their creative abilities), from support courses can be viewed as a hindrance to the integration of ESD into the architecture curriculum. This separation perpetuates the notion that the design studio is where [D]esign is carried out independent of the 'noise' of technical and pragmatic requirements. The idea of what constituted design is regarded as [D]esign with all else relegated to second place. Reasons often given for not including ESD in architecture curricula, are similar to that presented for architecture programmes across the world: Lack of academics with a background in ESD; ESD is regarded as non essential to the main stream curriculum; there are more pressing contextual issues that the curriculum needs to address in the context of developing nations, and; the curriculum is already over-crowded with core design issues.

6. Recommendation and Conclusions

The challenge of integrating ESD into the architecture curriculum is not simple. This investigation indicates that there is some way to go before sustainability is fully integrated into architecture education in East Africa. Current moves towards incorporation of ESD and EE into architecture curriculum is based largely on personal conviction. We must appreciate that to be able to implement change in the curriculum would require a change in mind-set, as teaching sustainable architecture requires a new approach, one that acknowledges the wide scope of architecture, beyond just that of building [D]esign. In this regard, we must acknowledge, in the words of Carol Franklin–of And ropogon Associates, Ltd. "Sustainable development is not a reworking of conventional approaches and technologies, but a fundamental change in thinking and ways of operating; you can't put spots on an elephant and call it a cheetah." How then can we ensure that sustainability becomes a part of the architecture curriculum?

Key to any strategy to incorporate ESD and EE into curricula is to acknowledge the limitations (perceived or otherwise) that hinder any implementation. First, we recognise that many faculty do not have the required experience and expertise to engage with ESD and EE as part of

design, let alone be able to integrate it as part of an architecture curriculum; Second, the lack of contextual information and good local examples are a significant short coming in the implementation of ESD; Finally, on the side of the students (and some faculty),is the perception that a single correct solution exists, something promoted at lower levels of formal education. The one size fits all approach negates a key concern for architects, who can act as "… moral citizens … engaging in an open process of negotiation, criticism and debate …" (Guy and Farmer, 2001: p.147).

Lack of participation of faculty from support courses within the design studio does have a significant bearing on the nature of engagement with ESD issues, and falls in an area described by Stevens (1998) as "Curricular Prestige". The emphasis, placed on studio components of architecture programmes correspondingly suggest the courses students place most emphasis on. This suggests a fundamental change in the way architecture education is presented is necessary. Rather than changing curricula to include additional courses in ESD, there may need to rethink the format of the programmes to better reflect the new reality of what constitutes architecture (Olweny 2006).

A contentious, but probably justified suggestion may be to rethink the use of the word 'Design' to refer to the activities carried out in the design studio. In the context of East Africa, this has connotation of the beautification of buildings. In a broader context, design is the process rather than just the product or architecture (Watson, 1997: Boyer and Mitgang, 1996). The term 'Design Integration' may be more appropriate to ensure the intentions are not misinterpreted and in order to ensure architecture is appreciated as a holistic undertaking and that it is only, " ... when the building of architecture is approached as an organization system that encompasses aesthetics, formal, and practical application, there is the possibility of transcending the common understanding of building technologies and materials acquired by rote mechanics of lecture and evaluated regurgitation." (Kucker, 1997:117) This is important in light of the broader mandate of architecture education that goes beyond current practice, and current approaches to practice (Rügemer, 2009).

Finally, to alleviate the lack of information and expertise, better integration of support and studio projects would be a major step forward bringing tutors into the design studio who can engage with students and their design projects. It is widely acknowledged by both faculty and students that the tutors for support courses should be part of the studio team, to ensure that what is taught in these courses is applied in design projects. Further, making information freely available would make it evident that ESD is not an unattainable foreign concept, but based on local contextual ideas and initiatives. Of interest could be a project similar to the EDUCATE scheme (*Environmental Design in University Curricula and Architectural Training in Europe)*, an initiative geared to the "… promotion of sustainability in the design of the built environment …" (EDUCATE, 2009). Architecture schools in East Africa could benefit from a similar initiative, looking at it as a means to collaborate, and to share information and resources. This could also address the perceived lack of qualified faculty and encourage students to take greater responsibility for their own learning, rather than relying on their instructors for information, not to mention encouraging a holistic approach to architecture education (Altomonte, 2009) as such databases are by their very nature interdisciplinary. The project; Promoting Energy Efficiency in Buildings in East Africa, a current project linked to this paper, has among its key goals, to respond to this need. The project, lead by UN-HABITAT seeks to create awareness and to build capacity in ESD and EE practices through collaboration with universities in the East Africa region.

Returning to Whitaker's article, a key question we need to ask is related to how far built environment professionals are prepared to push the envelope of what constitutes architecture practice. While there are efforts in the right direction, we are still a long way to fully engaging in the sort of dialogue advocated by Whitaker (2006).Integrating ESD into architecture education would be a significant step in the ESD agenda in East Africa. This however is only one small step in this direction that would require a concerted effort on the part of the different players, practice, academia, society and legislators to ensure ESD is incorporated into the architecture curriculum.

Incorporating ESD in the architecture curricula is to be regarded as a necessity if we are to transform our environments for a sustainable future. This does suggest a holistic and contextual approach to architectural education, rather than merely adding additional knowledge components to an already crowded curriculum. As we contemplate the future of architectural education, we can remind ourselves of what Milliner (2000), refers to as shifting boundaries in architectural education. What originally were regarded as the norm for the architecture profession, have rapidly morphed into a significantly different profession where the 'traditional' concept of the architectural professional is no longer applicable.

Acknowledgements

References

Association of African Universities, 2011: The Promotion of Sustainable Development by Higher Education Institutions in Sub-Saharan Africa: Survey Report, Global University Network for Innovation ((GUNi), International Association of Universities (IAU) and Association of African Universities (AAU), Accra

Altomonte, S., 2009: ENVIRONMENTAL EDUCATION FOR SUSTAINABLE ARCHITECTURE, Review of European Studies, Vol.1, No.2, pp12-21.

Boyer, E.L. and Mitgang, L.D., 1996: Building Community: A New Future for Architecture Education and Practice, Carnegie foundation for the Advancement of Teaching, Princeton, NJ.

Cortese, A.D., 2000: THE CRITICAL ROLE OF HIGHER EDUCATION IN CREATING A SUSTAINABLE FUTURE, Planning for Higher Education, March-May, pp15-22.

Edwards, B., 2004: SUSTAINABILITY AND EDUCATION IN THE BUILT ENVIRONMENT, in Cullingford, C. and Blewitt, J.(eds.) The Sustainability Curriculum: The Challenge for Higher Education, Earthscan, London, pp129-140.

Educate. 2009: Environmental Design in University Curricula and Architectural Training in Europe [cited January 22 2012]. Available from http://www.educate-sustainability.eu/home.

Fawcett, Palich&Nervegna, 2006. ECOLOGICALLY SUSTAINABLE DEVELOPMENT – GLOSSARY OF ESD TERMS, BDP Environmental Design Guide, Note 11, *Royal Australian Institute of Architects, Canberra*

Frampton, K., 1983: PROSPECTS FOR A CRITICAL REGIONALISM, Perspecta, Vol.*20,* pp.147-162.

Groat, L.N. and Ahrentzen, S.B., 1997: VOICES FOR CHANGE IN ARCHITECTUREAL EDUCATION: SEVEN FACETS OF TRANSFORMATION FROM THE PERSPECTIVES OF FACULTY WOMEN, Journal of Architectural Education, Vol.50, No.4, pp.271-285.

Guy, S. and Farmer, G., 2001: REINTERPRETING SUSTAINABLE ARCHITECTURE: THE PLACE OF TECHNOLOGY, Journal of Architectural Education, Vol.54, No.3, pp.140-148.

Kucker, P., 1997: RECOGNIZING A (FERTILE) GAP, Journal of Architectural Education, Vol.51, No.2, pp110–119.

Morrow, R. 2000: ARCHUTECTURAL ASSUMPTIONS AND ENVIRONMENTAL DISCRIMINATION: THE CASE FOR MORE INCLUSIVE DESIGN IN SCHOOLS OF ARCHITECTURE, In Nicol, D. and

Pilling, S. (eds.) Changing Architectural Education: Towards a New Professionalism, Spon Press, London, pp43-48.

Olweny, M. 2006: TECHNOLOGY AND ARCHITECTURE EDUCATION IN UGANDA, in Shannon, S., Soebarto, V. & Williamson, T. (Eds.) 40th Annual Conference of the Architectural Science Association ANZAScA - Challenges for Architectural Science in Changing Climates. Adelaide, Australia, The University of Adelaide and The Architectural Science Association ANZAScA, November 2006, pp 241-247.

Olweny, M.R.O. and Olweny, C.L.M., 2010: ETHICAL POSITIONS IN BUILT ENVIRONMENT EDUCATION, in Bakker, K. (ed.) *The African City Centre: [Re]sourced*, Proceedings of the International Conference, University of Pretoria, 25-28 September 2009, pp173-177.

Olweny, M.R.O., 2008: INTEGRATING SUSTAINABILITY AND ENVIRONMENTAL DESIGN IN AN AFRICA ARCHITECTURE CURRICULUM: THE CASE OF UGANDA, in Kenny, P., Brophy, V. and Owen Lewis, J., (eds.) Towards Zero Energy Building, 25th Passive and Low Energy Architecture (PLEA) Conference, Dublin, October 22-24.

Rügemer, J., 2009: TEACHING SUSTAINABLE STRATEGIES IN ARCHITECTURE: LEARNING FROM THE GLOBAL PERSPECTIVE, In Demers, C.M.H. and Potvin, A., (eds.) Architecture Energy and the Occupant's Perspective, 26th Passive and Low Energy Architecture (PLEA) Conference, Quebec City, June 22-24.

Said, E.W., 1978: Orientalism, Vintage Books, New York.

Salama, A.M.A., 2002: ENVIRONMENTAL KNOWLEDGE AND PARADIGM SHIFTS: SUSTAINABILITY AND ARCHITECTURAL PEDAGOGY IN AFRICA AND THE MIDDLE EAST. inSalama, A.M.A., O'Reilly, W. and Noschis, K. (eds.) Architectural Education Today: Cross-Cultural Perspectives. Comportements, Lausanne, pp51-59.

Stevens, G., 1998: The Favored Circle: Social Foundations of Architectural Distinction, Cambridge, Mass.: The MIT Press.

Tzonis, A. and Lefaivre, L., 1981: THE GRID AND THE PATHWAY, Architecture in Greece Vol.15, pp.164–78.

Uganda Martyrs University, 2012: Faculty of the Built Environment: Student Handbook and Outline of Courses, Uganda Martyrs University, Nkozi.

Watson, D., 1997: ARCHITECTURE, TECHNOLOGY AND ENVIRONMENT, Journal of Architectural Education, Vol.51, No.2, pp119–126.

Whitaker, B., 2006: ARCHITECTS ARE LAGGING INDICATORS FOR SUSTAINABLE DESIGN, *The New York Times Online Edition*, May 17.[cited October 20, 2012] Available from<http://www.nytimes.com/2006/05/17/business/businessspecial2/17build.html?pagewanted=1&_r=2#>.

Wright, J., 2003: INTRODUCING SUSTAINABILITY INTO THE ARCHITECTURE CURRICULUM IN THE UNITED STATES, International Journal of Sustainability in Higher Education, Vol.4, No.2, pp100-105.