"SUSTAINABLE APPROACHES
FOR BUILT ENVIRONMENT IN DEVELOPING COUNTRIES"

PROCEEDINGS

The 14th International Conference on

SUSTAINABLE ENVIRONMENT AND ARCHITECTURE (SENVAR)

Banda Aceh 7, 8, 9 November 2013

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Editors
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Husnus Sawab, ST, MT (Syiah Kuala University-Indonesia)

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Department of Architecture
Faculty of Engineering
Syiah Kuala University
Jl. Syech Abdurrauf No.7
Darussalam, Banda Aceh, Indonesia 23111
Ph. +6282150704363
University Website: www.unsyiah.ac.id
Conference Website: www.senvar2013aceh.org
E-mail: senvar2013aceh@yahoo.com

Welcome Remarks

Your Excellency, Mayor of Banda Aceh City, the president of SENVAR, and the Rector of Syiah Kuala University. Honorable guests from Heriot Watt University Edinburgh UK, Institute Sultan Iskandar UTM Malaysia, UTM Skudai Johor Malaysia, Tokyo Institute of Technology Japan , Hiroshima UniversityJapan, Deakin University Australia, Australian National University, HCU-Hamburg Germany, Universiti Teknologi MARA Perak Malaysia, Tanri Abeng University (TAU) Jakarta, Parahyangan Catholic University, Bandung Institute of Technology, Institute of Technology Sepuluh Nopember Surabaya, Atma Jaya Yogyakarta University,State University of Medan, Gunadarma University, Sebelas Maret University, Lambung Mangkurat University, University of Brawijaya Malang, University of Gadjah Mada Yogyakarta, Mercu Buana University, UNDIP Semarang, Sebelas Maret University, Duta Wacana Christian University Yogyakarta, Universitas Indonesia, Muhammadiyah University of Aceh, Research Institute for Human Settlements Ministry of Public Works, Denpasar Experimental Station for Traditional Housing Technology Development, Citra Rancang Consultant, academia civitas of Syiah Kuala and all of distinguised guests and students.

It is a great pleasure as a chairperson of organizing committee to welcoming all of you at the official opening ceremony of the 14th International Conference on Sustainable Environment and Architecture (SENVAR) 2013. Additionally, I am honored to host such an important event which is a part of the 50th anniversary of Engineering Faculty, Syiah Kuala University. As I mention in the initial speech, this event is attended by six different countries including United Kingdom, Malaysia, Japan, Australia, Indonesia, and Germany. The event is being sponsored by Syiah Kuala University and supported by some industries.

Ladies and gentlemen,
The theme of this year's conference is "Sustainable approaches for built environment in developing countries". All invited speakers and presenters from abroad and Indonesia will disseminate and discuss about the diverse issues related with sustainable architecture, local wisdom and sustainability, sustainable construction and material, low energy indicators for built environment, sustainable urban design and planning, sustainable village planning.

Finally, I would like to express my gratitude to all participants and sponsors, and also my sincere appreciation to all of seminar committee for all effort to make this seminar come about. We wish you to enjoy the programs of conference in plenary lectures, parallel presentations, and poster session and city tour of Banda Aceh.

Dr. Ir. Izziah, M.Sc
Chairperson of SENVAR 2013

Preface

The accumulation of human action and the effects of development pattern pursued by humanity to the environmental systems, such as landscape changes, water and air pollution, acid rain, ozone depletion, global warming, species extinction and resource depletion are leading to global changes in climate, ecological health, and in turn could affect the existence of human being.

Cities had been built on only two per cent of the world's land surface. Nevertheless, they use 75 per cent of the world's resources and discharge large amounts of waste. The growth of city is linked to urbanization. Because of urbanization, the number of city dwellers has increased and consequently the demand for building also increases. Buildings and the whole process of creating built environment contribute significantly to global environmental and ecological degradation. Two examples where this phenomenon can be observed is when affluent communities in developing countries develop built environment believed to perform high technology that actually neglect the adaptation to the local climate. The implication is excessive use of energy. On the other hand the marginal communities use local materials believing that it is a form of adaptation to the local climate when it actually lead to an excessive use of materials causing the scarcity of the products.

Therefore people are urged to give high contribution to a saver planet and consider efficient use of our resources. It is time to shift attitude and consciousness to the new paradigms and approaches that should be used by building professionals and stakeholder involve in the process of creating built environment to protect ecosystems and provide the basis for sustained life opportunity on earth. It is time to build with ecological and environmental consciousness not only for amenity and economy but also for sustainability and habitability.

Concerning these issues, the 14th International Conference on Sustainable Environment Architecture (SENVAR 2013) invites researchers, academia, government officers, practitioners and professionals to share and exchange knowledge and expertise in search of appropriate and effective strategies toward a more sustainable built environment and architecture. Strategies that help the concept of sustainable development and architecture to be viable and realized into development practices and could provide the best solutions for the wellbeing of both human as well as the environment specifically in developing countries.

The Committee of 14th SENVAR

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Sub-Theme C: Sustainable construction and material

Sub-Theme D: Low energy indicators for built environment

Sub-Theme E: Sustainable urban design and planning

Sub-Theme F: Sustainable village planning

Sub-Theme O: Others

Keynote Speakers

Keynote Speaker	Affiliation	Paper Title
Dr. D oug Harris	Heriot Watt University Edinburgh, United Kingdom Tel: +44 131451 4634 Email: d.j.harris@hw.ac.uk	Changing Attitudes to Sustainability
Prof. Dr. Mohd. Hamdan bin Ahmad	Institute Sultan Iskandar Universiti Teknologi Malaysia 81310n UTM Skudai Johor, Malaysia drmedan@gmail.com	Sustainable Metropolis - Low Carbon Society Of Iskandar Malaysia
Prof. Tri Harso Karyono	School of Architecture, Tanri Abeng University (TAU), Jakarta, Indonesia Email: karyono15@gmail.com ; t_karyono@yahoo.com	Indonesia Sustainable Development: Minimising CO_2 Emissions And EF Levels Without Sacrificing The Nation's Well-Being

A-05

SUSTAINABLE ARCHITECTURE: WHAT ARCHITECTURE STUDENTS THINK

Prasasto Satwiko
Architecture Department, Atma Jaya Yogyakarta University
Jl. Babarsari 44, Yogyakarta 55281, Indonesia
Email: p_satwiko@staff.uajy.ac.id or psatwiko@yahoo.com

Abstract-Sustainable architecture has become a hot issue lately as the impacts of climate change become more intense. Architecture educations have responded by integrating knowledge of sustainable design in their curriculum. However, in the real life, new buildings keep coming with designsthat completely ignore sustainable principles. This paper discusses the results of two national competitions on sustainable architecture targeted for architecture students (conducted in 2012 and 2013). The results are of high quality and prove that students are not only applying theories found in books but also doing innovations. Their designs show that students are able to put sustainable architecture in a broader context of the world life system. Some competition entrants even show that in the eyes of architecture students, sustainable architecture is not just about using renewable energy and environment friendly materials but also about contributing to the life system such as encouraging urban biodiversity.

Keyword: competition, students, sustainable architecture

I. INTRODUCTION

World population grows very fast and brings huge impact on earth. In 0 A.D., the earth was assumed to host around 250 million people. In 1955, the number became 2.5 billion. In 2011, it reached seven billion and is expected to reach nine billion in 2100. Meanwhile, the earth's area is not expanding. Natural resources have been extensively explored that now we are experiencing environment quality depletion.

Climate change, generated by global warming, is one of the current hot environmental issues. The increase of green house gases (GHG) concentration in the atmosphere has been claimed to cause global warming. Three major GHGs are CO2 (carbon dioxide), CH4 (methane) and N2O (nitrous oxide) plus water vapor. CO2 big contributors are deforestation and fossil fuel burning. CH4 and N2O are mainly from meat industries and have, respectively, 23 and 276 CO2equivalent. Buildings contribute to the rise of GHG concentration through material production, construction, and operational energy consumption. Building design has played major role in the energy consumption rate, particularly operational energy consumption.

Architecture has faced continually changing environment, which requires evolutionary design to adopt to that change [ ]. Urban climate, for example, has gradually changed. Cities in Indonesia have experienced increase inair temperature within the last decades. Global warming and urban heat island are the most reasonable explanation for the increase. In response to this climate phenomenon, as well as HVAC technology development, people install air conditioners as an instant solution. Energy free natural ventilation is no longer sufficient to provide thermal comfort. Mechanical ventilations consume electric energy which is mostly provided by Diesel electric generators. The amount of energy consumed by a building will be directly dictated by its design.

Architecture can play a significant role in sustaining the earth. This awareness has motivated architects and architecture users to seek more environmentally friendly designs. All possible interrelationships between architecture and environment are researched. Any possible potential should be looked [ ]. However, new buildings which ignore sustainable architecture principles are continuously built. This raises a question whether architects really know how serious our environment problems are.

This paper reviewed documents of two architecture competitions for students conducted in 2012 and 2013. It evaluated the students' designs as is and sought any signs that might reflect students' awareness of environment problems and how they applied sustainable architecture principles.

II. METHOD OF REVIEW

This paper is not based on exhaustive research. Instead, it is a review of the students' posters and design reports. Jurors' notes are taken into account. The procedure of the review: (i) understanding the term of references;(ii) selecting the parameters of sustainability based on literature study, which are appropriate to be used as assessment tool; (iii) evaluating and analyzing the designs based on selected parameters; (iv) finding common and unique design values; and (v) drawing conclusions.

Qualitative analysis was used in evaluating the designs. Students submitted 2D designs that made it impossible to evaluate the performance of their design using, for example, Ecotect software. No interview with participants

was made. Thus, the review was strictly based on what were presented on the posters and design reports, as is. Consequently, the students' effective and efficient ways of presenting their ideas are crucial, as it will influence reviewer's interpretations.

III. TERMSOF REFERENCESOF THE COMPETITIONS

Both design competitions were hosted by Department of Architecture, Atma Jaya Yogyakarta University in 2012 and 2013. The 2012 competition had the title "Biodiversity Architecture" which was derived from the main topic of the department's 30th anniversary "Architecture at the Peak of Civilization." The 2013 competition had the title "Loving Our Soul" for homeless activity center. Both competitions were targeted for students from undergraduate and diploma programs though the 2013 competition welcomed fresh graduates (not more than three years after graduation). There were 15 and 42 entrants for 2012 and 2013 competitions, respectively.

The 2012 competition explicitly challenged students to offer their fresh ideas in solving the current global environment crises through architecture designs. It highlighted the importance to refresh the connection between all living beings and non-living resources. The current peak of civilization is not necessarily reflected in a better environment. Instead, we all witness growing environmental problems. Present popular issue is the global warming that generates climate change, which cause disrupted weather, flood, famine, harvest failure, species extinction and diseases.

Human being has over-dominated the earth in all aspects. To support the life of more than seven billion people, natural resources have been exploited in such alarming rate. Fifty-five billions land animals and millions tons of sea animals are consumed annually. Rainforests are steadily cleared to support meat industries. Oceans are empty. The United Nations claims that everyday 293 species go extinct, disrupting the earth life system. The connection between man and their environment is in trouble[ ].

Architecture is the art of space for human. Yet, it should not be interpreted as the art of isolated space for human. Throughout the history, we can see that humane architectures are the ones with close relations to the environment, whether it is organic or non-organic. Vernacular and traditional architectures, for examples, always show efforts to be in harmony with nature. Some efforts are successful while others failed.

The main idea behind the 2012 competition's titlewas then to remedy the connection between architecture and its environment through biodiversity architecture. Bio-diverse architecture will lead to bio-diverse city, which is supposed to give positive impacts in bringing back the nature balance.

The 2013 competition was dedicated to draw architecture students' attention to the homeless. It used homeless activity center as the medium for students to express their understandings on the homeless' needs. It, however, stated clearly in its terms of references that one of the judging criteria was the ability of students in applying sustainability concepts creatively and innovatively.

IV. SUSTAINABLE ARCHITECTUREPRINCIPLESIN GENERAL

The term sustainable architecture has become more popular since around three decades ago. It gets mixed up with other terms such as green architecture, passive architecture, natural architecture, ecological architecture, and environment friendly architecture. Its popularity does not necessarily mean that sustainable architecture has just been invented. Vernacular and traditional architectures have long been claimed as having high sustainability values. Javanese traditional architecture, as an example, is equipped with a set of rules (called Petungan) which is not inferior compared to modern building sciences[ ].

Global awareness of environment quality deterioration and fossil fuel depletion has attracted architecture world to respond more seriously. Sustainability becomes a new design mantra. Seminars, conferences and competitions on sustainable architecture are conducted by various institutions. Software to help designing sustainable architecture is provided (such as Ecotect and EnergyPlus). Certification bodies for assessing the sustainability of architecture design were founded such as BRE (Building Research Establishment of UK) and USGBC (United States Green Building Council). They have made various assessment tools such as BREEAM (BRE), LEED (USGBC), NABERS (Australia), GREEN STAR (Australia), GREEN MARK (Singapore), IGEM (Indonesia), and Greenship (Indonesia). Books and other forms of publications about sustainable architecture are easily available. Schools of architecture are encouraged to adopt sustainable design principles in their curriculum.

In short, the current popularity of the term "sustainable architecture" has made the term sound like a new trend. In addition, as a new trend, any architect will not feel comfortable or confident if he/she does not articulate that term in his/her design. Unfortunately, this phenomenon does not prove whether those architects really understand what sustainable architecture is. An acclaimed sustainable building that wrongly applies sustainable design principles will mislead people's perception and lead to other erroneous designs. An example is green washing that is not really green [ ].

What people think about sustainable architecture is greatly varied. People with access to scientific references will have different perception about sustainability with others who do not have it and only get information from popular media. Sustainable architecture is commonly connected to energy and environment friendliness,although it is supposed to have a wider coverage such as economical, functional, social and cultural sustainability [ ].

By definition, sustainable architecture is "a general term that describes environmentally conscious design techniques in the field of architecture[ ]". Though 'sustainability' itself covers wide architectural aspects, it

seems that it is more linked to physical aspects such as low energy consumption and green materials than non-physical ones such as cultures. However, if we assume that sustainable architecture is somewhat similar to green architecture, then we can borrow from Robinson and Smith who make a list that green buildings should pay attention on these following aspects: (I) sustainable/durable/ low-maintenance building design and operation; (ii) energy efficiency and conservation; (iii) site/land management, sustainability, reclamation, and conservation; (iv) water efficiency, management, and conservation; (v) indoor air quality (IAQ); (vi) outdoor air quality (OAQ); (vii) material and resource management, recycling, and conservation (including the reuse of building materials and products); and (viii) innovation[ ].

U.S. Green Building Council through Leadership in Energy and Environmental Design (LEED) has set up guidelines for green building certification. It will rank a building according to the amount of points granted by fulfilling specified requirements. The rank is Certified (40-49 points), Silver (50-59 points), Gold (60-79 points) and Platinum (80 points and above). LEED certification covers aspects of (i) Sustainable Sites; (ii) Water Efficiency; (iii) Energy and Atmosphere; (iv) Materials and Resources; (v) Indoor Environmental Quality; (vi) Innovation in Design; and (vii) Regional Priority [ ]. LEED has been partially adopted by Green Building Council of Indonesia through Greenship certification.

Sassi, in his book "Strategies for Sustainable Architecture", offers six aspects to consider. Those are (i) site and land use; (ii) community; (iii) health and well-being; (iv) materials; (v) energy; and (vi) water. Sassi puts human and their social activities as important parameters [ ]. Another writer, Douglas, states that sustainability of a building also depends on its adaptability which involves durability, adaptability, energy efficiency, weather-tightness and comfort [ ].

Karyono, an Indonesian building scientist, offers some parameters for green architecture. Those parameters are (i) minimum site changing with respect toits original condition; (ii) minimum energy consumption building and environment design without sacrificing comfort; (iii) water efficiency; (iv) use of recycled, reused, renewable, low embodied energy materials; and (v) treatment and reuse of solid and liquid wastes. In his book, Karyono discusses more detailed available certifications [ ]. Though his book is inspired by Robert and Brenda Vale's book of Green Architecture [ ], Karyono's book can be appreciated as he puts green architecture in Indonesia's warm humid climate context.

Climate context is important. Books discussing architecture in warm climate are available and useful to build theoretical frame for sustainable architecture such as Hyde's [ ]. Even though it is not specifically written for warm humid climate, it is still useful as Mediterranean (warm climate) architectural style is popular in Indonesia. Hyde's book uses bioclimatic approach to solve environment problems. A book written by Stang has shown examples that local climate can be dominant factor to lead sustainable design [ ]. Its examples of tropical buildings, however, are not really applicableto warm humid climate with torrential rains. Bay and Ong give examples of sustainable architectures of warm humid climates [ ]. Their book is a compilation of many authors' thoughtswhich emphasize the importance of cultivating local wisdom of sustainability rather than merely using imported knowledge from non wet tropical climate countries. Moreover, they also underline the social and environmental dimensions in tropical sustainable architecture.

V. SUSTAINABLEDESIGNIN INDONESIA ARCHITECTURE CURRICULUM

Indonesia schools of architecture are independent to set up their own curriculum. The government, through the Ministry of Education, only gives general guidance. The Indonesia Institute of Architects has tried to formulize Indonesia architecture education curriculum for long. It has not come to any conclusion or applicable formula yet though sustainability issue has become one of its agenda. Every school of architecture has its own formula which reflects its vision and mission. It then depends fully on the will of any school of architecture whether they want to take the issues of sustainability seriously, or not. It can also mean, whether they will teach sustainable architecture in depth or just superficially (just for following the trend).

Sustainable architecture concepts can be delivered to students in qualitative and quantitative way. At preliminary design stage, qualitative (descriptive) method can be considered appropriate. At final stage, however, quantitative (analytical) method should be conducted. The present advanced development of computer technology has made it easier for students to assess the sustainability of their designs [ ].

Quantitative, as well as qualitative, aspects of sustainability are commonly taught at subjects such as building physics related courses which lean more to hard sciences [ ]. Meanwhile, the development of architecture education seems to lean toward soft sciences. Schools of architecture are used to be called "architecture engineering" but now are only called "architecture" even though they are still within faculty of engineering. Consequently, today schools of architecture teach much less hard science subjects than their predecessors, including building physics related subjects. Thanks to the internet, students can fulfill their interest on sustainable architecture from virtually unlimited sources.

School of Architecture of Atma Jaya Yogyakarta University is just an example of schools which are still delivering building science subjects sufficiently. At undergraduate level, students would take Architectural Ventilation Design, Architectural Lighting Design and Architectural Acoustic Design subjects; each of these compulsory subjects has three credits. If they want to deepen their understanding of sustainability, they can take optional subjects available i.e. Energy Conscious Architecture (2 credits) and Ecological Architecture (2 credits). At post-graduate level, students can take Advanced Architectural Ventilation Design, Advanced

Architectural Lighting Design, Advanced Architectural Acoustic Design subject, Energy Management and Sustainable Architecture, each has three credits. The campus has set its new mission to be a green campus which will make it a real laboratory for students. However, blending sustainable architecture concepts into curriculum actually can be introduced since pre-university education [ ].

VI. RESULTSOF COMPETITIONS

Entrants' documents were reviewed using three groups of parameters: (1) application of basic or common sustainability values;(2) effort to use advanced available technology, and(3) effort to innovate design or develop unique solution. These three groups are simplification of sustainable parameters found in green building certification assessment mentioned in sub-chapter IV. Group 1 covers values that commonly or popularly linked to sustainable architecture such as the use of natural ventilation and lighting, climate responsive design, sustainable materials, and disposal treatment. Group 2 covers the use of available technology such as solar cell, wind turbine, solar adaptive glass, light tube, and smart technology. Group 3 covers application of unique solution and innovative design that makes the building act as an integrated body to gain its sustainability.

As one of the jurors of both competitions, the author has the advantage of comparing the results of both competitions. Some of the immediate findings are:

1. In both competitions, students used computer graphical technology extensively. They produced attractive designs and presentations.
2. The 2012 competition, being mainly dedicated to sustainable architecture, showed more explicit sustainability values than the 2013 competition.
3. In both competitions, qualitative design approach of sustainable architecture was dominant. Only one entrant involved computer environment simulation in its design development process.
4. Students shared common interpretations of sustainable architecture such as adopting natural ventilation and lighting, and using solar cell and wind turbine.
5. Sense of informality and relaxed atmospherewere dominant since the participants were not asked to submit detailed drawings.

TABLE I
ENTRANTS GROUP ACCORDING TO PARAMETEROF SUSTAINABILITY

Parameter groups	2012competition – 15 entrants (A)	2013 competition– 42 entrants (B)	57 entrants (A + B)
1	14 (93.3%)	38(90.5%)	52 (91.2%)
2	12 (80.0%)	6 (14.3%)	18 (31.6%)
3	5 (30.3%)	2 (4.8%)	7 (12.3%)

VI. DISCUSSION

As it had been expected, almost all entrants (students), 91.2%, tried to adopt popular sustainable architecture parameters. Most of them merely adopted sustainable concepts generally found in textbooks. Some others, 31.6%) were more ambitious by putting everything they imagine as sustainable design elements in their design. Even though this phenomenon gave a positive sign about the students' awareness of current environment problems and how they offered solutions, it does not prove that their design will work as they expected. Failure to respond to the warm humid tropical climate of Indonesia is one of the doubts whether students really understand their concepts. Examples of the negative signs are ignorance of shading and heavy rain. Moreover, the lack of quantitative evidences made it difficult to judge the effectiveness of the designs.

No participant applied innovative technology that can support sustainable architecture. This phenomenon is interesting since there are many technologies that can support sustainable architecture such as light tube and smart glass. Those kinds of technologies can be found easily and freely in the Internet. Moreover, participants did not seem to explore state of the art sustainable architecture technology such as neuromorphic architecture [ ] and surfaces containing artificial 'cells' that absorb carbon dioxide which can make buildings greener [ ].Students did not explicitly link their design to scientific based reasoning such as their selection to particular building shape which will affect energy performance [ ] or their selection to location and orientation which may influence CO2 emission [ ]. However, 12.3% students managed to introduce unique solution though it is not backed up by scientific reference.

With the current critical environment problems, sustainable architecture movement should be taken seriously. The fact that students used qualitative descriptions without being backed up by reasonable quantitative analysis showed that they cannot guarantee that their design will work. This shows that students take the environment issues lightly. In fact, environmental ethics and morality should be played in design[ ]. In 2013 competition, only 20% participants explicitly mentioned common sustainable factors such as recycled materials, natural ventilation and lighting, and greenery. Thus, sustainable architecture principles do not seem to be compulsory design factors yet.

Greenery seems to be a popular trend. Around 80% participants adopted greenery in various forms such as green roof, vertical garden, urban farming, hanging garden, and ceiling garden. Greenery seems to be considered as a dominant part of sustainability. The understanding of greenroof application in Indonesia and its contribution to sustainability might have been easier through popular publications such as one written by Feriadi [ ].

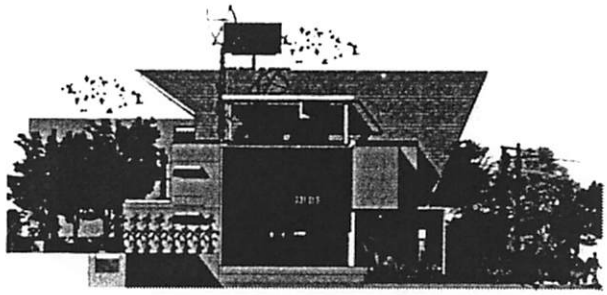
VII. CONCLUSION

A review through two architecture competitions' documents shows that entrants (students) know and are able to apply popular sustainable architecture principles such as adopting natural ventilation and lighting, using recycle materials and applying more greenery including greenroof. However, there is no indication that they will voluntarily apply sustainable principles in all their designs. They use qualitative approaches to sustainable design instead of quantitative ones which makes their design's sustainable performance less reliable. Students understand that sustainable architecture is not only about building for human being but also about gaining balancedinterrelationship between human, animals and plants. Sustainable architecture is about blending architecture with nature which is expressed obviously by extensive use of greenery.

TABLE II
2012 COMPETITION

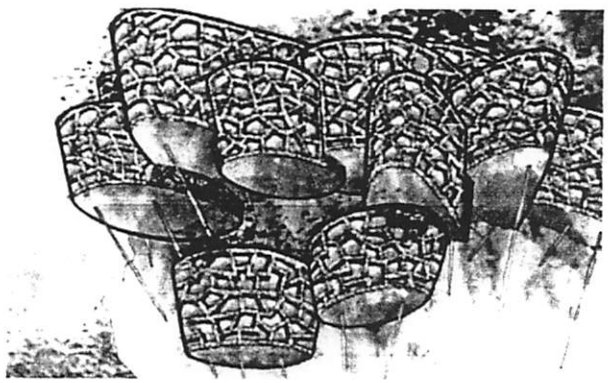
First prize Gita Surya Wardhani and Vincentius Sarbudi Prasetya: Nest for Rest.

Features: Detailed approach to biodiversity (plants, animals and human), cell for urban farming (tomato, rambutan, pawpaw, sunflower, marquise, carrot, grapes, corns, water kangkung, paddy), ponds for ducks and fish, bring back food chain to urban environment, solar cell, wind turbine, rain water storage tank, micro-hydro generator at close by river, recycled materials (aluminum, mineral water bottles, tank, timber, ceramic tiles), natural ventilation and lighting, black and grey water treatment (for garden watering), bio-septic tank, bio-pores, green roof, breathing walls, vertical garden (west wall shading), garden for sansiviera, lavender, etc., nests for wild birds, deciduous trees to attract wild life (insects, etc.).



Second prize Titus Pandu Wismahaksi: Grip the Nature.

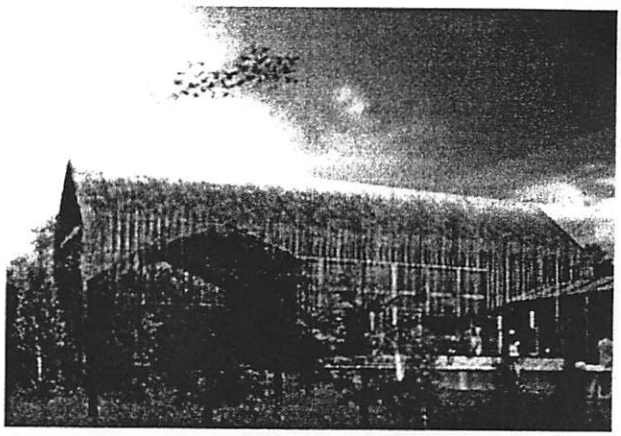
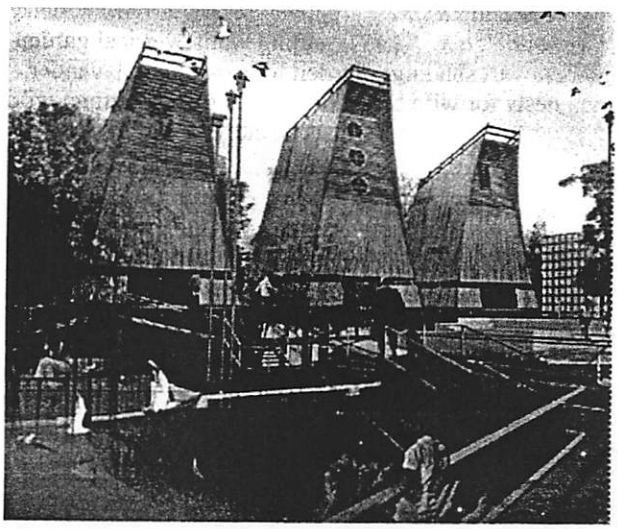
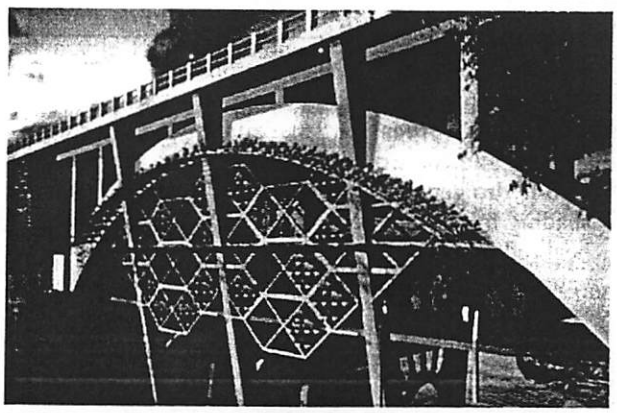
Features: greening non fertile earth, provide places for wild life, photovoltaic, bio fuel, vertical gardens, roof garden for food and bio water purification, rain water storage tank, natural ventilation and lighting.



Third prize Victor Setiawan, Alfonsius Anggi and Alexander Dhea: Adaptation House.

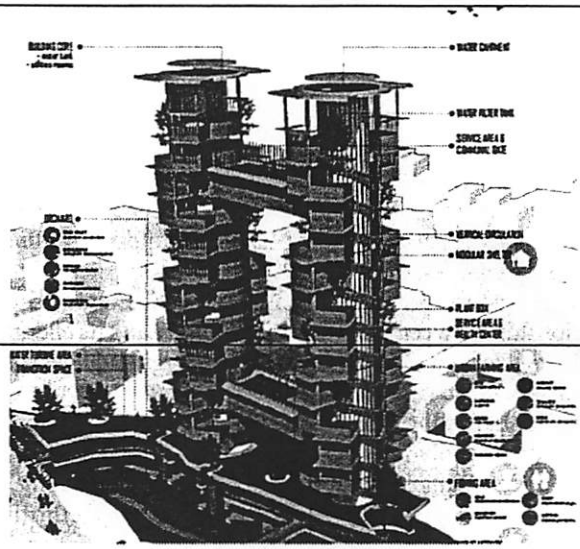
Features: environmentally responsive (adaptive), follows greenship criteria (Indonesia), site development (green roof, vertical garden, ceiling garden), energy efficiency and conservation (photovoltaic, wind turbine, micro-hydro generator, natural ventilation and lighting, shading from plants, cooling from water pond, solar heat reduction from water tank, rotatable windows), materials from places less than 50 km away (new and recycled, including coconut shells, coconut wood, laminated bamboos,), bio-septic tank, site a connection place for animals, plants and human. Human isolated space is limited.

TABLE III
2013 COMPETITION

First prize Akbar Hantar R.: Bridge Sanctuary. Features: utilizing unused spaces under an existing bridge for the homeless, sustainable (functionally) modular capsules for rooms, helping clean river program, productive spaces for the homeless, the road as rainwater collector, bio water purification, natural ventilation and lighting.	
Second prize Robert Simbolon and M. Fadhillah: Kampung Merdeka Tunawisma. Features: verticulture and agriculture with organic fertilizer, fish pond, natural ventilation and lighting, natural building materials (coconut wood, bales).	
Third prize Vincentius Sarbudi and I Komang Suryana: Stage of Breath) Features: elevated floors, bamboos as shadings, garden for biodiversity, natural ventilation and lighting.	
Jonathan, Essi, Pandu: Satata Gama Karta Raharja. Features: utilizing unused spaces at and around an existing bridge, rainwater harvesting, micro-hydro generator, biogas, waste disposal treatment (from river), vertical garden, natural ventilation and lighting, recycle materials (bottle, timber)	

Alfonsus Anggi: Homeless High

Features: land efficient, urban farming (extensive use of hanging garden), rainwater harvesting with bio filter, modular shelter, micro hydro generator, natural ventilation and lighting, biogas, greenroof



Amalia Devitasari, Hikmatyar Abdul Aziz, Muh Satya: Empowerment House

Features: Roofgarden

ACKNOWLEDGMENT

This paper has been based on the review to two architecture competitions' documents provided by students of Department of Architecture, Atma Jaya Yogyakarta University.

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