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NZAAR International Event Series on

NATURAL and BUILT ENVIRONMENT, CITIES, SUSTAINABILITY and ADVANCED ENGINEERING

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NZAAR KEYNOTE SPEAKERS



Ir Ahmad Izdihar Supaat

President

Malaysia Green Building Confederation (MGBC)



Keynote Speaker 1: Ir Ahmad Izdihar Supaat,
Malaysia Green Building Confederation (MGBC),
Malaysia

Title: Official Opening & Introductory to Sustainability Practices



Prof. Dr.-Ing. Horst Kreimes

Professor

Hochschule Rosenheim, Germany



Keynote Speaker 2: Prof. Dr.-Ing. Horst Kreimes,
University of Applied Sciences Rosenheim, Germany

Title: “From biomass to electricity and heat/chill – three different generation ways”



Prof. Dr. John Tookey (Virtual)

Professor & Head of Built Environment Department

AUT University, Auckland, New Zealand



Keynote Speaker 3: Prof. Dr. John Tookey,
AUT University, New Zealand

Title: Construction Industry in New Zealand and Sustainability Challenges



Engr. Gregers Reimann
Managing Director
IEN Consultants Sdn Bhd, KL, Malaysia



Keynote Speaker 4: Engr. Gregers Reimann, IEN Consultants Sdn Bhd, Malaysia
Title: Reclaiming the Streets



Prof. Dr. Nik Meriam Sulaiman
Professor & Former Sustainability Cluster Dean
University of Malaya (UM), KL, Malaysia



Keynote Speaker 5: Prof. Dr. Nik Meriam Nik Sulaiman, University of Malaya, Malaysia
Title: Urban Sustainability Challenges – The Nexus Approach



Engr. Masoud Moinfar
Managing Director
Fenestra Malaysia Sdn Bhd, KL, Malaysia



Keynote Speaker 6: Engr. Masoud Moinfar, Fenestra Malaysia Sdn Bhd, Malaysia
Title: Sustainability of Sustainability in Malaysia



Dr. Husam AlWaer (Virtual)
Senior Lecturer & CECHR Associate Director
University of Dundee, Dundee, UK



Keynote Speaker 7: Dr. Husam AlWaer, University of Dundee, UK
Title: Helping Places Address Change and Uncertainty: Experience from Europe

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TABLE OF CONTENT

NZAAR INTERNATIONAL EVENT SERIES ON NATURAL AND BUILT ENVIRONMENT, CITIES, SUSTAINABILITY AND ADVANCED ENGINEERING

Encompassing

ALBE 2016	<i>International Conference on Architecture, Landscape & Built Environment</i>
CEASCM 2016	<i>International Conference on Civil Engineering, Advanced Structures & Construction Management</i>
EERE 2016	<i>International Conference on Environmental Engineering & Renewable Energy</i>
GCS 2016	<i>International Conference on Geography, Climate & Sustainability</i>
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PAPER ID	PAPER TITLE & AUTHORS	PAGES	TARGET CONFERENCE
NZAAR-ALBE-16-01	HYBRID WATCH USING INTERNET OF THINGS Madhumithaa S R*, Balamurugan V T, Deepa R & Rajasekar L	1-2	ALBE 2016
NZAAR-ALBE-16-03	VIRTUAL AND PHYSICAL ARCHITECTURAL ATMOSPHERE Anders Hermund* & Lars Simon Klint	3-4	ALBE 2016
NZAAR-ALBE-16-05	SCREEN DESIGN AND APPLICATIONS FOR SUSTAINABLE BUILDINGS Fida Isam AbdulHafiz* & Mohamed El Amrousi	5-10	ALBE 2016
NZAAR-ALBE-16-08	REVIEW ON SUSTAINABLE AND INNOVATIVE APPROACH TOWARDS MOSQUE DESIGN IN CONTEMPORARY WORLD Nangkula Utaberta*, Nayeem Asif	11-15	ALBE 2016
NZAAR-ALBE-16-14	STRATEGIES FOR MAKING NEW ZEALAND'S EXISTING BUILDINGS ENERGY EFFICIENT IN THE WARMER CLIMATE Wei Chen*	16-18	ALBE 2016
NZAAR-ALBE-16-15	A BIM-BASED FRAMEWORK TO DEAL WITH PARTICULAR CLAIM BEFORE CONSTRUCTION STAGE Yang Yu*	19-21	ALBE 2016
NZAAR-ALBE-16-39	INTERNAL AND EXTERNAL COST OF SPANISH MOSSES AS GREEN ROOF WITH ZERO MAINTENANCE IN HOT AND HUMID CLIMATE Tachaya Sangkakool* & Kuaanan Techato	22-23	ALBE 2016
NZAAR-ALBE-16-46	ARE YOU EXPERIENCED? METHODS OF MAPPING BEHAVIOUR AND EXPERIENCE IN TRANSACTIONAL ENVIRONMENTS Stephen Anderson*	24-30	ALBE 2016
NZAAR-ALBE-16-50	ANALYSIS ON THE FACTORS AFFECTING COMMUNITY ATTACHMENT OF RESIDENTS LIVING IN RESIDENTIAL ENVIRONMENTS FOLLOWING URBAN REGENERATION Mun Young A, Su Jungah*, Lim Donghyun & Kim Honggyu	31-32	ALBE 2016

NZAAR-ALBE-16-75	VERTICAL MONUMENT VERSUS HORIZONTAL LANDSCAPE COMPARISON OF CHINESE AND WESTERN CONTEMPORARY MEMORIAL Li Zhang*	33-44	ALBE 2016
NZAAR-ALBE-16-87	PREFERRED TEMPERATURE IN AN AIR-CONDITIONED BUILDING: A CLIMATE CHAMBER EXPERIMENT Nur Dalilah Dahlan*	45-47	ALBE 2016
NZAAR-ALBE-16-88	CULTURAL SUSTAINABILITY IN ARCHITECTURE Aiswarya Shylaja Baburaj*	48-54	ALBE 2016
NZAAR-ALBE-16-93	INTELLIGENT ALIVE ARCHITECTURE WITH BIOLOGICAL APPROACH TO DYNAMIC DESIGN, ROLE OF COMPUTATION AND PARAMETRIC TECHNIQUES AS SMART WAYS OF CONTROLLING ARCHITECTURE Mahdiar Ghaffarianhoseini*& Roxane Fallah	55-56	ALBE 2016
NZAAR-ALBE-16-94	THE ESSENCE OF PROMOTING GREEN ROOFS FOR BUILDING COOLING ENERGY REDUCTION IN NEW ZEALAND Farnaz Sheikh*	57-58	ALBE 2016
NZAAR-ALBE-16-95	PARAMETRIC ANALYSIS OF THE THERMAL COMFORT CONDITIONS OF UNSHADED COURTYARDS IN THE TROPICAL CONTEXT OF KUALA LUMPUR Pegah Maroofee*, Amirhosein Ghaffarianhoseini, Norhaslina Hassan	59	ALBE 2016
NZAAR-ALBE-16-96	THE ROLE OF GREEN ROOFS TOWARDS ENHANCING THE VISUAL APPEARANCE OF URBAN NEIGHBORHOODS Ziba Kazemi & Amirhosein Ghaffarianhoseini*	60-62	ALBE 2016
NZAAR-CEASCM-16-16	RELEVANCY MEASURES OF ERRORS IN DISPLACEMENTS OF FINITE ELEMENTS ANALYSIS RESULTS A.B. Bolkhir* & T. K. Yousif	63-71	CEASCM 2016
NZAAR-CEASCM-16-68	EFFECT OF DIFFERENT MIXING WATER ON COMPRESSIVE STRENGTH OF CONCRETE Salmaliza Salleh* & Amithira Subramaniam	72-76	CEASCM 2016
NZAAR-CEASCM-16-69	PRODUCTION OF HIGH STRENGTH CONCRETE BY PARTIAL REPLACEMENT OF FINE AGGREGATES WITH RECYCLED GLASS Salmaliza Salleh* & Mohammad Arshad Hossany	77-85	CEASCM 2016
NZAAR-CEASCM-16-70	EFFECT OF USING COPPER SLAG AS A SAND REPLACEMENT IN MORTAR Salmaliza Salleh* & Umanee Dasan Dayananda	86-89	CEASCM 2016
NZAAR-CEASCM-16-91	GEOTECHNICAL STABILITY OF GABION WALLS Chandr Toshani Rampat*	90-98	CEASCM 2016

NZAAR-EERE-16-20	INVESTIGATION ON WIND ENERGY POTENTIAL WITH OMNI-DIRECTION-GUIDE-VANE (ODGV) IN MEIKTILA, THE REPUBLIC OF UNION OF MYANMAR Thandar Nwe*, Chong Wen Tong & Ong Hwai Chyuan	99-101	EERE 2016
NZAAR-EERE-16-42	THE EFFECT OF TEMPERATURE AND GAS/LIQUID RATIO ON CO₂ REMOVAL PERFORMANCE BY WATER- BASED NANO-BUBBLE PROCESS Jirayu Kanlaya ^{1*} , Navadol Laosiripojana ¹ , Nutthachai Pongprasert ² , Varit Srilaong ²	102-103	EERE 2016
NZAAR-EERE-16-43	TREATED TRANSPARENT CONDUCTING FILMS FOR FULL FLEXIBLE ELECTROCHROMIC DEVICES Kanyanee Sanglee ^{1,2} , Surawut Chuangchote ^{1,2,*} , Pipat Chaiwiwatworakul ^{1,2} & Pisist Kumnorkaew ³	104-105	EERE 2016
NZAAR-EERE-16-45	OPTIMIZATION OF LIGNIN SEPARATION PROCESS FROM BLACK LIQUOR USING STRONG ACIDS AND SUPERCRITICAL CO₂ Natthatida Kunwong ^{1*} , Navadol Laosiripojana ¹ & Verawat Champreda ²	106-107	EERE 2016
NZAAR-GCS-16-22	INTERSTATE WATER RESOURCE RISK MANAGEMENT: TOWARDS A SUSTAINABLE FUTURE FOR TRANSBOUNDARY RIVER BASINS OF CENTRAL ASIA Parviz Normatov, Abulqosim Muminov & Inom Normatov*	108-115	GCS 2016
NZAAR-GCS-16-71	SELF ORGANIZING NEURAL NETWORK: A METHOD FOR FEATURE ANALYSIS OF LANDS Amir Houshang Ehsani*	116-119	GCS 2016
NZAAR-GCS-16-76	THE EFFECT OF SELF-ESTEEM AND SOCIAL RESPONSIBLE CLAIMS ON GENERATION Y CONSUMERS' PERCEPTIONS ABOUT COFFEE BEAN PRODUCTS Yun-Ting Zeng*	120-121	GCS 2016
NZAAR-GCS-16-78	A STUDY ON SUSTAINABLE JOURNALISM PRACTICE FOR SUSTAINABLE DEVELOPMENT IN MALAYSIA Ihediwa Samuel Chibundu*	122-125	GCS 2016
NZAAR-UDCP-16-02	EXAMINING THE THERMAL PERFORMANCE CHARACTERISTICS OF OUTDOOR SPACES IN THE TROPICAL CONTEXT OF KUALA LUMPUR Amirhosein Ghaffarianhoseini*, Umberto Berardi, Ali Ghaffarianhoseini, John Tookey	126	UDCP 2016
NZAAR-UDCP-16-24	A COMPREHENSIVE APPROACH TO THE ASSESSMENT OF VISUAL CONSISTENCY IN TOWNSCAPE Dheyaa Hussein* & Peter Armstrong	127-129	UDCP 2016
NZAAR-UDCP-16-25	A STUDY ON THE APPLICATION OF CRIME PREVENTION THROUGH SMART ENVIRONMENTAL DESIGN FOR THE CULTURAL PROPERTIES CONSERVATION AND PROMOTION JeongYeon Cho*, Kwanyoung Yoon, YongHee Kim & JeaSun Lee	130-133	UDCP 2016

NZAAR-UDCP-16-27	LAND RIGHTS IN CRISIS: FINDINGS AND LESSONS FROM IRAQ Laith Hady Alossmi ^{1,2*} & Vian Ahmed ²	134-140	UDCP 2016
NZAAR-UDCP-16-28	STUDY ON THE PHENOMENON AND FEATURES OF ANCIENT CHINESE CITIES AND ARCHITECTURES AFFECTED BY THE TRADITIONAL CONCEPT OF TIME AND SPACE Liangwa Cai* & Peng Zeng	141-142	UDCP 2016
NZAAR-UDCP-16-33	ANALYSIS ON ELEMENTS IN PEDESTRIAN ENVIRONMENTS TO REVITALIZE THE COMMERCIAL STREET Soeun Kim*, Seungjoon Yoo, Noory Han & Jeasun Lee	143-144	UDCP 2016
NZAAR-UDCP-16-36	STUDENTS PERCEPTION ON SUSTAINABLE IN CREATING ECO CITY LIVING COMMUNITY: CASE STUDY AT BANDAR CASSIA, BATU KAWAN, PENANG, MALAYSIA Wan Noor Anira Hj Wan Ali @ Yaacob*, Nadiyah Mat Nayan & Siti Syamimi Omar	145-151	UDCP 2016
NZAAR-UDCP-16-52	A COMPARATIVE ANALYSIS OF PERIOD DETERMINANTS IN NEWTOWN PROJECT AND HOUSING REDEVELOPMENT PROJECT OF SEOUL Yongjoo Seo, Song Seo Young*, Yun Young Kun & Hong-Kyu Kim	152-153	UDCP 2016
NZAAR-UDCP-16-53	URBAN CONTEXT OF CHURCH ARCHITECTURE & SPATIAL RECONFIGURATION AIMED FOR IMPROVING UTILITY IN USING ARCHITECTURAL SPACE Park Seungbae, Oh Sangjoon*, Yeo Jangkwon & Kim Hongkyu	154-155	UDCP 2016
NZAAR-UDCP-16-54	REPURPOSING UNDERUTILISED SPACE AS PUBLIC SPACE IN BANDUNG: LEARNING FROM LONDON BOROUGH REDESIGNING STUDY Tika Savitri Deddy Hasan ST, Denny Zulkaidi	156-167	UDCP 2016
NZAAR-UDCP-16-60	ASSESSMENT OF EGYPTIAN NEIGHBORHOOD SPATIAL CONFIGURATIONS AFTER THE REVOLUTION, USING SPACE SYNTAX THEORIES Sherine Shafiq & Ann Reda Helmy*	168-171	UDCP 2016
NZAAR-UDCP-16-63	AN ARCHITECTURAL-MORPHOLOGICAL ANALYSIS OF THE MUGHAL GARDENS OF THE 16TH AND 17TH CENTURIES: ENGAGING CULTURAL FORMS AS STRATEGIES FOR PASSIVE DESIGN FOR URBAN SUSTAINABILITY Nurul Syala Abdul Latip ^{1*} , Puteri Shireen Jahn Kassim ¹ , Mustaffa Kamal Bashar Mohd Fauzi ¹ , Shaukat Mahmood ²	172-180	UDCP 2016
NZAAR-UDCP-16-86	A NEW APPROACH TO URBAN HEAT ISLAND ASSESSMENT IN THE CONTEXT OF GREATER KUALA LUMPUR Logaraj Ramakreshnan ^{1,2*} , Nasrin Aghamohammadi ² & Amirhosein Ghaffarianhoseini ³	181-183	UDCP 2016
NZAAR-UDCP-16-89	AN ASSESSMENT OF TRAINING AND PROGRAM PRACTICES IN ADOPTION OF HYDROGEN FUEL CELL VEHICLES (HFCV) IN MALAYSIA: A STUDY IN BANGI INDUSTRIAL AREA, BANGI, SELANGOR Rusinah Siron ^{1*} , Tan Kwe Lu ² & Mohd Amin Tasripan ³	184-190	UDCP 2016

HYBRID WATCH USING INTERNET OF THINGS

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Abstract

Internet-of-Things (IoT) is the expansion of internet services. Uses of new technologies in IoT environment are increasing rapidly. The approach starts from the insight of smart-watches for taking care of personal health and smart homes are those where household devices/home appliances could monitor and control remotely. When these household devices in smart homes connect with the internet using proper network architecture and standard protocols, the whole system is called as Smart Home in IoT environment or IoT based Smart Homes. If the web affiliation is down, the embedded system board manages and operates the appliances domestically. In this paper, the integration of smart watch and smart home is done with help of IoT, its called hybrid watch.

Keywords: Hybrid Watch, Internet of Things (IoT), Smart Home, Healthcare

1. Introduction

Today, technology has become an integrated part of people's lives. It influences in many aspects of daily life and has allowed better social interaction, ease of transportation, the ability to indulge in entertainment and in media and it has helped in the development in medical field and automation. The Internet might even be utilized in home automation that offers several decisions from economical use of energy to additional console, protection and safety [1]. Even over great distances the user monitors and manages their various home appliances and turn on/off the T.V without any human intervention. Despite these advantages, home automation has however received extensive approval and an attention owing to its high significance and complexness. Hybrid watches are about to extend the scope of support for people, who want to stay in their familiar home in a safe and self-determined way, as long as this is justified by medical reasons [2]. In addition to usual diseases, the health of people is threatened in multiple ways:

1. By tumbles
2. Getting lost during an absence from home

3. Dehydration due to insufficient liquid ingestion

In these situations, a suitable Hybrid-watch developed to provide effective assistance in the home and health care.

2. Literature Review

This paper summarized enabling technologies developed over the past decade and put a great deal of emphasis on surveying studies focused on the deployment of wearable sensors and systems in the context of a concrete clinical applications, with main focus on rehabilitation [1]. In this paper optimizing the care model and by improving the access to significant patient health information [2]. The implementation of the smart home application and of the physical prototype based on the Link Smart Internet of Things framework has satisfied the development requirements and eased the development process as a whole [4]. IoT based smart home controlling using GSM and web interface. Prototype operates for data gathering and transmission using GSM-SMS [5]. Prototype is capable of monitoring and controlling the devices in the deployed environment [6].

3. Research Methods

The research method covers elaboration of the conceptual framework, research design, utilized method, analytic approaches and validation phases. In present scenario, hybrid watches have almost all the features which are very much important in a daily routine basis. We have so many features similar to smart phones such as call forwarding, messaging, browsing etc. In addition we have introduced a new innovation which compromises health condition of a person and automatic control of home appliances. Earlier these were performed by the aid of certain features available in smart phones which could be transmitted to the watch for further performance. When it comes to healthcare each and every individual is very conscious. In the present prototype that we have designed the PIC Microcontroller collects information of a person's heartbeat and temperature and transmits it to gateway through the GSM. After this process the information is carried to the cloud through message queue telemetry transfer protocol (MQTT) and this is then further moved to the doctor's clinic. So, this feature invariably monitors person's health condition disregarding all other factors. The next innovation is that controlling home appliances in the same hybrid watch using IoT. The measurement of the intensity of the light using LDR sensor and by the temperature, the collected information is sent to the GSM which is further transmitted to the PIC micro controller. This provides a digital feedback in the hybrid watch and the relay control every appliance in the home.

4. Discussion and Conclusion

The ultimate outcome of the study is the promising potential of a hybrid watch is to monitor patients health and automatic control of home appliances. The wireless communication protocol has security problems that could be solved and additional features like an alert notification system, GPS functionality, and a local

database with limited access could be implemented as part of a future certified/standard hybrid watch.

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VIRTUAL AND PHYSICAL ARCHITECTURAL ATMOSPHERE

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Abstract

This study, of the similarities between the perception of architectural space experienced in physical space conditions and in Virtual Reality, intends to clarify to what extend subjective and objective attributes of architectural space can be conveyed through a direct use of Building Information Models in Virtual Reality. 60 test persons experienced a specific test space as either a physical or a virtual environment, while data from their experiences was collected through a quantitative/qualitative questionnaire. The overall conclusion, from this phase of the study, is that even a simple BIM model through HMD VR can convey rather precise information about both subjective and objective experiences of architectural space, ambience and atmosphere. Next phase of the study will include eye-tracking data from the two scenarios.

Keywords: *Perception of Space, Virtual Reality, Head Mounted Display, BIM, Architectural Design.*

1. Introduction

This extended abstract introduces a study of the similarities between the perception of architectural space experienced in “normal” physical space conditions (A) and experienced using Virtual Reality (VR) Head Mounted Display (HMD) technology (B). The examination intends to clarify to what extend subjective and objective attributes of architectural space can be conveyed through a direct use of VR Building Information Modeling (BIM) models. A self-chosen constraint in the experiment dictates that the VR model loads directly from the modelling software to the viewer software without need of conversion through other software. The importance of this, relates to the limitations of time and money in the early architectural design phase, that for the present simply makes the creation of a photorealistic VR environment, as seen e.g. in the gaming industry, unfeasible. The next step in the study will be to include recorded eye tracking data, analyze it, and map it to these results.

2. Literature Review

Leyrer et al. [1] concludes that when designing and creating virtual

environments in which the perception of spatial layout is important, eye height as well as a self-representing avatar should be taken into account to produce the desired perception. While good studies on distance measurement in VR exist [2], the study of architectural space or its ambience in VR have not to our knowledge been carried out before, in similar tests. Mikael Johansson et al. [3] have analyzed existing viewers and developed a prototype VR BIM viewer that we have been able to use in our experiment’s virtual scenario.

3. Research Methods

The experiment was set up using an auditorium at the Royal Danish School of Architecture as the physical location (A) and a BIM model of the same auditorium as the virtual location (B). In the situation A, we define the “normal condition” as a situation where a test person is experiencing a specified existing physical architectural space.

In the situation B, the same architectural space, is presented to the test person through the HMD VR technology Oculus Rift, using a 3D digital architectural building information model. We use a

quantitative/qualitative interview matrix to assess to what extent the perception of space through VR technology holds similarities to the experience under normal, or close to normal, circumstances. In each scenario were used the same two specific locations (using the test person's correct eye-height in the viewer). Here the test persons were asked questions about their perception of the space they were in. First they were asked to describe their experience of the atmosphere of the room with three words, and the experience of the height of the room with one word. Afterwards they were asked 17 questions answerable on a scale from 1-7, and three questions about estimation of depth, width, and height of the room. These questions addressed four different areas of architectural perception: The space itself, lighting, sensation & estimation, and materials. The matrix questionnaire is inspired by C. Melhuish's definition of corpothetics [4] and S. Zeki's work on micro-/macro-consciousness [5]. The results from the two scenarios provided the dataset for comparing the physical and the virtual experience of the room. We used 60 students for the test: 30 for each scenario.

4. Discussion and Conclusion

The result of the study shows high similarity between the two scenarios with a difference of less than 1% in 11 of the 20 questions, 1-2% in 4 of the questions, 2-3% in 2 of the questions. Only three questions had a difference higher than 3 %; respectively 3.4%, 4.1%, and 5.2%. The latter, highest difference, relates to a question about perception of the quality of the materials in the room. This was expected, since this particular quality is presumed difficult to provide through VR vision only. The results related to both lighting and feeling well and safe in the room hold, more surprisingly, a difference below 1%, even though the virtual model did not provide accurate light or any shadows. The results from the open questions about the experience of the

atmosphere in the room are surprisingly close when compared. Thus, the top three of freely chosen words describing the atmosphere in the two scenarios, out of 90 words describing each scenario, were respectively: Bright (67%), Quiet (33%), Open (27%) in the physical and Bright (50%), Open (30%), Empty (17%) in the virtual. The term 'quiet' makes sense in the physical environment, while the VR did not include any audial stimuli. The overall conclusion, from this phase of the study, is that even a simple BIM model through HMD VR can convey rather precise information about both subjective and objective experiences of architectural space, ambience and atmosphere.

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SCREEN DESIGN AND APPLICATIONS FOR SUSTAINABLE BUILDINGS

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Abstract

Traditional vernacular architecture in the United Arab Emirates constituted namely of adobe houses with a limited number of openings in their facades. The thick mud and rubble walls and wooden window screens protected its inhabitants from the harsh desert climate and provided them with privacy and fulfilled their comfort zone needs to an extent. After the rapid increase in reinforced concrete villas with glass and steel fenestration that replaced traditional vernacular dwellings. There is a need to revisit regional architecture and precedent building traditions in order to resolve the increase in carbon footprint per/capita in the UAE. The focus of this paper is on reducing the dependency of mechanical cooling systems through the design of different types of façade screens and shading devices, and to develop awareness to Architecture students to culture through the production of patterns for traditional screens and how they can contribute to climate and privacy requirements in the Middle East region. This paper highlights the importance of hands on education for student architects and how physical modelling helped improve their understanding of Sustainable design.

Keywords: *Building Screens, Façade Design, Sustainability, Environmental design.*

1. Introduction

Traditional vernacular architecture in the United Arab Emirates developed to reflect tribal Bedouin cultural values such as privacy, in addition to climate responsive forms. Sustainability in the pre-petroleum era is manifested by vernacular dwellings that were founded on local/available building materials in each region with adobe courtyard houses with wind towers-*barjeel* as a predominant prototype. The urge for privacy stipulated façade solid to void ratios resulting in mostly solid exterior facades with small highly located fenestration units covered in perforated window screens. Al-Bidyah mosque in Fujairah (Figure 1) with its thick walls creating a thermal mass, stepped domes and stucco windows is a good example of the practicality of the Bedouin community and the importance of human scale reflected in their built heritage. The lack of monumentality in the oldest mosque in the UAE (1480-1680AD) exemplifies how tribal communities used sustainable materials and were conscious of design techniques that responded to hot arid climatic conditions. Al-Bidyah mosque

exemplifies the importance of orientation integration of regional vernacular expression to site context.



Figure 1. Al-Bidyah Mosque Fujairah

Traditional architecture in the UAE highlights the different masonry techniques that availed and how they inherently reflected thermal and visual comfort in addition to their integration to the surrounding urban context. Another form of local building typology was the *Arish* or *Barasti* huts that are palm frond shelters created to allow for ventilation during the hot summer months. These developed a rectangular form with flat roofs, or triangular tent-like structures created by

split-palm trunks and palm fronds that allowed for an infiltration of light and air. (Figure 2) As outlined by Sandra Piesik today in the rapid era of globalization not too many craftsmen remain that have the knowledge to work with traditional materials such as coral stone and palm fronts. [1]



Figure 2. Arish hut and adobe architecture Al-Ain city, Abu Dhabi.

Traditional adobe urban enclaves in the UAE developed climate responsive patterns in the form of the *Fareej* in Abu Dhabi that evolved as result of the interaction between different tribal families to create a neighborhood shaped by adobe courtyard houses and *Arish* huts. Narrow shaded corridors known as *Sikka* opened to local squares known as *baraha* where communal activities took place. The *Fareej* offered a well-recognized arrangement of adobe architecture with perforated screens that evolved to control the harsh solar radiation without compromising the aesthetic quality of the space and the occupants' well-being. Shade was an important factor that was obtained by architectural elements such as desert landscape/palm and supplementary plants in addition to *liwans* which were local loggias that reduced the effect of the direct sunlight on the walls of the buildings.

Today UAE cities have changed dramatically to reflect the monumentality of modernity and the effect of the global economy on the building industry as high-rise concrete and glass towers overshadow traditional building traditions and reshape the city skyline. It is therefore instrumental to educate the new generation of architects to the importance of the carbon footprint caused by modern building stocks, and to develop innovative approaches dedicated to reducing the impact of modernity on its surrounding environment. The Brundtland Report for the World Commission on Environment and Development (1987). [2] highlights that Sustainability is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Therefore reducing the dependency on mechanical systems, and control of climatic conditions through passive strategies is important. [3]

The Abu Dhabi Vision 2030, is planning to implement a series of comprehensive development strategies, the region will transform over the next 20 years, as part of the Economic Vision 2030 which has a Structural Framework Plan, supervised by the Urban Planning Council (UPC). In Abu Dhabi, shading is required throughout the year. As a result, the general rule is to protect all facades from excessive amount of solar radiation. In summer, north and south facades get only limited solar radiation due to the high sun altitude at noon time. In winter, the sun rises in the South East hence, South facades need to get shading by horizontal louvers. East and west facades receive a high portion of solar radiation at low sun angles; hence, flexible shading design is essential to reduce the heat gain. Estidama guidelines seek to mitigate the negative impacts of thermal heat gain through comprehensive systems of shade and ventilation. [4] Such guidelines such as design using shading screens, passive design, and renewable energy sources are essential for future

architects. Therefore it was highlighted to students during the learning process, throughout the course of the semester to think not only about the current needs of people, but also to study the building codes in stipulated by Abu Dhabi UPC such as Estidama and LEED.

2. Literature Review

In the architecture of traditional Emirati houses traditional Wind towers *barjeel*, and courtyard houses created stack cooling effects that could reduce the dependency on mechanical cooling systems. Examples of vernacular architecture in the Gulf are in contrast to modern villas since traditional architecture had facades a wide use of screening devices such as *Claustra* screens that helped the transition from traditional to modern architecture. Screens in this in-between style that transitions from tradition to modernity the control the direct high-intensity of sunlight allowed a uniform distribution of air flow. [5] Traditional dwellings of the UAE such as the residence of Sheikh Zayed in Al-Ain (Figure 3) demonstrate the essence of sustainable design through the use of screens, shaded colonnaded corridors *liwan* and adobe construction techniques to create private spaces that conformed to particular cultural norms and communal needs such as the flexibility to expand in order to house the extended family throughout time and space. [6] The study of screens based on precedents proved to be a popular technique that helped students understand the importance of sustainable design and passive cooling. After creating models of prototype screens, several tests were conducted to calculate the amount of Sun, light and wind that goes through the screens affecting the heat load and light entering the building. Students understood that sun angles differed during summer when they may be a need to screen against both heat and glare, whilst during winter there will be a need to open up the building. Traditional dwellings such as the Sheikh Zayed residence in Al-Ain are good

design precedents for students since they include *liwans* that circumambulated the building and acted as a loggia that covered the outdoor sitting areas in addition to its climate function of passive cooling and creating of a cool air draft between spaces.

In environmental design choices are often made in relation to the local conditions, so that the facade not only creates the room behind but also constitutes an important element in the control of the room's climate and light levels. Unscreened sunlight can heat a room to an extent where it is not comfortable to stay in it. [7] This means that buildings are often designed with loggias, or porticos which create shaded areas at the building perimeter. Building facades need to be designed to accommodate climatic variation and to create comfort zones using screens that define the spaces adopted from traditional architectural elements such as *liwans*.



Figure 3. Sheikh Zayed House Al Ain

Comparable vernacular typologies are also found in Al-Hiba village in Morocco, which proved useful as an example to teach students about the advantages and disadvantages of Adobe architecture. Especially that the UAE is currently investing in the preservation of adobe vernacular heritage in Morocco. Masdar, the Abu Dhabi renewable energy company, has completed the installation of 9,000 solar home systems Morocco as part of a scheme to advocate renewable energy. It also exemplifies the cross-national

interests in preservation and conservation of environmental architecture from the pre-industrial era. El-Hiba exemplifies an intact urban fabric and living community within traditional courtyard houses. It also represents the dissemination of regional design and building techniques to adapt to climatic context. Similar to the *Fareej* the streets of Al-Hiba village are very narrow to create shade and act as cool air tunnels. Houses densely clustered reflected the *Fareej* concept that had existed in Abu Dhabi with an urban fabric designed with the purpose of screening against the sun creating shaded corridors that provides good protection against heat and strong sunlight. In traditional adobe architecture in the UAE that has undergone restoration lighting has been modified and thereby does not make the building appear as it does in its original context, but instead to offer a very different and selective view. The impact of conservation was also examined since restored buildings usually have facades that are more reflective to daylight. [8]

3. Design Methodology

The approach of physical modelling as an educational means to combine theory with a hands on teaching approach proved very effective. Students were first introduced to the basic definitions of sustainability, they learned through theoretical conduct the different views of sustainability, what it is and how it can be delivered. The negative impact of the building and construction industry on the environment came as a main drive to captivate the students' attention to the cause, since a significant percentage energy resources are consumed by residential architecture. Students were guided throughout the course of the semester to not only think about the current needs of people, but also to put the industry needs and market competition on their minds. That is by trying to create a Thermal Comfort Zone for the habitats. [9] Since contemporary architecture has

evolved to become a mega scaled iconic sculptures admired and appreciated by the users and observers. Yet on the other hand there is a continuous debate and rising importance of renewable energy and CO₂ emissions produced and resources consumed throughout a building's life cycle.

Reducing dependability on mechanical cooling systems was addressed through a hands-on approach to designing screens which proved to be a popular technique that helped the students understand the importance of sustainable design and passive cooling. And allowed them to implement sustainable design concepts they have recently learned and put their newly born sustainable awareness to action. This could be achieved without contradicting with the main design and concept creation phase, as they can actually use it to add individuality and pioneer to their designs and forms

Each group was required to come up with 3 to 4 different innovative Screen designs, that can be constructed and implemented in the United Arab Emirates precisely and the Middle East region generally. The aim of the screen design was to provide privacy for the conservative inhabitants and grant the building with an exclusive unique design, which distinguishes the building façades, and grant the form with particular conceptual approach and cultural trace. They were required to model the screens physically in 30cm x 30cm either by scaling down the full screen design to fit the required dimension or scaled part of the screen that can be used as a repetitive pattern in the original façade area that needs to be covered.

The groups started with sketching and brainstorming concepts and ideas to produce screens that reflect particular design approaches and trends. Variety of concepts were covered, some screens were based for the traditional patterns and embodied designs of the Region as they

were aiming for reproducing traditional patterns, (Figure 4) while another group decided on introducing contemporary and abstract designs that they believed would fit better with the rapid rate of urbanization in Abu Dhabi and the UAE.



Figure 4. Students during the Preliminary sketching stage

Two main criteria were given to students the first being Privacy and the second was the effectiveness in protection from Direct Sunlight. To evaluate the privacy level of the screens a void to solid ratio was quantified, by valuing the ratio of the sum of the areas of the window \screen openings to the gross area of the window\screen with an approximate ratio 1 to 0.7 i.e. the larger area of the screen was actually Void providing more exposure to the interior spaces. The privacy level was increased by proposing to cover the openings in the screen with a translucent material such as fiber glass to allow the sun light in without exposing the interior of the building. For the second criteria the protection from direct Sun light and glare. Students had to study the direct sun reflection level of the screens, by creating a 30 x 30 x 30 cm testing box that is open from one side and had a small opening on the opposite side measure the lighting intensity and effectiveness of the screen.

Students took their inspiration from design abstract shapes that they abstracted and applied irregular in a random distribution. They discussed as a team how geometric shapes could add an edge and character to a modern building and how it affected its volume and form. In another attempt

students opted for an Islamic interlacing star pattern and tried to apply it within a modern context. Students used combinations of repeated squares, circles and polygons, and tried to interlace and overlap to create complex patterns. They came up with repetitive patterns and singular large less clustered motifs. They felt the need of reflecting the culture and tradition of the region through the building façade regardless the building function. The aesthetic feeling that occurs from the shadow casted on the interior developed a cultural identity to the space and students felt that it created a good counter design in an era of globalization.

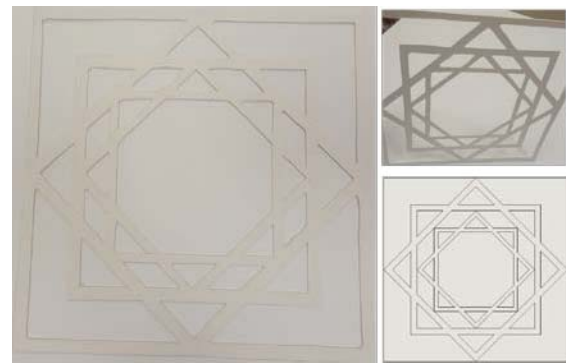


Figure 5. Designing a Screen using a traditional Islamic star pattern

Through screen design students were introduced to a better understanding sun shading devices and louvers and however they function technically through the design of their basic elements. In the context of modern architecture louvers are not known for being a fundamental design elements, they also understood the complexity of combining aesthetic and cultural criteria to a technical device. This incited students to innovate and work as a team to discuss designs that embraced aesthetic as well as technical qualities. Adding the privacy component which is an essential element in the design of Emirati dwellings and community that highly values privacy.

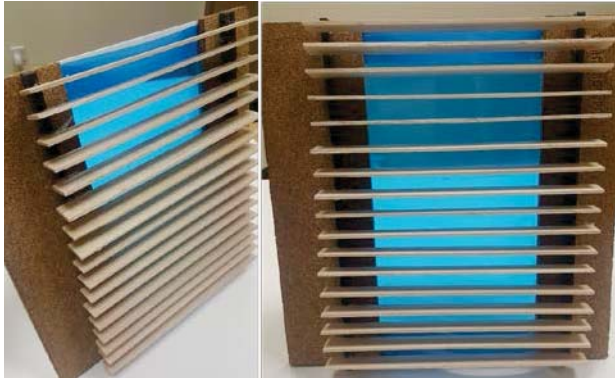


Figure 6. Horizontal louver Screen Design

Another group of students decided to design horizontal louvers since they are essential design components in facades facing south. They also represent the modernist solution to shading interior spaces and exist it different forms and sizes in the Middle East from Colonial times in the 19th century. Student designed horizontal slates to simulate a facades that is facing south and applied the louvers in different angels and with tinted and transparent glass behind it. (Figure 6) The tinted glass provided interesting effects on the indoor daylight and limitation glare.

4. Discussion and Conclusion

In this study, the architectural design of indigenous vernacular architecture was examined in terms the effects of climate and privacy measures through the study of precedents. The use of the contemporary geometries reinterpreting traditional patterns on screens represents an inevitable necessity in the creation of a building's identity in the modern Arab city, to counter global changes in architecture. Although Sustainability has been used broadly in Abu Dhabi the government is taking serious steps through introducing the Estidama initiative which promotes sustainability through a system of ratings for new buildings such as villas and private residences. There is also a notion to revisit the existing heritage and produce new designs that are more culturally sensitive and adhere to communal issues such as privacy. Highlighting the cultural

values of the UAE within the context of sustainability and environmental design proved to be effective since students showed great interest in their production of several screen designs. And their appreciation of explaining complex technical issues through a hands-on approach and learning through implementation.

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REVIEW ON SUSTAINABLE AND INNOVATIVE APPROACH TOWARDS MOSQUE DESIGN IN CONTEMPORARY WORLD

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Abstract

Mosque is one of the major establishment within a Muslim community in countries with Muslim majority as well as countries where Muslims are minority. For most of the cases in Muslim major countries, there are more than one mosque to be found in any locality. In contemporary world, where environmental issues are given high priority, identifying sustainable approach for designing mosques are strongly recommended. This paper aims to analyze the principles of Islamic teachings toward attaining a balanced built environment and its implication on developing a sustainable language for mosque architecture in contemporary world. It analyzes the indigenous characteristics of the Prophet's (pbuh) mosque and draws lessons from therein. It also presents discussion on the contemporary Polder Mosque in Netherlands and its innovative sustainable features. Recommendations are made consequently regarding sustainable approach of mosque design in the contemporary world at the end of this paper.

Keywords: Mosque, Sustainability, Islamic architecture, Innovative design, Islamic Values

1. Introduction

Islam is the third and last monotheistic religion following the former two- Judaism and Christianity [1]. As a religion, Islam offers the complete set of guidance both in spiritual and physical or social contexts. And undoubtedly from the very beginning of the religion these spiritual and physical contexts were guided through the institution of mosque, around which the lives of Muslims' revolved as the communities grew gradually [2]. Oleg Grabar marked the initial periods of the development of mosque when innovative ideas and creative thinking enabled the institution to evolve with the changing requirements of Muslim societies. Unfortunately, Later period, from twelfth century onward, the doors of innovations were closed by majority of the Muslims resulting a stagnant situation in the development and evolution of mosque [1].

Shervin Nekuee stated that, Muslims were innovative and inspiring, not introverted but out in the wide world. But today people confuse about seeking inspiration in

the past with copying the past. Concrete and steel, molded into historical forms cannot conjure up the spirit of the old Islamic empire. Nostalgia is beautiful, fragile emotion, but bombastic buildings reflect only bad taste and ignorance [3]. She calls for a revival in innovation, creativity, open mind and the courage to explore in order to bring back the lost glory of Islam and creative solutions to design and plan mosques with flexibility and functional variety would definitely be a step forward towards it. And this requires people with vision and imagination. These comments indicates that the 21 century mosques are recommended to be contemporized with proper vision towards attaining a sustainable language for mosque architecture. The aim of this paper is to present an elaborate discussion on the eternal idea of mosque to find out the teachings of Islam on sustainable approach towards built environment. Moreover, recommendations on sustainable practices will be made following an analysis on contemporary mosques.

2. Perpetuity of the institution of mosque

Robert Hillenbrand refers to the mosque as the principle religious building of Islam [4]. Tajuddin Rasdi, prominent contemporary scholar on Islamic architecture, stated the same opinion with more emphasis that mosque is the most important building in Islam [5].

Spahic Omer's comment should be noted for highlighting the significance of mosque institution in the life of Muslims. He stated that without any confusion the mosque is and always will be the center of Muslim life. He also mentioned two justification for this comment. First one being the inherent nature of man to long for worshiping its creator while the second one is man's tendency for social interaction and communal gathering in order to solidify the bonds of society which in return secure the welfare of the individual as well as the community life [6]. It should also be noted how this statement echoed the teaching of the Qur'anic verse stated before. On portraying the importance of mosque as a central institution for the Muslims, Omer combined the spiritual and the social role side by side, thus establishing the concept of Islam and mosque as its central institution in order to guide the Muslim communities toward their complete way of life. Therefore, as long as the Muslim communities exists, the institution of mosque will continue to act as a social nucleus.

Reported by Tajuddin Rasdi in his book 'Rethinking Islamic Architecture', Faruqi said, "today fortunately, the relevance of God to every aspect and element of space-time is being discovered by western Christendom and the repudiation of an isolated, unique, religious, holy or sacred is being prepared for. In its place, the religiousness of everything is being discovered, a religiousness that does not consist in the thing's being a mere relatum. Islam has for centuries been teaching the

religiousness of all space-time, of all life." [7]. The statement clearly announce the timelessness of Islamic teachings and its validity throughout the span of time.

Similarly, timelessness of mosque institution demands that reinterpretation of its activities and architecture to match the needs of modern Muslim societies is utterly significant. As stated by Dr. Spahic, "the mosque institution is bound to serve as a focal point of the religious and social life of the Muslims, advancing its physical stature as a guidepost and its message as an inspiration and guidance in all our development, building and planning undertakings." [8].

Tariq Ramadan believes the principle of Islam can be translated over and over again into a form, suitable to each new context; creativity is a key role player in this regard [3].

In summary, the teaching of Islam and the practices of Prophet (pbuh) certainly are valid for any generation. It is upon that particular generation to use the imagination and creativeness of their minds, so that, they can interpret these teaching in appropriate way, applicable for their time.

3. Lessons of sustainability from early mosques

The Prophet's (pbuh) mosque, Al-Masjid AN-Nabawee, is an appropriate example of sustainable building practice. The most remarkable character of this mosque was its simple method of construction, using locally available materials and technology and its flexible physical layout allowing any further modifications to be undertaken without hampering the balance of surrounding nature. And this mosque opened the door for practicing mosque architecture without being biased by any per-conceived idea and apply locally available resources such as, materials,

building technology and physical characteristics.

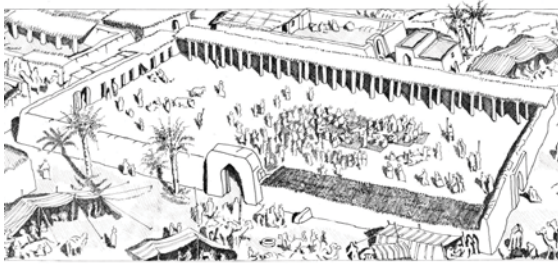


Figure 1. Prophet's (pbuh) mosque, an example of simplicity and humbleness (Source: Author)

Azra Akšamija argued about the preconceived formal expression for designing or defining mosques and provision for innovation. She stated, "The absence of formal definition of the mosque allows for innovation in mosque design. Yet innovation can only be possible if both architects and Muslim communities accept the foundational ideological elasticity of Islam that allows for the mosque's formal transformation and cultural adaptability." [3]

Tariq Ramadan believes the principle of Islam can be translated over and over again into a form, suitable to each new context; creativity is a key role player in this regard [3].

In a hadith narrated by Abu Hurayra, Prophet (pbuh) clearly stated the practice of building extravagant mosque as a wrong attitude, thus prohibited in Islam. Prophet (pbuh) said, I was not commanded to build high mosques. In another hadith, Prophet (pbuh) said, one of the portents of the Day of Judgment is that you will vie with one another in building mosques [9].

These hadiths echoed the Qur'anic verse prohibiting wastefulness [10]. The practice of building mosque of humble expression targeted to the betterment of Muslim communities continues throughout the history of Muslim civilization until the later stumbled and started to endure

decline in its numerous, if not all sections [6].

It was reported that in the Suleymaniye Complex at Istanbul, during the Umayyad Regime, the soot from candles lit in the mosques was collected and reused as ink to write [11].

From the teachings of early texts of Islam as well as the practices of early generation of Muslims, sustainable practices towards built environment were an integrated part in the ideology of the Muslims. It is only when the Muslims closed the door of innovative thinking and engaged themselves in following the traditions of the past without being sensitive towards the surrounding environment, the mosque architecture lost its sustainable character. Now, in contemporary times, the Islamic scholars once again urging for proper interpretation of Islamic philosophy. This also implies on the practitioners related with Islamic architecture to realize the inherent sustainable character of Islamic built environment as well as the needs of contemporary world to redefine the architecture of mosque suitable to this particular era.

4. The issue of sustainability in contemporary mosques

Modern world makes us able to think beyond the possibilities of traditional practices. Access to information and the extent to share it with people worldwide are now easier ever than before. Contemporary world also requires the design of the mosque to be sustainable and environmental friendly. Suggested by [12] communal mosques are recommended to be designed according to sustainable design characteristics in terms of architectural form and space. For example, maximizing day light uses, incorporating passive energy sources, use of renewable materials for construction etc. are no more a choice but strongly recommended for every mosque. Emphasizing on context

based architecture [13] stated despite the fact that architects tend to use iconic elements for mosque design, the vernacular style of mosque architecture is more sensitive towards the surrounding environment. [14] suggested that the electricity supply for the mosque is recommended to be generated most economically and ecologically by applying alternative source of power. The proposed Polder Mosque in Netherlands have provision for a park to create urban breathing space for its users and wind mills as alternative source of energy [3].



Figure 2. Polder mosque, Netherlands, Incorporation of innovative technology (Source: www.a10.eu)

Relating the idea of mosque with Frank Lloyd Wright's concept of organic architecture [15] state that there is possibility to learn from the organic architecture of Frank Lloyd Wright in developing an alternate approach for mosque design. That study showed the close connection between the teaching of Prophet (pbuh) and the organic approach of Frank Lloyd Wright towards design. The current mosques should take this in consideration for minimizing environmental impact and the new designs for mosque are recommended to exercise the sustainable schemes as much as possible.

5. Findings and Recommendations

From the discussion above it could be noted that the sustainable practice in mosque building is not a new concept in

Islam. Rather it has a deep and strong root in the practices of early periods of Muslims. These practices could be arranged into two sections- sustainable philosophy and sustainable applications.

Sustainable philosophy refers to the eternal teachings which remain unchanged and act as guideline for the practice of mosque architecture. The scope of these teachings is general in character and not limited to certain contexts or time. Among the teachings, most notable one is the prohibition of wastefulness. This put constraints to all kinds of extravagant practices that are harmful towards the nature as well as infeasible in financial aspects.

Utilization of local resources is another important teaching which ensures that the physical impact of construction as well as maintenance will be reduced to a minimum level. In contemporary terms, this will ensure a low carbon foot print in the built environment.

The sustainable applications follows these principles. Derived from these principles, it is recommended for mosque architecture to be contextual in every aspect- layout, materials, building technology and human resources. Being sensitive to the needs of the community and accommodate appropriate functions related to society are equally significant.

6. Conclusion

It is recommended for mosques to apply sustainable design schemes to minimize its impact on nature. Mosque is the center where people come to learn and practice good deeds. So a sustainable approach towards design will ensure a healthy and friendly environment for the Muslims as well as encourage them to spend more time in the mosque and participate in its activities. Moreover, people will learn to be sensitive in dealing with the environment if the interaction hub of their

community i.e. the mosque itself is designed in environmental friendly way.

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STRATEGIES FOR MAKING NEW ZEALAND'S EXISTING BUILDINGS ENERGY EFFICIENT IN THE WARMER CLIMATE

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Abstract

As construction industry and buildings are consuming large amounts of energy and resource, green building has become a focus in the built environment. However, the performances of buildings' energy efficiency can be influenced by the changing climate because global warming is a universal phenomenon. This paper aims to propose the effective strategies for improving NZ's existing buildings' energy efficiency through envelope retrofit. The method of this research is using eQUEST, a simulation tool, to examine different building energy retrofit packages and evaluate their effectiveness under the predicted weather changing pattern, such as warmer winter and hotter summer.

Keywords: Green Building, Energy Efficiency, Retrofit Simulation, Climate Change, Envelope

1. Introduction

With the improvement of living standard and the increase in population, the past decades have seen dramatic surging energy demand and consumption in construction industry all over the world. It is estimated that the energy consumed by construction activity and buildings' operation accounts for almost 40 percent of the total energy use. Meanwhile, about 40% of the total CO₂ emissions is generated by buildings [1].

Thanks to the increasing awareness of sustainability, green building has emerged as a concept that can provide sustainable approaches for built environment. On the other hand, making the existing buildings more sustainable is believed as effective approach to green the construction industry. Retrofitting of the existing buildings is critical for reducing the resource and energy consumption and mitigating the greenhouse gas emissions. However, the climate change is a crucial factor in the buildings' sustainability, because a large part of energy consumed by a building is caused by the temperature adjustment, like cooling in the summer and heating in the winter.

However, few research has been done to evaluate the effectiveness of energy retrofitting in New Zealand, especially regarding to the life cycle performance under the scenario of climate change.

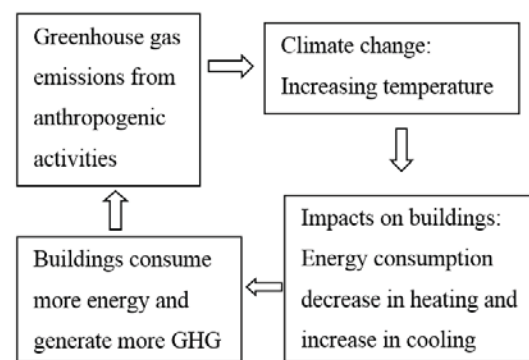


Fig 1. The interactive impact between buildings & climate

As shown in Fig.1, while the construction industry have impact on climate change, the changed climate is going to influence the buildings, such as its thermal performance and energy consumption pattern. The retrofitting package for existing buildings need to be designed to work effectively not only in the current climate but also in the future climate. Thus, this paper aims at evaluating

different envelope retrofitting package under the warmer climate.

2. Literature Review

Some literatures have highlighted the green buildings' performance. Byrd and Leardini [2] argued that some of the design feature of NZ's green buildings failed to keep them sustainable when the climate change was taken into account. Some are focusing on retrofitting strategies, like the researches of Gong, Akashi [3], Nik, Mata [4], [5]

3. Research Methods

Step 1. The energy demand of each building is largely dominated by the temperature. This paper will first analyse the future temperature change of several main cities in New Zealand. Weather data will be collected through historic information and the newest literature.

Step 2. In order to assess the performance of retrofit packages in terms of their ability to make buildings more adaptive to the climate change, data will be collected through the result of simulation run by eQUEST (3.65), a simulation software that can analyse the energy performance of a given building in certain location during certain period of time. Energy simulation of different envelope retrofitting package will be done, both in the current climate and in the predicted future climate and the result will be evaluated.

4. Discussion and Conclusion

A baseline model was created and the energy simulation was run by the software. Retrofit packages are:

- Building fabric insulation
- Glazing retrofit (i.e. low-E glass, shading, multiple glazing, etc.)
- Glazing proportion
- Window shading

Each package will be examined to show their effectiveness in reducing energy use. One of the results of an office building simulation are shown in figure 2.

Conclusions:

1. The reduction of glazing proportion made a most significant difference in saving electricity used by summer cooling.
2. For the office building, winter heating energy can be effectively reduced by upgrading the wall insulation.

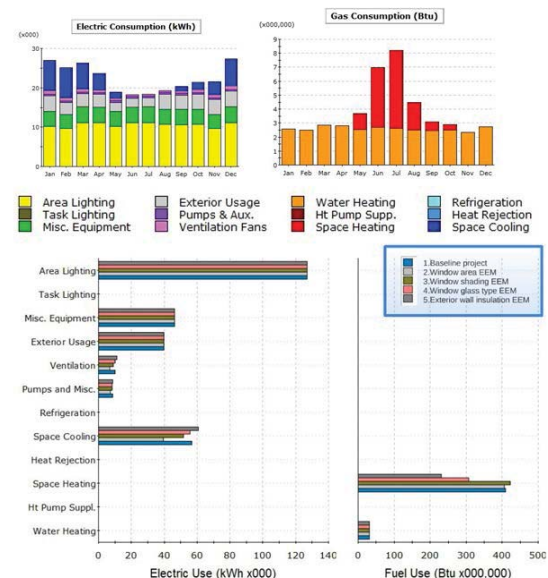


Fig 2. Example charts of data

5. References

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A BIM-BASED FRAMEWORK TO DEAL WITH PARTICULAR CLAIM BEFORE CONSTRUCTION STAGE

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Abstract

The Building Information Modeling (abbreviated as BIM) plays an important role in both design and construction industries. The established BIM-based framework is proposed to solve the problem of particular claim that is caused by the lack of communication among the different design teams for the different parts of the entire project before the construction stage. A mixed research methods approach is adopted in this research, the case study is used to demonstrate the necessary of dealing with particular claims in design stage and the amount of delays and overruns of cost can be reduced by the proposed framework. As a result, the data from the case shows that using the framework can reduce more than 29% cost of the particular claims.

Keywords: Building Information Modelling, Design Variation, Particular Claims, Costs and Delays, Construction Planning

1. Introduction

People can solve the problem of poor communication between various types of work within Building Information Modeling. Before the BIM appeared, the production efficiency in construction industry is lower and the situation of wasting resources including manpower and materials can be seen in almost every corner of the project as a consequence of the changes of the construction drawings [1]. The popularization of BIM is not as developed as the traditional 2-D software such as AutoCAD. A principal reason for the lack of popularizing of BIM is the traditional tendering model, which is used very widely nowadays [2]. In the tendering, the overwhelming majority of winners' quotations are the lowest, sometime their quotations are almost equal to the costs of project, or even lower than the costs, therefore the main way for them to get the profits is to ask for the claims. The BIM-based framework is proposed to solve the problem of particular claim, the framework is as followed:

- 1) After all the design teams finish all kinds of construction 2-D drawing, such as the main structure, HVAC, water supply, drainage, sprinkler, fire hydrant, electricity and so on, make the different contractors who build or install different parts transform the 2-D drawing into 3-D BIM software with the same sequence of construction.
- 2) When every construction unit transform the construction drawing completely, another main task for them is finding out the defects which may cause the claims, then they can calculate the quantities of the potential variations and the costs of them.
- 3) The contractors should ask the proprietor for the claims which do not occurred but must happen in the future. However, for the compensation, only the costs are not enough, because the construction units prevent the variations before they occurred, and it can save lots of time and materials, so a coefficient for the claim is extremely necessary here. They can multiply the costs by the

coefficient which should be determined in the tendering stage with the proprietor.

2. Literature Review

The BIM technology has been applied in the construction planning area, including design, estimating, scheduling, the cost of project and so on. The project schedule will be improved and the hidden defect of the project will be detected by using BIM in construction planning, in other word, the BIM technology will make the construction planning more effective and accurate. Consequently, using BIM in construction planning can reduce the probability rate of delay, risk, cost overrun in project process [3]. The variations are always caused by the changes of construction drawing as a result of the fact that the proprietor wants to change the size, the style, and the materials of the construction project [4]. The variation occurs in construction projects frequently and a lot of researches have studied the effects of it. Nevertheless the delays and overruns of cost which are caused by the variation have appeared in almost every construction project [5]. The final purpose of the claim management is solving the dispute or problems effectively between the contractor and the proprietor, and it is also an intelligent way to avoid the arbitration [6].

3. Research Methods

A case study is used to reveal the necessary of dealing with particular claim before construction stage and how many delays and overruns of cost can be reduced by using the proposed framework; the interviews are used to figure out the construction project members' opinion of the traditional way to handle the claims and their reaction of the proposed framework. The data of the case includes the total cost of the construction project, the delays, the manpower costs and the materials costs caused by the claims which can be avoided by the proposed framework. Through analyzing this data, it can be seen

that the application of this framework can reduce not only the time delays but also the costs of project, in addition to this, the completion date of construction project can be reckoned more exactly than before.

4. Discussion and Conclusion

The point of my view is discussing the variety of cost caused by the claims, and the proportion of claims which can be avoided by using the proposed framework. As a result of the amount of claims in this whole project is too large, it is difficult to collect all the claims and analyze them, so I only collect the data from one of the contractors called China Construction First Division. There are 40 claims totally asked from contractor to proprietor, 16 particular claims can be solved by the proposal framework. The amount of these 16 claims is 418,145 NZ dollars, and the total amount of all claims is 1,399,207 NZ dollars, so we can get the rate of saving money of the established framework by dividing the saved amount by the total claimed amount:

$$418,145 \text{ NZ dollars} \div 1,399,207 \text{ NZ dollars} \times 100\% = 29.88\%$$

It can be seen clearly that using the established framework can reduce more than 29% of the total claimed amount for the proprietor, and the delays and waste of materials can accordingly be decreased significantly because the conflicts between different sectors are avoided before they occur.

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INTERNAL AND EXTERNAL COST OF SPANISH MOSSES AS GREEN ROOF WITH ZERO MAINTENANCE IN HOT AND HUMID CLIMATE

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Abstract

Green roofs have been proposed for sustainable buildings. Internal and external cost ensures the economic feasibility by reviewing the efficiency related to energy consumption, mitigation of urban heat island, improvement of air pollution, water management, sound insulation, and ecological preservation. This paper used Spanish moss for green roof in hot and humid climate. It is an angiosperm belonging to the family Bromeliaceae Tillandsia type. It is known colloquially as “air plant” that grows upon tree branches, in sunshiny or partial. Spanish moss is a passive natural “air plant” with rootless and soilless. It is epiphyte (no need soil like orchid). It is also xerophyte (drought tolerant). It absorbs carbon dioxide during the night time (Crassulacian Acid Metabolism Plant) and closes the stomata during daytime to avoid water releasing. It is the growth retardant plant which is good for building envelope)green facade or green roof(because of the low maintenance requirement.

Keywords: *Spanish Mosses, Green Roof, Zero Maintenance, Sustainable Buildings*

1. Introduction

Green roofs have been increased in many countries because the benefits of green roofs have been accepted for sustainable buildings. The decreases of buildings energy demand for cooling can be happened by using green roofs resulting in heat reduction in the building and the save energy meaning the reduction of GHG emission for mitigation of climate change. However, high economic barriers of green roofs are the initial construction cost, irrigation system, and supporting structure. This study aims to describe the cost and benefits of Spanish moss for green roofs to support the decision making of buildings both private and public sectors. The highlighting of internal cost and external cost of Spanish moss would be helpful as well.

2. Literature Review

Basically green roofs are also known as environmental friendly product in different name e.g. living roofs, eco-roofs, roof wig. It has normally the built vegetation

covering on final layers [1]. The major classifications of green roofs are intensive and extensive green roofs. Extensive green roof has been explained as unexpected loads. The investigating of effective benefits of green roofs is the energy balance of the building [2]. The energy consumption decreases as the increasing of the thermal insulation capacity into roof. Other benefits are low maintenance cost, extended lifetimes of roofs, reduced capabilities of water runoffs, improved market price of building, increased solar radiation, provided natural shadow to against the solar radiation, decreased urban heat island effects, reduced quantity of dust particles in the air, and protected noise pollution, and provided diversity of habitat.

3. Research Methods

The decision making in choosing green roofs for building is based on several factors to be reviewed in this paper. Internal costs are also named private costs which determined and managed just by

private organization such as: the owner, architect, engineer and developer. Consequently, the external costs are also named social costs because these are extremely related to the resultant on economic, environment or social system. This paper targets to analyze the internal and external costs of Spanish mosses roofs.

4. Result and Discussion

Internal costs consist of initial construction, repair and maintenance and disposal or recycling costs. Initial construction costs are extremely important for instance covering structure, hanging structure and labor. The covering structure of Spanish mosses consists of lightweight steels such as steel box, slotted angle steel and welded wire mesh. In addition, the total of initial Spanish mosses roofs was estimated at \$ 76.67/m². Furthermore, operation and maintenance costs in this study were inspected the watering, weeding and cutting of lifespan operation. The characteristic of Spanish mosses had low operation and zero maintenance because CAM plants do not require watering, weeding and trimming. The analysis of operation and maintenance costs of air plant green roofs were estimated at \$3.58/m² twice per year. Regarding the demolition and recycling cost of green roofs are included disposal growing mediums, transportation materials, plant demolition and recycling. The characteristic of lightweight and not require the soil or substrate as a result to very low disposal. The disposal and recycling costs of air plant green roof was evaluated at \$5.37/m². The external costs of green roofs had been demonstrated green roofs as a mean of pollution abatement which improved urban air quality, human health and human wellbeing. Similarly, Spanish mosses roof

are made of the sustainable materials resulting in social benefits and less pollution. The internal benefits of green roofs are distinctly the value-added of energy consumption reduction, increasing of surface function, recreational space and aesthetically of the building, property value and opportunities in market, roof longevity, avoided storm water in drainage system, plant in the market. Obviously, the installations of green roofs are the pollution mitigation and benefits to communities. External benefit approaches in green roof have significant public benefits to provide with regard to environment, economic and social. Therefore external benefits was considered from the emission in the production process, air quality improvements, carbon reduction, habitat creation, mitigation of urban heat island effect, reduction of infrastructure costs, reduction of flood risk, provision as of recreational space, increasing surface function, and aesthetic of green roof.

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ARE YOU EXPERIENCED? METHODS OF MAPPING BEHAVIOUR AND EXPERIENCE IN TRANSACTIONAL ENVIRONMENTS

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Abstract

This paper investigates the use of tangible and intangible experiences both as a recording process and as a design tool. It is particularly focused towards the practical application in service and retail design and its development as a key part of the design process and as a control and test medium for existing situations. The methodology is purposely fluid to allow for a variety of situations and also to promote future development and exploration through collaboration. The findings are applied to and explored within existing situations and proposed design interventions.

Keywords: Experience, Blueprinting, Journey, Modal, Transactional

1. Introduction

The initial inquiry stemmed from basic experience mapping of journeys through spaces and appropriate responses.

Through exploration of the psychological and phenomenological responses this was expanded to try and gain a richer method of communicating and recording. The research was also intended to strengthen the links between recording, analysing and integrating experience into the design process.

In the search for this some parallels were drawn between the work of visual artists and their recordings of experience. Which seemed to suggest some useful pathways to explore.

The research follows three key strands:

- Review and overview of writings of experience
- Dissecting the key components of experience
- Experimental methods of mapping and recording experiences as design tools

Where possible these have been tested in live situations and feedback has been gained to determine success and potential development and improvement.

2. Literature Review

The starting point came from the idea of the original experience by Gadamer in Coxon [1] from which it is argued that each experience might be considered unique. In the same volume Heidegger's ideas of the conscious and everyday experience begin to form a structure with ideas of the cumulative experience. This was paralleled with Kahneman's [2] Modes of Experience and his identification of the use of System 1 and 2 thinking, that of the considered and automatic response. These were merged to create a model of the two basic responses to experience which forms the basis of the Experience Diagram (Figure 1). The first part of the diagram recognises also the idea of time as a factor of experience and the idea of the cumulative experience, again from Heidegger in Coxon [1].

This is developed further through Adcock [3] and Kusume & Gridley [4] who provide a practical and relevant interpretation and implementation particularly related to retail and branding situations. This section develops the two systems of thinking and begins to apply them to particular situations, in particular

the ideas of instant and effortful decisions cited by Adcock [3]. These were further informed by Gladwell's [7] ideas of how we make decisions based on a variety of systems such as thin slicing small amounts of information to construct a scenario. These ideas inform the central section of the diagram and are connected to create some tangible areas for further exploration. Complementary themes were also identified by Hekkert & Karana [5] and Jacobs & Wintrob [6] through research into the ideas our experience with materials and also ideas of perception through cognitive signs and signals. These ideas, together with Kusume & Grindley's [4] idea of a '360° experience' are articulated in the final section of the diagram which merge and blur the earlier

ideas of rigidly separated systems. The idea of blueprints or maps as a visual communication method was identified initially through Kusume & Grindley [4] and Garcia [8] and this was developed into a more visual strand through the work of Hockney [9] and Willats [10] to produce pertinent directions for application into site studies. These were particularly relevant in developing the ideas of time and the personal and subjective nature of an experience. These studies are summarised in the Experience Diagram (Figure 1) which provides an initial map of how the research themes relate to and combine with one another. This is an attempt to articulate and form linkages of experience research establishing common themes such as time and the subjective nature of experience.

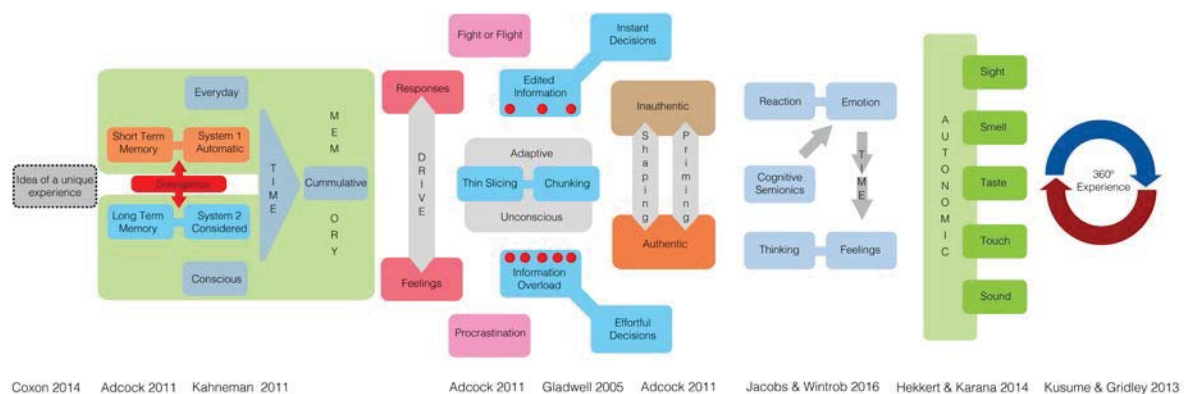


Figure 1. Experience Diagram

3. Research Methods

From the key themes established, the work developed initially from desk studies and experiments of mapping experiences with students on one of the design units that I teach at the University of Portsmouth.

The idea of a continuous experience, based on a series of stages or phases began to develop allowing the individual components to be examined as part of the overall framework. This also allows for the 'units or boundaries' recognized by Coxon [1] to be examined in a visual diagram.

This research developed around the idea of an Experience Cycle (Figure 2), which provided a framework for exploration of

both theory and practice and developing existing research whilst providing opportunities for new testing approaches.

From this basic template ideas of the Experience Cycle were explored which is particularly relevant to the transactional environment. Research into existing mapping tended to focus on areas of success and fail points and produce a form of 'Sine curve' of experience. In the development of the research I was particularly interested in how the user moved from one experience phase to the other and the methods that can be employed to smooth and improve this with a particular focus on bridging the potential

gaps between phases. The Experience Cycle in Figure 2 is an initial attempt to look at ways and methods to mitigate this.

It responds to the key phases of experience developed from that of Marzano in Kusume & Grindley [4] with a modification by myself. These are denoted in the blue boxes at the top together with

some key points of reference for each phase. The red dotted lines indicate potential points where the experience might fail with suggested attention points to raise or prevent this failure. The cycle should be considered as a loop system referencing subsequent visits, responses and additional external factors.

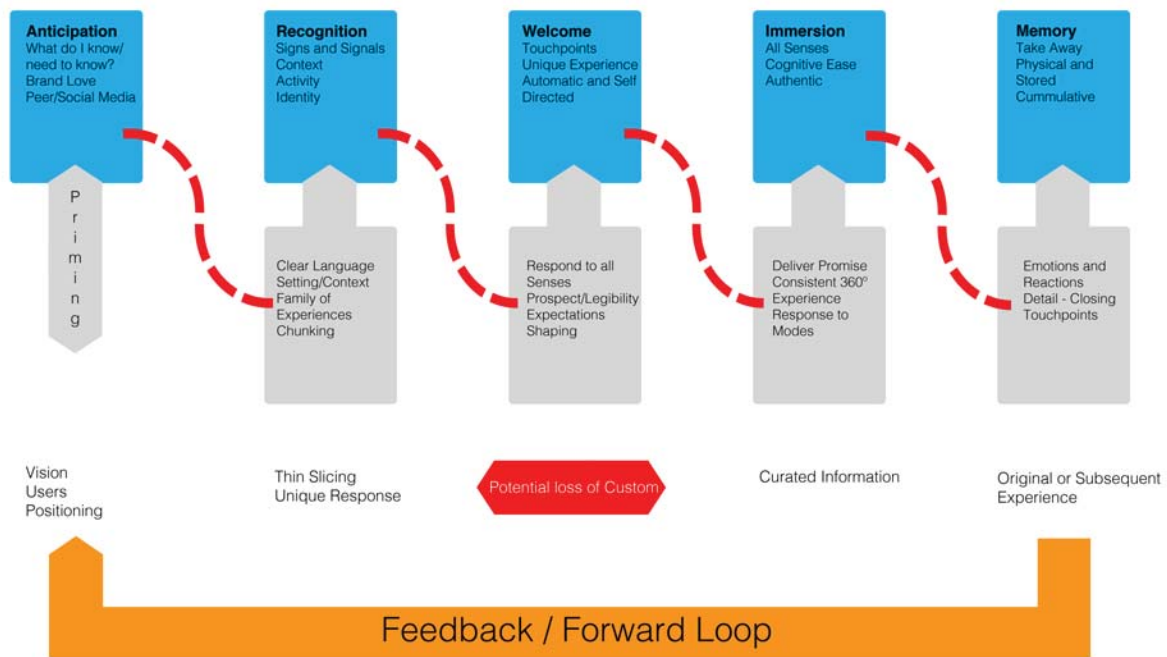


Figure 2. Experience Cycle

Some initial testing and validation was carried out relating to my project work which was initiated through a series of snapshots taken of a simple visit to a coffee outlet. This was an attempt to mirror some of the explorations of Willats [10]

whilst relating specifically to some of the ideas of Jacobs & Wintrob [6] and Gladwell [7] particularly the ideas of gathering small, sometimes peripheral, amounts of information and using these to shape a response.

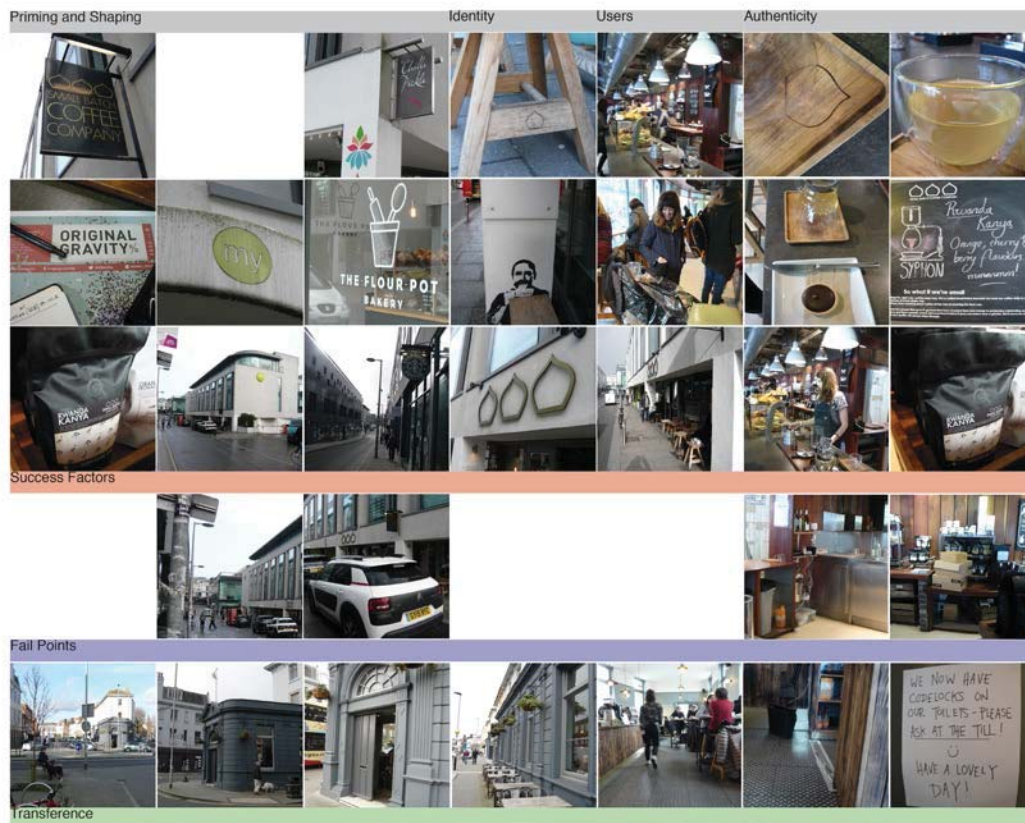


Figure 3. Recording Experience

Although this begins to record experience and identifies some of the areas and methods of interest it is really a stepping stone towards more meaningful recording. The position of the outlet within an area of small scale businesses is evident and this provides a degree of priming for the experience. This is also evident (but not recorded) in the people visiting the outlet and how the small outside area spilling out onto the pavement begins to shape the experience. In some ways this mitigates potential fail points such as traffic obscuring the entrance.

Important touch points such as service and delivery are intuitive and accommodating whilst maintaining an intimate and authentic experience. In particular the making area is visible and open and speaks of 'knowing the product' even to the extent where cleaning equipment is not considered offensive. However the experience is not consistent across outlets and the lower set of images illustrates that in another outlet cleaning equipment is

visible but, due to the context, was not considered to reflect positively on the experience.

This formed the basis of further research which I was able to carry out through a live design project as an appraisal of a potential site and design response.

4. Discussion and Conclusion

The key objective of the research was to explore new methods for mapping and designing experiences in the built environment both using research but also from an exploration of the methods of visual artists as referenced. From this I have used ideas to record and communicate a range of experience stages and modes which are explored from a theoretical perspective but also applied to my work in both education and practice. The initial outputs of these suggest a range of approaches and the initial results have provided useful insights.

The study is based on the initial appraisal for a retail unit set within a vibrant residential, retail and cultural area of London which is home to a number of high end brands and smaller businesses. The corner site is at a busy junction both in terms of pedestrian and vehicle flow with some potential conflicts. The initial study focuses the Anticipation and Recognition phases of the experience and particularly relates to how the retail environment might respond to this. The approach begins at a macro level placing the building in a site context and here is particularly concerned

This figure shows a large, complex street scene from London, featuring a central intersection with a large white building, a yellow building, and a black car. The scene is surrounded by various smaller images showing different parts of the street, including a bus stop, a shop, and a street sign. The central image is a 360-degree view, with smaller images showing different directions and details.

From this initial exploration it was clear that the approaches to the building provided a variety of experiences: that of a busy retail thoroughfare compared with a more leisurely approach from principal transport links and a cultural hub. When examining the building as a composition it's relationship with context appears with equal weight from either vista. Traditionally this might suggest a visual response proportionate to this, with a retail perspective focused towards the retail thoroughfare and little response to the more residential street.

International Conference on Architecture, Landscape and Built Environment (ICALBE 2016) 28

relationship with the scale and residential nature of the buildings. These became evident when viewing the building as a whole although this is only a brief snapshot in the experience.

This is expressed in Figure 5 as a response to these immediate experiences whilst offering a continuation through to the Welcome phase and beyond. This process unearths the possibility of two different responses that the building might present to it's immediate and even more distant contexts.



Figure 5. Recognition Response

The work presented is at an 'in progress' stage and further developments and exchanges are encouraged. In particular the idea of a variety of visual methods is a potential avenue I intend to explore. To this end I have included a closing piece of initial ideas which begin to link the phases of experience studied above with those of the retail journey. This has been incorporated into a simplistic sketch which also explores some design themes and attitudes.

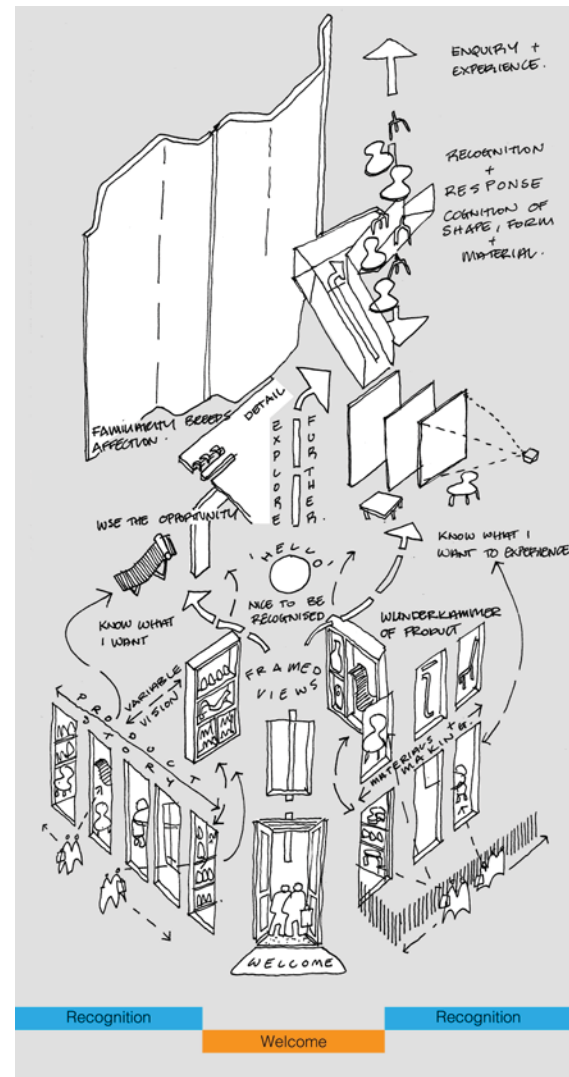


Figure 6. Retail Journey

This applied research forms strong links between academic and industry practice and one that is particularly pertinent to those working in a brand environment. The intention of this work is to both contribute to this but also to develop approaches from other areas of practice to provide new visual methods of communication and representation.

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ANALYSIS ON THE FACTORS AFFECTING COMMUNITY ATTACHMENT OF RESIDENTS LIVING IN RESIDENTIAL ENVIRONMENTS FOLLOWING URBAN REGENERATION

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Abstract

To induce local civic participation in the course of urban regeneration and invigorate the recovery of a local identity and the formation of positive awareness, the degree of attachment is an important factor, while serving as an emotional and behavioral evaluation index with regard to a residential area. In this context, the objective of this study is to analyze factors affecting the community attachment focused on resident-participatory urban regeneration regions of Seoul City, and further, to analyze influential elements involving community attachment via an empirical approach methodology. Through the analysis, we found residential area's identity and human network shall be developed. Public relations regarding urban regeneration projects shall be continuously promoted to attract more participation from residents. In addition, development to be a small size of village unit may improve the more intimate networking. Finally, community facilities shall be upgraded and expanded, while community centered activities shall be more encouraged.

Keywords: Urban Regeneration, Community attachment, Residential area, Residents' participatory activity

1. Introduction

As we face a turning point toward new urban development triggered by a decline in urban functions and a slowdown of growth in the modern society, the paradigm has been shifted toward urban regeneration, with a greater focus placed on the direct participation of residents, the maintenance of local communities and a people-centric context.

Despite the fact that the degree to which residents feel attached to their local society has recently been given more attention in the urban planning and design, research on community attachment in the field of urban regeneration is still scant. Given that factors affecting the level of attachment, such as residents' participatory activity and awareness on urban regeneration, are more likely to be diversified, it is time to carry out research in order to address what factors have effects on the degree of attachment to the local society.

2. Literature Review

The literature review section is divided into three sections: resident participatory urban regeneration, community attachment, and residents' participatory activity. Seoul city declared conversion to a new paradigm so-called "resident participatory regeneration" program. The effects of the resident-participatory residential area regeneration program can be largely divided into 'social regeneration, physical regeneration and economic regeneration' [1]. Community attachment is positive inclination to which residents feel to a community. Moore, et.al. (1994) measured two factors of place identity and dependence as involvements with attachment [2]. Kang, S.K. (2001) measured community attachment based on three dimensions composed of identity, dependence and social friendship, the result of which was found that identity is the highest and dependence the lowest[3]. Community attachment factors are chosen for this study are dependence, identity, and

social friendship. Since resident or citizen participation can be defined in a diverse view, the concept itself provides complexity not easy to define. It is defined as direct participation by general residents with authority not endowed officially in policy making processes [4]. Seo (2012) defines that residents' behaviors for the purpose of local development and progression through direct or indirect participation [5]. In this study residents' participatory activity is defined as "a series of activities to exert influence to and get involved with any policy or decision making by residents".

3. Research Methods

The objective of this study is to analyze factors affecting the community attachment focused on resident-participatory urban regeneration regions of Seoul City. Theoretical study was carried out to extract the concept of the community attachment along with its relevant factors and compositional elements, and an empirical analysis was performed with regard to residential characteristics and the degree of awareness on urban regeneration projects, residents' participatory activities and socio-demographic characteristics. The subjects surveyed for the analysis range, among those designated as residential environment management regions by Seoul Metropolitan City, across 10 regions, for the experimental research on the population selected, analysis data was constructed by ranking community attachment as a dependent variable and ranking awareness on urban regeneration project, socio-demographic characteristics and residents' participatory activity as independent variables.

4. Discussion and Conclusion

Through the analysis, the requirements of the residential area subjected to urban regeneration to enhance the community attachment are as follows: First, residential areas having an identity shall be

developed. Second, public relations regarding urban regeneration projects based on the understanding of social/economic local activities shall be continuously promoted to attract more participation from residents. Third, human networks shall be established. Fourth, development to be a small size of village unit may improve the more intimate networking. Finally, community facilities shall be upgraded and expanded, while community centered activities shall be more encouraged. The present study is considered to potentially develop a model for urban regeneration with the ultimate aim of strengthening the community attachment by improving the identity of local residents, enhancing the awareness of urban regeneration projects and promoting the community based activities and participatory activities of residents in a more diverse manner.

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VERTICAL MONUMENT VERSUS HORIZONTAL LANDSCAPE COMPARISON OF CHINESE AND WESTERN CONTEMPORARY MEMORIAL

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Abstract

At the age of globalization, like other developing countries, the faces of China's cities are losing their characteristic under the powerful influence of Western culture, sharing the same modern looks without any distinction. However, there is a type of architecture that could escape the control of this influence—memorial. Because, as the carrier of state and national collective memory, it witnesses the history of China, bears the stigma of the age. In China, memorial still has a close relationship with the tendency of political power and mainstream ideology. Meanwhile, memorial is closely related to politic, economy and culture of particular times. As the time goes by, memorial is altering and developing constantly on both spirit and form. Comparing the status of the Chinese and Western contemporary memorial, we may still be able to feel the difference between the two in culture and ideology.

Keywords: *Memorial, China, West, Contemporary, Comparison*

1. Introduction

At the age of globalization, like other developing countries, the faces of China's cities are losing their characteristic under the powerful influence of Western culture, sharing the same modern looks without any distinction. However, there is a type of architecture that could escape the control of this influence—memorial. Because, as the carrier of state and national collective memory, it witnesses the history of China, bears the stigma of the age. In China, memorial still has a close relationship with the tendency of political power and mainstream ideology. Meanwhile, memorial is closely related to politic, economy and culture of particular times. As the time goes by, memorial is altering and developing constantly on both spirit and form. Comparing the status of the Chinese and Western contemporary memorial, we may still be able to feel the difference between the two in culture and ideology.

2. Two Important Periods That Influenced The Chinese Contemporary Memorial

For a long period of time in the history of mankind, as the tool that upper class used for maintaining their power and show the legitimacy of it, memorial carries strong political overtones and obvious features of personality cult. From the Trajan's Column of Roman period to Triumphal arch of Napoleonic, towering gigantic volume and solid stone clearly express the powerful authority and the claiming eternal of it. In First and Second World War period, due to the heavy casualties and serious damage to civilization caused by the war, there were a large number of memorials being built to remember and reflect this catastrophe in human history. Chinese modern memorial also began to appear during this period. The most important memorial at that time is the mausoleum of Sun Yat-sen (Fig.1), the president of Republic of China, the founder of modern China. He started Xinhai Revolution to overthrow the feudal rule of the Qing Dynasty, promoting democracy policy in politics, and advocating a comprehensive learning from the West. In that period of time, there were a large number of Western-style

monument, sculpture and memorial plaza be built.

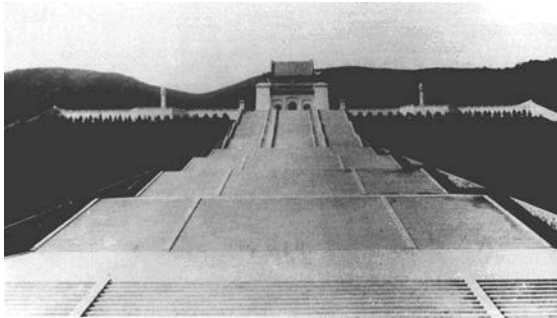


Figure 1. Figure 1. The mausoleum of Sun Yat-sen, Nanjing, 1930s

The designer of the mausoleum of Sun Yat-sen is Lu Yanzhi, a Chinese architect who studied architecture at Cornell University, and worked at Henry Killam Murphy Architects for two years. Beaux-Arts architecture training and his comprehending of official architecture style of Qing Dynasty made the mausoleum become a special Chinese modern memorial. The whole mausoleum followed the structure of traditional ancient Chinese mausoleum, which is a complete spatial sequence composed successively by memorial arch, corridor, tomb gate, stele pavilion, stairs, memorial hall and tomb (Fig.2).

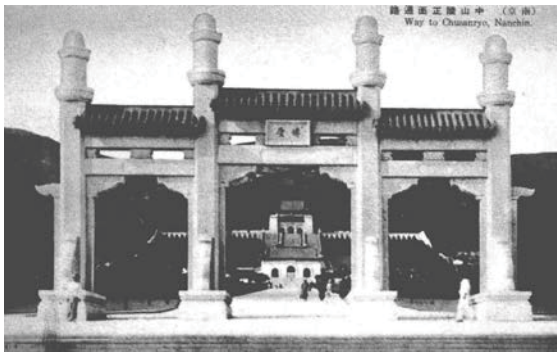


Figure 2. The mausoleum follow the spatial sequence of ancient Chinese mausoleum

A noteworthy thing is that, viewed from the air, the whole mausoleum is designed to be a bell shape for symbolizing the national awakening and caution from the president (Fig.3).

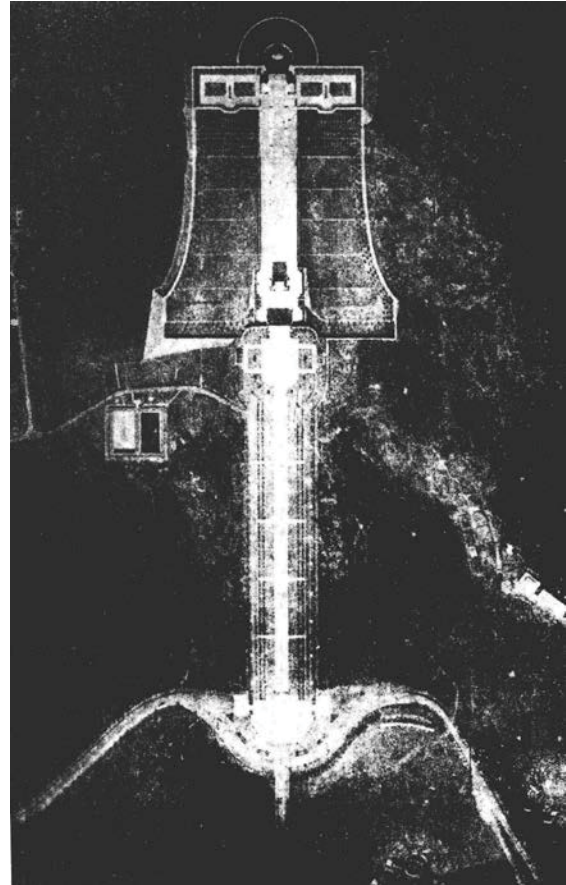


Figure 3. The whole mausoleum is designed to be a bell shape

This figurative symbolism has a significant impact on the conceiving of contemporary Chinese memorial.

After the People's Republic of China was founded in 1949, in order to arouse the people's patriotic enthusiasm also enhance the united cohesion of the whole country, government built considerable thematic and narrative monuments. Affected by Soviet Union, those memorials mostly adopted expressions of revolutionary realism, romanticism and symbolism. The themes were either glorious history of heroic city after baptism of flames and smoke or epic deeds of war heroes. One of the most representative memorial during that time was Monument to the People's Heroes, which combined the characteristics of Chinese classical architecture and Romanesque architecture (Fig.4).



Figure 4. Monument to the People's Heroes, Beijing

It makes good use of thematic relief sculpture to reappear the bloody and brutal war scenes, letting visitors feel the vivid flying bullets and roaring bombers, at the same time, remember the immortal heroes who gave their lives for the safety of nation. This narrative and romanticism method, which through describing the epic scenes and typical figures in major events to express ambitious political themes, still has a deep influence on the conceiving of Chinese contemporary memorial.

3. Two Typical Contemporary Chinese Memorials

THE MEMORIAL HALL OF THE VICTIMS IN NANJING MASSACRE BY JAPANESE INVADERS

December 1937, what happened in Nanjing shocked the world. 300000 Chinese citizens were slaughtered by Japanese army in one week. To commemorate this miserable tragedy, government built a memorial at Nanjing Jiang Dongmen, one

of the biggest remains buried ruins, in 1985, and expanded it twice at 1995 and 2005 (Fig.5).



Figure 5. The memorial hall of the victims in Nanjing massacre by Japanese invaders

The main idea about the memorial was to create a grievous, solemn and isolated space for mourning and meditation. Stone walls carved with Victims' names encircled the memorial Space to form a closed square. Among the square, elements such as paths, sculptures and festival hall were used to divide it into three parts (Fig.6), representing the three themes: War, Slaughter and Peace. Entrance of memorial was designed as a broken saber, symbolizing the massacre, also intimating evil defeated by justice ultimately.



Figure 6. The memorial square enclosed by walls

On the memorial square, barren pebbles covered the entire ground to simulate the silence and deadish after massacre. Broken ruins and huge cross indicated suffering and death (Fig.7).



Figure 7. The huge bell and cross on square indicated suffering and awaken

Black granite and pool created a solemn meditation space, where people paid homage to the victims and mourned for them (Fig.8).



Figure 8. The entrance of festival hall, surrounded by black marbles

The last part was the park of Peace, which isolated from surroundings by relief sculpture wall and landscapes. Finally, huge sculpture of the goddess of peace stood at the end of the park, symbolizing the hope and rebirth after the war (Fig.9).



Figure 9. The huge sculpture of the goddess of peace, symbolizing the hope and rebirth

The whole memorial uses narrative space and symbolic sculpture to successfully create a sequence from death to grief, then to hope. Those spatial sequence and symbolic expression can be clearly found in the design of the mausoleum of Sun Yat-sen. Also, those typical scenes expressed by massive sculptures have strong heroism and romantic color, which can be found exactly on Monument to the People's Heroes. As we can see, the conceiving of the memorial hall is deeply influenced by some important monument in the history of modern China. This influencing is naturally, deeply and universally, which closely associated with the social formation and ideology of modern China.

5.12 WENCHUAN EARTHQUAKE MEMORIAL MUSEUM

Another representative contemporary monument is 5.12 Wenchuan Earthquake Memorial. May 12th, 2008, an 8.5 earthquake hit Wenchuan, caused 69,227

people dead, 374,643 injured and 17,923 missing. To recall the dead and remember this amazing destructive earthquake, government built the memorial for mourning next by the county ruins which is already razed to rubble by the earthquake. The memorial, named “crack”, was designed as the shape of lightning, attempting to express the metaphor “freeze the disaster moment on the earth as lightning speed, left eternal memory for posterity” (Fig.10).



Figure 10. 5.12 Wenchuan earthquake memorial museum seen from top

The shape of the memorial was formed by earth landscaping, which through cutting and rising the ground to model the main shape, leading the visitors into underground by sunken square and extending paths(Fig.11).



Figure 11. The shape of the memorial was formed by earth landscaping

Those so called “Memorial Paths” was formed as a huge crack, insinuating the physical and mental injure caused by earthquake. As visitors walking slowly above the ground, toward the bright and open plaza of memorial, instantly clearing world brought them back to reality (Fig.12).



Figure 12. Memorial Paths beneath the earth

Suddenly changing of the environment beckoned a completed emotional catharsis. It is obvious that using crack to analogize the injures caused by earthquake is the similar symbolism that used in bell-shaped plan of the mausoleum of Sun Yat-sen. Both of them are placing memorial with certain implication by imitating figurative objects to express specific spirit. In addition, using “crack” to freeze the fragment moment of the earthquake, to bring visitors back into the scene when event occurred, shares the same purpose of eternal timelessness created by Monument to the People's Heroes. It can be concluded that, design of 5.12 Wenchuan Earthquake

Memorial is also strongly affected by former memorial in history (Fig.13).



Figure 13. The plaza of memorial and the entrance of the memorial

4. Comparison Of Chinese And Western Contemporary Memorial

SPACE AND FORM

Memorial itself is not a spiritual thing, but a medium, which used to transform the commemorated person or event into solid bodies, letting people experience the spirits when standing in front of them. Social and cultural evolution influences the form and expression of memorial, transforming those solid bodies from figurative monument to abstractive landscape. Germany's national Memorial for the Murdered Jews of Europe in Berlin is the typical memorial like that.

The memorial designed by Eisenman was built in 2003. Its main part is a 20,000 square meters open-air plaza, on which standing 2,711 concrete blocks of varying height. Seeing from distance, it looks like a breeze blowing wheat fields, while close observed, it feels like walking into a huge puzzle (Fig.14).



Figure 14. Memorial for the Murdered Jews of Europe in Berlin

Eisenman does not believe these concrete blocks have any symbolic meaning, but it is undeniable that, at first glance, they are like 2,711 sarcophaguses of victims, quietly lying there, silent recount that part of the brutal history (Fig.15).



Figure 15. 2,711 concrete blocks of varying height

But when you slowly walking into those standing stones, undulating ground and scattered blocks make you feel submerged gradually by an ocean of death. Paths less than 1 meter wide only allow one person

passing, leading you into the center of this dead ocean, where all the hustle and bustle of the city suddenly leave you away, left desperate and suffocating abyss. Looking at the end of the path, you can faintly see the light of hope (Fig.16).



Figure 16. Paths less than 1 meter wide lead into the center of this dead ocean

Following the light, you finally finish the path and turn back into reality. Until then, you can understand the value of freedom and the precious of life, at the same time, feel sympathy and sadness about the Jews who had been persecuted to death. For such an abstract object, each experienced people will have different feelings and understanding. Not like a figurative sculpture, letting people penetrate designer's intention straightly, it gives audiences myriad possible interpretations. Meanwhile, as a city landscape, the memorial square is a completely open public space, which can easily assimilate into city lives. Every citizen and tourists can go inside and experience it at any time. Public participation fulfils its

commemorative significance and value to the maximum extent.

Another typical case is Washington Vietnam Veterans Memorial, which designed by architect Maya Lin. Main part of the memorial is a V-shaped black granite wall, on which's polished surface curved over fifty thousand names of American soldiers died in the war (Fig.17).



Figure 17. Black marble wall with names reflects the surroundings

The entire wall is placed in a large lawn, using altitude difference to create a low-on-sides and high-in-middle morphology, which increases the curved names from sides toward middle. This gradual change gives audiences a strange and irresistible interest. The whole place is quiet and harmonious with the surrounding, without heroic sculpture and tablet statements of history (Fig.18).



Figure 18. Washington Vietnam Veterans Memorial, quiet and harmonious with the surrounding

People stand in front of the wall fully curved with dead names, rethinking about the meaning of war and peace, generating emotional resonance. The wall leaves the merits and demerits of this War to audiences for judging.

As we can see, ideological trend of today's Western memorial conceiving is changing. Expression of official ideology and grand narrative is transforming into voicing public emotion and collective memory. Traditional gigantic volume and figurative entities are no longer adaptable to convey more and more specific emotion sustenance under modern art and culture concept. People's understanding of commemorate becomes more and more abstract, no longer pursuing the nobility and eternity of monument itself. Formally they would like to merge memorial into daily life by city landscapes, realize the memorial behavior by public participation. Park, squares and landscape paths replace those towering monumental structures, as everyday walking and relaxing place, make the original sacred memorials full of vitality of secular and deeply rooted into people's hearts.

On contrast, Chinese contemporary memorials influenced by inherent forms, still stay at pursuing the sublimity and eternity of commemorations. Recreating the historical scenes is the most common conceiving of a memorial, which usually realized by massive monumental structures, and intuitive figurative sculptures. Symbolism is the most idiomatic method to express eternity of memory. Memorial as carrier of this eternity, is separated from temporal era in time, and appears as a historical existence. Paying tribute to these memorials is an activity that detached from people's daily lives. People only visit those memorials on special days or at certain festival, just like

only on the anniversary of death people will go to pay homage to a dead relative. It can be conclude that, when conceiving a memorial, Chinese concern more about visual memento, Western emphasize more on psychological memories.

5. Urban Functions

Memorial plays a part as spiritual identity in a city. The rise and evolution of a city, contain thoughts and feelings formed from common experience and communication of citizens, including those memorable events and characters. It is these living stories create the city's unique context and spirit, which become an important part of recognition and emotion of the city. These context and spirit are endowed to the memorials in cities mostly. In some famous cities, people always arouse those impressive monuments, which stand for marks of cities. Apparently, memorial serves as an important urban function, which is changing constantly by the development of society.

In contemporary western world, the most representative example of functional changed memorial is the reconstruction project of New York World Trade Center. In this empty space formed by the Collapsing of former World Trade Center, people conceive building a memorial park to remember those who lost their lives in the attack. But in this base with extremely complex environment, people need more than just a simple monument, but also a commercial space, office space, and a transportation complex integrating the New York subway, ferry and roads linked with airport. In this complicated urban space, memorial is no longer as a separated, pure monument, but more integrated with the environment, and other functional space, turning into a comprehensive city space (Fig.19).



Figure 19. The Site of World Trade Center is extremely complex

As Eisenman said in the introduction of new World Trade Center planning at the first round of bidding scheme, “In the tradition of Rockefeller Center and Union Square, we propose to build a great public space for New York City at the World Trade Center site. We call this Memorial Square. While the 19th and 20th century precedents for urban plazas are contained spaces, our 21st century Memorial Square is both contained and extended, symbolizing the connections of this place to the city and to the worlds... Given the nearly 2,800 people who died here and the thousands more who were physically and emotionally scarred by the horror of September 11, we believe that it is not necessary to contain or divide the site, but to expand it by extending into the surrounding streets. This is achieved through a series of “fingers,” reminders that the magnitude of what happened here was felt far beyond the immediate site. At the same time, they facilitate connections between Memorial Square, the waterfront, the proposed NYC Transit Center, and greater Lower Manhattan.”

As we can see, today’s Western memorial is being transformed from a single functional monument to a multi-functional commemorative space. The memorial in the urban space is no longer an isolated monomer, but a living urban space that combined with the future of the whole area together. In contrast, memorial in today’s China, is still performing as a single-functional structure, standing out of the

city background. The memorial hall of the victims in Nanjing is located in downtown. Instead of connecting with surroundings, it was designed to isolate from the environment to keep its purity and independence. Enclosed Memorial Square would not help attracting people to come and stay. Fixed single visit line reduces the possibilities of commemorative realization. Literally, the memorial hall likes a lonely stone, standing in the crowds, purely and sacred, but hardly integrated into the context.

6. Public Participation

Most of the memorable historical events happened among public, who have their own memories and feelings about those events. No matter what memorial built for, person or event, it should be more focus on the public spiritual level. Planning and decision-making process of a memorial shall also alter from authority determining to public participating, which, as a management of urban space, greatly changed the appearance of Western monumental space. Reconstruction project of New York World Trade Center is a classic case study about how public psychology affects the form of public memorial space and how public participation can lead memorial conceiving to a better result.

For the New York Trade Center reconstruction project, the American public responded with great enthusiasm and concern. Through twice democracy consideration meetings, public actively involved in the draft of reconstruction plan. As the winner of the final bid, Libeskind pointed out in the program narrative, “When I first began this project, New Yorkers were divided as to whether to keep the site of the World Trade Center empty or to fill the site completely and build upon it. I meditated many days on this seemingly impossible dichotomy. To acknowledge the terrible deaths which occurred on this site, while looking to the

future with hope, seemed like two moments which could not be joined. I sought to find a solution which would bring these seemingly contradictory viewpoints into an unexpected unity. So, I went to look at the site, to stand within it, to see people walking around it, to feel its power and to listen to its voices. And this is what I heard, felt and saw. Finally, based on the public monumental psychological, Libeskind implanted a Ground Zero, a quiet, meditative and spiritual space where people can journey down with deliberation to the bedrock foundation of two towers (Fig.20).



Figure 20. Two huge holes left by the collapse of World Trade Center be transformed into memorial named “Reflecting Absence”

If the World Trade Center reconstruction plan is a model of how public participation can influence the decision of public memorial space at the macro level, then the conceiving process of 9/11 National Memorial Museum is the typical case that public manipulate the design of memorial architecture at micro level. The proposal named “Reflecting Absence” intended to create a resonance space which can connect feelings of loss and empty caused by the collapse of World Trade Center. With the two holes left by the destruction of the twin towers, designer tried to express a sense of loss, to both form a manifestation of countless lives lost, and to express the meaning of rebirth on this memorial. The year after “Reflecting Absence” be chosen, the design was

questioned and criticized by the media, public and especially the relatives of the victims. Family Federation strongly opposed to the idea that memorial be built underground, especially the names of the deceased would be engraved on the underground hall. Responding for the requirements of victims’ families, design was changed. All the victims' names are engraved on a wall surrounding the two giant pools, letting people feel nostalgia for the dead, at the same time, getting the strength of reborn and hope (Fig.21).



Figure 21. Memorial nowadays should not only recall the past but more about facing the future

Contrasting the process of contemporary Chinese memorials from project plan, design to construction, public participation and rights are extremely weak. The top-down political decision and the absolute power of the few authorities are still dominant in the implementation phase of the project. In most cases, the expression of monumental carries strong official ideology, yet overlooked the true feelings of public about the history. This situation is related to role of power symbol that memorial play for a long time in history of China, also related to the passive and low enthusiasm of populace about public space design. There is still a long way to go to enhance the influence of public participating on memorial design.

7. CONCLUSION

Just as Frampton had written in his book <Modern Architecture: A Critical History>, Monuments are the expression of man's highest cultural needs. They have to satisfy the eternal demand of the people for translation of their collective force into symbols. The most vital monuments are those which express the feeling and thing of this collective force – the people. Today, memorial project is involved with all levels of society. It is a complicate, diverse complex, of which multiple aspects should be considered at the first beginning, such as integration with society, fitness with public commemoration of psychology, and the influence on people's behavior and mentality. As developed so far, the forms and social functions of memorial have made a huge change. It has stepped down the altar, moving towards secularization and humanize. By comparing we can see, there is still a large gap between Chinese and Western memorial. Chinese architects need to learn from the West in many aspects, to make China's memorial moving towards a more liberal and democratic direction.

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PREFERRED TEMPERATURE IN AN AIR-CONDITIONED BUILDING: A CLIMATE CHAMBER EXPERIMENT

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Abstract

This paper documents the findings from series of climate chamber experiments on preferred temperatures gathered from 29 college-age participants from The University of Sydney, Australia. The analyses include monitoring of participant's core temperature, 7-point skin temperatures, participant's preferred temperature and thermal sensation throughout a total of 180 minute experiment duration. The mean individually determined preferred temperature from 29 participants was 25.1°C (± 1.2) and mean skin temperature of 33.7°C (± 0.6). The findings are compared with those of similar experiments conducted about 20 years ago, in warmer climatic zone and with different types of participants. Statistically insignificant differences suggest that occupants cannot be naturally adapted to prefer warmer ambient temperatures.

Keywords: Preferred Temperature; skin temperature; thermal sensation; thermal preference; climate chamber.

1. Introduction

There are concerns that the widespread use of air-conditioning may reduce the ability of a population to acclimatize to hot weather [1, 2]. In order to provide the thermal conditions suitable for building occupant's thermal comfort, many field measurements and controlled experiments were conducted to suggest the suitable preferred temperature across different metabolic rate, age groups and climate zones [3-8].

Given the 23 year gap in using climate chamber experiment to determine occupant's temperature preference, it is likely to investigate whether an invariant finding is still relevant. Therefore, this study repeats the experiment procedure from [7], in order to identify the current building occupant's preferred temperature.

2. Preferred Temperature Experiment

2.1 Participants

Participants in this experiment comprised of 29 college-age from The University of Sydney students, 12 male and 17 female, of whom 12 were South Americans, eight were Chinese, three were Anglo Saxons,

two were Indians, two were Middle Easterners and two were Europeans. They were exposed to adjustable indoor ambient temperatures under variable air valve (VAV) conditions in a climate chamber.

2.1.2 Instruments

Participant's core and skin temperatures were monitored throughout the three hour experimental period. Participants' core temperatures were detected using a CoreTemp® sensor ingested 8 hours before the scheduled session. The sensor's signal (of 262 kHz or 300 kHz) passes harmlessly through the body to the CorTemp® Data Recorder worn outside the body. The core temperature was recorded every 5 minutes.

Seven-point skin temperatures, at the forehead, left hand, left forearm, left abdomen, left anterior shin, left anterior thigh and left instep, were measured using wireless thermistors (i-Buttons). The digital thermometer measures temperatures from -55°C to +100°C, typically in 0.2 seconds with an accuracy of $\pm 0.5^\circ\text{C}$ within 0°C to +70°C. The skin temperatures were recorded every 5 minutes. Participants

were instructed to wear standard uniforms, which included a long-sleeved cotton twill shirt, denim long trousers, socks, covered shoes and their own underwear. The clothing insulation value of this light summer ensemble was 0.60 clo [9].

2.1.3 Preferred Temperature Experimental Procedure

Experiment sessions were conducted in the Indoor Environmental Quality Lab, The University of Sydney, Australia, using the facilities described in [10]. Set point adjustments and monitoring of the ambient temperature and relative humidity in the occupied zone of Chamber 1 were 0.6 m above the floor and were logged every 5 minutes by the Building Management and Control System (BMS) – Automated Logic. Chamber 1 was set to an operative temperature of 25.7°C. This temperature was obtained using Fanger's comfort equation in order to calculate a PMV value of zero with the specified clothing ensemble, activity level ($W/m^2 = 60$), relative humidity (30%) and air velocity (0.13 m/s) [4, 11]. An iPad® IEQ questionnaire application was developed to administer two psychometric scales on a fast 60-second turnaround. All selections were saved to the iPad® memory in a time-stamp comma separated file. After 30 minutes in Chamber 1, participants were asked to vote their thermal preference and thermal sensation every 10 minutes for the remaining 150 minutes of the experiment. The questions that assessed thermal preference and sensation were:

- i) Do you want a change of the air temperature? (Scale used: 1 = want warmer temperature; 0 = no change; -1 = want cooler temperature).
- ii) How would you rate your current thermal sensation? (Scale used: (-3 = cold; -2 = cool; -1 = slightly cool; 0 = neutral; 1 = slightly warm; 2 warm; 3 = hot).

3. Discussion and Conclusion

Preferred temperatures (T_{Pref}) from 29 participants were normally distributed, as assessed by Shapiro-Wilk's test ($p > 0.05$) and there were no outliers in the data, as assessed by inspection of a boxplot. Mean T_{Pref} for three preferred temperature groups, namely Cool Group (25th percentile): 23.5°C (± 0.76), $n = 8$, $p < 0.001$; Middle Group (50th percentile): 25.1°C (± 0.37), $n = 12$, $p < 0.001$; and Warm Group (75th percentile): 26.2°C (± 0.69), $n = 9$, $p < 0.05$ were significantly different from the earlier T_{Pref} of 25.7°C reported by de Dear and co-workers [7]. The mean T_{Pref} did not differ significantly between male and female.

Mean skin temperature (T_{sk}), mean core temperature (T_c), mean body temperature (T_b) and mean thermal sensation vote (TSV) were averaged over the final 30 minutes of the experiment. The T_{pref} reported by de Dear et. al. [7] is slightly warmer compared to our current T_{pref} , with exception to nine participants who perceived 26°C as their T_{pref} (Table 1). Mean T_{sk} of the current sample at 33.7°C (± 0.6) was warmer but not significantly different from the 33.1°C (± 0.6) as reported by [7].

In this study, the preconditioned 25.7°C in Chamber 1 was perceived to be warm and almost 70% of the participants somewhat persistently wanted a cooler ambient temperature until they achieved their T_{pref} (i.e.: $< 25.7^\circ\text{C}$). The inverse relationship between outdoor and indoor temperature in thermal history investigation by Chun et. al. [12] was not fully evidenced in the current study, where eight participants perceived the pre-conditioned 25.7°C as warm and preferred a cooler ambient temperature. This response could be partly due to the fact that experiments were conducted when Sydney, Australia was experiencing the warmest winter on record. Nine warm days reaching at least 30°C, and no cold spells below 20°C, were

recorded from August until October in 2013 [13].

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CULTURAL SUSTAINABILITY IN ARCHITECTURE

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Abstract

This paper intends to examine existing studies on cultural sustainability and thus advance this emerging area of research by understanding the linkages between the concepts of culture, architecture and sustainable development. The highlights of the study includes the increasing recognition of culture as powerful and important aspect in fostering economic, social and environmental domains of sustainable development. By understanding culture and built environment relationships, there is a greater scope in generating a greater awareness of the people of a place and understand the beliefs and values they share as a society, and to comprehend the uniqueness and differences that make them and their built environment distinct from one another. When there is a deeper understanding of the things that are important to people, the built environment and their inter-relationships, architects and planners can make decisions about the future to meet the users' social and cultural needs and at the same time, preserve the environment for the next generation through sustainability principles.

Keywords: Architecture, Culture, Sustainability

1. Introduction

The face of built environment has rapidly undergone significant changes as the result of globalization, when sustainability surfaced to untangle its social, economic and environmental problems. Sustainable design practices began to be adopted across the world in response to the growing environmental awareness to reduce the human impact on the environment. However “cultural irrelevance” was spreading across our built environments in the quest to create and evaluate this new and modern approach to architecture. The terse definition of sustainable development put forward by the World Commission on Environment and Development for the United Nations General Assembly in 1987, states “Meeting the needs of the present without compromising the ability of future generations to meet their own needs”. Architecture was always about bridging the gap between new architectural techniques and older techniques, where this looking back was slowly dying out as a more focus was on the physical aspects of

sustainability than the tangible and intangible values in culture.

2. Culture & Cultural Sustainability

In order to understand cultural sustainability, an understanding of the term ‘culture’ becomes essential. Culture is “a way of life” for a civilization, a “social production and transmission of identities, meanings, knowledge, beliefs, values, aspirations, memories, purposes, attitudes, and understanding” (Hawkes: 2001). There is immense value behind the social expressions divulged through the built form architecture of a place, which makes it essential to understand culture deeply, for practical sustainability. The significance of culture in a sustainable built environment is becoming more evident today, for a healthy and sustained development of our societies. Rapoport asserts that socio-cultural factors are considered primary in shaping built form, whereas climate, construction materials, methods, and technologies secondary (Rapoport: 1969). To maintain the balance

and harmony in the natural environment there is a need to understand sustainability not only through the commonly associated social, economic and environmental issue but also through a cultural perspective. Culture is recognized by Hawkes as the “fourth pillar of sustainability” and it's a key component and drives to achieve a sustainable and healthy society (Hawkes: 2001). Hence the focus of cultural sustainability design is to meet the users’ social and cultural needs and preserve the environment for the next generations. Cultural sustainability involves efforts to preserve the tangible and intangible cultural elements of society in ways that promote environmental, economic, and social sustainability (NZMCH 2006; Duxbury 2012). This has paved way to a new approach in the perception of sustainability.

3. Relevance of Cultural Sustainability

Culture is a key parameter in sustainable development as it frames people’s relationships and attitudes towards the built and the natural environment. Sustainable development is an integral part of the society and culture; affecting all aspects of operations in the built environment. Research in cultural sustainability is essential for understanding the concerns for cultural continuity, which can be investigated in the traditional dwellings/homes from across the world by identifying existing traditional technology and settlement patterns etc. Studies of ancient cultures reveal that this cultural-sustainable parameter has been fully accounted for in determining a logical synthesis in place making. With modernism the cultural context in the design process started to fade, wherein a universal design methodology which is not in context with the cultural values of a particular society/ place began to be adopted. So starting to look deeper into what once existed and how it came about is crucial to find clues for developing a

sustainable built environment. Scrutiny and analysis of culture will help find solutions that benefit people’s strengths and values (Boschi: 2003).

4. Culture in/for Sustainability.

Sustainable architecture is usually approached as an issue of technological and energy performance due to which the discourse surrounding it has remained separate from the broader perspective of architecture as a cultural project. “Current technologically based sustainable architectural approaches and design methodologies often fail to coincide with the cultural values of a particular place or people” (Guy and Farmer 2000: 80), which calls for a need to identify the role of culture in sustainability. “Traditional wisdom and lore in building, using renewable resources and indigenous skills, may still offer wisely managed, economically effective and culturally appropriate solutions to the world’s increasing housing needs” (Oliver, 2006) which gives cues that probe into the cultural aspects of a place, would yield design solutions that are responsive to local conditions and those that are economically viable and have withstood the test of time. Indigenous architecture has been inherently sustainable and modern architects have employed those principles in creating architecture that is in relevance to culture and kinder to the environment (Dayaratne: 1999, 2000, 2003, 2007).

Recent researches have demonstrated both the value and logics of learning from vernacular for sustainability where social and cultural values are closely associated with building design style and function. Hence there is a definite connection between architecture and culture which relates to location, and so over time its characteristics become representative of a locality’s cultural heritage. And cultural sustainability and the connection with the built environment involve the development

of building forms, materials and construction methods resonant with the local culture and expertise (Williamson et al. 2003).

Keeping the past as reference, buildings are critically important in the domain of cultural sustainability as they are the built reflection of the aspirations of those for whom they are built (as well as for those who design and build them), and collectively they represent the beliefs and priorities of their society through its history (Beynon 2009). A less quantitative, more qualitative perspective on sustainability is crucial in the assessment of architecture in the today's context.

5. Architectural Practices should adopt Cultural Sustainability.

An efficient sustainable built environment that includes economic and socio-cultural sustainability supports local economy (Allen 2009).

The built environment is an integral part of spatial construction, and the history of building is a history of identity and therefore any alterations to buildings, involve elements and forms that relate to particular cultural and societal patterns (Beynon 2010).

Culture is a crucial instrument that will drive sustainable development with broader social, economic and environmental impacts on the society and hence it should be placed at the centre of our development strategies. Today many cities across the world use cultural heritage to encourage sustainable urban communities and cultural heritage and infrastructure can serve as strategic tools for revenue generation. Culture plays an important role as a non-renewable resource that is a vital part of our cities; the adaptive re-using of the historic urban environment adds to the quality of life of their inhabitants by strengthening their sense of

belonging, social cohesion and providing a pleasant environment that mitigates excessive urbanization (UNESCO 2012b), thus fostering cultural sustainability.

Historic towns and the historic parts of cities are of immense worth for their uniqueness and identity (Duxbury 2012). Culture contributes to sustainable built environment through the protection of historic buildings which need to be conserved for economic as well as cultural continuity. Other measures that can be adopted are sustainable urban retrofit schemes and regeneration/urban renewal programmes on an urban scale. Design practices focussing on sustainable architecture and smart/sustainable cities, within the dominion of the societies' identity to protect its continuity, is also very essential. The cultural heritage of a place is a powerful asset for inclusive economic development, since it attracts investment and ensures green, locally-based, stable and decent jobs relating to a wide range of sustainable activities in areas such as conservation, construction and adaptation (Hosagrahar 2013).

Culture, sustainability and sustainable development are complicated concepts wherein a comprehensive framework of study is essential to formulate policies integrating strategies that include the environment, the economy and quality of life. Development measures and schemes should ensure a strong 'cultural flow' in policies and enable a culturally sustainable society after a thorough understanding of the current flaws and difficulties in its application towards development.

6. Difficulties and Threats

With the progress of knowledge about the adequacy and impact of sustainability, its attainability has been explored into different walks of life. Architects and planners, however; are trying to establish their knowledge in four areas: environmental, economic, social and

cultural, popularly termed as the four pillars of sustainability. While a connection between culture and sustainability is under exploration, researchers need to focus on culture as a distinguished aspect with credible methods of assessment for their effectiveness in design. Environmental and economic aspects of sustainability have been deeply researched and practiced in the design of built environment with strong means of assessment of their effectiveness, but social and cultural aspects of sustainability, still lacks reliable and suitable solutions to implement them in design. The domain of cultural sustainability is still emerging, where there should be an opportunity to compare the effects of design interventions.

Another issue which forms a threat to culture is the emergence of globalization, which has brought about rapid social change & urbanization which is at the cost of existing cultures and built environment. Due to this modernization the traditions are vanishing and there is also a irreplaceable loss of knowledge bearers. Damage by tourism and competition with commercial media is adversely affecting the region's original identity, for the sake of technological and economic advancement. Political projects which override common values and lack of financial support to support these sustenance are others threats to their rapid loss and deterioration. These phenomenon have introduced an important number of risks for culture; such as: the loss of regional cultural spaces, of local urban culture, of historical "originals." More often we have seen these aspects disappear; and sometimes they replaced or reproduced as a commoditization of the original cultural heritage (Fithian & Powell: 2009). These combined insights and threats give us make evident that we have to change our present ways of looking at sustainability and incorporate cultural aspects into our values system. Mass produced system of modern architecture to

solve social problems has come to its limits and a new approach to sustainability inclusive of the four pillars needs to be adopted.

7. Discussion and Conclusion.

Of all important factors affecting the society, culture is one essential aspect that should emerges as an independent parameter in the realm of sustainable architecture. It must be a separate, distinct, and integral part of the design policies and strategies of sustainable development. Studies focuses on the sustainability of the culture of a place will lead decision makers to create improved cultural centers and meaningful urban spaces. When such an approach to design is established along with the other physical aspects of sustainable development, a culturally sustainable community will evolve which will have better ability to sustain and build on its own resources. By investigating the concerns and issues discussed in this paper, building a culturally sustained built environment in harmony with the natural and social environment could be realized by designing with the vision and objectives of sustainable architecture. This approach can effectively maintain cultural integrity, continuity and solidarity among the community as well as at the same time to preserve the environment for the next generations.

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INTELLIGENT ALIVE ARCHITECTURE WITH BIOLOGICAL APPROACH TO DYNAMIC DESIGN, ROLE OF COMPUTATION AND PARAMETRIC TECHNIQUES AS SMART WAYS OF CONTROLLING ARCHITECTURE

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Abstract

Intelligent Architecture is the idea of utilizing computation design techniques for achieving smart responsive dynamic design solutions that has been inspired by biological behaviour patterns. This research is analysing a series of case studies and prototypes that has been designed and fabricated within the same principles. The idea of architecture of change, agility, responsiveness and computational design in architecture refers to the problem of adapting built environment to its surrounding natural platform and evolving architecture in the same way that natural systems has.

Keywords: *intelligent architecture, biomimicry, computational design, biology in design, architecture of change*

In recent years, there have been versatile socio-cultural, ecological and environmental issues emerging in our cities, starting from 20th century where the loss of regional difference began to undermine the uniqueness of place, removing us from understanding what local region and climate have to offer and the buildings were predominantly seen with the emergence of engineering and technological solutions as their dominant factor in design. In that regard, numerous green movements and environmental concerns have emerged to lead toward environmentally benign solutions for the built environments. To address architecture in that regard, the most effective solution embraces a movement on which buildings will be read as living forms and cities as organic systems.

Today, with the global target to promote environmentally responsive buildings, various studies draw attention to the promising role of passive design strategies. However, considerably less attention has been paid to the circumstances of creating highly responsive and regenerative buildings that are equipped with interactive

building fabrics towards ensuring dynamic potentials for responding to the surrounded environment. In this line, this research explores the biomimicry design principles which are characterized as an inspirational source with practical potentials towards designing regenerative built environments. [1]

One may discuss that we should first decode the rules of nature and obey them in the future design, and one may argue the similarity of those rules to the ones for human life. Nature is creative as people are, and the creativity of the nature in its own context and the symbiotic relation between its members should become an inherent source of inspiration for human in order to form his artificial natural environment that embody dynamic potentials to respond to the surrounded context. [2][3]

This research theorizes that the natural world encompasses an immense database of design initiatives that can inspire creative thoughts. In this research, using computational design techniques such as generative, parametric and responsive

design, the focus is on the exploration of the advance design tools to employ biomimicry essence in architectural design following the principles of architecture of change. According to Branko Kolarevic 'the architecture of change' refers to buildings, which can be adapted in some way or other to the dynamic process of habitation.

Methodology for exploring this idea is to test a series of case studies and prototypes that has been designed and fabricated in various scales and applications within the same principles. Any of these prototypes explores interactive installations, motion in built form, responsiveness to environments and use of computation as a smart technique for understanding, designing and behaving with respect to biological studies.

The idea of architecture of change, agility, responsiveness and computational design in architecture refers to the problem of adapting built environment to its surrounding natural platform and evolving architecture in the same way that natural systems has. Indeed, these concepts and devices are better defined as tools than goals. Beyond the ideas of organic forms, archology, sustainable architecture and nature-friendly buildings, it can be argued that the goal should be designing buildings as living forms and cities as infrastructural natural systems. In that sense architecture of change plus biomimicry will be the mean and computation will be the tool for that biological evolution of man-made environment.

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THE ESSENCE OF PROMOTING GREEN ROOFS FOR BUILDING COOLING ENERGY REDUCTION IN NEW ZEALAND

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Abstract

With the growing rate of Greenhouse Gas (GHG) emissions globally, the need for promotion of a sustainable resolution to diminish the consequent impacts of this phenomenon is evident. Moreover, global warming concerns have been the centre of emphasis lately as this matter is becoming of outmost significance to the well-being of future generations. Indeed, New Zealand as a leading society towards endorsement of sustainable built environments, forms an appropriate platform to encourage diverse green design approaches headed for a sustainable future. Consequently, this research focuses on the essence of promoting green roofs in New Zealand.

Keywords: Green Roofs, Environmental Sustainability, Sustainable Future Cities, New Zealand

Global warming [1], as a significant driver of environmental degradations [2], if not tackled, will result in catastrophic outcomes. Contemporarily, the negative impacts of this phenomenon has resulted in various negative consequences including elevated levels of building cooling energy consumptions [3, 4].

Alternatively, the concept of green roofs offers promising insights towards reduction of building energy loads [5]. This concept, once broadly implemented, is expected to significantly assist with reduction of urban air pollutions [6]. Besides, it is anticipated to reduce GHG emissions. This article emphasizes on the essence of implementing green roofs in New Zealand. Concerning climatic conditions [7], green roofs are seen to be more efficient in terms of reducing building cooling loads in the Northern island of New Zealand.

As a sustainable feature towards endorsement of built environment resilience, promotion of green roofs in New Zealand not only results in minimization of building cooling loads but also helps building a unified green city image. Concerning the urban context,

green roofs are also expected to minimize the Urban Heat Island (UHI) [4] impact.

This article accentuates the importance of research in the context of implementing green roofs in New Zealand and its potential benefits to minimize building energy performance. The Auckland Council, New Zealand Green Building Council and many other relevant organizations have planned and implemented the application of green roofs in New Zealand.

Ultimately, it is stressed that; successful design and employment of green roofs in New Zealand will eventually assist in minimizing the negative impacts of growing global warming concerns.

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PARAMETRIC ANALYSIS OF THE THERMAL COMFORT CONDITIONS OF UNSHADED COURTYARDS IN THE TROPICAL CONTEXT OF KUALA LUMPUR

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Abstract

In recent years, there has been a growing interest in exploring the impacts of urban built environments and their design configurations on outdoor thermal comfort conditions, particularly in the tropical contexts. Urban built environments and their interrelations with micro-climatic variations are considered as significant parameters for improving the experience and overall satisfaction of users in cities. Moving forward, the rapid urbanization and current construction developments in metropolitan cities, including Kuala Lumpur, have increased the need to create more thermally comfortable outdoor environments for recreational activities and beyond. As a result, several scholarly studies have drawn attention to the crucial necessity for a consistent collaboration between urban designers, architects and urban climate scientists to take into account the outdoor thermal comfort principles in order to address the urban greening targets. From another viewpoint, recent studies present the great potentials of courtyards towards ameliorating the thermal performance of urban built environments. Accordingly, this study explores the thermal performance characteristics and outdoor thermal comfort conditions of selected courtyards in the University of Malaya (UM) city campus in Kuala Lumpur. The study concentrates on physiologically equivalent temperature (PET) using RayMan software as an appropriate outdoor thermal comfort index to evaluate the impacts of versatile heat mitigation strategies and design configurations on PET variations. Findings reveal that while courtyards encompass substantial potentials to be utilized as micro-climatic modifiers, they can have extremely poor performance if they are not efficiently designed and constructed based on climate responsive approaches. Furthermore, the findings demonstrate that the studied courtyards generally failed to provide thermally pleasant outdoor spaces for their occupants throughout the entire period of field measurements as indicated by their high PET values. Finally, it can be concluded that during the design of outdoor spaces, including courtyards, in the tropics, more attention should be paid to the vital role of heat mitigation strategies.

Keywords: Sustainability, Outdoor Thermal Comfort, Courtyards, Heat Mitigation, Hot and Humid Climate

THE ROLE OF GREEN ROOFS TOWARDS ENHANCING THE VISUAL APPEARANCE OF URBAN NEIGHBORHOODS

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Abstract

In recent years, numerous researchers have examined the sustainable performance of buildings integrated with green roofs. The reviewed studies predominantly confirm the environmental, social and economic benefits of green roofs once efficiently designed and constructed in accordance with the micro-climatic attributes. Nevertheless, very few studies have evaluated the aesthetical potentials of green roofs. Accordingly, this study aims at exploring the potentials of green roofs for beautifying the urban neighborhoods and enhancing the visual appearance of mid-rise residential buildings' rooftops. Finally, findings highlight the current challenges of utilizing green roofs in building industry and put forward new solutions.

Keywords: Green Roofs, Urban Built Environments, Urban Neighborhoods, Visual Appearance, Visual Perception

Recent studies repeatedly report the rapid urban growth and increase of urban density in many large cities in both developed and developing countries. As a result of this rapid urbanization, various researchers have been arguing the negative impacts of the increased number of ongoing construction developments on users, society and environment. In this regard, looking at some of the key environmental challenges of the 21st century including climate change and global warming, with viewpoints to the crucial role of urban built environments, architects and urban designers should continuously draw adequate attention to the development of innovative approaches towards sustainable design of buildings.

Among the core existing sustainable design strategies in the context of building industry, this study looks at the growing attentions in recent years about the use of green roofs in various cities with different climatic conditions. Accordingly, the aim of this paper is to explore the current status of the implementation of green roofs as one of the key trends of sustainable design

in the city of Tehran in Iran. Furthermore, the study analyzes the potentials of green roofs for improving the aesthetical appearance of urban neighborhoods through exploring the visual perception of users.

In essence, green roofs are defined as the rooftops that are partially or completely covered by vegetation. There are generally two main types of green roofs namely intensive and extensive. Latest studies demonstrate several advantages of green roofs which can be categorized into social, environmental and economic dimensions. Reviewing recent key studies related to the impact of green roofs, it is proven that the vegetated rooftops can considerably improve the indoor and outdoor thermal comfort, air quality, and energy efficiency while they can contribute to the enhancement of biodiversity and stormwater management [1]. More recently, studies attempt to look at the large-scale benefits of green roofs towards decreasing the urban heat island (UHI) intensity in large dense cities [2]. From another viewpoint, among the social

benefits of green roofs, the study refers to their potentials for developments of new platforms for outdoor social activities, improvement of the visual appearance of buildings and city, and enhancement of users' health. The economic benefits of green roof are principally about the decrease of energy consumption, and increase of property values.

On the other hand, recent studies indicate that green roofs can result in highly diversified thermal performances depending on their technical configurations and relevance to the climatic characteristics. Therefore, there is a significant need to promote the climate responsive design of green roofs for achieving the maximum advantages. Furthermore, a key challenge of using green roofs is the high initial costs related to the design, construction and maintenance of this sustainable design strategy. While various studies have explicitly confirmed the long-term economic benefits and the pay back periods for the application of green roofs, many professionals are yet not fully aware of these research findings. The other

challenge of applying green roof is its diversified performance in different climatic conditions and accordingly, it becomes a complex and multifaceted task to efficiently design a green roof which can successfully perform in a city such as Tehran in both hot and cold seasons.

Finally, this study argues that the majority of scholarly studies and practical implementations related to green roofs are predominantly related to the energy-oriented objectives. As a result, considerably less attention has been paid to the visual benefits of green roofs. Looking at figure 1, it is criticized that many of the current rooftops in mid-rise residential buildings in Tehran city are not designed with viewpoints to the aesthetical principles. Hence, users, staying in their residential units, do not enjoy a visually appealing urban neighborhood. To respond to this criticism, the study evaluates the potentials of green roofs for beautifying the urban neighborhoods and enhancing the visual appearance of the rooftops while exploring the visual perception and satisfaction level of occupants.



Figure 1. A Typical Visual Appearance of Urban Neighborhoods in Tehran City with Viewpoints to the Current Rooftops of Mid-Rise Residential Buildings

To conclude, the study discusses that the consistent dialogues between architects, urban designers and urban policy makers, as proposed by previous studies, should

not be limited to the circumstances of achieving more energy efficient urban built environments. Therefore, many other parameters such as the above-mentioned

points about the neglected visual benefits of sustainable strategies should be taken into consideration.

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RELEVANCY MEASURES OF ERRORS IN DISPLACEMENTS OF FINITE ELEMENTS ANALYSIS RESULTS

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Abstract

This paper highlights the methods of error estimation in finite element analysis (FEA) results. It indicates that the modeling error could be eliminated either by performing finite element analysis with successively finer meshes or by extrapolating response predictions from an orderly sequence of relatively low degree of freedom analysis results. In addition, the paper eliminates the round-off error by running the code at a higher precision. The paper provides application of the procedure of error estimation in finite element analysis results. It draws a conclusion based on results of application of methods of error estimation. And recommends an analysis process that leads to accurate estimates of displacement error in finite element analysis result to measure the accuracy and a possible improvement on it by monotonic convergence of the displacements results.

Keywords: *Finite element analysis (FEA), Discretization error, Round-off error, Mesh refinement, Richardson Extrapolation, Monotonic convergence*

1. Introduction

The inaccuracy induced by using a finite number of generalized nodal displacements in finite element analysis is called modeling error. Our objective is to establish a reliable error estimate in displacements of a structure analyzed by finite element method. The modeling error can be classified into two categories. The first category of modeling error estimator is based on estimates of the exact solution to the differential equation which are higher-order accurate than the underlying numerical solutions and includes approaches such as Richardson extrapolation, order refinement and recovery methods from finite elements. The second category of error estimator based on the residual (i.e. the truncation error) and includes discretization error, transport equations, finite element residual methods and adjoining method extensions. There are certain restrictions on the error estimators in order to reach to a reliable error estimate. These restrictions includes mesh refinement policy rules of extrapolation that guarantee monotonic convergence of the results and use of high precision code.

2. Discretization error

The basis of FEA is taking a system governed by differential equations and partitioning it into regions (elements) that can individually be solved with simple linear equations. This partitioning creates a series of linear approximations that strive to map, as closely as possible, the true continuous solution. Using structural stress-strain as the primary example, the FEA code takes the mesh approximation and solves for the displacements at each node given the loading and constraints on the model. Next, as a secondary operation, the code approximates the stress contour in each element by looking at the relative displacement of the nodes of that element. In this manner a stress contour is determined for each element – an approximation of the stress throughout each individual element, including at the edge of the elements and the node locations. Given that this contour is approximated based only on the displacement of the nodes of the element in question, the stress contour will not necessarily be continuous from one element to the next. Essentially, this discontinuity of the stress contour from

one element to another is the discretization error. As the size of each element is reduced towards zero this error goes to zero given that the increasing number of partitions is approaching the true continuous system [7]. The number of d.o.f. is infinite in the mathematical model but finite in an FE model. The FEA solution is influenced by the number of elements used, the number of nodes per element, the nature of element shape functions. Integration rules used with isoperimetric elements and other formulation details of particular elements. [12].

3. Round-off error

Rounding error refers to loss of information due to truncation or rounding of numbers to fit a finite computer word length. This kind of error is present in element and structure matrices before a solution algorithm is applied. Due to finiteness of the computer word lengths, only a finite subset of the infinitely many real numbers can be represented in the machines. None of the irrational numbers and very few of the rational numbers can be represented [20]. The study of round-off error is crucial when solving a linear system of equations, since it may pollute and even destroy the solution of the problem. Round-off error is of particular concern in adaptive hp-finite element (FE) computations, where h denotes the element size and p the polynomial order of approximation, both varying locally throughout the computational grid. There is a potential for large round-off errors when using heavy mesh-refinements in a hp-adaptive FE discretization to approximate a particular feature of the solution. Since the condition number controls the round-off error, a natural approach to minimize error is by decreasing the condition number. One way to achieve this is by performing an optimal scaling of basic functions [6]. And the Computer round-off errors develop with the representation of floating point

numbers on the computer and the accuracy at which numbers are stored. With advanced computer resources, numbers are typically stored with 16, 32, or 64 bits. Round-off errors are not considered significant when compared with other errors. If computer round-off errors are suspected of being significant, one test is to run the code at a higher precision or on a computer known to store floating point numbers at a higher precision. One can attempt to iterate a coarse grid solution to a residual of machine zero; however, this may not be possible for more algorithms that are complex. [9]. For most minicomputers, single precision refers to a 32-bit and double precision to a 64-bit word length for real numbers which corresponds to a decimal number of between six and seven significant figures in 32-bit and ten to fifteen significant figures in 64-bit. Cases can occur when the nature of the problem and its numeric representation can produce such a build-up of round-off errors that the results produced may be quite meaningless. It may be necessary then to use double-precision arithmetic in the sensitive accuracy structural analysis programs. But the consequences, while they will include a far more accurate result, will entail penalties of increased running time and memory requirements. As we can see the case study results in single-precision (32bit) results and the double-precision (64bit) results later, the precision error more affective when the analysis results are in relative small values than the big values of the results.

4. Accuracy of mesh refinement

The creation of meshing in finite element models is the most important step in the entire analysis since the decision made at this point will affect the accuracy and the economy of the solid model. Thus, the choice of mesh for various analyses is crucial. An element or mesh that is good in one problem area such as magnetic field may be poor in another such as stress

analysis. Even in a specific problem area, an element may behave well or badly, depending on particular geometry, loading and boundary conditions, for reasons of better accuracy and efficiency, quadrilateral elements are preferred for two-dimensional meshes and hexahedral elements for three-dimensional meshes [13]. This preference is clear in structural analysis and seems to also hold for other engineering disciplines. The mesh quality has been defined as a combination of two criteria such as element quality and enough number of elements in the mesh. The quality of the surface mesh should be good to get acceptable finite element results. Element quality for quadrilateral element is defined by two factors namely: Distortion factor and Aspect ratio. When generating a finite element mesh, one can expect more accurate results with more refined mesh (smaller size but larger number of elements within a confined area). However as the model gets larger In FEA, larger model does not mean larger geometry, but rather the complexity due to the number of elements used), the computer will spend more time to generate the results of the analysis. It is often very important to minimize the computing time without a significant loss in the accuracy of the solution to achieve satisfying results with minimum computing time [19]. The most efficient element model to use for particular analysis varies with accuracy requirements, number of degree of freedom and computer implementation. Usually higher degree elements should be selected when accuracy requirements are high. The most efficient grid arrangement varies with the analysis purpose, computer code and accuracy required. Generally, optimized grid should be used for studies of elements characteristics, focused grids for production analysis of complex systems, and regular grid when extrapolation can be exploited. Use of successive grids which lack the discipline of an optimum, focused or regular arrangement can lead to an acceptable

mesh design. However, it could also incur exorbitant time penalties to attain the required accuracy or lead to oscillatory or divergent sequence of analysis results [15]. In addition to the requirement that the order of accuracy of a solver be verified, Richardson extrapolation also depends on a uniform refinement of the discretization size. When applying Richardson extrapolation to a relatively simple approximation such as that of an extrapolation to partial differential equations in one dimension, uniform refinement remains relatively simple. The computational domain, or mesh, in one dimension consists of a straight line subdivided into appropriate intervals. A typical mesh refinement consists of dividing each subinterval of the original mesh in half. The result, obviously, is a new mesh with twice as many intervals as the original, a refinement ratio of 2. In two dimensions, refinement of a structured mesh remains essentially the same, but extended to an extra dimension. The same refinement ratio of 2 increases the number of elements by a factor of 4. The issue of refinement becomes significantly more difficult, however, when dealing with unstructured meshes in two dimensions. For a sequence of meshes to be appropriate for Richardson extrapolation, the meshes must be geometrically similar. [2]

5. Accuracy in extrapolation

Richardson [4] bases the most commonly used extrapolation-based discretization error estimator off work in 1910. The method was used to calculate a fourth-order accurate solution for a second-order finite-difference calculation of stresses in a masonry dam. The method was applied to solutions obtained on multiple mesh levels with grid doubling to estimate the true asymptotic solution Richardson [7]. Later explores implementations and pitfalls of the method and demonstrates accuracy with simple applications such as the calculation of π and the natural log base e . Richardson used a refinement factor of two

(i.e. grid doubling) and a formal order of accuracy of two, Richardson extrapolation has since been generalized to apply to any formal order of accuracy and refinement factor [8].

Richardson extrapolation makes the assumption that the solution is smooth and that the two solutions are asymptotic. Extrapolation can in some cases increase oscillations in the solution and can magnify iterative and round-off error. In addition, the extrapolated values are generally not conservative [8] and can result in a less accurate solution than the fine grid solution. With these considerations, Richardson extrapolation was eventually adapted as an error estimator expressed as the difference between the numerical solution and the extrapolated solution forming the base for the error and uncertainty estimators included in this study. The success of Richardson extrapolation is due to its generality because it can be applied to any scientific computation regardless of the discretization method (e.g. finite-difference, finite-volume, or finite-element) and because it is an a-posteriori error estimator, the method is not code intrusive and relatively easy to implement. Extrapolation is a methodology for improving the order of accuracy of numerical solutions that involve the use of a discretization size h . By combining the results from numerical solutions using a sequence of related discretization sizes, the leading order error terms can be methodically removed, resulting in higher order accurate results. Richardson extrapolation is commonly used within the numerical approximation of partial differential equations to improve certain predictive quantities such as structures deformation, once these quantities are calculated on a sequence of meshes. Within this paper, Richardson extrapolation is applied directly to the solution algorithm used within existing numerical solvers of partial differential

equations to increase the order of accuracy of the numerical result without referring to the details of the methodology or its implementation within the numerical code. Only the order of accuracy of the existing solver and certain interpolations required to pass information between the mesh levels are needed to improve the order of accuracy and the overall solution accuracy. Richardson extrapolation relies on an observation about the shape of the error terms in a numerical approximation. Assume $N(h)$ is a numerical approximation of order p to an exact result $N(0)$.

The algorithm is consistent when the exact result is obtained as h goes to zero. Richardson extrapolation has been used to increase the order of accuracy of numerical approximations to the derivative of a function and to the integral of a function over a bounded domain. It can also be applied to the numerical solution of ordinary differential equations, although the computational cost is greater than certain specialized methods. Unfortunately, the application of Richardson extrapolation to partial differential equations is subject to certain issues that must be addressed for the method to achieve higher order accuracy. These issues include the effects of dispersion, which can cause variation in the locations of physical features of the solution based on mesh resolution, improper implementation of the algorithm so that the original theoretical order of accuracy is not achieved, and poor mesh refinement resulting in sequences of meshes that are not geometrically similar. Several issues regarding Richardson extrapolation have been addressed. Successful application to partial differential equations that exhibit significant dispersion has been performed via application to the residual rather than the solution. The issue of proper code implementation has been addressed through extensive code verification, either through comparison to the known exact

solution, or through a "manufactured" solution. Lastly, geometrically similar meshes have been created through h-refinement. [1,2,21,22]

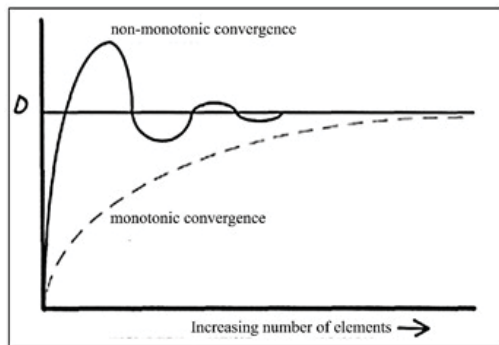


Figure 1. Convergence, Reference: *steven lepi, "A Practical Guide to finite elements a solid mechanics approach", page 198*

6. Monotonic convergence

To illustrate the concept of monotonic convergence, the graph in Figure.1 shows exact displacement, D , at some point in a structure. The dashed monotonic convergence line suggests that as the finite element mesh is refined, the finite element solution approaches (converges upon) the exact value. Note that for every increase in the number of elements, displacement on the monotonic line becomes a better approximation for the exact displacement. When convergence is monotonic, the analyst knows that each successive refinement yields a more accurate solution than the preceding one. The analyst can therefore intuit if further mesh refinement will yield significantly better results, or if the current level of refinement is sufficient. However, the same cannot be said when convergence is non-monotonic. When convergence is non-monotonic, further mesh refinement may provide better or worse accuracy, making it difficult to determine the number of elements needed in a particular model. Monotonic convergence has an advantage in that the degree of mesh refinement needed for a particular level of accuracy can be inferred by observing how much the solution changes between each refinement. For example, if the change in displacement is small with each successive mesh

refinement, the solution is assumed to have converged, and further refinement will not render a more accurate model. (This, of course, does not always mean that the correct answer has been obtained, only that the results will not be more accurate with further refinement.) In light of the advantages of monotonic convergence, finite elements are typically designed to ensure such behavior, although there are some exceptions which will be mentioned shortly. To ensure monotonic convergence of the finite element solution, both the individual elements and the assemblage of elements ("the mesh") must meet certain requirements. The term h-convergence is used in reference to the process where the predicted displacement in a finite element model had better represent the exact displacement as a larger number of smaller elements is employed. Only h-type elements are considered in this text, thus, the term monotonic convergence herein implies convergence using the h-method of finite elements.

Displacement within a finite element is interpolated from the discrete values of displacement at the element's nodes. To generate a finite element interpolation function, one usually begins with a displacement assumption, typically a polynomial with adjustable terms (a_i). That a displacement assumption must:

- 1- Have sufficiently differentiable terms
- 2- Be complete
- 3- Have linearly independent terms
- 4- Satisfy the essential boundary conditions of the element

If a displacement assumption used for simple one-dimensional problems satisfies the requirements above, the finite element model will exhibit desirable convergence characteristics, namely, monotonic convergence.

Requirements to ensure monotonic convergence:

To ensure monotonic convergence of displacement predicted by the finite element method, both the individual

elements and the assemblage of elements ("the mesh") should meet the five requirements described below although the property of geometric isotropy is not included, it will be considered a general requirement for displacement assumptions. Requirements 1 and 2 are equivalent to maintaining completeness in energy, while Requirement 3 ensures that inter-element compatibility is maintained.

- 1- Rigid body representation: The displacement assumption must be able to account for all rigid body displacement modes of the element.
- 2- Uniform Strain representation: Constant strain states for all strain components specified in the constitutive equations of a particular idealization must be represented within the element as the largest dimension of the element approaches zero.
- 3- Compatibility between Elements: The dependent variable(s), and P1 derivatives of the dependent variable, must be continuous at the nodes and across the inter-element boundaries of adjacent elements.
- 4- Mesh refinement: Each successive mesh refinement must contain all of the previous nodes and elements in their original location
- 5- Uniform strain representation: The mesh must be able to represent uniform strain when boundary conditions that are consistent with a uniform strain condition are imposed

If all of the requirements are met, the finite element solution will converge, monotonically, with mesh refinement. This presumes that other errors, such as computational round off error, are not introduced in the solution procedure. Two conditions are required for such monotonic convergence of finite element solution: the elements must be complete and the element and mesh must be compatible.

7. Illustrative case study

The straight cantilever beam (see Fig.4) is a frequently used test problem which can be applied to beam, plate, and solid elements, its virtues are its simplicity and the fact that all of the principal element deformation modes described earlier (constant and linearly varying strains and curvatures) can be evoked by loads applied to the free end. We have added different element intensity principally to test the accuracy of finite element analysis results due to discretization and mesh refinements, to reduce the effect of round off error in the FEA results we intent to use single (32-bit) and double (64-bit) precision digits in the analysis calculations. The design of a comprehensive set of element test problems should, of course, take into account the parameters, which affect accuracy. These parameters can be classified under the headings of loading, element geometry, problem geometry, and material properties. With regard to loading, the problem set should, as a whole, provide significant loading for each of the types of deformation, which the elements can exhibit. Each element that discrete has a standard shape which may be the only shape that the developer has tested. In all cases the standard shape is a square to be used but the discrete intensity will vary for each case element. Poisson's ratio has a strong effect on element accuracy as its value approaches 0.5. Such values should be included in the problem set if the use of nearly incompressible materials is contemplated. Plasticity affects element accuracy in much the same way as incompressible material. Plasticity and all other nonlinear effects are outside the scope of the paper. Anisotropic material properties also have a significant effect on element accuracy, which will not be examined here. The test element parameters Straight cantilever beam elements. Length =6.0 in; height =0.2 in; thickness = 0.1 in; modulus of elasticity $E= 1.0 \times 10^7$ Ib./in²; Poisson's ratio $\nu = 0.30$; modulus of rigidity $G=3,846,154$ Ib.

/in2. Loading= one unit forces at free end upward. (Note: All elements have equal volume and QUAD 4 type.) The incompatible bending modes option should be applied to prevent the Poisson's effect extra stress at the support. [13]. The independent solution is derived using elementary beam theory that assumes no local Poisson's effect occurs at the support. The beam is modeled in commercial software SAP2000 to match this assumptions.

As we can see in Table I lists the extrapolated tip deformation by Richardson polynomial extrapolation associated finite element analysis using h^0 , h^2 , h^4 , h^6 function. These estimates agree with the actual tip deformation to the fifteen digits of accuracy. As we can see the results of the tip deformation values found that the first three polynomials close to the theoretical calculated value and by closer look we conclude that the third extrapolation polynomial is the most accurate value to the theoretical calculated value. Therefore, the extrapolation equation will be:

$$\Delta = 0.108078000014558 \times h^0 - 2.70000002825901 \times 10^{-2} \times h^2 + 9.42123920642551 \times 10^{-10} \times h^4 + 1.13479955757952 \times 10^{-9} \times h^6$$

Table 1. Extrapolated Beam Tip Deformation at Each Element Size

No of elements	element size (1/No. elements)	Extrapolated Beam Tip deformation(in)
1	1.000000000000000	0.081078001808891
2	0.500000000000000	0.10132800020524
4	0.250000000000000	0.106390500000853
8	0.125000000000000	0.107656125010377
16	0.062500000000000	0.107972531263469
32	0.031250000000000	0.108051632786849

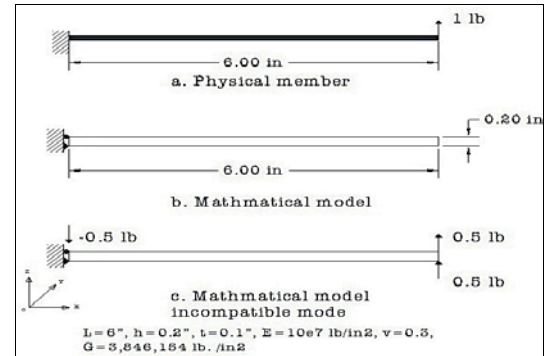


Figure 2. a. Beam element physical model including applied load. b. mathematical model. c. mathematical model in incompatible bending mode

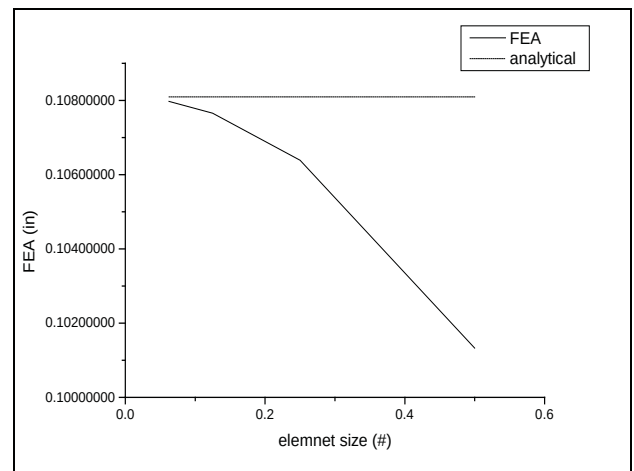


Figure 3. the case study monotonicity proof.

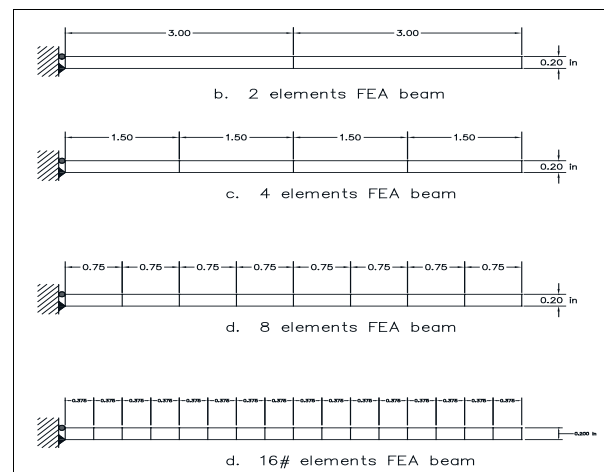


Figure 4. FEA Beam mesh refinement.

Table 2. Mesh Refinement Results of Deformation at Free End

No. of Elements	Single precision (32 bit)	Double Precision (64bit)	Difference =(64bit-32bit)	error % = (difference / DP64bit)*100
1	0.0810780000124783	0.0810780000124783	0.000000000000000E+00	0.00000000000000000000000000000000%
2	0.1013280000204860	0.1013280000204880	1.99840144432528E-15	0.00000000000197221048863218%
4	0.1063905000008500	0.1063905000008500	0.000000000000000E+00	0.00000000000000000000000000000000%
8	0.1076561250103760	0.1076561250103760	0.000000000000000E+00	0.00000000000000000000000000000000%
16	0.1079725312634680	0.1079725312634450	-2.29954943975486E-14	-0.00000000002129754126208380%
32	0.1080516327874710	0.1080516327868490	-6.22002449546244E-13	-0.00000000057565298506247800%

8. Discussion and Conclusion

Table 3. Results

method	Tip deformation	% of error
Analytical Tip deformation	0.108093599996256	0.00000%
Mesh Refinement	0.108051632786849	-0.03883%
Extrapolated Tip deformation	0.108078000014558	-0.01443%

This paper propose the procedure required to obtain a reliable estimate of error in displacement of finite element analysis results. The following conclusion may be drawn:

- 1- the Richardson's extrapolation technique may be used to obtain a reliable measure of error in displacement of finite element analysis results if certain conditions are satisfied such as:
 - a. high precision code is used in the analysis (64-Bit) system.
 - b. Use of polynomial error functions in the form ($\Delta = a_0 + a_1 * h^2 + a_2 * h^4 + a_3 * h^6$)
 - c. Monotonic convergence of the displacement function is guaranteed
 - d. The results of finite element are obtained by mean of the confirming elements.
- 2- The case study shows that the error estimate in displacement at the free end of the cantilever using extrapolation is (-0.01443) percent in comparison with analytical results. It also shows that the error estimate in displacement at the free end of the cantilever free end using mesh refinement is(-0.03882) percent in comparison with the analytical results

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EFFECT OF DIFFERENT MIXING WATER ON COMPRESSIVE STRENGTH OF CONCRETE

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Abstract

The research focused the effect of different qualities of mixing water on the compressive strength of concrete. It aims to prove that the usage of different mixing water will be suitable for making concrete providing similar strength as conventional tap water. The concrete design mix of Grade 35 with water cement ratio of 0.5 was prepared with Ordinary Portland Cement using water samples, such as river water, rain water, lake water and factory waste water collected from various sources were used to cast 150 mm³ concrete cubes. The cured concrete cubes were tested on 1, 3, 7, 14 and 28 days for compressive strength evaluation. The results showed that the compressive strength of concrete cubes made with lake water and river water increased with days and have almost equal strength as conventional tap water.

Keywords: Concrete, Compressive, Strength, Water, Qualities

1. Introduction

Water plays a significant part in the formation of concrete as it vigorously participates in the chemical reaction with cement. The quality and quantity of water is necessary to be looked into very cautiously. In practice, very frequently properties of aggregate and cement is exercised but the control on the quality of mixing water is repeatedly ignored. There are various types of water namely river water, rain water, lake water and factory waste water which are easily accessible that were used for making the concrete cubes specimen of size 150mm³ as per BS EN 1008:2002 [1] and tested at 1,3,7,14 and 28 days to find the compressive strength.

2. Literature Review

In Malaysia, multiple sources of water are accessible in different part of the country to be used for mixing concrete. If water is fit for drinking it is fit for making concrete [2]. The assumption that if water is fit to drink it is suitable for making concrete is not always correct [3]. Two criteria should be considered in evaluating the suitability of water used for mixing concrete [4]. One

is the impurities in the water will have an effect on the properties and quality of concrete and the other is the degree of impurity which can be tolerated. Impurity in water samples can impair the strength of compressive strength of concrete [5]. Impurities and deleterious substances which are present from water used in mixing concrete are likely to interfere with the process of hydration, preventing effective bond between the aggregates and matrix. The impurities sometimes reduce the durability of the aggregate [6]. Although, some criteria states the suitability of water for mixing concrete oblige that the water be clean and free from harmful material, these specifications may not always be right. Some waters which do not meet these criteria have been found to produce concretes of satisfactory quality [4]. Acid waters may be accepted as mixing water based on their pH values. However, water with pH value lesser than 4 should be avoided for mixing concrete.

3. Research Methods

The concrete mix of Grade 35 with water cement ratio of 0.5 were prepared, and by using different qualities of mixing water

such as river water, rain water, lake water and factory waste water to cast 150 mm concrete cubes.

3.1. Materials

i. Ordinary Portland Cement (OPC)

Ordinary Portland Cement (OPC) Type 1 was utilized for the research work in accordance to BS EN 197-1 (2000) [8].

ii. Water

Figure 1 shows few samples of selected waste water obtained from different sources are collected for this research such as river water, lake water, rain water and factory water in order to test for the effects of using different types of mixing water on the strength of concrete.



Figure 1. Water samples – lake water, river water, factory waste water, rain water (from left to right)

iii. Coarse Aggregate

Crushed stone of with nominal maximum size of 12.5mm was used as coarse aggregate. The coarse aggregate met the grading requirements of BS EN 932 (1999)[9] with water absorption 0.81% and specific gravity 2.64.

iv. Fine Aggregate

Local mining sand with water absorption of 0.6% and specific gravity of 2.65 is used for this project work as fine aggregates according to requirements of BS EN 932 (1999)[9].

3.2. Preliminary Assessment on Mixing Water

Several methods are performed to assess the quality of mixing water in accordance

to BS EN 1881 [7] requirements. Table 1 below shows the results obtained.

Table 1: Physical characteristic of mixing water

	Results	
Oil and Fats	No visible traces of oil and fats	
Detergents	Foam only present in factory water	
Colour	Tap water	Clear
	River	Lighter than pale yellow
	Rain	Clear
	Lake	Clear
	Factory	Darker than pale yellow
Suspended matter	Lesser than 4 ml	
Odour	Tap water	No smell
	River	Slight smell
	Rain	No smell
	Lake	No smell
	Factory	Strong smell
Acids (pH)	Tap water	8
	River	8
	Rain	6
	Lake	7
	Factory	8

Source: BS EN 1881:2002

3.3. Concrete Design Mix

The concrete design mix of 1:2:4 proposed for this research study is Grade 35 concrete per m³ tabulated as per Table 2 in accordance to BS EN 12390-2.

Concrete mixing shall comply with BS 1881-125 [7]. The mixing shall be persistent until the materials are evenly distributed. In case of segregation after unloading from the mixer, the concrete must be remixed.

Table 2: Grade 35 design mix

Cement (kg)	395
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Water (kg)	205
Coarse Aggregate (kg)	1170
Fine Aggregate (kg)	635

3.4. Workability

Workability refers to the behavior of fresh concrete and it measures the deformability of the fresh concrete. Slump test was conducted to check on the workability of the freshly made concrete prepared with five different types of water samples. Table 3 shows the slump results produced by five different samples.

Table 3: Slump test results

Water samples	Slump (mm)
Tap water	60
River water	80
Rain water	80
Lake water	70
Factory water	90

3.5. Density

The density of fresh normal weight concrete generally varies from 2200 to 2600 kg/m³.

3.6. Water Curing

All specimens of concrete cubes and cylinders were labeled and placed into the water curing tank. The specimens were cured in accordance with BS EN 12390-2 [10]. The samples of concrete cubes and cylinder were cured for 1 day, 3 days, 7 days, 14 days and 28 days respectively.

2.7. Setting Time

The initial setting time tests were conducted for cement. The initial setting time for the mix proportions using tap water, river water, rain water, lake water and factory waste water are analyzed to meet the standard requirements. The BS 3148: 1980[11] for Ordinary Portland Cement stated that the initial setting time of cement must not be less than 45 minutes.

2.8. Compressive Strength Test

Compression test is the most commonly performed test to determine the compressive strength of hardened concrete.



Figure 2. Compression testing machine

The compression test is carried out on concrete cubes specimens. The cube specimens of size 150x150x150mm were used. The cubes were water-cured for 1, 3, 7, 14 & 28 days. The specimens which were removed from curing tank were kept aside for drying until they were ready for testing. The compression testing machine as shown in Figure 2 was used to test the cured specimens. For each day tested, the cubes were placed on the loading apparatus and the load was released at a controlled loading rate. The critical load is reached once the load indicators needle recorded the exact failure point. A total of 75 concrete cubes were casted using five different samples of selected waste water as shown in Table 4.

Table 4: Sample Preparation of cubes specimens

Test	Age of testing (days)	No. of cubes tested	Total
Compression test	1	15	75
	3	15	
	7	15	
	14	15	
	28	15	

4. Discussion and Conclusion

4.1. Setting Time

Table 5 shows the initial setting time results obtained from all five water samples.

Table 5: Initial setting time results

Water samples	Initial Setting Time (min)
Tap water	90
River water	135
Rain water	150
Lake water	105
Factory water	195

The graph pattern from Fig.3 shows clearly that sample consisting the mixture of cement and factory water has the slowest setting time compared to other types of water samples.

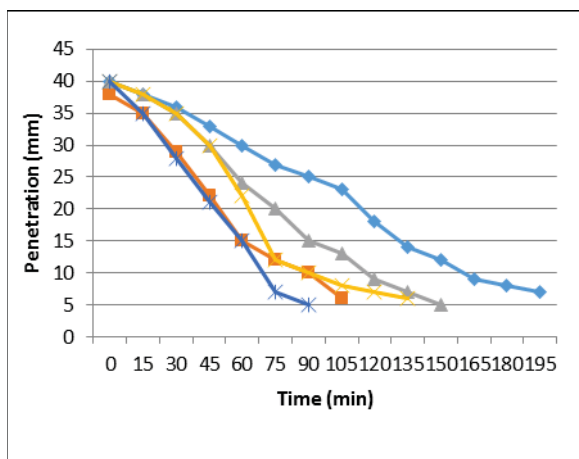


Figure 3. Initial setting of cement

4.2. Compression Test

The compressive strength of concrete cube test was carried out in accordance to the BS 1881-116:1983[7]. The concrete specimens of 150 mm cubes were casted, cured and tested on 1 day, 3 days, 7 days, 14 days and 28 days. A compression machine is used for testing the specimens. A total of 75 concrete cubes were casted using five different samples of selected waste water. The maximum load sustained by the specimen was recorded and calculated respectively. Mean value of compressive strength obtained from five cylinders were taken as the compressive

strength of the concrete as shown in Table 6.

Table 6: Compressive Strength of cube specimens

Water samples	Compressive Strength (N/mm ²)				
	Day 1	Day 3	Day 7	Day 14	Day 28
Tap water	16.80	21.33	28.98	33.33	37.33
River water	15.42	25.42	29.78	32.22	33.91
Rain water	10.00	14.57	26.89	19.87	31.11
Lake water	15.47	23.42	28.31	32.67	35.68
Factory water	18.58	25.56	19.20	26.44	16.22

From Fig.4 and Fig.5, the following conclusions can be summarized as below:

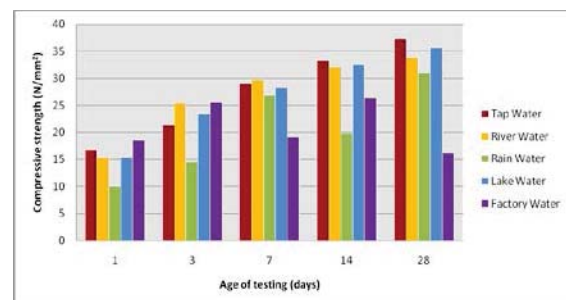


Figure 4. Compressive Strength of concrete at 1, 3, 7, 14 & 28 day

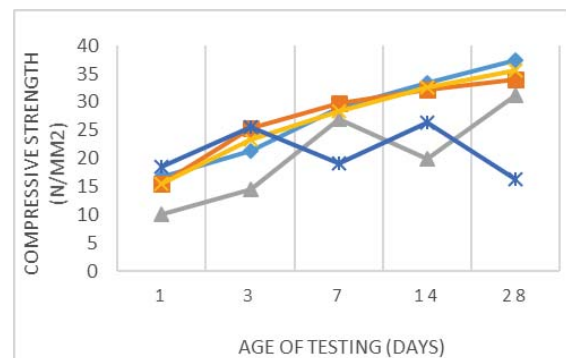


Figure 5: Comparison of compressive strength of cubes at 1, 3, 7, 14 & 28 days

(i) Results shows that concrete made from river water and lake water have compressive strength of 33.91 N/mm² and 35.68 N/mm² which are almost equal to at least 90% of strength made with tap water.

(ii) It was observed that concrete made with factory waste water with a pH of 8, gives 20% less 28 day compressive strength compared to tap water.

(iii) The concrete made with rain water have slightly less 14 day compressive strength compared to other specimens. (10% less compared to tap water).

(iv) Rain water with pH of 6, has an almost equal 28 day compressive strength of 31.11 N/mm² to tap water.

(v) The concrete made with river water has 3% higher 7 day compressive strength compared to tap water.

(vi) It can be concluded that slightly acidic, alkaline, brackish or fetid smelling water should not be discarded outright.

(vii) Therefore, river water and lake water can be safely used as mixing waters for concrete if it meets the required standard.

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PRODUCTION OF HIGH STRENGTH CONCRETE BY PARTIAL REPLACEMENT OF FINE AGGREGATES WITH RECYCLED GLASS

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Abstract

Concrete is undoubtedly the backbone of the construction industry. On the other hand, to produce concrete requires a considerable amount of natural resources so as to satisfy the demands on the market. This experimental paper investigated the effect of partially substituting fine aggregate with recycled glass to produce high strength concrete in order to alleviate the burden on the natural sources. A conventional high strength concrete was compared to different mixes containing glass aggregates as a replacement for fine aggregate at levels 10%, 25%, 50% and 75%. All the specimens were tested at 1-, 3-, 7-, 14- and 28-days air cured. Different types of tests were conducted and accurate data were collected and fully achieved and it can be noted that with increasing percentage of glass the compressive strength of concrete has a tendency to decrease. The maximum compressive strength for 10% and 75% were 48.81MPa and 32.11MPa respectively. The range of fresh density of glass concrete was found to be from 2237-1896 kg/m³.

Keywords: High Strength Concrete, Fine Aggregate, Glass Aggregate, Sustainable, Waste Materials

1. Introduction

Glass as a waste has become a main component of solid waste in many countries. In addition it can be in various forms for examples: windows containing flat glass, container glass, bulb glass and especially cathode ray tube glass. Right now, even if a small quantity of post-consumer glass has been reused and recycled, the remaining waste which amounts to 84% of the waste glass is sent to landfill. Being 100% recyclable material, glass possesses exceptional aesthetic properties and high performances which in turn make them suitable for many uses. Moreover, some studies suggest that the using glass as an aggregate in concrete can be very advantageous in the development of high quality concrete.

This research has four main goals that other students from different field of study can make reference that will provide them some aspects of using recycled bottles as a substitute for fine aggregate in concrete to

produce high strength concrete. In addition, this can trigger them to use other waste as an alternative to be used in construction material and raise awareness to the dangers with regard to the environment protection. Furthermore, developers and contractors can acquire information and knowledge resulting to the improvement in the method of construction by using alternatives than using fine aggregate in a concrete mix. Besides, regarding the aspect of innovating new ideas, non-government as well as government sectors can use new alternatives to exploit their resources for construction projects. Most importantly the purpose of this research will give a clear cut aspect of the feasible use of junk materials to be used as a construction material.

Several numbers of attempts have been made and were successful by using glass as an additive in concrete mix. Certain mix proposed among others has been successful in attaining some specific objectives.

2. Literature Review

The production of glass can be made in many various forms including container or packing glass, bulb glass and flat glass among others [1]. In the same line of thought, the use of glass products have taken great leap and as a result, an abrupt increase in waste glass. The production of glass from China and USA is approximated to be 32 and 20 Mt respectively while the EU countries producing around 33Mt of glass [2]. The United Nations, in 2004, estimated the total volume of solid waste to be 200 million tonnes of which 7% comprises of glass waste all over the world. As a matter of fact, in 2010, in the United States, the approximate value of waste glass was 4.6% of total MSW generation [3]. Besides, in Turkey this value amounts to 120,000 tonnes of which only 80,000 tonnes were recycled [4]. The Americans, in 2006, produced around 12 million tonnes of glass of which only 22% were recycled [5]. The waste glass generated daily in Hong Kong is approximated to be 373 tonnes per day in 2010 of which around 4500 tonnes were recycled per annum and in the same line, only 3.3% of it was recycled and the other 96.7% was sent to landfill for dumping [6].

From all these stated facts and figures, it came to the necessity to use these waste glasses in building materials. This literature contains a lot of previously performed papers relating the use of waste glass as a crucial component of building materials.

2.1 Workability

Metwally [7] has investigated waste glass performance in concrete mixes and as a

result he obtained a decrease on the workability. Taha and Nounu [8] used recycled glass as a substitute for fine aggregate with size less than 5 mm at levels 50% and 100% by volume and as a result he obtained a reduction in workability with an increase of glass content in the specimens. Park *et al.* [9] substituted fine aggregate with recycled glass of size 5 mm at levels 0%, 30%, 50% and 70% by weight in concrete mixes and reported that the compaction efficiency and slump decreases as the glass content of the samples increases. Castro and de Brito [10] reported a reduction in the workability of concrete mixes by replacing fine aggregate by waste glass aggregate with size less than 4mm at levels 5%, 10% and 20% by volume. In his research several w/c were used and the results of the workability showed a reduction in workability with increasing glass content. On the hand, Batayneh *et al.* [11] substituted sand by crushed glass at levels 0%, 5%, 10%, 15% and 20% keeping the w/c fixed and from the results he reported that the workability of the mixes was not affected by the inclusion of glass sand. Malik *et al.* [12] observed an increase in the workability with increasing glass content by the inclusion of glass sand to natural sand (size 1.18-0.075mm) at levels 10%, 20%, 30% and 40% by weight. Borhan [13] also reported an increase in workability with the substitution of natural sand to recycled glass (size 2.36-0.075mm) at levels 0%, 10%, 20%, 30%, 40% and 50% by volume. Terro [14] substituted natural sand with crushed bottle glass (size 4.75-0.075mm) at levels 0%, 10%, 25%, 50% and 100% by weight and reported the mixes containing glass had a higher workability than the control.

Table 1: Effect of glass sand on workability of concrete mixtures

Author	Glass content %	Glass size (mm)	Positive effect
Metwally[7]	-	-	x
Taha and Nounu[8]	50 and 100	<5	x
Park et al.[9]	30, 50 and 70	5	x
de Castro and de Brito[10]	5, 10 and 20	<4	x
Batayneh et al.[11]	5, 10, 15 and 20	BS 882:1992	No effect
Malik et al.[12]	10-40	1.18-0	✓
Borhan[13]	20, 40 and 60	3-0.5	✓
Terro[14]	10, 25, 50 and 100	4.75-0.075	✓

From the positive effects shown in Table 1, the researchers came out to the conclusion that waste glass sand can increase the workability due to the fact that of the poorer cohesion between smooth surface of cement paste and the glass sand (impermeable)[15]. In addition due to the lower absorption capacity [16] and the smooth surface of glass [17] are the foremost reasons of high workability. On the other hand, some studies reported a decrease in workability using glass sand as fine aggregate, this is so because of the sharp edges, angular shapes, harsh texture and also greater aspect ratio of glass sand that delay the bond of the glass particles and cement paste.

Ismail and Al-Hashmi [18] observed a decrease in fresh density of concrete mixtures by 1.26%, 1.96% and 2.26% with presence of 10%, 15% and 20% glass sand of size 4.75-0.15mm as a substitute for sand by weight. Batayneh *et al.* [19] also observed a decrease in fresh unit weight of concrete specimens containing glass sand. de Castro and de Brito [20] observed a decrease in fresh density of concrete mix containing glass sand. Borhan [21] observed a decrease in the fresh unit weight of concrete mixes containing glass sand. Taha and Nounu [8,22] reported a decrease in fresh density of concrete mixtures recycle glass sand. Table 2 below summarizes the effect of glass sand on fresh density of concrete.

2.2 Density

Table 2: Effect of glass sand on fresh density of concrete

Author	Glass content (%)	Glass size(mm)	Decreased fresh density
Ismail and Al-Hashmi[18]	15 and 20	4.75-0.15	✓
Batayneh et al.[19]	5, 10, 15 and 20	BS 882:1992	✓
de Castro and de Brito[20]	5, 10 and 20	<4	✓
Borhan[21]	20, 40 and 60	3-0.5	✓
Taha and Nounu[8,22]	50 and 100	<5mm	✓

2.3 Mechanical Strength of Concrete

Batayneh *et al.*[11] observed an increase in the compressive and splitting tensile strength of concrete mix containing waste glass at levels 5%, 10%, 15% and 20% by weight. Borhan [13] stated an increment of 15% ,for the 20% by weight recycled waste glass as a substitute for sand, in the 28 days splitting tensile strength. On the other side,

he also reported a reduction of 22% for the proportion of 60% of glass substitute for sand. Gatham *et al.*[19] observed an increase in the compressive strength with the substitution of waste glass at levels of 10% and 20% for sand. Park *et al.*[9] noticed a decrease with increasing glass content in mechanical properties at levels 0%, 30%, 50% and 70% by weight of concrete. Malik et al.[12] reported an

increase in the mechanical property of concrete with the inclusion of glass sand as a replacement for sand at levels 0%, 10%, 20% and 40%. On the other hand he reported that the proportion of 40% reduced the mechanical strength of the concrete. Taha and Nounu [8] noticed no big

difference in the mechanical strength of concrete with the inclusion of glass aggregate as a substitute for sand at levels 50% and 100% by volume. Table 3 below summarizes the effect of glass aggregate on the mechanical strength of concrete.

Table 3: Effect of glass aggregate on the mechanical strength of concrete

Author	Glass content (%)	Glass size (mm)	Positive effect
Batayneh et al.[11]	5, 10, 15 and 20	BS 882:1992	✓
Borhan [13]	20	3-0.15	✓ (age 28days)
	60	3-0.15	X (age 28days)
Gautam et al.[19]	10 and 20	4.75-0.15	✓
	30 and 40	4.75-0.15	x
Malik et al.[12]	10, 20 and 30	1.18-0	✓
	40	1.18-0	x
Park et al.[9]	30, 50 and 70	<5	x
Taha and Nounu[8]	50 and 100	<5	x

From the studies [8, 9, 11, 12, 19], the reduction in strength is directly related to the sharp edges and smooth surface of the glass in turn resulting in weak bonds being formed at the interfacial transition zone (ITZ) whereby glass bonds with cement paste matrix [23]. On the other hand the increase in strength can be explained due to the fact of glass particles' strength and surface texture compared to that of sand [11]. In addition, other study relates the increase of strength with the pozzolanic reaction of fine glass particles [21].

3. Research Methods

Within all the series of experiments conducted, the mechanical strength of concrete is one of the main objective in this paper whereby one among of the mix proportion used will achieve high strength property and can be used as a replacement for natural sand in concrete. Details of the experiments are given in the next sections.

3.1 Materials

1. Cement

Ordinary Portland cement (OPC) with specific gravity of 3.14 g/cm³ was used.

2. Fine Aggregate (FA)

Local mine sand was used as fine aggregate with fineness modulus 2.7 and specific gravity of 2.7 g/m³ and also its size and shape is beneficial in getting uniform particle size distribution in glass concrete. The glasses used were sieved and 1-5mm of glass particles also were used as fine aggregate replacement in the specimens for this study. Figure 1 below shows how the glass were collected and processed.

3. Coarse Aggregate (CA)

Crushed granite with maximum size of 20mm was used as coarse aggregate.

4. Other materials

Neutral (pH 7) potable water from the University's laboratory was used.

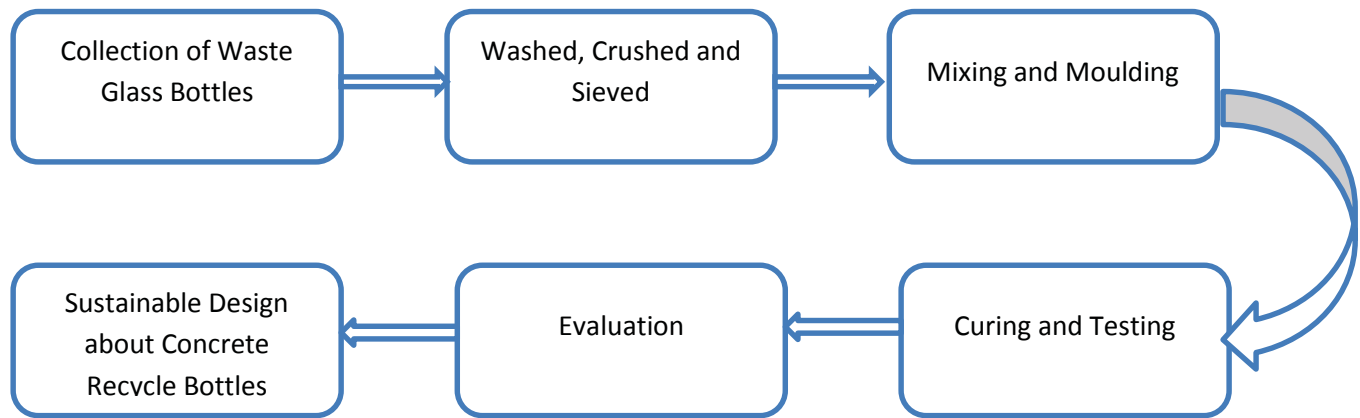


Figure 1. shows how the collection of glass was collected and processed

Details of the concrete mixes are shown in Table 4 whereby A1, A2, A3 and A4 mixes contain 10%, 25%, 50% and 75% of glass aggregate as a replacement for natural sand. The HSC mix represents the mix of grade 50 high strength concrete and also acted as a control for this research. The procedure for the mixing (hand batching) as follows: firstly, the glass will be mixed with sand in surface dry condition and mixed thoroughly for approximately 2-3 minutes. Coupled with that, cement will then be added to the mix followed by the addition of water. Finally the coarse aggregate will then be added. After 10 minutes of mixing the concrete, the latter is then poured in casting moulds into 3 layers and well compacted. After 24 hours, the specimen will be removed from the moulds without damaging the specimen and cured (Air Curing) before testing them. On the other hand, the high strength concrete will be prepared under same condition as described

above except there will not be any presence of glass in the mixture. In the same line of thought, the water content of both the glass high strength concrete and high strength concrete grade 50 will be kept constant. The specimens comprised of 150 mm cubes and 100mm diameter x 200 mm cylinders.

For the physical properties of glass such as specific gravity, aggregate impact value test and sieve analysis were recorded (BS EN 1097-6:1998; BS EN 1097-2:2010; BS EN 933-1; 2012) [25,26]. For the main tests performed, all tests were conducted using the following Eurocode Standards (BS EN 12350-2:2009, BS EN 12390-7:2009, BS EN 12390-3, BS EN 12390-6)[27,28,29]. The hardened concrete tests were carried at 1-, 3-, 7- and 28- days of air cured specimens. The tensile splitting tests were carried out at on 28-day air cured specimens.

Table 4: Design Mix Proportion of concrete

Mix Details	Ratio		
	Water/cement (w/c)	Sand/Cement (s/c)	Aggregate/cement (a/c)
A1	0.67	1.41	2.89
A2	0.67	1.41	2.89
A3	0.67	1.41	2.89
A4	0.67	1.41	2.89
H.S.C	0.67	2.00	4.00

4. Results and Discussion

4.1 Physical properties of Glass:

Figure 2 shows the distribution for the sizes of both glass and sand used as fine

aggregates in the mixes. From the figure, it can be deduced that the maximum size for glass was 2 mm as well as natural sand also having a maximum size of 2 mm.

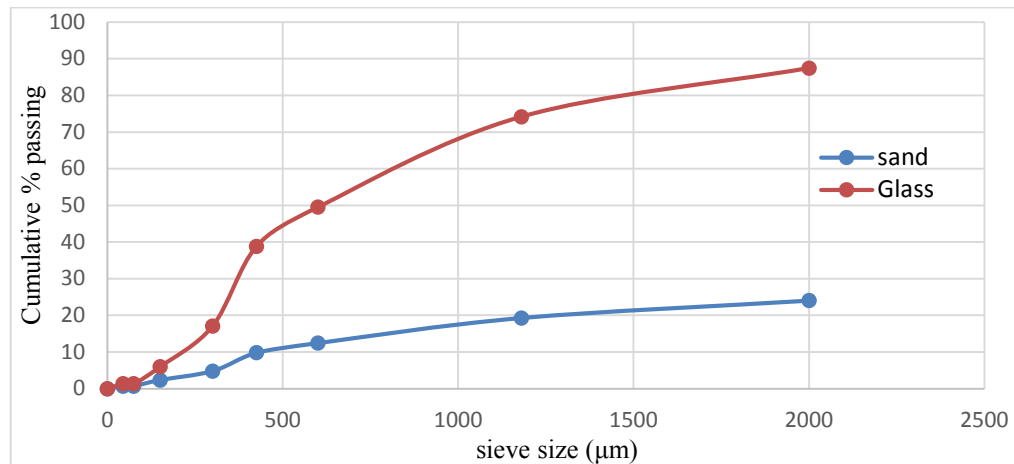


Figure 2. The particle distribution of fine aggregates

Table 5 compares the physical properties of waste glass and sand. The density of concrete with glass replacement was decreased due to the lower specific gravity of glass. This finding is considered

advantageous as it will decrease the dead weight of a building being constructed. The lower water absorption of glass justify high workability of concrete mix.

Table 5: The physical properties of waste glass and sand [30]

Physical property	Waste glass	Sand
Specific gravity	2.19	2.57
Density (kg/m ³)	1672	1688
Absorption (%)	0.39	2.71
Pozzolanic index (%)	80	-

4.2 Workability:

Table 6 shows the results for the slump tests performed for all mixes. Upon performing the mixing of the specimens, it was noticed that the batch A1 and A2 took around 5 minutes and it was easier to mix compared to the other mixes. In the same line of thought, the other specimens A3 and A4

took longer than 5 minutes (around 5-7 minutes) specially the A4 batch containing the most amount of glass content, 75%. It can be noted that mixing became lengthier with increasing amount of glass content. The mixing for the control (H.S.C) was within 5 minutes and achieved good consistency.

Table 6: Slump test results

Mix number	Glass replacement (%)	Mix proportion	Slump(mm)
A1	10	1:1.41:2.89	60-100
A2	25	1:1.41:2.89	80-120
A3	50	1:1.41:2.89	80-100
A4	75	1:1.41:2.89	100-150
HSC	-	1:2:4	60-140

4.3 Compressive strength

The compressive strength of mix A1 at an early stage was reported to be more or less same as that for the HSC. At a later stage it was observed that the compressive strength of mix A1 was more or less same as the HSC mix as shown in Fig. 3 below. The

remaining mixes A2, A3 and A4 with levels 25%, 50% and 75% respectively were reported be lower than that of the HSC. The compressive strength of A1, A2, A3 and A4 were recorded to be as 48.81, 30.59, 25.11 and 20.29 MPa respectively at day-28. The compressive strength of the high strength

concrete mix was recorded to be 49.93 Mpa at day-28.

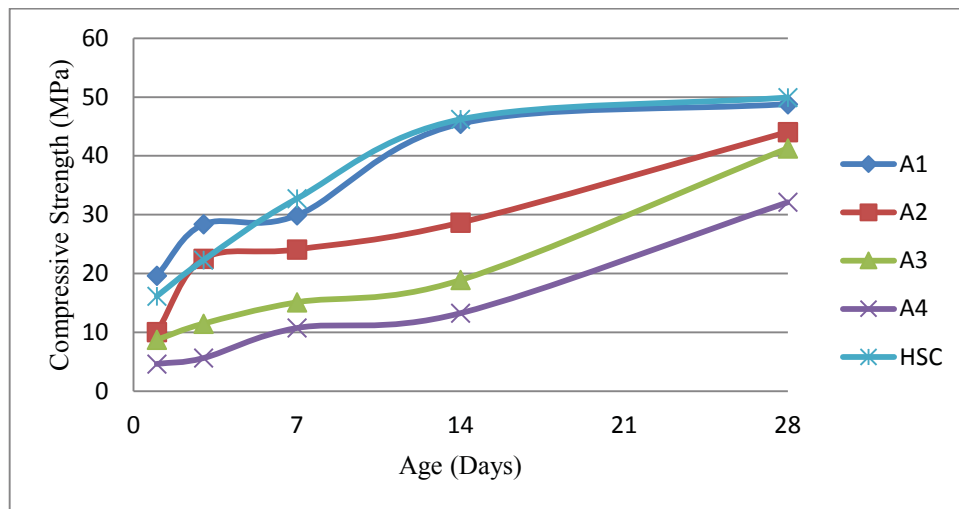


Figure 3. The compressive strength development of mixes

4.4 Density

The relationship between the densities and compressive strengths of the concrete specimens are shown in Fig. 4. It can be

deduced that as the proportion of glass aggregates increases, the density of the specimens decreases.

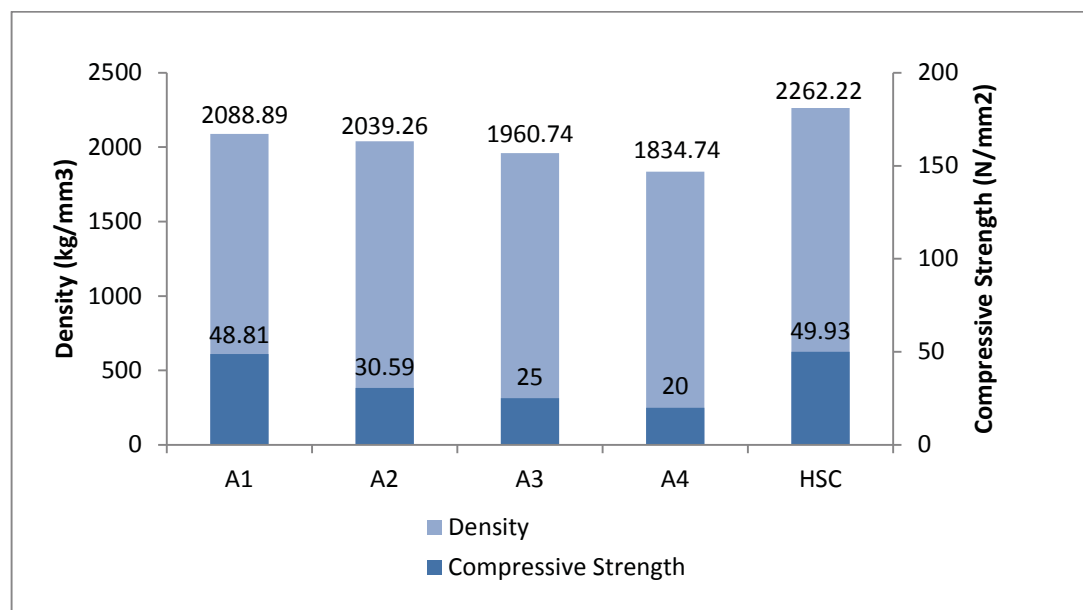


Figure 4: Relationship between densities and Compressive Strength

4.5 Conclusion

This paper, together with reviews from previous works, investigated the substitution of fine aggregate with waste glass at different levels in concrete. Hardened properties, fresh properties and durability of concrete mix containing waste glass aggregates also were studied. The

following conclusions can be summarized below:

- 1) High strength concrete grade 50 can be achieved with partial replacement of glass as fine aggregate.
- 2) The 10% glass replacement concrete has proved to have

- compressive strength properties than other glass contents.
- 3) The 10% glass replacement specimens have more or less same compressive as the control does.
 - 4) The use of glass as a substitute for fine aggregates decreases the water-cement ratio depending on the amount present in the mix.

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Acknowledgement

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EFFECT OF USING COPPER SLAG AS A SAND REPLACEMENT IN MORTAR

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Abstract

There has been a significant rise in the importance in the sustainability and resource efficiency in the current construction industry. The aim of this study is to replace sand in mortar mixes by using waste copper slag from shipping industries. It examines how the compressive strength is affected when the waste copper slag replaces fine aggregate. The percentage replacement of sand by granulated copper slag were 0%,10%,20%,30%,40% and 50% by sand weight. There was an increase in the compressive strength of mortar by about 35-40%. The experimental investigation found that sand can be replaced by 40% of waste copper slag in the current study.

Keywords: Copper Slag, Compressive Strength, Sand Replacement, Mortar

1. Introduction

This research is to compare the compressive strength of conventional mortar and mortar mixed with copper slag. This project was focusing on testing mortars with different proportions of copper slag (10%, 20%, 30%, 40%, and 50% of sand weight).

Copper slag is a by-product obtained during smelting and refining of copper. The waste copper slag can be used as abrasive tools, road construction, and ballast [1]. Copper slag is known to be a hazardous waste which is categorized as Scheduled Waste 104 under the Department of Environment Malaysia report. Copper slag may be used in the construction industry as a filler to replace sand in mortar [10].

2. Literature Review

The strength behavior of concrete was studied by Brindha *et al* (2010) [4] by replacing sand with copper slag in the concrete manufacturing process. As results, it was found that the strength increases with 40% weight replacement of sand with copper slag. However, after this percentage, the strength decreased.

The durability properties of copper slag admixed concrete was studied by Brindha and Nagan (2011) [5] and they found that the control concrete had a higher resistance to the sulphuric acid solution (H_2SO_4) than the concrete with copper slag.

The impact of foundry sand in mortars and concrete was studied by Saveria Monosi *et al* (2010) [6] and they found that they could manufacture structural mortar and concrete with used foundry sand to partially replace natural sand. As a building construction material, the discarded foundry sand was recycled suitably for use.

The impact of using quarry dust as a partial replacement of sand in concrete was studied by Chandana Sukesh *et al* (2013) [7] and they found an increase in the performance of concrete in relation to its compressive strength.

3. Research Methods

3.1 Mortar Design Mix

There were 6 types of design mix. The first consisted of standard mix mortar currently being used in the industry as the control for the experiment. The following design

mixes were composed of different proportions of copper slag, which are 10 %, 20%, 30%, 40%, 50% of sand weight. For each design mix a set of three (3) cube samples of 100 mm length were made for the compression test. Another set of 3 cylinders and 3 cubes of length 50 mm were cast for the sorptivity and water absorption test.

Mortar used in this research was made with water, sand and cement with a ratio of 1:2.2:0.50 (cement: sand: water). Mortar grade suggested was of grade 3 which provides the highest compressive strength. Being used thoroughly as a joint between brick wall and many other purposes, grade 3 mortars should provide the strongest joint at 7.5mm thickness when used for masonry purposes.

3.2 Tests Conducted

Three main types of test have been conducted during this research, namely sorptivity test, water absorption test, and compression test.

3.2.1 Sorptivity Test

The sorptivity test measure the rate of absorption of water by capillary suction. For each proportion of copper slag added, a set of 3 samples is tested and the average is taken into consideration. Before testing, the specimens were kept in the oven for 48hours. After which it was kept for another 24 hours in desiccators at room temperature. The diameter of each sample was verified to be the same which is 100mm. the weight of each specimen was recorded to the nearest 0.1g. The bottom of the specimens was immersed in water and their weight was recorded at different time interval.

3.2.2 Water Absorption Test

The water absorption test is to help in determining the effective porosity of the specimen. Specimens were kept in oven for 36 hours, then in the desiccator for

further 24 hours. The samples were then tested at different time intervals.

3.2.3 Compressive Strength Test

A mixture of cement and sand having a ratio of 1:2.2 was prepared for this experiment. A water ratio of 0.50 was added to the mix, to provide a high workability for the mortar. The mortar was mixed using the conventional mortar mixer. The cubes formworks were oiled to allow easy removal of the specimens. After mixing, the (100 x 100 x 100) mm cubes were filled with mortar. To eliminate the presence of honey combing, the samples were then taken to the vibrator for 30 seconds. The samples were then allowed to set and were then placed in the curing tank before testing. For each percentage of copper slag added, a set of 3 samples were taken for testing and the average was taken into consideration.

Mortar cubes were tested after seven (7) days, fourteen (14) days and at (28) days of curing. Mortar cubes were levelled on top of the compression machine and load was applied on increasing manner until the cube is cracked uniformly.

4. Discussion and Conclusion

4.1 Physical Properties of Copper Slag

The physical properties of copper slag used in this research are shown in Table 1. It is observed that the high specific gravity of copper slag caused the increased of mortar's density.

Table 1: Physical properties of Waste Copper Slag

Appearance	Shiny, black, glassy, rough scratched surface
Particle shape	Angular, sharp, rough and colloidal
Density (kg/m ³)	2386.82
Water absorption (%)	19.1
Moisture content (g)	9.58
Specific gravity	3.49

4.2 Sorptivity and Water Absorption of Copper Slag Mortar

The results of sorptivity test and water absorption test are shown in Figure 1 and Figure 2 respectively. These tests have been conducted at 7 days, 14 days and 28 days curing age of the specimens.

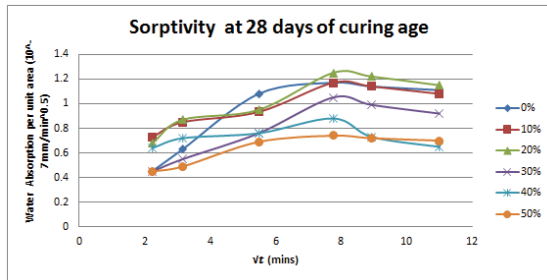


Figure 1. Sorptivity at 28 days of curing age

A lower water absorption by capillaries is made mortars consisting of 40% copper slag used as a partial sand replacement. The specimen was found to have finer pores. From the Figure 1, it may be seen that the replacement of sand by copper slag in the 20%wt samples, that it has absorbed more water than the conventional mix.

The mortar with 50% as percentage of sand replacement was analysed, it was found to have more pores than the specimen from the 40% sand replacement.

It was also observed that the rate of water absorption of the mortar specimen decreases as the curing age increases.

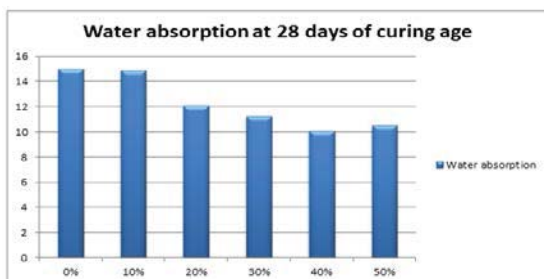


Figure 2. Water absorption at 28 days of curing

From Figure 2, it can be noticed that 40% of copper slag as a sand replacement is the best mix as it absorbed less water than the other samples.

4.3 Compressive Strength of Copper Slag Mortar

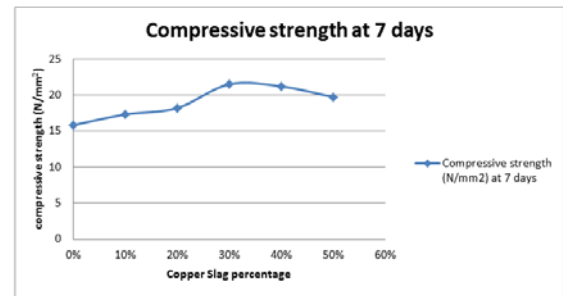


Figure 3. Compressive strength at 7 days

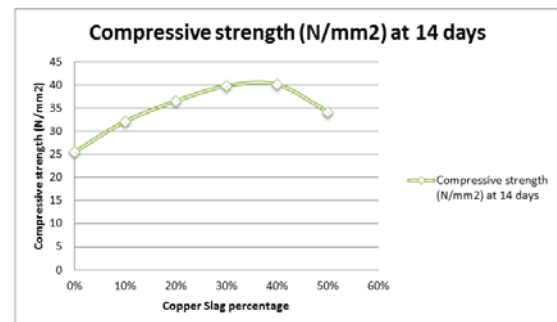


Figure 4. Compressive strength at 14 days

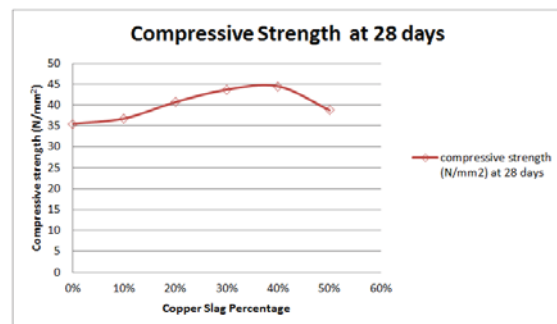


Figure 5. Compressive strength at 28 days

The density of the concrete mix has increased due to the usage of copper slag which has a higher specific gravity than sand.

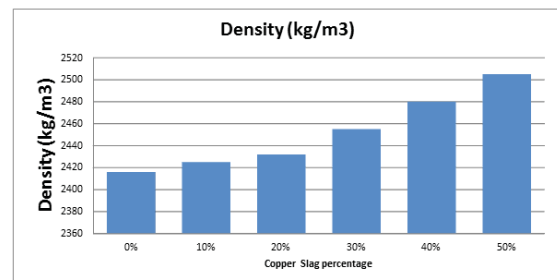


Figure 6. Density of mortar with copper slag

When the waste copper slag was added in the right amount to an optimum percentage

by weight of sand, it results as a remarkable increase in the compressive strength of mortar. The results from the Figure 6 show that the compressive strength of the mortar specimens has increased when a percentage of 35% to 40% of copper slag was added by proportionally reducing the amount of sand. However when 50% of copper slag was added to the mortar mix; the compressive strength decreases slightly but it was still higher than the conventional mortar, as illustrated in Figure 7.

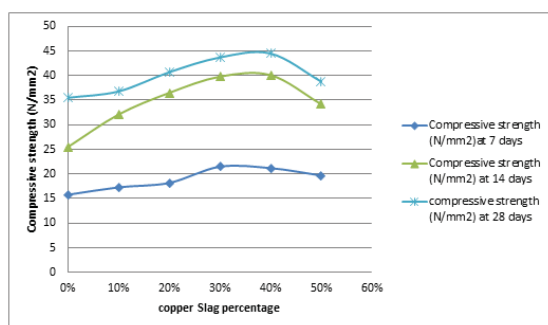


Figure 7. Compressive strength envelope

From the results of these experiments and research that has been conducted, the following conclusions may be drawn:

- The usage of waste copper slag in mortar increases its density thus increasing its self-weight.
- Waste copper slag definitely increases the compressive strength of mortar when used to a percentage of 40% added by weight of fine aggregate.
- The recommended percentage to use waste copper slag as a sand replacement is 35% to 40%.

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GEOTECHNICAL STABILITY OF GABION WALLS

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Abstract

The geotechnical stability of the Frontface and the Backface gabion retaining walls under different soil and loading conditions is compared based on the factor of safety achieved using different Eurocode 7 design approaches. The wall is treated as a single gravity entity and a parametric study is performed by varying its breadth-to-height ratio, degree of inclination, surcharge, and soil parameters, which include unit weight and internal friction angle. Factors that significantly influence the geotechnical stability at the Ultimate Limit State (GEO) were found to be the internal friction angle of the backfill and the breadth-to-height ratio of the wall. The eccentricity of the Frontface gabion wall renders it more effective, in terms of the factor of safety achieved with respect to the number of gabion baskets used. At small breadth-to-height ratio, the failure criterion is overturning and at large values of this ratio, the structure is more prone to sliding failure. The choice of a sufficiently conservative design approach therefore depends on the design loads and design material properties involved.

Keywords: Design Approach; Eurocode 7; Gabions; Gravity wall; Limit State

1. Introduction

Gabion walls are cellular gravity retaining structures consisting of rectangular cages, fabricated from a welded mesh or woven steel wire, filled with ballasted materials of appropriate size and characteristics (British Standards Institution, 1995). As compared to a conventional concrete retaining structure, a gabion wall is significantly less expensive, and can be rapidly constructed by stacking individual units onto each other when quick interventions are needed without the need of specialized skills or equipment (Jayasree, 2008). Eurocode 7 (British Standards Institution, 2004) is used for the design of gravity-retaining structures at Ultimate Limit State (GEO). However, unlike BS 8002 (British Standards Institute, 1994), EC7 does not detail the design of gabion retaining walls. The ULS design involves the application of partial factors from EN1997-1 to typical soil parameters or resistances and to characteristic actions or action effects so as to achieve a certain target reliability (Bauduin et al., 2005; Orr, 2000). Although it was the original aim of EC7 to ensure a unified design approach throughout

Europe, different design approaches have been developed to accommodate varying conditions. The choice of the different design approaches has a substantial effect on the design of geotechnical structures since their corresponding partial factors may not always lead to a level of safety comparable with the conventional global safety concept (López, 2011; Smith & Gilbert, 2011). Furthermore, the application of the partial factors at different levels of calculation yields different results and can have a significant influence on the final design even when the same design approach is being used (Orr et al., 2005). T.L.L. Orr et al. (2005) found that, for gravity retaining structures, the most conservative design approach varies and this is thought to be mainly a result of the way eccentricity and inclination of the surcharge are calculated.

According to BS 8002, (BS, 1994), a gabion wall can be categorized as a permanent structure and should be designed to have a high structural reliability and corrosion-resistant wire-meshes. Gabions are flexible structures which are able to withstand deflections from undercutting or land

slides (Highland & Bobrowsky, 2008). However, Ramli et al. (2013) found out, through a scaled experiment, that the lateral deformation induced by the various loading stages is – irreversible for the walls. This suggests that gabions, regardless of shape or configuration, behave as inelastic structures. According to Jayasree (2008), who carried out finite element analysis on gabion structures, the facing width has negligible effect on the lateral forces developed in the backfill and, therefore, the base is modelled as a strip footing having a constant friction factor with respect to the ground. (Amato et al., 2014) stated that minor design modifications to the gabion baskets would not alter the structural stiffness or strength of the wall. Therefore, the gabion wall has been modelled as a rigid trapezoidal gravity block (Figure 2) under active earth pressures, and verified only at the Ultimate Limit States(GEO). Lahmadiet et al. (2015) highlighted the impact that different of soil parameters in design such as the soil friction angle, unit weight of materials, and geometric ratio and these are varied in this study. Selective results have been plotted and evaluated accordingly in order to determine the parameters that govern the stability of the gravity retaining structure. A spreadsheet was developed and used to reduce repetitive hand calculation and a parametric study was performed to find out the most conservative design approach based on different soil parameters, wall geometry and loading conditions.

2. ULTIMATE LIMIT STATE (ULS) DESIGN ACCORDING TO EN 1997-1

2.1 METHODOLOGY:

According to Eurocode 7, (9.2(2) P), the following failure criteria need to be considered in ULS design:

- Failure by topping,(overturning)
- Failure by sliding on the base,

- Bearing capacity failure of the soil below the base.

The following principle needs to be satisfied (2.4.7.3.1(1)P): $E_d \leq R_d$

Where E_d and R_d are the design values of the ‘effect of actions’ and ‘resistance to the actions’ respectively, both calculated by applying the partial factors given in Table A.3, Table A.4 and Table A.13 in EN1997-1. Different designers have suggested varying methods of applying partial factors in design (Orr et al., 2005; Orr, 2000). The calculation methodology illustrated in Figure 1 has been developed and general equations (Modular Gabion Systems, 2004) have been modified by incorporating partial factors in the equations ((2)-(14)).

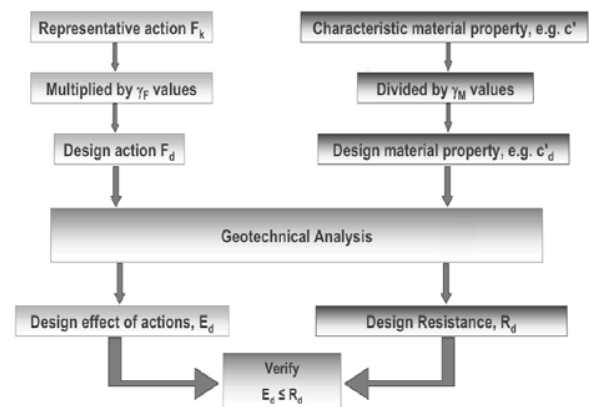


Figure 1: The methodology for the geotechnical analysis at ULS according to EC7.

2.2 MODEL

Rock-filled gabions are gravity structures designed using the same methodology as that employed for gravity walls, which rely on their weight to achieve stability against lateral forces caused by retained soil and surcharge. Igneous rocks, $\gamma_{avg} = 30\text{kN/m}^3$, are most appropriate for gabion fills since they exhibit similar behaviour when used for this purpose (Jayasree, 2008). Water pressure is neglected because of the high void ratio (30-40%) of the gabions.

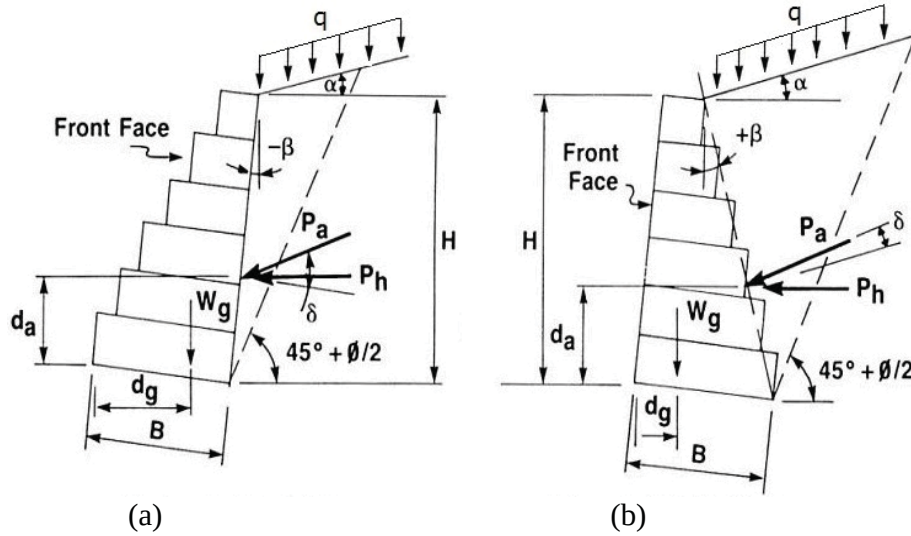


Figure 2: Gabion retaining wall models) (a) Frontface gabion wall, (b) Backface gabion wall.

2.3 SOIL PARAMETERS

According to Simpson (2000), partial factors should be applied as directly as possible rather than to quantities derived later in the calculation. The variation of active earth pressure by the depth of the wall in cohesive-frictional soils has a non-linear distribution. However, the point of application of the pressure always acts at the lower one third of the wall height (Ahmadabadi & Ghanbari, 2009). Applying partial factors, the resultant force of the triangular pressure distribution modifies to:

$$P_a = \frac{K_a \gamma_s H^2}{2 \gamma_G} \gamma_\gamma \quad (2)$$

If a uniformly distributed load, q , is acts vertically on the backfill. Equation (2) is modified to:

$$P_h = K_a \cos \beta \left[\frac{\gamma_s H^2}{2} \gamma_\gamma + q H \gamma_Q \right] \quad (3)$$

The lateral earth pressure coefficient, K_a is given by Coulomb's equation since the values of K_a agree closely to the charts given in the Eurocode (Valsson, 2011).

$$K_a = \frac{\cos^2(\phi_d - \beta)}{\cos^2 \beta \cos(\delta + \beta) \left[1 + \sqrt{\frac{\sin(\phi_d + \delta) \sin(\phi_d - \alpha)}{\cos(\delta + \beta) \cos(\alpha - \beta)}} \right]^2} \quad (4)$$

2.4 OVERTURNING MOMENT CHECK

Taking moment about the toe of the wall yields:

$$M_r \geq SF_o M_o \quad (5)$$

Each moment is calculated from the product of the net force and its perpendicular. If

surcharge is present, the distance from the base at which the P_h acts is:

$$d_a = \frac{H \left[H + \frac{3q}{\gamma_s} \left(\frac{\gamma_\gamma}{\gamma_G} \right) \right]}{3 \left[H + \frac{2q}{\gamma_s} \left(\frac{\gamma_\gamma}{\gamma_G} \right) \right]} + B \sin \beta \quad (6)$$

The overturning moment is:

$$M_o = d_a P_h \quad (7)$$

The resisting moment is:

$$M_r = d_g W_g \quad (8)$$

2.5 SLIDING RESISTANCE CHECK

The lateral earth pressure and the frictional resistance at the base of the wall are related by:

$$\frac{\mu W}{\gamma_{G, fav} \gamma_{RH}} \geq SF_s P_h \quad (9)$$

The soil and gabion friction factor, μ , is approximately $\tan 35^\circ$ (NAVFAC, 1986).

2.6 BEARING PRESSURE CHECK

Owing to their flexibility, gabion walls are appropriate for soil with poor bearing capacity and saturated retained material. According to Lin, Yang, Li, & Zhao, (2009), who observed the behaviour of gabion walls in the laboratory, the

vertical pressure spreads nearly uniformly and is always less than theoretical values. Thus, the Terzaghi bearing-capacity equation can be used, and the need for passive pressure is not essential since there is negligible settlement. The eccentricity, e , of the resultant vertical force from the midwidth of the base, $B/2$ is:

$$e = \frac{B}{2} - \frac{(M_r - M_o)}{W_v/\gamma_{G, fav}} \quad (10)$$

For the resultant force to lie in the middle third:

$$-\frac{B}{6} \leq e \leq \frac{B}{6} \quad (11)$$

The maximum pressure under the base, Q , is then

$$Q = \left[\frac{w_v}{B\gamma_G} \right] \left[1 + \frac{6e}{B} \right] \quad (12)$$

The maximum pressure must not exceed the allowable soil bearing pressure, Q_{ult} :

$$Q\gamma_{RV} \leq SFbQ_{ult} \quad (13)$$

Where Q_{ult} is given by Terzaghi's bearing-capacity equation.

$$Q_{ult} = \gamma_c N_c c' + \gamma_q N_q q + 0.5 \gamma_r N_\gamma B \gamma \quad (14)$$

3. RESULTS AND DISCUSSION

This is performed by analyzing at least 3 graphs per external stability checks for every parameter varied listed below. The results are plotted in graphs showing the factor of safety against various wall heights for every fixed geometric ratio, B/H .

Table 1: Parameters studied

Parameter	Graph						
	1	2	3	4	5	6	7
Height, H (m)	2 - 10	2 - 10	2	2	2	2	2
Width, B (m)	0.5H	0.5H	0.4 - 4	1	1	0.2 - 4	0.2 - 4
Horizontal inclination, α ($^\circ$)	5	5	5	0-10	5	5	5
Vertical inclination, β ($^\circ$)	-5	+5	± 5	-10 - 10	± 5	0	0
Surcharge, q (kN/m ³)	10	10	10	0 - 10	10	10	10
Cohesion, c (kN/m ³)	0	0	0	0	0	0	0
Unit Weight of basket, γ_b (kN/m ³)	21	21	21	21	21	21	21
Unit Weight of soil, γ_s (kN/m ³)	14	14	14	14	14 - 24	14	14
Friction angle, ϕ ($^\circ$)	35	35	35	35	35	20 - 50	20 - 50
Friction factor, δ ($^\circ$)	35	35	35	35	35	35	35

3.1. EFFECT OF USING DIFFERENT DA FOR CALCULATION

- ◆ - B-EQU LIMIT	- ■ - B-DA1C1	- ▲ - B-DA1C2	- ✕ - B-DA2	- ✱ - B-DA3C1	- ○ - B-DA3C2
- ◆ - O-EQU LIMIT	- ■ - O-DA1C1	- ▲ - O-DA1C2	- ✕ - O-DA2	- ✱ - O-DA3C1	- ○ - O-DA3C2
- ◆ - S-EQU LIMIT	- ■ - S-DA1C1	- ▲ - S-DA1C2	- ✕ - S-DA2	- ✱ - S-DA3C1	- ○ - S-DA3C2

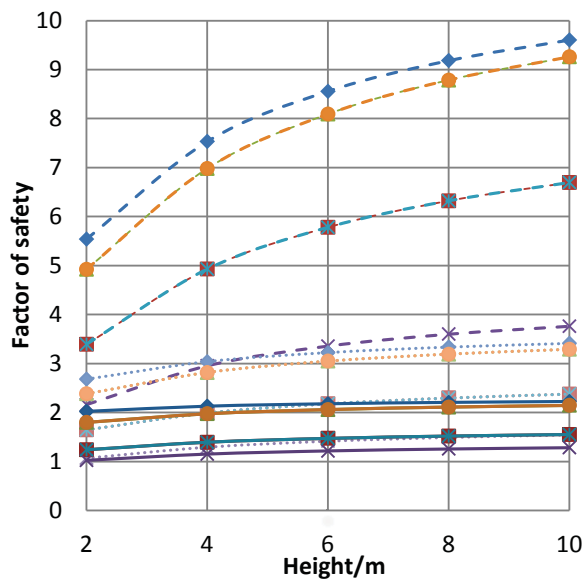


Figure 4: Effect of varying height on Front face wall for different design approaches

Graphs show that the Frontface gabions walls provide a higher factor of safety and are more effective than Backface gabions walls for the same number of baskets used and subjected to the same conditions. It is suggested that DA1C2, which overlaps with DA3C2, is the least conservative followed by DA1C1, DA3C1 and finally DA2, which is the most conservative design approach for all the three external stability checks. Even though the geometric ratio, B/H was kept constant at 0.5, the factor of safety achieved increased with increased height

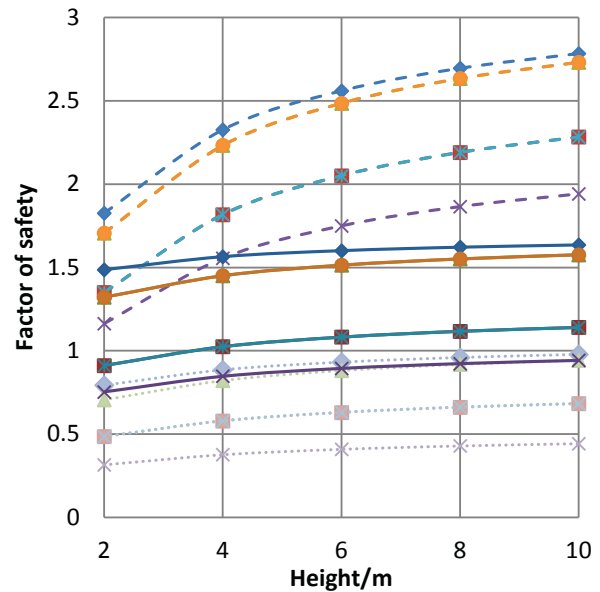


Figure 5: Effect of varying height on Back face wall for different design approaches

in both cases. Thus even if the height, H , increase is compensated by the same amount in terms of base width, B , the factor of safety still increases for overturning and bearing failure. Frontface gabion walls are expected to fail by sliding whereas Backface gabion walls are more prone to overturning. Bearing failure is less likely to happen in both cases. The similarity of both graphs suggests that the geometric ratio affects both of the walls.

3.2. EFFECT OF B/H RATIO

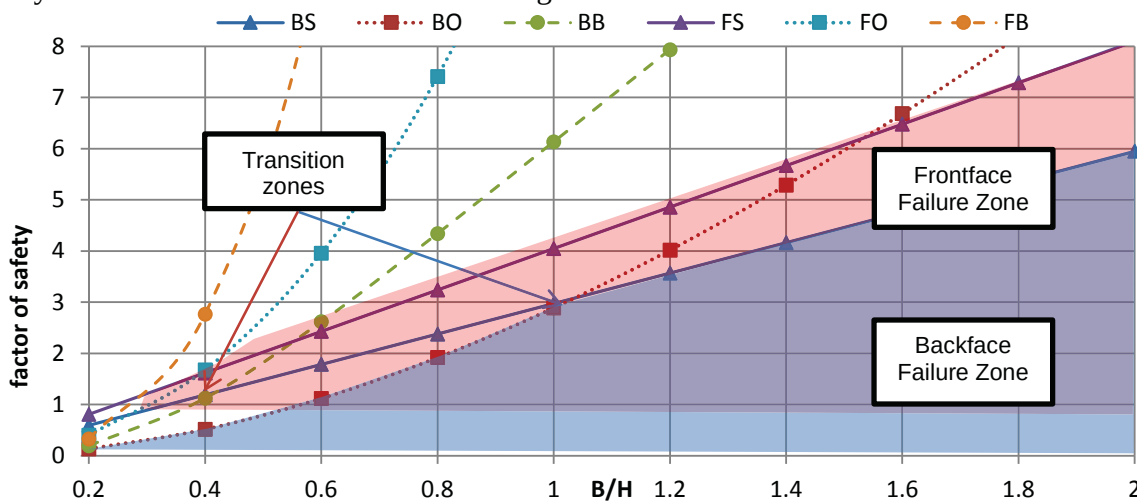


Figure 6: Effect of varying breadth-height ratio of retaining walls

An increase in B/H ratio increases the factor of safety for all cases. The increase in bearing capacity was found to be most significant. The curves for both cases are similar and as the geometric ratio increases, failure starts by overturning failure followed by sliding. This confirms that the stability of the walls is not affected by height, but by the B/H ratio. To find this changing point the equation of

overturning(5) is equated to the equation for sliding(9). This gives:

$$d_g = \mu d_a \quad (15)$$

Hence, the centroid of the gabion wall is the determining factor since μ and d_a were constant in both cases. Apart from the eccentricity, the inclination angle, β , of the gabion is the only difference in both cases.

3.3. INCLINATION ANGLE AND SURCHARGE

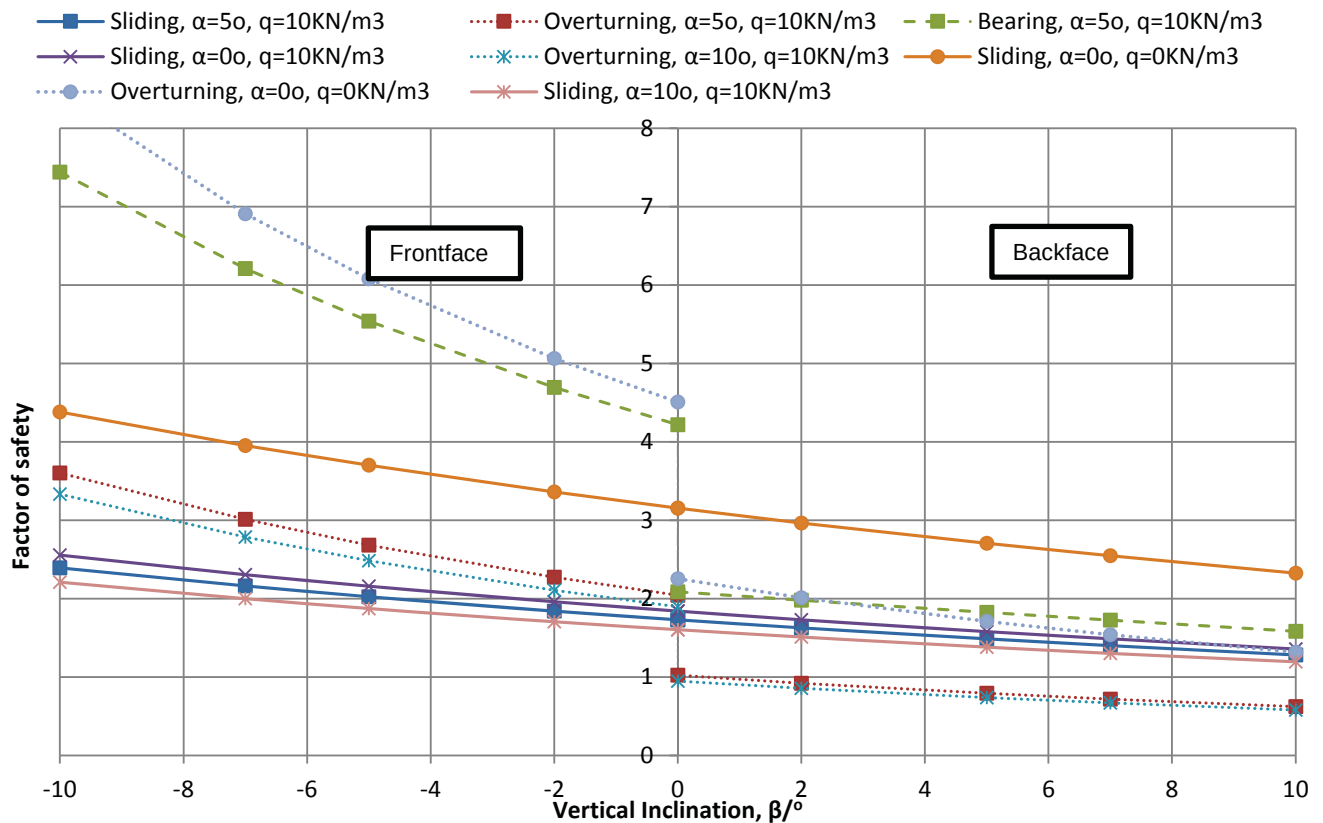


Figure 7: Effect of inclination angles

For a Frontface gabion, increasing the angle from the vertical increases the factor of safety against failure whereas for a Backface gabion, a greater inclination lowers the stability as the eccentricity decreases. Increasing surcharge decreases the factor of safety and this effect was found to be very significant as far as overturning failure is concerned. Surcharge has a maximum effect when the angle of horizontal inclination, α is 0° . When there is no inclination, the factor of safety against sliding is the same for both walls.

It can be concluded that surcharge and the angle of inclination from the horizontal affect both walls equally. The factor of safety against overturning is significantly higher in Frontface and suggests that Frontface is more resistant to topping failure.

3.4. EFFECT OF UNIT WEIGHT OF SOIL TO WALL STABILITY

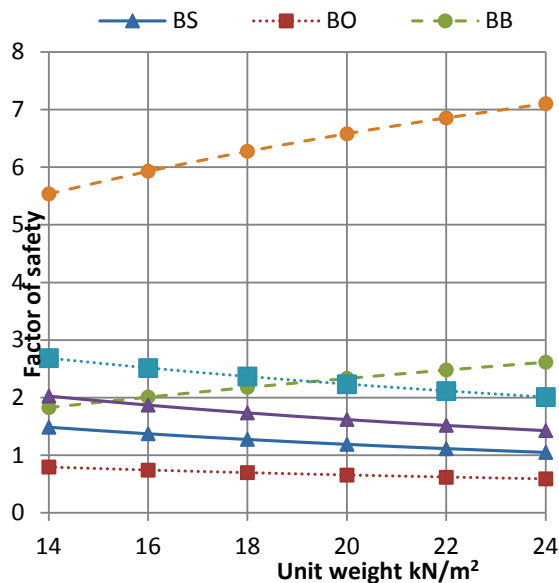


Figure 8: Effect of increasing unit weight of backfill

Variations in the unit weight of the backfill do not significantly affect the factor of safety achieved. The factors of safety for sliding and overturning are related to the unit weight of ballast and the unit weight of soil. It was observed that when the unit weight of soil is approximately equal to the unit weight of the gabion, the factor of safety did not change with increase in height at constant B/H. Increasing the unit weight of soil decreases the factor of safety in both cases since the lateral force acting on the gabion increases. The increase of weight of the ballast provides more stability since the normal force is increased. Lowering the value of the unit weights has the reverse effect. i.e decreasing the ballast unit weight will lower the factor of safety against sliding and overturning. However, a significant increase in the unit weight of the ballast leads to bearing capacity failure. The bearing capacity increased when the unit weight of the backfill was increased.

3.5. EFFECT OF FRICTION ANGLE



The previous section leads to the conclusion that the failure criterion of all design approaches starts from overturning failure followed by sliding failure. Figure 9 and 10 serve to verify if the choice of the design approaches has an effect on the failure criterion.

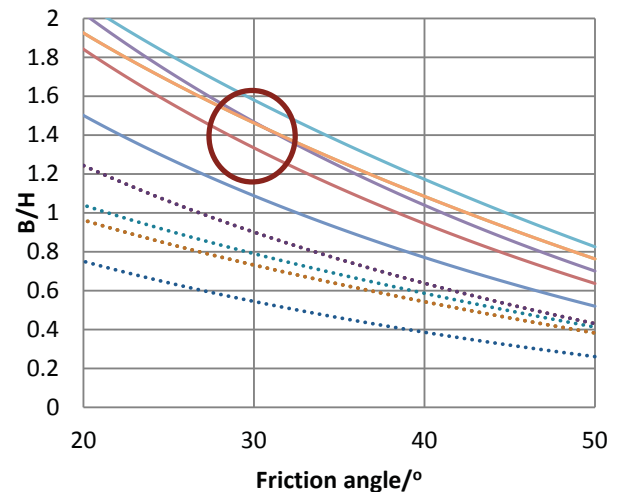
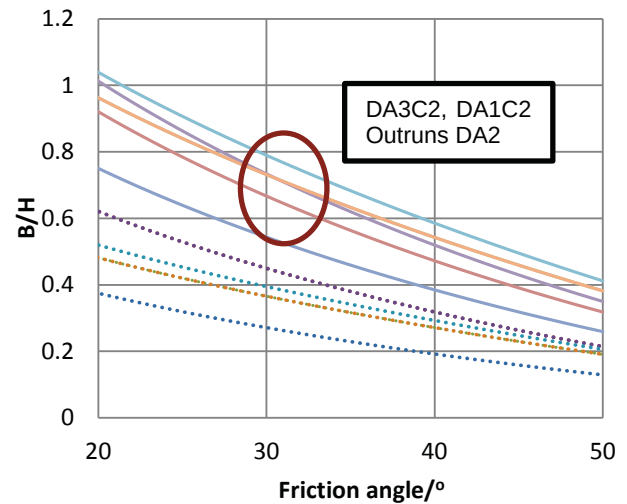


Figure 9: B/H vs ϕ for Frontface wall

Figure 10: B/H vs ϕ for Backface wall

With an increase in the friction angle of the retained soil, the B/H ratio increases because the lateral force acting on the wall decreases with a decrease in the active pressure coefficient. DA3C1 is the most conservative design followed by DA1C2, which is overlapped, by DA3C2, followed by DA2 and DA1C1 for sliding. However, as the friction angle increases, DA1C1 outruns DA2. For overturning DA3C2 and

DA1C2 are most conservative, followed by DA3C1, DA2, and then DA1C1. Therefore, the choice of the design approach for the most conservative design varies according to the material that is retained and the breadth-to-height ratio of the retaining structure. This final graph confirms that the Frontface gabion is the best choice for a gabion retaining structure. Therefore, it is believed that at large friction angles, DA1C1 and DA3C2 are more sensitive to the friction angle than to the unit weight of soil.

4. CONCLUSION

Backface gabions are more effective than Frontface gabions since the factor of safety against all geotechnical failure criteria achieved by the Backface gabion is higher than that achieved by the Frontface under the same soil conditions. It has been found that as the B/H ratio of the gravity walls increases, the failure criterion shifts from overturning to sliding and it is suggested that the failure mode is a function of the eccentricity of the structure. Frontface and Backface gabions are more resistant to topping failure and sliding failure respectively. The failure criterion was found to be independent of height for constant B/H ratio, inclination angles, β and α , surcharge and unit weight of soil retained by the gabion walls. An increase in the degree of inclinations of the wall from the vertical improved stability for the Frontface gabion wall while the reverse effect occurred for the Backface wall. It is found that sliding stability is the same for both walls when there is no inclination. The most conservative design approach is DA2 for low friction angles and DA1C2 when the friction angle becomes large and material parameters have greater effect. The exact point at which the choice of the most conservative design approach changes depends on the material parameters and loading conditions involved. Sliding failure was also found to be unaffected by an increase in height at constant B/H ratio and when the unit weight of the soil retained was approximately equal to the unit weight of the gabion basket. Bearing

failure is unlikely to happen in both cases except for realistically small B/H. DA2 was most affected by actions while DA1C2 by soil parameters. DA1C1 and DA3 were affected by both actions and soil parameters. Overall stability is mostly affected by the internal friction angles of the retained soil and the ratio B/H.

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Notation List

B	breadth of wall (m)	W_v	resultant vertical force (w_g) (kN)
BB	bearing capacity of Backface wall	X_i	distance to the local centroid of the area A_i (m)
BO	overturning of Backface wall	Y_i	height of section corresponding to X_i (m)
BS	sliding of Backface wall	b	width of a gabion basket (m)
B-XXX	bearing capacity of design approach xxx	c	cohesion of soil(kPa)
DA1C1	design approach 1 combination 1	d_a	distance from base to equivalent force acting (m)
DA1C2	design approach 1 combination 2	d_g	distance from to to centroid (m)
DA2	design approach 2	e	eccentricity (m)
DA3C1	design approach 3 combination 1	h	height of a gabion basket (m)
DA3C2	design approach 3 combination 2	n	number of gabion basket
EC7	Eurocode 7	p_a	active earth pressure (kN)
FB	bearing capacity of Frontface wall	p_h	horizontal component of earth pressure (kN)
FO	overturning of Frontface wall	q	surcharge (kPa)
FS	sliding of Frontface wall	α	angle from the horizontal to the slope of backfill (°)
-XXX	bearing capacity of design approach XXX	β	angle of Backface slope with vertical (°)
K_a	coefficient of active earth pressure	γ_s	unit weight of backfill (kN/m ³)
M_o	overturning moment (kN/m)	γ_b	unit weight of 1 gabion basket (kN/m ³)
M_r	resisting moment (kN/m)	γ_G	partial factor for unfav permanent actions
N_c	Terzaghi coefficient for cohesion (kPa)	$\gamma_{G,fav}$	partial factor for favourable permanent actions
N_q	Terzaghi coefficient for overburden (kPa)	γ_Q	partial factor for unfav. variable actions
N_γ	Terzaghi coefficient for self-weight (kPa)	$\gamma_{Q,fav}$	partial factor for favourable variable action
O-XXX	overturning of design approach XXX	γ_{RH}	partial factor for sliding resistance
Q_{ult}	ultimate bearing capacity (kPa)	γ_{RV}	partial factor for bearing resistance
Q	bearing capacity (kPa)	$\gamma_{c'}$	partial factor for effective cohesion
SF_b	factor of safety against bearing failure	γ_θ	partial factor for coefficient of shearing resistance
SF_o	factor of safety against overturning	γ_γ	partial factor for unit weight, γ
SF_s	factor of safety against sliding	ϕ	internal friction angle of soil (°)
S-XXX	Sliding of design approach XXX	δ	friction factor between wall and ground (°)
W_g	weight of gabion wall (kN)	μ	coefficient of the sliding friction, $\tan\phi$ (°)

INVESTIGATION ON WIND ENERGY POTENTIAL WITH OMNI-DIRECTION-GUIDE-VANE (ODGV) IN MEIKTILA, THE REPUBLIC OF UNION OF MYANMAR

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Abstract

The aim of this paper is to present the potential of wind energy for a remote area of Meiktila, central part of Myanmar. A total of 10 years monthly mean wind data at 10m height were assessed from Myanmar Meteorological Department. The collected wind speed data was calculated at 60m hub height. Annual mean wind speed in the region was 2.78m/s and the annual wind energy available was 88.24W/m² or 773kWh/year in the height of 60m. The values of annual Weibull shape parameter (k) and scale parameter (c) were 1.58 and 3.04m/s respectively. The annual maximum energy output was 7113kWh powered by 2kW rated wind turbine integrated with Omni-Direction-Guide-Vane (ODGV) and the cost of electricity obtained was found \$0.21/kWh in the best scenario. According to the results, the selected location is only suitable for small scale wind energy application.

Keywords: Wind Speed, Wind Energy, Omni-Direction-Guide-Vane, Meiktila, Green Energy

1. Introduction

Energy has a key role to form modern economy. In developing countries, such as Myanmar, energy consumption has increased to improve their living while natural resource accessibility decreases. So meeting of growing energy demand in a safe and environmentally responsible manner is a key challenge. Therefore, the use of renewable technology has been developed to produce required energy demands for the past few years. Myanmar's population is approximately 60 million, with two-thirds of population living in rural areas[1, 2]. In 2010, 26 percent of its population was living remote rural areas without electrical grid access and quite poor. Myanmar's per capita electricity consumption is only 100 kWh per year, the lowest among ASEAN's countries. Greater use of renewable energy technologies is one of the promising ways to reduce poverty in remote rural area. The technology is developing fast, and small-scale renewable energy to provide power to electrical grids is now the cheapest option for the poor [3]. In recent years,

Myanmar has begun to exploit a wide scale of renewable energy sources, particularly solar, wind, hydro, geothermal and biomass. Myanmar has vast potential of renewable resources and now it is increasingly considering wind energy. This article concentrates on the potential of wind power to provide Myanmar with a viable renewable energy source.

2. Literature Review

Wind energy development is at the experimental and research phase in Myanmar. The evaluation of wind energy resources using modern systems has been conducted since 1998, led by the Myanmar Scientific and Technological Research Department. New Energy and Industrial Technology Development Organization (NEDO) of Japan studied in 1997 on renewable energy potentially available in Myanmar and occurred wind energy of 365.1 TWh per year in generally windy areas. Some potential areas were identified by JICA/ NGO joint survey in 2001. Judging from existing data, hilly regions of Chin and Shan states, coastal regions in the

south and western part of the country, and central part of the country appear to have the best potential for harnessing wind power[3]. But particular survey is needed to size and design the system before implementation. Appropriate site selection for wind efficiency is important and necessary. Only a very few small capacity of 300-600 W wind generators are used in lower part of the country[4]. The aim of this study is to determine the wind energy potential for electricity generation in remote area of Meiktila, central part of Myanmar, by using the Omni-Direction-Guide-Vane (ODGV). The ODGV is an augmentation device which can increase power generation of conventional wind turbine from available wind site by achieving high performance directional flow of the on-coming wind speed, guiding the wind stream to a better flow direction of the VAWT. It was designed for low wind speed regions for improving energy generation of conventional wind turbine[5]. This work is the first time analysis of wind energy potential for this region in Myanmar.

3. Materials and Methodology

The wind speed data of Meiktila over a period of ten years have been assessed and statistically analyzed. The wind speed data were recorded at a height of 10m by a cup generator anemometer by Myanmar Meteorological Service. The wind regimes are characterized by two Weibull parameter functions: the probability density function (PDF) and the cumulative distribution function (CDF). They are given by the following equations Eq.1-5[6, 7].

$$f(v) = \frac{k}{c} \cdot \left(\frac{v}{c}\right)^{k-1} \cdot e^{-\left(\frac{v}{c}\right)^k} \quad (1)$$

$$k = \left(\frac{\sigma}{\bar{v}}\right)^{-1.086} \quad (2)$$

$$c = \left(\frac{1}{n} \sum_{i=1}^n v_i^k\right)^{\frac{1}{k}} \quad (3)$$

$$\sigma = \left[\frac{1}{n} \sum_{i=1}^n (v_i - \bar{v})^2\right]^{\frac{1}{2}} \quad (4)$$

$$F(v) = 1 - \exp\left[-\left(\frac{v}{c}\right)^k\right] \quad (5)$$

Where $f(v)$ is the probability of observing wind speed v , k is the dimensionless Weibull shape parameter and c is the Weibull scale parameter (m/s). $F(v)$ is the cumulative distribution function, $\bar{v}$ is the mean wind speed (m/s) and σ is the standard deviation of the known wind speed data (m/s).

The most common expression for the variation of wind speed with hub height is the power law having the following form [8, 9]:

$$\frac{v_2}{v_1} = \left\{ \frac{h_2}{h_1} \right\}^m \quad (6)$$

Where v_2 and v_1 are the mean wind speeds (m/s) at heights h_2 and h_1 , respectively. The exponent m depends on surface roughness and atmospheric stability.

The long-term average wind power density can be expressed by Eq. 7 [10] based on the Weibull probability density function. $P_w(v) =$

$$\frac{1}{2} \rho A v^3 r \left(1 + \frac{3}{k}\right) \quad (7)$$

Where ρ is the air density (1.225 kg/m³), A is the swept area of the rotor blades (m²) and v is the wind speed (m/s) and $r(x)$ is the gamma function of (x) .

The power output of the wind turbine can be expressed by Eq.8[10].

$$P_{w,avg} = \int_0^{\infty} P_w(v) f(v) dv \quad (8)$$

The average energy output E_{out} for a period of time and the cost per kWh of wind-generated electricity can be calculated as Eq.9 and Eq.10[10].

$$E_{out} = P_{w,avg} \Delta t \quad (9)$$

Where Δt is the time period.

$$\text{Cost /kWh} = \frac{\text{Annual Cost}}{\text{Annual Energy Output}} \quad (10)$$

4. Discussion and Conclusion

The aim of this study is to assess the potential of wind powers in Meiktila, the Republic of Union of Myanmar. Long term wind speed data of Meiktila during the period of 2004-2013 have been statistically analyzed. Mean wind speed measured at 10m is determined as 1.46m/s for the studied period. Wind power density and wind power output of the turbine based on the Weibull parameters for 60m height were calculated. The propose region has low wind resource potential with wind speed of 2.78m/s while annual k and c values were 1.58 and 3.04m/s, and the power of 88.24w/m² or 773kWh/year at the height of 60m. Based on the result of yearly Weibull CDF, the operating possibilities is 75% of yearly wind speed at 60m height if 2m/s are used as the cut- in wind speed for wind turbines. Hence small scale wind turbines can be used to provide electricity in this area. The ODGV can increase the actual wind speed of the selected site to a large higher wind speed. At 60m height, the actual highest wind speed of the location was occurred at 6.99m/s in July and it increases to 12.83 m/s with the effect of ODGV while the actual lowest wind speed was reached to 2.69m/s from the original wind speed of 1.58m/s. Hence the ODGV can give the effective impact on the wind electric generation system and wind turbine size of 2kW with ODGV is the best scenario and can produce 7113kWh of annual energy output at 60m hub height. The result of this study can support information to wind research in Myanmar even though wind characteristics analysis indicates low potential of wind energy in the proposed area.

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THE EFFECT OF TEMPERATURE AND GAS/LIQUID RATIO ON CO₂ REMOVAL PERFORMANCE BY WATER- BASED NANO-BUBBLE PROCESS

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Abstract

The Nano-bubble process is a novel effective technology for CO₂ removal. Its advantages are their high specific area and stagnation in the liquid phase, which increase the gas dissolution. This study proposes the application of system using swirling jet flow method for the CO₂ absorption from mixture gas consisting of 60%v/v CO₂ and 40%v/v N₂ at 1000 ml/min using water as an absorbent. The effects of water temperature and gas/liquid ratio were studied. The results indicate that CO₂ outlet concentrations were in the range of 3.1%-8.6% at gas/liquid ratio of 0.05-0.2 with a constant inflow rate of gas. When temperature was decreased (from 27.5 to 5°C), CO₂ outlet concentrations reduced from 3% to 2% at 20 l/min of water. The CO₂ removal performance could be significantly improved because the decreasing of the temperature increased the viscosity of liquid and residence time of CO₂ bubbles in the column.

Keywords: Nano-bubble, CO₂ Removal, Gas Dissolution, CO₂ Absorption, Bubble Column

1. Introduction

The world's energy demand is increasing rapidly both households and industrial. Among the fuel resource used in power production consists mainly of hydrocarbon and carbon dioxide (CO₂). Generally, before refining utilizing fossil fuels, CO₂ has to be removed in order to protect equipment from corrosion. There are many methods of removal of CO₂. The mainly methods are chemical absorption and gas filtration. Moreover, its regeneration energy requirement are high and it's easy to corrosion [1]. Recently, the study of Nano-bubble process is a novel effective technology for CO₂ removal. The aims of this study are to study the effects of water temperature and gas/liquid ratio on CO₂ absorption.

2. Literature Review

The Navaza et al., 2009 [2] found that increased the MDEA concentrations increased the total amount of CO₂ absorption but it had no influence on the gas absorption rate. On the other hand, the

increased gas flow rate influence on the gas absorption. Then, water has been used as an absorbent called water scrubbing. The solubility of CO₂ in water is much higher than CH₄ and H₂S. The CH₄ purity can achieve 80–99% from raw biogas. Karamah et al., 2010 [3] studied the micro-bubble ozonation in a bubble column with water as liquid phase. The authors found that with the higher the liquid and gas flow rate the volumetric mass transfer coefficient is higher.

3. Research Methods

The experimental set-up consists of a cylindrical vertical acrylic column. The size of the column is 0.3 m x 2 m. The water with gas bubbles were discharged from the swirl-type bubble generator to generate small gas bubbles then water with the small gas bubbles went to the bottom of the column. The bubble generator produced average bubble size 63.976 µm. This column was opened at the outlet gas stream. The mixture gas consists of consisting of 60%v/v CO₂ and 40%v/v N₂

at 1000 ml/min were used. Water flow rate at 15 °C was adjusted by valve from 5 to 20 l/min. Gas/liquid ratio is fixed gas flow rate at 1000 ml/min. Start, water was filled into the column at appropriate liquid level 1.8 m, then open the gas flow inlet. The temperature was controlled by cooling in the range 5-27.5°C. All the experiment were performed at 40 minutes.

4. Discussion and Conclusion

The different experiment of CO₂ absorption in water were carried out by varying the gas/liquid ratio from 0.05-0.2 (Figure 1).

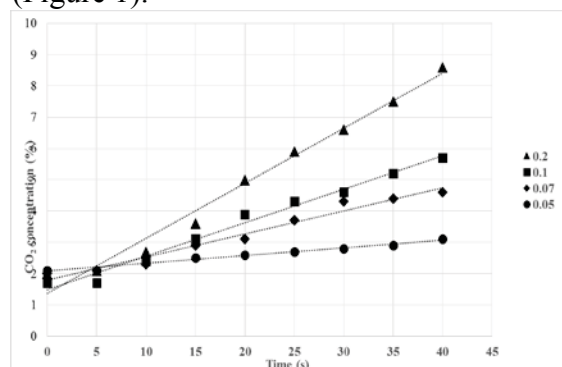


Figure 1. Effect of gas/liquid ratio varying from 0.05 to 0.2 on CO₂ outlet concentration at 15°C

The results show that at 15°C of water, outlet CO₂ concentration were 3.1%, 4.6%, 5.7%, and 8.1% at gas/liquid ratio 0.05, 0.07, 0.1 and 0.2, respectively. Decreasing gas/liquid at lower ratio resulted in higher gas absorption. This is because of the mass transfer rate between gas and liquid [4]. For the effect of the water temperature varying at 5, 15, 27.5°C as shown in Figure 2, the maximum outlet CO₂ concentration was 2.8, 3.1, and 3.5%, respectively. This behavior is due to the fact that reducing viscosity of liquid causes higher gas holdup in the column [5]. Besides, it was observed that the percentages of outlet concentration increases with time.

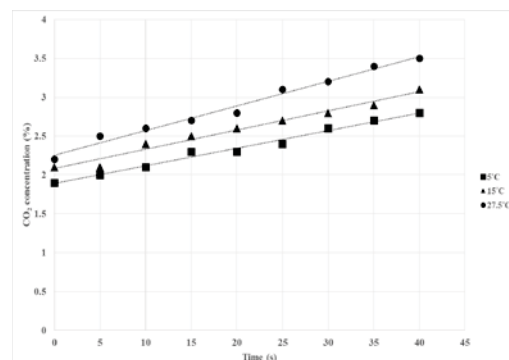


Figure 2. Effect of temperature from 5 to 27.5°C at gas/liquid ratio of 0.05 on CO₂ outlet concentration

Since feed water contains small amount of CO₂, high CO₂ content could be initially absorbed into water as the driving force is the highest value at the starting point of the process.

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TREATED TRANSPARENT CONDUCTING FILMS FOR FULL FLEXIBLE ELECTROCHROMIC DEVICES

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Abstract

Treatment process by methanesulfonic acid solution was used to improve electrical conductivity of poly 3,4-ethylenedioxythiophene:poly(styrene sulfonic acid) (PEDOT:PSS). Weak acid could be used in the treatment because some PSS chains were moved out from the polymer mixer films without damage on the substrates. Variation of number of PEDOT:PSS thin-film layer showed different conductivities. Two layers of treated PEDOT:PSS films were adequate for use as transparent conducting films. Obtained transparent conducting films on polyester substrates were used to fabricate flexible electrochromic devices. The devices showed reversible change in color with switching applied voltages (± 3 V). Cyclic voltammetry (CV) and UV-vis-NIR spectroscopy were used to confirm the activity of P3HT/treated-PEDOT:PSS electrode and investigate the light transmission properties of full flexible devices, respectively.

Keywords: Conductivity, Flexible Electrochromic Devices, Methanesulfonic Acid, PEDOT:PSS

1. Introduction

Electrochromic or smart windows are devices from a group of materials which they can control the amount of light from outside pass through interior of the buildings. Reversible change in color of the devices was occurred after applications of electric current [1]. Most of electrochromic devices are fabricated on glass-based materials which are made from transparent conducting oxide (TCO) substrates. However, TCOs have high cost, poor mechanically flexibility and quite high mechanical brittleness. PEDOT:PSS is a flexible conducting material, but the conductivity of polymer films is still low. Weak acid solution can increase the conductivity of PEDOT:PSS films.

2. Literature Review

In many previous reports, the conductivity of PEDOT:PSS films can be improved by treatment processes. The addition of organic compounds, such as ethylene

glycol, dimethyl sulfoxide (DMSO), methanol (CH_3OH), sulfuric acid (H_2SO_4), phosphoric acid (H_3PO_4), etc., leads to increase in conductivity of PEDOT:PSS films to apply in the electrochromic devices [2-4]. In this contribution, the increase of conductivity of PEDOT:PSS thin films by treatment with methanesulfonic acid solution and the use of obtained transparent conducting electrode for fabrication of flexible electrochromic devices are reported. Poly (3-hexylthiophene) (P3HT) and lithium perchlorate (LiClO_4) were used as an electrochromic layer and an electrolyte, respectively. Close devices were fabricated and characterized.

3. Research Methods

PEDOT:PSS (PH 1000) aqueous dispersion were coated on polyester substrates with two-time coating by convective deposition method. The coated samples were annealed at 110°C on a hot

plate for 30 min. PEDOT:PSS films were treated by methanesulfonic acid solution (4 M) by one-time coating. Samples were dried at 110°C on a hot plate again. P3HT solution was coated on the obtained transparent conducting films. The samples were then annealed at 110°C for 60 min in vacuum. Another PEDOT:PSS-coated polyester film was used as a counter electrode of an electrochromic device. Electrolyte 0.1 M of LiClO₄ was injected into between two electrode films.

4. Discussion and Conclusion

The conductivity of pristine films was about 43 S/cm. For the relationship of conductivity of treated PEDOT:PSS films and number of polymer layers, it was found that the conductivities of 1, 2, 3, 4, and 5 PEDOT:PSS layers were 865, 1064, 1413, 1643 and 2306 S/cm, respectively. Increasing layer of PEDOT:PSS with treatment process showed continuous increase of conductivity of the film samples. It was found that 5 layers of PEDOT:PSS gave the highest electrical conductivity. Although, 5-layer film gave the best conductivity, it was too translucent to be used in the actual electrochromic applications. Weak acid can be induced to increase conductivity of PEDOT:PSS films because some PSS chains are moved out from the polymer matrix films without damage on the substrates [2,3]. The cyclic voltammogram of P3HT/treated-PEDOT:PSS electrode were performed in three-electrode system using 0.1 M LiClO₄ in an aqueous solution with a scan rate of 0.02 V/s. The reversible oxidation/reduction processes of 1 to 3 cycles of CV were found between 0.25 and 2.0 V. All anodic peaks continually slowly decreased after increased a scan number, because the normal film, purple color, was swollen on surface of substrates. However, this change can be recurrent many of times with no obvious difference. The transmittance spectra of flexible electrochromic device are demonstrated

before applied voltage, the normal state of device gave the transmittance spectra around 20% at 500-600 nm. When the voltage was applied at 3.0 V, transmission of oxidized state increased to 35%.

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OPTIMIZATION OF LIGNIN SEPARATION PROCESS FROM BLACK LIQUOR USING STRONG ACIDS AND SUPERCRITICAL CO₂

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Abstract

Black liquor is the major waste from pulp and paper industry. Generally, it contains the amount of lignin fraction around 10-20% depending on the pulping process. The extracted lignin can be efficiently converted to several value-added products. In this work, lignin was comparatively extracted from black liquor by acidification and sub- and super-critical CO₂. For the first method, lignin precipitation was achieved by decreasing alkali black liquor pH from 10 to 2 with strong acid (H₂SO₄ and HCl) then filtrate with Glass fiber filter to separated solid and liquid phase. In the second technique, the acidification using CO₂ under sub and supercritical conditions which obtain pH 5 then use membrane to separated liquid and solid phase. The lignin precipitated percentages from each technique were measured and optimized for enhancing the highest yields of precipitated lignin.

Keywords: Lignin, Black liquor, Acidification process, supercritical CO₂, lignin Precipitation

1. Introduction

Nowadays, the problems about energy and environment are the topics with high global concerns, therefore, renewable biomass energy was increasing interest as sustainable alternative energy. Usually, the biomass is the raw material for pulp and paper industry, which generate the black liquor. Normally, it contains the amount of lignin fraction around 10-20% then, lignin was removed to extract for another products. The structure of lignin is very heterogeneous so, the fractionation process is an important step to obtain specific type of lignin. In the present work, lignin was obtained from black liquor resulting from laboratory. The lignin was comparatively extracted from black liquor by acidification and sub- and super-critical CO₂. Obtaining lignin-rich by both methods were characterized in term of chemical properties.

2. Literature Review

Garcia *et al.* [1] investigated about the acid precipitation of black liquor and selective the precipitation. The achieved precipitation of black liquor is decreasing pH from 12.64 to 0.72 and by adding sulphuric acid (98 %, w/w). The experiment was achieved at pH 0.72 and percentage of lignin 52.36%. Fredrix and Hans [2] studied the filtration properties of lignin suspension which was precipitated at different pH and temperature. The results of the yield increased when the pH decreased. The yield of precipitated lignin decreased when the reaction temperature increased. Nadja carchet *et al.* [3] studied an organosolv lignin, extracted in organic acid media, or called Biolignin. In their work, they have developed the procedure to acetylate lignin using supercritical carbon dioxide as a solvent in term of the supercritical conditions. Kouisni *et al.* [4] investigated separation of lignin from black liquor by oxidizing, acidifying and filtering the acidified black liquor. The

process provides larger lignin particles and higher dry solid content than from corresponding non-oxidized, acidified black liquor.

3. Research Methods

The starting material is black liquor provided from laboratory. The black liquor was separated to liquid and solid fractions. To extract lignin from alkali black liquor, first step is acidification process of alkali black liquor. In this work, strong acids and carbon dioxide was used acidified. First method, the strong acids *i.e.* H_2SO_2 and HCl was used to decrease pH from 10 to 2 at atmospheric pressure for precipitated lignin rich. Second method, using CO_2 under sub- and super-critical conditions are studied in a Parr reactor to decrease pH value of alkali black liquor. After lignin precipitation, the black liquor will be separated into solid and liquid fractions by the filtration process. The black liquor from strong acid precipitation were filtrated with Glass fiber filter $1.2\ \mu\text{m}$ (Whatman) and, black liquor from CO_2 acidification were filtrated with ceramic membrane (10 kDa).

4. Discussion and Conclusion

The effect of acid types (*i.e.* H_2SO_4 and HCl) on the precipitation yield of lignin from black liquor under different reaction times was carried out. The highest percentage of lignin precipitation achieved at the reaction time of 24 hours and using the sulfuric acid are presented in Fig.1. The temperature at $80\ ^\circ\text{C}$ archived the highest percentage yield of lignin were shown in Fig 2. The acidified process that using CO_2 at super-critical condition shown the higher percentage of lignin yield than sub-critical condition.

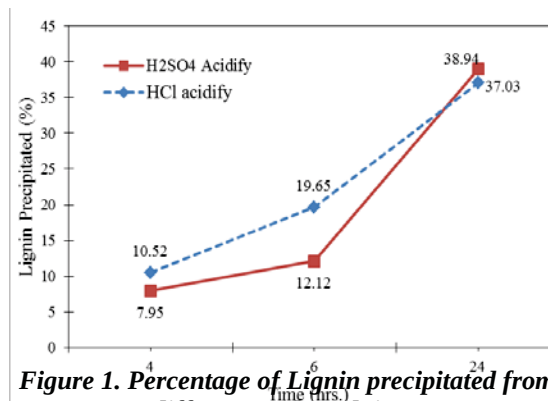


Figure 1. Percentage of Lignin precipitated from different acids and times

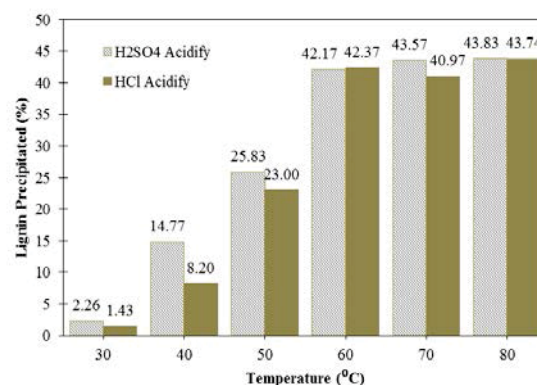


Figure2. Percentage of Lignin precipitated from different acids and temperature.

5. References

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INTERSTATE WATER RESOURCE RISK MANAGEMENT: TOWARDS A SUSTAINABLE FUTURE FOR TRANSBOUNDARY RIVER BASINS OF CENTRAL ASIA

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Abstract

The background for this study was the importance of the allocation and use of water resources of Transboundary Rivers in Central Asia. Firstly, for the equitable use of water resources by the countries of the region requires first the determination of the actual volume of water flow of Transboundary Rivers. This requires systematic monitoring of dynamics of change of water flow. The paper presents the results of study of dynamics of change of water flow of the Transboundary Zeravshan River for the period 1931-2011 and main tributaries of Amudarya the Vakhsh River. The significant change of the river flow and the impact of climate change on the state of glaciers of the Zeravshan river catchment observed

Keywords: Transboundary River, Central Asia, Zeravshan River, Water flow, Meteorology

1. Introduction

About 60% of the water that potentially flows to the lower Aral Basin originates in the high mountains of Tajikistan. The demand for winter hydropower generation in the upstream countries, where the dams are located, conflicts with the summer demand for irrigation in the downstream parts of the basin. The poor and inadequate information on the available water resources is leading to erroneous planning decisions and a biased distribution of water resources. Hence, these issues contribute to interstate Transboundary water sharing conflicts between the riparian states.

To provide sustainable water management, it is important to obtain reliable information on the present and future water resources and their evolution in relation to human activities, to global changes and to climate evolution affecting the hydrological and melting regime of the main tributaries to the Amu Darya and Sir Darya.

2. Literature Review

The Zeravshan River one of the tributaries of the Transboundary Amudarya Rivers formed on the territory of the Republic of Tajikistan and flows to the territory of the Republic of Uzbekistan Main hydrological characteristics of the river described in [1]. The average

annual flow of water of the Zeravshan river is 158 m³/sec and the average annual volume of runoff is about 5.0 km³ [2]. Monitoring meteorological conditions of the basin of the Zeravshan River and hydrological parameters of the river on the territory of the Republic of Tajikistan carried out in four meteorological and five hydrological stations. There is currently only hydrological station Dupuly. The total glaciation area of the Zeravshan river basin is 437.9 km². Among 632 glacier of the Zeravshan river basin, the largest is Zeravshan glacier by a length of 27.8 km and an area of 132.6 km².

According to the Hydrometeorology Agency of the Republic of Tajikistan, there was a substantial change of the geometric dimensions and mass loss of glacier Zeravshan for the period 1927 - 1991. Only for the period 1991-2009 years, the glacier retreated at an average annual 88-94 m and its area decreased by 700 Th. m² and by 2050 to decreases by 30-35% is expected [3].

The Vakhsh River is the main river of the Republic of Tajikistan that merging by the Pyanj River forms the Amu Darya – the largest river in Central Asia. Potential energy resources of Vakhsh represent 28.6 Mln. kWt (250 Bln. kWt·h/year of electricity). The formation of river flow determined by the

hydrological regimes of its tributaries. The main tributaries of the Vakhsh River is Surkhob and Obikhingou rivers. The Surkhob river is formed by the confluence of the Kyzilsu and Muksu tributaries.

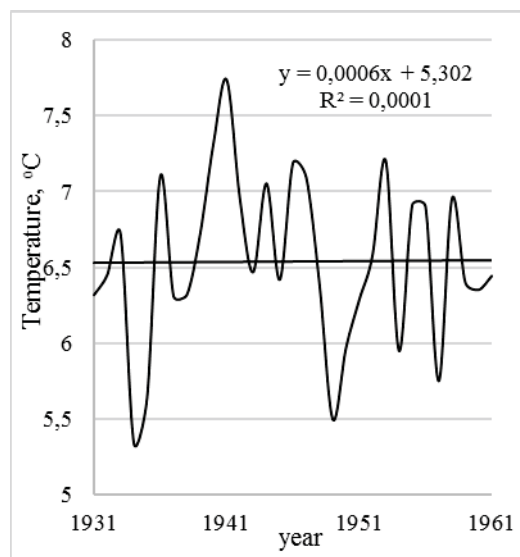
3. Research Methods

In the present paper were used the data of meteorological stations of Dehavz close to the Zeravshan glacier and Iskanderkul in the basin of the Yagnob river for the period 1931-2011. Measurement of hydrological characteristics of the Zarafshan River is at the station Dupuly that is the only hydrological post on the Zeravshan River. The influence of meteorological condition of the Vakhsh River tributaries basins on change of water flow carried out by used of meteorological data from stations Lyakhsh (Kyzilsu river basin), Tavildara (Obikhingou river basin) and Garm (the basin of the river Surkhob river basin) for the period 1960-1990.

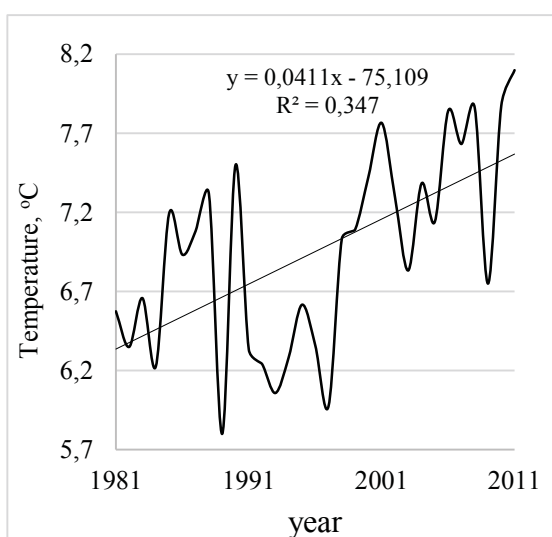
4. Discussion and Conclusion

The deviation of annual average temperature in the area of the Zeravshan glacier for the periods 1931-1961 and 1981-2011 presents on the Fig.1(a, b).

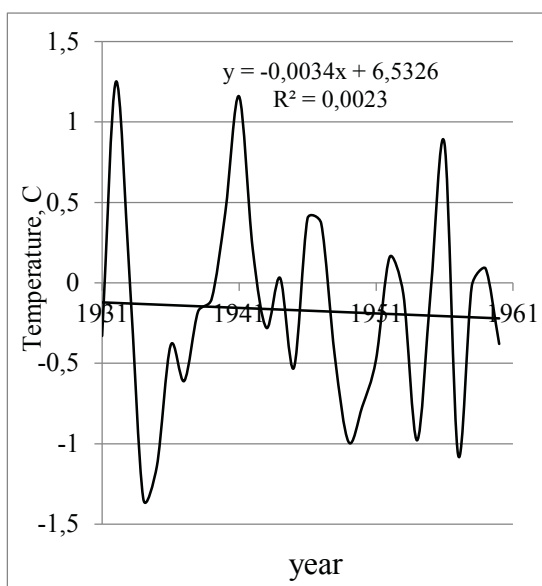
The considered period is characterized by abundant precipitation in the form of a solid phase (at a height of over 2500 m, precipitation falls only as snow). This suggests that the period 1931-1961 characterized by a favorable condition for the increase of glacier mass and not their degradation as follows from information of Agency on hydrometeorology of Tajikistan.



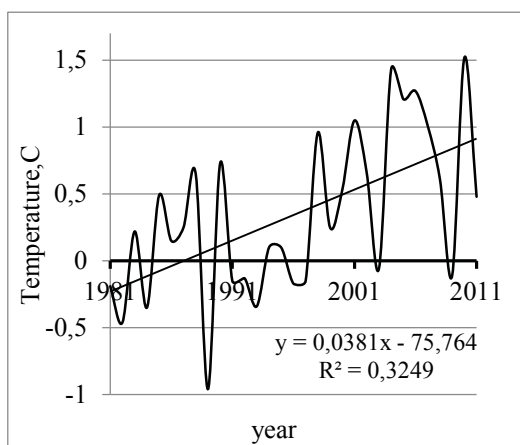
a



b



c

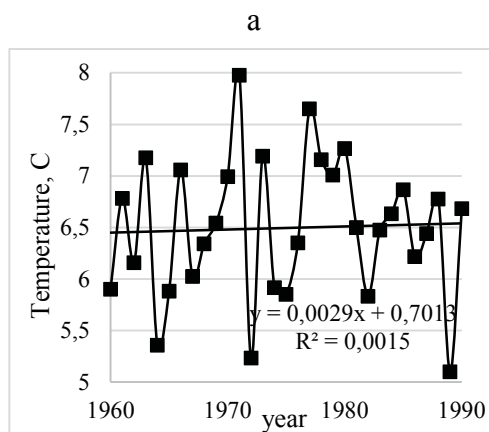
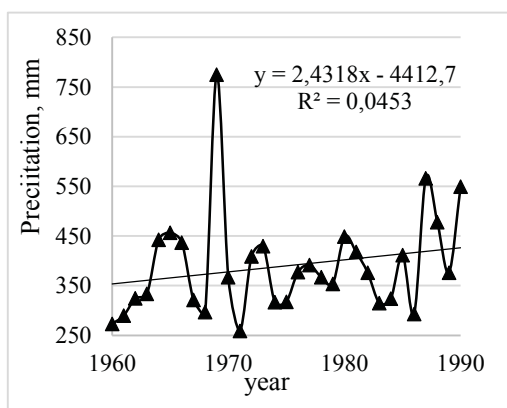


d

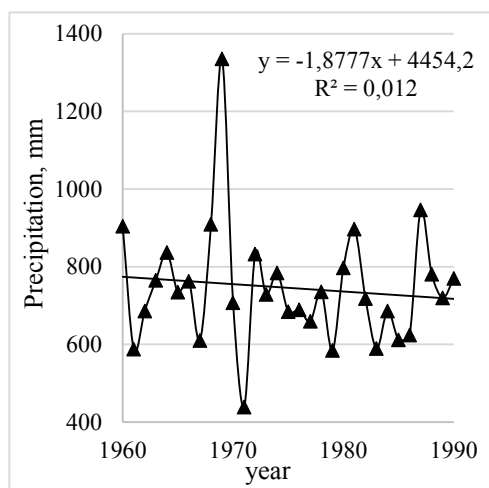
Fig.1. Change of annual average temperature for the periods 1931-1961 and 1981-2011 in the area of the Zeravshan glacier (a, b) and in the Yagnob river basin (c, d), respectively

The trend of change of temperature for the period 1981-2011 shows opposite character to comparison with the period of 1931-1961 while precipitation maintains its almost constant value (Fig.1b). The results of meteorological observations in the basin of the Yagnob river presented on the Fig.1(c, d) shows that the change in temperature for the period 1931-1961 remains almost unchanged value and as in the case of Zeravshan glacier region during the period 1981- 2011 a significant growth is observed.

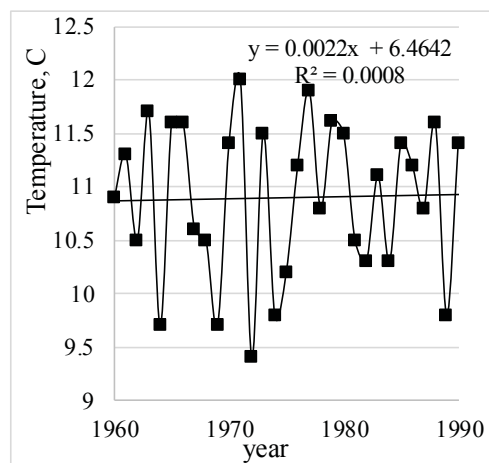
The results of monitoring of the meteorological condition of the Vakhsh River tributaries basins are present on the Fig.2. From the Fig. 2 it is obvious that if on the upstream of the Vakhsh River for the period 1960-1990 the precipitation characterized by increasing trend but on middle flow transformed to decreases trend.



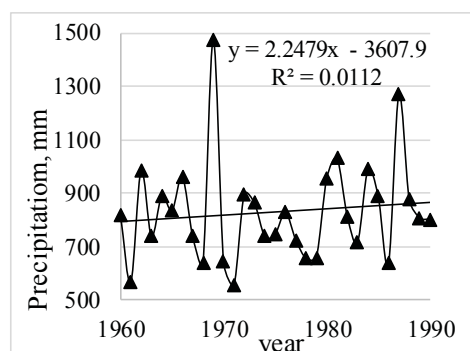
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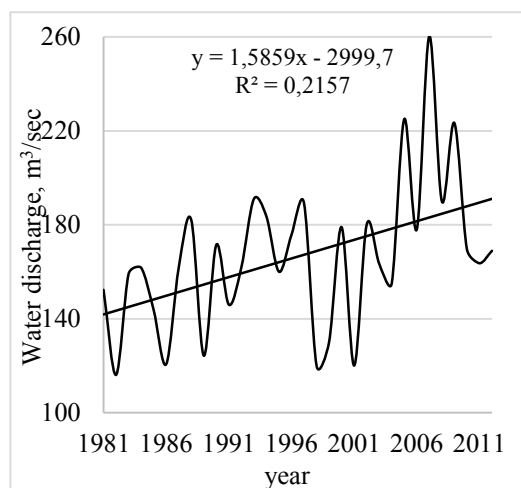
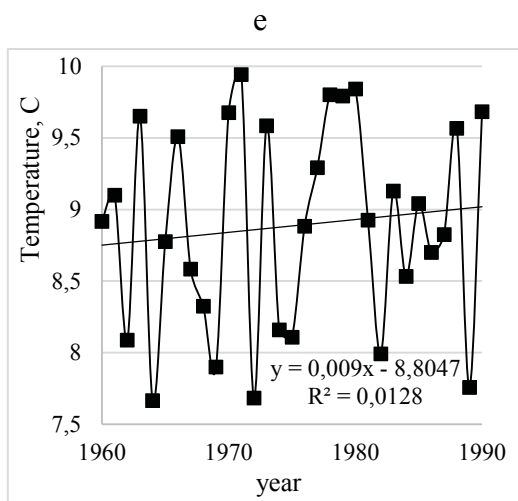


Fig.2. Annual average precipitation (▲) and temperature (■) on the data from meteorological stations Lyakhsh (a, b), Garm (c, d) and Tavildara (e, f) for the period 1960-1990.

On the Fig. 3(a, b) presents an average annual flow of the Zeravshan river for the periods 1931 - 1961 and 1981-2011 years, respectively.

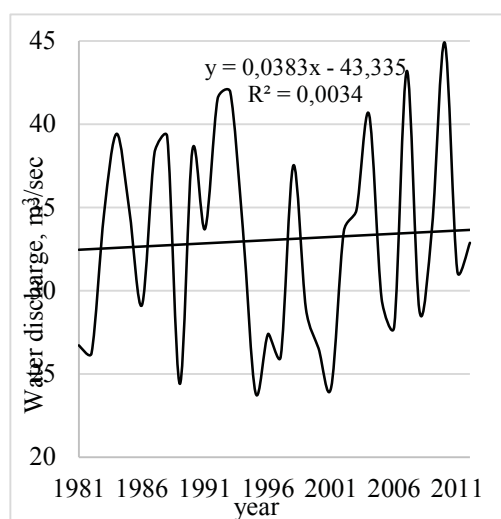
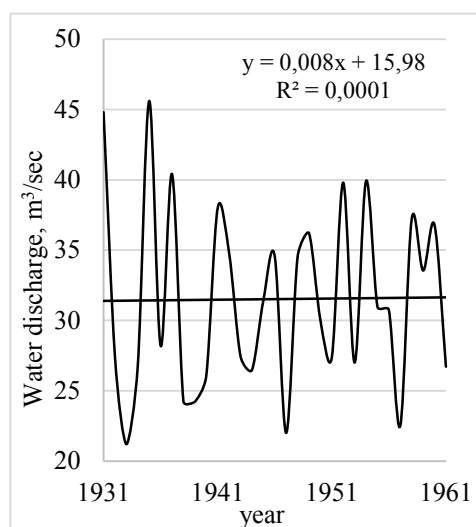
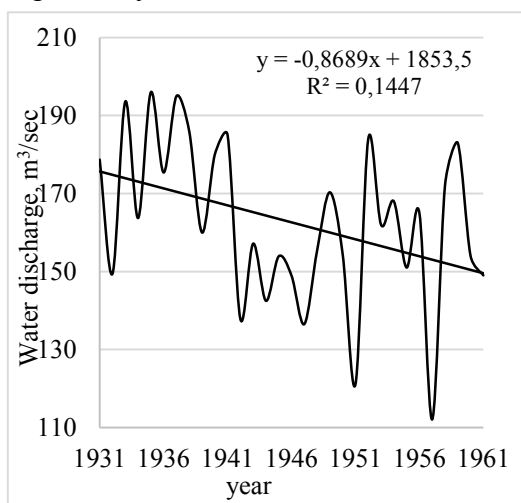


Fig.3. Zeravshan (a, b) and Yagnob rivers (b, d) water discharges for the periods 1931-1961 and 1981-2011.

The decrease trend of water discharge observed for the period 1931-1961 on the

Fig.3 can be explained by the fact that due to low and almost constant values of temperature, the precipitated solid precipitation not subject to aggregate transformation and, conversely, accumulate in the form of next layer of seasonal snow. Such scenario for the river Yagnob observed for the period 1931-1961 characterized by almost constant value of water discharge (Fig.3 c). A completely different behavior of the Zeravshan river runoff changes that is significant increase of water discharge for the 1981-2011 is observed (Fig. 3b).

On the Fig. 4 present the actual hydrographs of the rivers Zeravshan and Yagnob rivers for the periods 1931-1961 and 1981-2011 years demonstrated that water discharge maximum of the Zeravshan and Yagnob Rivers occurs in July and June, respectively. It can assumed that different months of observation maximum water discharge of the rivers associated with the location of their catchment at different heights a.s.l.

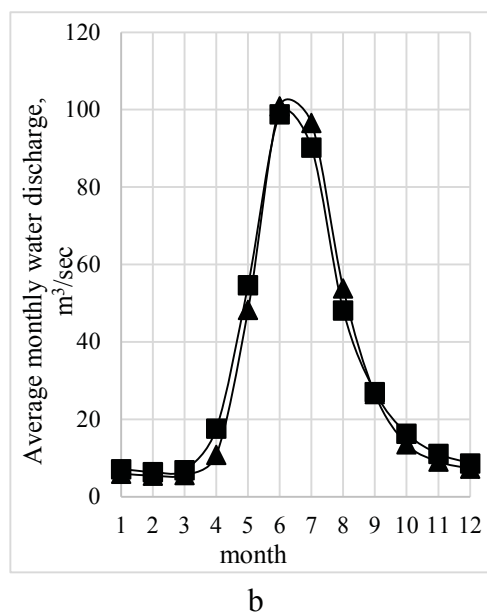
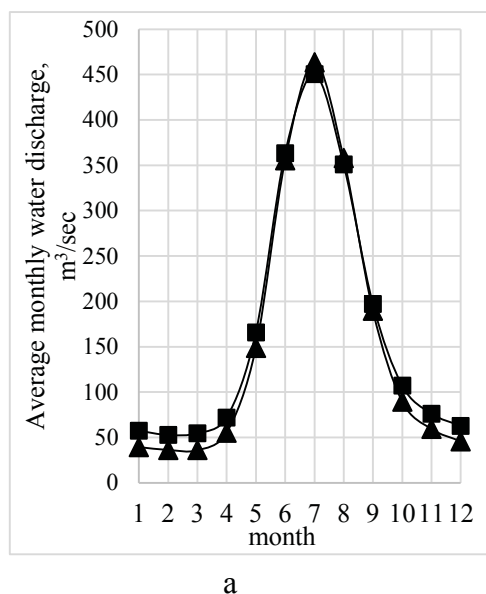


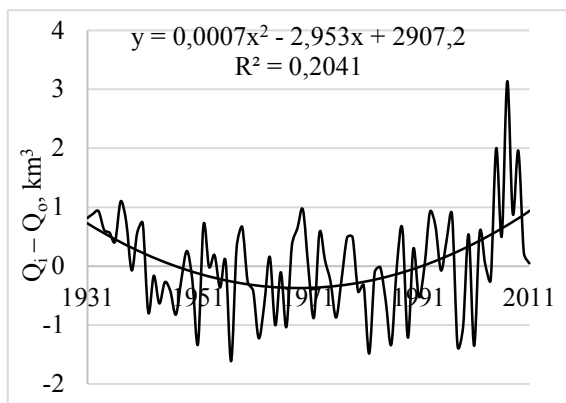
Fig.4. Zeravshan (a) and Yagnob (b) rivers hydrographs for the periods 1931-1961(▲) and 1981 - 2011 (■).

The period 1981-2011 in comparison with the period 1931-1961 characterized as follows from Fig. 4(a) by decreases of the Zeravshan River water flow. The average annual flow of the Zeravshan River according to calculation results for the periods 1931-1961 and 1981-2011 are 5.352 and 5.182 km³, respectively and for Yagnob River are 1.02 and 1.04 km³.

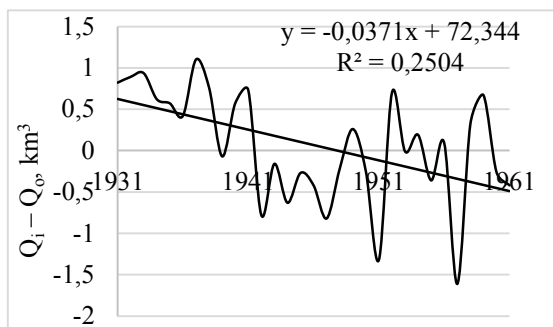
For estimation of the climate change impact on water availability in the river Zeravshan on the Fig.5 present is changes of annual runoff of river at hydrological station Dupuly for the period 1931-2011, in the form of the time dependence of deviation values of the volume of annual runoff from mean annual values:

$$\Delta Q = Q_i - Q_o.$$

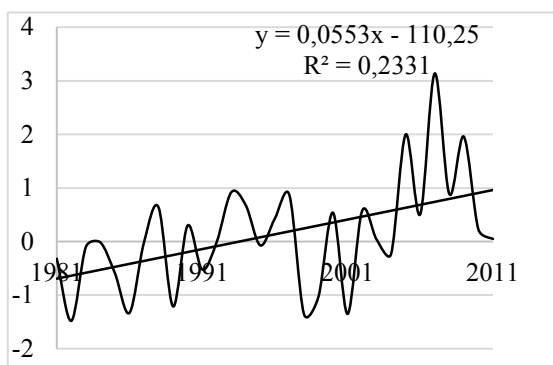
Where Q_i is the total water runoff for i year, Q_o is the mean annual water runoff for the period 1931-2011.



a



b



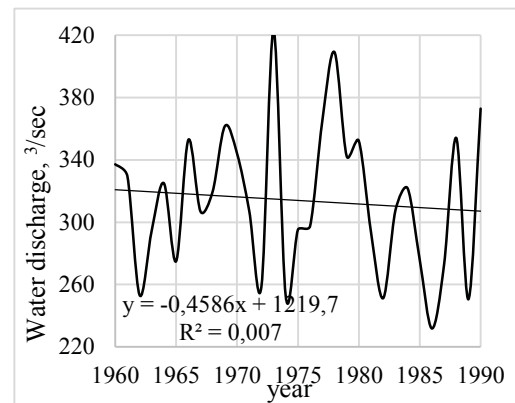
c

Fig.5. The actual water content of the Zeravshan river(a) for the period 1931-2011 and for the periods 1931-1961(a) and 1981-2011 (b).

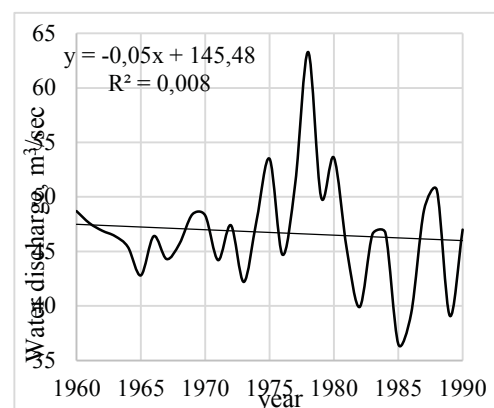
The trend of changes of the Zeravshan river flow for the periods 1931-2011 (5a) and the periods 1931-1961 and 1981-2011 separately presented on the Fig. 5(b) and Fig.5(c) respectively.

On the Fig.6 (a, b & c, d) the dynamics of water flow changes in Kyzilsu, Surkhob & Muksu, and Obikhingou the tributaries of the Vakhsh Rivers for the period 1960-1990 is present. Analyses of presented on the Fig.6 dependencies show that for the considering periods (1960-1990) the Vakhsh river tributaries flow have not changed

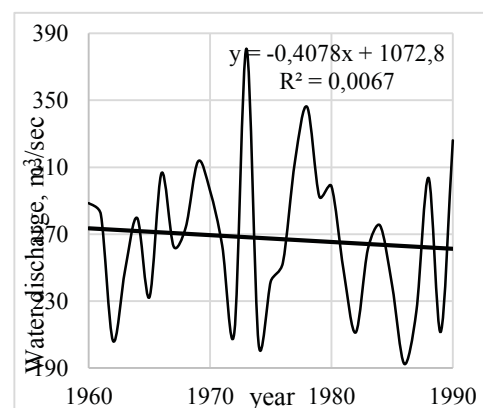
significantly and characterized by decreasing trends.



a



b



c

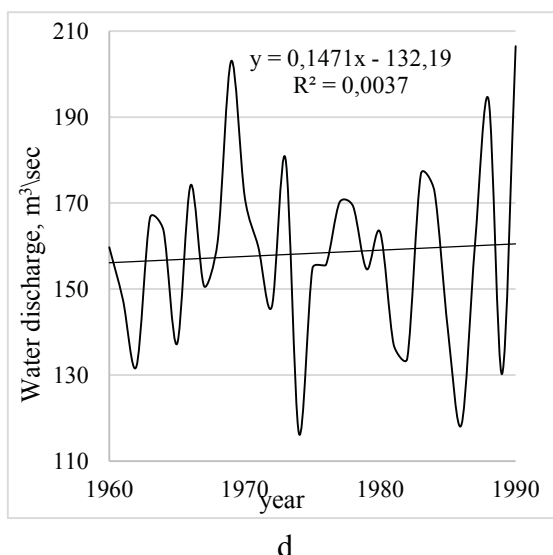


Fig.6 Dynamics of changes of the Kyzilsu (a), Surkhob (b), Muksu(c) and Obikhingou (d) rivers water flow for the period 1960-1990, respectively.

The Kyzilsu river hydrograph shown on the Fig.7 confirms the observed and present on the Fig. 6(a) decreases trends of runoff for the period 1960-1990.

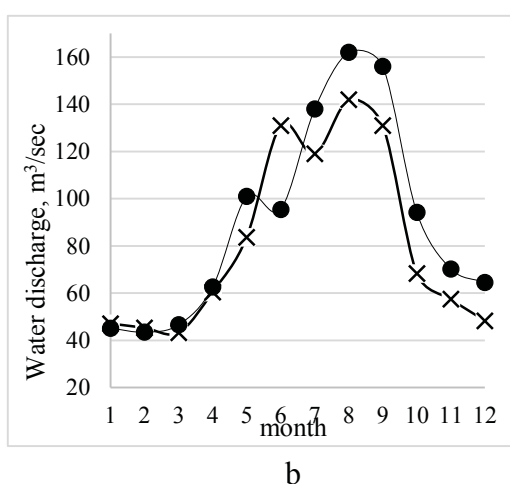
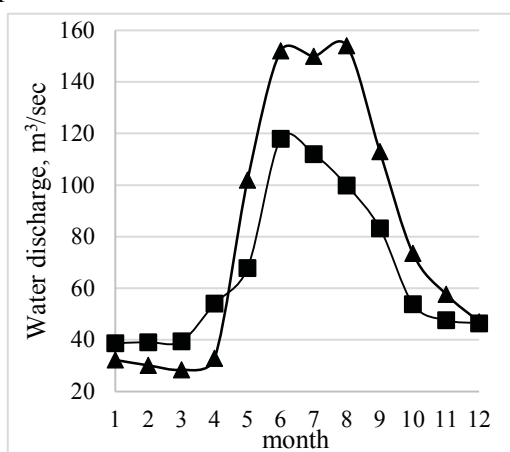


Fig.7. Hydrograph of the river Kyzilsu 1960 (▲), 1990 (■), 1970 (X) and 2000 (●).

In addition, shows that river hydrograph in 1960 is characterized by two peaks of water flow corresponding to the June and August months. We can assume that the maximum value of runoff in June associated with the processes of melting of seasonal snows and rainfalls and in August in which the maximum value of the runoff more than in June with the contribution of glacier runoff. In turn, the Kyzilsu river hydrograph is indistinct by maximum value of runoff in June. The river hydrograph for 1990 characterized by camber and an expanded parabola seems to be associated with mixing of seasonal snow and glacial runoff. The same pattern observed for the Surkhob and Obikhingou rivers hydrograph.

At a comparative representative analysis of meteorological conditions of the Zeravshan glacier area for the periods 1931-1961 and 1981-2011 are observe different trend of temperature change of the considered periods. At almost constant temperature for period 1931-1961, significant growth for the period 1981-2011 observed. Almost a similar picture was observed in the Yagnob river basin of the Yagnob River. It was found that the decrease trend of water flow of the Zeravshan river in the period 1931-1961 to transit to a significant increase in the period 1981-2011. Finds a reduction in the volume of runoff from 6.08 km³ of the period 1931-1961 to 5.36 km³ for the period 1981-2011. Thus, mismatch data of Agency of Hydrometeorology of the Republic of Tajikistan on the degradation of glacier Zeravshan and results of meteorological observations can only speak for 1931-1961.

Study of the hydrological characteristics of the main tributaries of the Vakhsh River-Kyzilsu, Muksu and Obikhingou and meteorological conditions of the river basins. Despite the main contribution of thawing waters of a glacier on the formation of river flow it was found that for the period 1960-1990 years the water discharge dynamics have decreasing character. Taking into

account this phenomenon it was suggested that glaciers in basins of tributaries of the Vakhsh River despite the overall global warming have not changed significantly. For monitoring of meteorological parameters of the river basins were used a data of meteorological stations Lyakhsh, Tavildara and Garm for the period 1960-1990. The choice for the research period 1960-1990 is justified by the fact that the period covers the years of the construction of the Nurek reservoir with hydroelectric power station, its content and generate electricity.

According to the obtained results, the trend of changes of the precipitation in the basins of tributaries of the Vakhsh River has the increasing character, with minor increase of average temperatures. This indicates that the reduction in river flow not related to rainfall. The hydrograph of rivers-tributaries of the Vakhsh River found two extreme corresponding to May-June and August-September months of the year, respectively. It suggested that they are associated with the contribution of spring rainfall and the melting of the glaciers, respectively.

Acknowledgement

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SELF ORGANIZING NEURAL NETWORK: A METHOD FOR FEATURE ANALYSIS OF LANDS

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Abstract

The exploration and categorization of Shuttle Radar Topography Mission (SRTM) data for classification and extraction of topographic features is a challenging task. This paper presents a semi-automatic approach using artificial neural networks -Self Organizing Map (SOM) and SRTM data for analysis and identification of land features in Lut Desert. Lut Desert or Dasht-e Lut is among the hottest, driest desert regions in the world. This area is characterized by homogeneous repetition of wind-eroded landforms, some of the world's highest mega dunes and salt flats in southeastern Iran. In this hyper arid region the extremely unidirectional winds have fluted the bedrock outcrops and old lake beds to aerodynamic forms, called yardangs. A SOM with a low average quantization error was used for further analysis. Feature space analysis, morphometric signatures, three-dimensional inspection and auxiliary data facilitated the assignment of semantic meaning to the output classes in terms of geomorphometric features. Results are provided in a geographic information system as thematic maps of landform entities based on form and slope. The results demonstrate that a SOM is an efficient tool for analyzing and recognition of desert lands features.

Keywords: Self Organizing Map, Radar data, Neural Network, Desert

1. Introduction

The Lut desert or Dasht-e Lut in the south east of Iran is described as the “thermal pole of the Earth”. With an area of about 80000 square kilometres it is regarded to be among the hottest, driest desert regions in the world [1-3]. The eastern part of Lut desert is characterized by a great massif of dunes and sand rises, while the western part contains Yardangs, some of the world's largest desert forms separated by large wind-swept corridors [4]. The yellowish-red Pleistocene clay deposits of the former Lut lake are now sculptured into straight bizarre shapes resembling buildings known as yardang (they are called by the Iranian Baluchis *Kalut*, desert cities) up to 80 m high and 120 km long running in NW-SE direction [2]. Yardangs a Turkmen word used by the Swedish explorer Sven Hedin[5] meaning ‘steep bank’ occur also on Mars and possibly on Venus . They are streamlined forms up to 150 km long and 75 m in height resulting from a number of formative processes, including wind abrasion, deflation, fluvial

incision, desiccation cracking, slumping, weathering and mass movement [6, 7].

2. Literature Review

Self-Organizing Map (SOM) is an unsupervised and nonparametric artificial neural network algorithm that clusters high dimensional input vectors into low dimensional (usually two dimensional) output map in such a way, that topology of the data is preserved. Preserving topology means that the SOM mapping preserves the relations between input items. Points that are near to each other in the input space are mapped to nearby map units in output space [15].

3. Research Methods

In this paper, we use 90 m DEM data, produced from SRTM 3 arc sec. version 3, and the SOM algorithm for identification of yardangs in the western part of Lut desert. For morphometric analysis [11]. The second order derivatives of DEM are affected by geomorphological processes [11, 14]. To calculate the morphometric

features, a local window is passed over the DEM and the change in gradient of a central point in relation to its neighbours is derived by a bivariate quadratic function:

$$Z = ax^2 + by^2 + cxy + dx + ey + f \quad (1)$$

Where: x, y, Z are local coordinates and a to f are quadratic coefficients [11].

Yardang identification and analysis in the study area was performed using the data set proposed by Wood [14]. Slope, cross sectional curvature, maximum curvature and minimum curvature are derived by fitting a bivariate quadratic approximation surface. Kohonen's Self Organizing Map (SOM) is an unsupervised artificial neural network for clustering and visualization of information, preserving the topological relationship in the input [15]. It converts the nonlinear statistical relationships of high dimensional input data to low dimensional (usually two dimensional) output grid [15].

The SOM characteristics like learning ability, abstraction with topology preservation and visualization can be utilized in complex tasks such as morphometric analysis and landform classification [16, 17]. The frequency histogram and average quantization error of the results are compared. Using feature space analysis, spectral signature analysis, three-dimensional inspection, auxiliary data, Landsat ETM+ data and high resolution satellite imagery from Quick Bird, dependency of optimal map units to morphometric features i.e. yardangs were defined.

4. Discussion and Conclusion

The thematic map of distributional pattern of yardangs in the entire area can be obtained by the SOM outlined earlier (Fig 1).

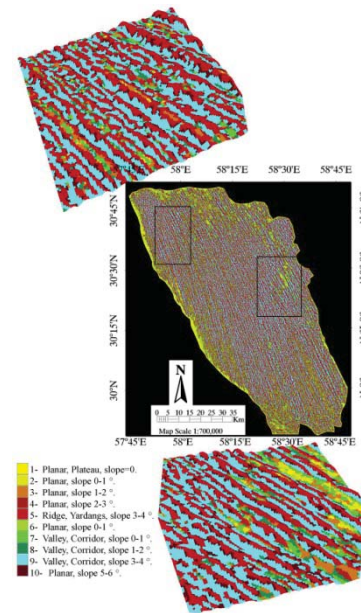


Figure 1. Desert land features by SOM method.

Result of this method revealed that from the total 6481 km² coverage of the study area, about 2035 km² (31%) are classified as yardang while corridors, described by 3 classes (7, 8 and 9), in total cover 2732 km² (42%). Class 6 characterizes planar area with slope 0-1°, which is smallest detected area with only 18 km². And external factors e.g. one-directional strong winds, fluvial incision and occasional rainfall (Gutierrez-Elorza et al [21]. Nevertheless, other non 117eolian processes such as cracking, weathering, slumping, piping, etc., are important for their evolution. In this paper, a semi-automatic method, SOM, as an unsupervised neural network algorithm was very effective and useful for identification and recognition of yardangs in the Lut desert, Iran.

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THE EFFECT OF SELF-ESTEEM AND SOCIAL RESPONSIBLE CLAIMS ON GENERATION Y CONSUMERS' PERCEPTIONS ABOUT COFFEE BEAN PRODUCTS

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Abstract

This study aims to examine how the personality trait of self-esteem influences Generation Y (Gen Y) consumers' attitudes and purchase intentions towards coffee bean products claimed to be either fair-trade or organic. Gen Y consumers' perceptions about coffee bean products are investigated in the present study as they have become a significant consumer segment for the worldwide market. An online survey methodology will be implemented to collect data for further analysis. Findings of the study will provide insights into relationship between Gen Y consumers' self-concept and their purchase behaviours as social responsible consumers. It provides potential value in assisting entrepreneurs in promoting organic or fair-trade coffee bean products among Gen Y consumers. The findings may be applied to other industry, such as fair-trade tea leaf industry.

Keywords: Generation Y, Social Responsible claims, Self-esteem, Sustainable product, Coffee Bean

1. Introduction

Over the past two decades, the number of ethical consumption, either being fair-trade or organic, has grown significantly (Crane and Matten, 2003) as the two attributes associate with environmental protection and support of small farmers (Luetchford, 2015). It also represents an ethical product choice that helps consumers show their preferences to support a more just and sustainable world (Barham & Weber, 2011).

Gen Y consumers, born between 1977 and 1994 (Giovannini et al., 2015), is the main target segment of consumers for sustainable product focused companies. This is because they are young, huge and powerful group with a long future of purchase decision-making (Hwang et al., 2015). Gen Y consumers are also found to be more sceptical about ethical messages than other generations (Bhaduri and Ha-Brookshire, 2011). However, very little prior research examines how self-esteem and sustainable messages of being organic or fair-trade will influence Gen Y consumers' buying behaviours. Therefore, it will be the focus of the present study.

2. Literature Review

The theory of reasoned action (TRA) (Ajzen & Fishbein, 1980) was commonly applied in prior studies and found to be effective and useful in predicting purchase behaviours in relation to social responsible consumption (Hwang et al., 2015).

The TRA will be used in this research as a theoretical framework.

3. Research Methods

An online survey method will be used to collect data. All participants will receive an email that directs them to the online questionnaire. Responses will be recorded by SurveyMonkey® and analysed by SPSS 21 software.

Gen Y consumers are the target population. A convenience sample of college and university students within Gen Y's age bracket will be conducted in Western Australia. The contact email of potential participants will be gathered from the academic registrar's offices. All potential participants will receive a survey invitation email explaining purpose and contributions

of the study along with a consent form for them to sign. Both open- and close-ended questions are included in the survey questionnaire. The former will be analysed by content analysis and the latter will be analysed by quantitative analysis.

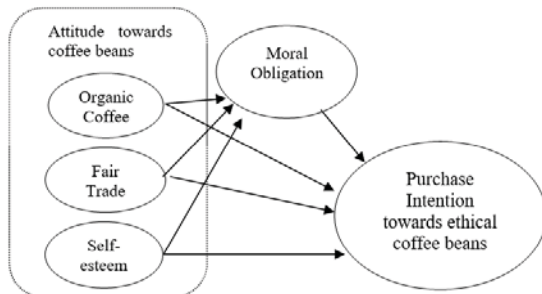


Figure 1. Theoretical Framework

4. Discussion and Conclusion

Gen Y consumers have become a significant segment for sustainable product consumption with increasing purchase power and sustainability awareness. However, very few prior studies have researched on how Gen Y's self-esteem and moral obligation will influence their purchase intention towards organic or fair-trade coffee bean products. The present study aims to narrow the gap in the literature and shed some light on sustainable product consumption among Gen Y consumers. The study findings can assist entrepreneurs in promoting fair-trade or organic certified coffee bean products to young consumers as it provides some insight to understand how Gen Y's perceptions towards socially responsible products. The findings may be applied to other similar sustainable industry, like fair-trade or organic tea leaf industry. It will lead to a more eco conscious product choice and a more sustainable environment. As the present study uses convenience sampling method, some limitations may exist within the study. That is because the sample collection is limited to a certain geographical location. Samples collected may not represent the entire population. Generalisation of the findings will also be limited. The adoption of convenience sampling method, instead of other more

representative methods, is justified by the exploratory nature of the present study. It is recommended that future research may choose a sample that is more representative of the population. Future study may examine consumers in different geographical location or under other age brackets, which can then be compared to the results obtained by the present study.

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A STUDY ON SUSTAINABLE JOURNALISM PRACTICE FOR SUSTAINABLE DEVELOPMENT IN MALAYSIA

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Abstract

Sustainable journalism is the brand of journalism that does not only think about improving quality of media contents today, but also seeks to sustain this to the benefits of generations to come. The study of sustainable journalism becomes important because the need for quality journalism is on the rise as societies become more complex and citizens become more empowered by the social media tools. On the other hand, sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The United Nations has observed that in correcting ecological imbalances and responding appropriately to climate change crises, larger attitudinal changes are required to ensure access to food, water, energy, education, health, and other areas where mal-adaptations exist. The world body also noted that more often, the environmental angle is lost while reporting domestic developmental concerns, resulting in misdirected public perception. Therefore this research aims to fill the knowledge gap, expose Malaysian journalists to the body of socio-scientific research they can use as foundational tools and support them in creating more enduring, wholesome narratives, while tackling interdisciplinary threads of public discourse involving sustainability, governance and economic development. This study utilizes a general definition of journalism, which addresses both traditional and new forms of journalism, and through qualitative research approach, aims at identifying opportunities that sustainable journalism presents to Malaysia's sustainable development and also the obstacles in achieving it. It builds on the agenda setting theory of the press, especially on the assumption that sustainability can only be investigated through such integrated research approaches and in close contact with the journalistic practice in Malaysia.

Keywords: *Sustainable Development, Sustainable Journalism, Millennium Development Goals, Sustainable Development Goals*

1. Introduction

This is a work in progress and is hinged on the United Nations post 2015 sustainable development agenda. The term sustainable development was first used in 1987 in the *Brundtland Commission Report on Our Common Future*. The commission (1987) defined sustainable development as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” and the term has been used in international summits covering environmental and development issues. In Rio de Janeiro Brazil summit in 2012, the participating countries agreed to develop a set of sustainable development Goals (SDGs) to build upon to replace the Millennium Development Goals (MDGs) by 2015. Although sustainability has

become something of a buzz word, but in its original and broader contexts it means that journalism should be able to meet the needs of the present without compromising the ability of future generations to meet their own needs. Every society requires a journalism that seriously addresses the sustainability challenges facing it, and this means that journalism as a practice as well as a business can only survive in this technology age on its capacity to ensure sustainability in teaching and in practice. Kovack and Rosentiel (2007) stated that journalism is not defined by technology, nor by journalists or the techniques they employ. Rather the principles and purpose of journalism are defined by something more basic – the function news plays in the lives of people. They added that news is that part of communication that keeps us

informed of the changing events, issues, and characters in the world outside. Though it may be interesting or even entertaining, the foremost value of news is as a utility to empower the informed. In furtherance, they opined that the purpose of journalism is to provide citizens with the information they need to make the best possible decisions about their lives, their communities, their societies, and their government. In Malaysia, the government emphasizes much on sustainable development, and sees the media as partners in its various development efforts. In this wise, men and women who report news are called on to be responsible in the manner in which they gather and disseminate information, with a view to ensuring sustainable reporting that must be ethical, truthful, responsible, balanced and fair. On the other hand, the expectations of members of Malaysian public is that sustainable journalism in the country will move beyond reporting breaking news on what the government said, to a more prolonged civic engagement that encompasses investigation of public office holders whenever the need arises. Again, they expect to see that media coverage of issues impacting Malaysian communities must be conducted in such a manner as to foster collective action and public engagement. However, the questions that need to be asked are; how is journalism engaging Malaysian youths today? What kind of message do journalists in the country send to the youths? Besides, how will journalism practice in Malaysia today sustain the future?

2. Literature Review

The United Nations (UN) Millennium Development Goals (MDGs) framework expired in 2015, and before the expiration, governments of different countries, development agencies and other organizations had already started to discuss what would happen in the years after 2015. In view of this, the United Nations (2015) developed journalists' toolkit on reporting

the post-2015 development agenda. In the toolkit, the world body detailed different aspects of media coverage on global issues. They include poverty eradication, food security and sustainable agriculture, healthy lives and sustainable living environments for all, education and lifelong learning, water and sanitation for a sustainable world. Others are sustainable economic growth, energy and industrialization, sustainable consumption and production (SCP), climate change, marine resources ecosystems and biodiversity, and peaceful and inclusive societies, means of implementation and global partnership.

Agenda setting describes a powerful influence of the media in its ability to tell members of the public what issues are important. The core assumption of the theory is the creation of public awareness and concern of salient issues by the news media. To demonstrate the power of the media in setting agenda, McCombs and Shaw investigated the US presidential campaigns in 1968, 1972 and 1976, with the 1968 focusing on awareness and information. They attempted to assess the relationship between what voters in one community said were important issues and the actual content of the media messages used during the campaign. They concluded that the mass media exerted a significant influence on what voters considered to be the major issues of the campaign

Sustainable development means different things to different people. To some, sustainable development is a serious issue that must be tackled, but to others, it cannot be achieved. This is where the role of the media becomes very important. Journalists are expected to set the sustainable development agenda by focusing on those issues that will help the government to achieve development targets for the country. However, it is interesting to note that most of the governments of countries of the world see

sustainable development as important task that must be accomplished in order for younger generation to have surest foundation of their future.

In Malaysia, several studies have been done on sustainable development. For example, in their exploratory study on preliminary insight on sustainability reporting and assurance practices in Malaysia, Sawani, Zain and Darus (2010), found that sustainability reporting and assurance practices are observed as in an up-coming stage in the country, noting that most respondents disclosed conducting various environmental and social activities but failed to report them.

Lee and Chuan (2012) in their study on communicating environmental sustainability in Malaysia, found that even though there is high level of awareness on environmental sustainability, yet many staff of the company under study do not often participate in the company's sustainability initiatives. These go a long way to show peoples' attitude towards sustainable development in general, and sustainable environment in particular.

3. Research Methods

This study uses qualitative research approach, with respondents drawn from the newspapers with highest circulation in Malaysia. This includes both the English and local language newspapers. It makes use of in-depth interview to get information from Editors of the newspapers. The choice of editors is informed by the fact that they are the ones that make editorial decision on what kind of stories to cover. Also, editors are the last gatekeepers in the news editing process, and have the right to reject, amend or approve particular new stories.

4. Discussion and Conclusion

In the UNESCO series on Journalism Education entitled *Media as partners in*

education for sustainable development: a training and resource kit, Bird, Lutz and Warwick (2008) stated that it is not essential to have a science degree in order to report accurately what scientists are saying and doing. They noted that a good journalist should however learn something about the subject on which they are reporting, adding that a journalist reporting climate change for example need to gain rough knowledge of the science involved. Their position is that a journalist needs to know just enough to make sense of what the experts are saying, but not so much as to confuse members of the public with excess details. Bringing the agenda setting function of the media into play here, it is pertinent to note that the media may not be very effective in swaying public support for or against sustainable development. However, by consistently raising particular questions and issues and by showing interest in one of the many aspects of sustainable development, the media can lead discussion that will elicit public engagement.

In this technological era, where the mainstream media are in stiff competition with the social media and other alternative media, the role of the journalists in reporting sustainable development has been challenged the more. This is in view of the fact that ordinary citizens with smart phones now participate in news production. The social media tools such as Facebook, twitter, and Whataspp among others have armed the public with the platform to disseminate information. This means that it is no longer a matter of choice for Malaysian journalists to report sustainability, rather it is now a matter of necessity and urgency. Notwithstanding, from the data generated so far for this study, Malaysian journalists do report sustainable development, even though there is not much of advocacy reporting on the issue.

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EXAMINING THE THERMAL PERFORMANCE CHARACTERISTICS OF OUTDOOR SPACES IN THE TROPICAL CONTEXT OF KUALA LUMPUR

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Abstract

The growing urban expansion in the tropical context of Kuala Lumpur in recent years has radically increased the need for creating more thermally comfortable and liveable outdoor spaces for the microclimatic enhancement of the urban environments. Nevertheless, despite the growing interest in the analysis of the circumstances of ameliorating the outdoor thermal comfort conditions in the tropics, this study argues that there is a need for more in-depth and comprehensive scholarly studies in hot and humid climate of Kuala Lumpur. In this study, using field measurement and parametric simulation via ENVI-met, the thermal characteristics of different outdoor spaces located in the university of Malaya (UM) campus are evaluated. The study looks at both shaded and unshaded outdoor environments and predicts their performance under versatile sky conditions. Findings reveal that many of the outdoor spaces in the UM campus fail to provide thermally pleasant environments for their users. The majority of these thermally uncomfortable outdoor spaces encompass very similar design attributes, i.e. openness to the sky with no possibility of shading, relatively far from the surrounded trees and considerably less vegetated, and covered by low albedo surface materials such as asphalt. To conclude, the study develops new technical guidelines to optimize the thermal performance of outdoor urban areas in the tropics.

Keywords: Outdoor Urban Environments, Outdoor Spaces, Thermal Performance Characteristics, Outdoor Thermal Comfort

A COMPREHENSIVE APPROACH TO THE ASSESSMENT OF VISUAL CONSISTENCY IN TOWNSCAPE

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Abstract

This paper provides a theoretical framework for the establishment of an arithmetic tool for evaluating visual consistency in order to tackle the phenomenon of visual disorder in contemporary townscapes. Visual consistency refers to the amount of similarity between townscape components. The paper explores parameters of visual consistency in townscape. It uses arithmetic methods to enable the establishment of an objective method of assessment which depends on the visual perception of users. The paper identifies urban space as a critical factor and focuses on its geometric variables in the evaluation of visual consistency of townscape. The proposed quantitative assessment is based on users' preferences towards these variables as well as the position of observers in townscape. This approach underpins the likelihood of expert's subjective assessment and permits the establishment of a unified framework which achieves a higher level of consistency and satisfaction among the citizens of evolving townscapes.

Keywords: Townscape, Urban Design, Urban Space, Visual Assessment, Visual Consistency

1. Introduction

Townscape is the spatial organization and visual appearance of natural and cultural components of the built environment. The paper attempts to tackle a contemporary issue of visual disorder of townscape, resulting from two urban challenges. First is the visual deterioration of the townscape due to the rapid growth of population and advance in the number of motor vehicles. Second is the lack of a reliable visual evaluation of townscape quality and consistency. These challenges necessitate the establishment of an objective assessment of parameters related to visual consistency in townscape. The paper offers a theoretical basis for a practical tool which can alter the current understanding of architectural form and its application in urban space. This tool is currently under development and experiments are required to validate its theoretical approach.

2. Literature Review

Townscape perception is achieved by the observation of its objects, their aspects and the relationships between them. Visual objects in townscape are classified into site

and objects on the site. Objects on the site are organized into four groups: buildings, other outdoor elements, vegetation and humans [1]. The perception of objects depends on their visual aspects, which distinguish elements from their context. These aspects are formal and positional. Formal aspects relate to characters that provide an object its appearance. These aspects are shape, size, colour, texture, material, detail and ornament. The position of objects plays a major role in forming relationships between objects [2]. Visual consistency in townscape involves a group of relationships. These relationships are the most significant in the perception of townscape. They rely on the aspects of objects and their number. These relationships are scale, enclosure, redundancy and harmony. Harmony is a key relationship; it is fundamental in the achievement of the balance between contrast and continuity and, thus, visual consistency in townscape. Providing a method to determine its preferred level is required. The main objective of the research in urban design is to define the most significant element in its visual assessment.

Hence, a better description will be provided to define the way an urban setting responds to alterations and to make a better prediction of the impact of different planning policies. Urban space is the most significant part of townscape. What is perceived as urban space may be considered as a void that is defined by elements placed on a site [3]. Spaces in the city are vital objects since whenever people are in the outdoor environment of a city, they are in and moving through spaces of one sort or another. Cities may contain the same visual objects. However, it is the underlying principles and relationships of their spaces that differ. The quality of the components of townscape defines the quality of its urban space, and vice versa. The paper proposes a method to visually evaluate townscape based on the quality of its urban space which, in turn, is represented by its geometry. Geometry is the three-dimensional structure of urban space that characterises visual objects in townscape, their aspects and the relationships between them. This structure is formed by vertices which are points connected by line segments to mathematically represent three-dimensional surfaces of objects. The number, position and colour of these vertices control all parameters associated with visual consistency in townscape. It is imperative to assess the preferences of the users of a townscape that is under development. These users have a consensus about what they favour or dislike due to common cultural and environmental factors [4, 5]. Thus, data from user preferences of existing or virtual townscape will help to understand the impact of parameters of visual consistency in townscape and, thus, to analyse and improve a proposed development.

3. Research Methods

The proposed assessment of visual consistency depends on four measurements. These are the number of vertices, the urban ratio and the consistency of both the position and the colour of vertices. The

result of this assessment can differ based on the location of the observer. Thus, a virtual line which represents an observer's path and average eye level is the reference for all measurements. This line is identified as the observer's reference line. The first measurement detects the number of vertices which are visible from the observer's reference line. Visible vertices within the cone of observer's vision are more significant and thus will be allocated larger values than those outside it. The second measurement calculates the urban space ratio of townscape. The space ratio is formed by vertices which shape the top visible edges of townscape. The space ratio of each of these vertices is its vertical distance to the observers' reference line divided by the horizontal distance between them. The average space ratio of these vertices represents space ratio of their townscape. The third measurement determines the consistency of vertices' position. The paper employs a statistical method, namely population standard deviation in this measurement. In this calculation, each data point represents the position of a visible vertex in relation to the observer's reference line. The last measure calculates consistency in the colour of visible vertices. The same statistical method, population standard deviation, will be used. A method called colour distance (ΔE) using a formula known as (CIEDE2000) is used to determine the difference between each colour value and the mean. The values resulting from these four measurements will only be reasonable in terms of the consideration of their impact on the visual perception of users. Thus, a group of virtual townscapes will be designed to contain different values of the four indicators. These townscapes will be scored by users through the implementation of the pairwise comparison method [6]. As the score of each townscape and its four measurements becomes known, an equation to predict the amount of visual consistency based on users' perception can be determined using the statistical method of

multiple linear regression [7]. In order to verify this approach, the resultant equation is used to assess and rank another group of townscapes based on their visual consistency. These townscapes are further ranked by the same group of users to evaluate the agreement between the two types of ranking using a method of correlation. The result is an equation to predict the significance of any townscape based on user preferences towards parameters of visual consistency in townscape.

4. Discussion and Conclusion

In response to the inadequacy of traditional methods of townscape visual evaluation, this paper hypothesises an alternative method based on an arithmetic assessment of townscape parameters and their perception. The paper proposes a model to objectively evaluate townscape through two types of data. The first is quantitative; it relates to urban space ratio, the number of visible vertices of townscape and variation in both position and colour of these vertices. The second is subjective and deals with observers' response to the quantitative data. Accordingly, the model constructs a predictive equation regarding visual consistency in townscape. The result is a flexible arithmetical method to effectively represent the visual requirements of townscape users and eliminate the likelihood to encounter unguided individual judgements by decision makers. This paper paves the way for the construction of an online application which predicts public response towards townscape development to assist planners in their design decisions regarding visual consistency in townscape.

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A STUDY ON THE APPLICATION OF CRIME PREVENTION THROUGH SMART ENVIRONMENTAL DESIGN FOR THE CULTURAL PROPERTIES CONSERVATION AND PROMOTION

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Abstract

The cultural properties that are spirits of national culture in tandem with nation's values must be the assets that need to be inherited intact to our descendents. However, the cultural properties are usually exposed to various natural and artificial environments, or in danger of being damaged or extinguished. In order to conserve the cultural properties in their entirety, an environmental design is required, which would warrant their conservation and people's convenient access to them as well. With such basic conception in mind, this study was aimed at reviewing the patterns of crime in regard to the cultural properties, and thereupon, analyzing the guidelines and criteria for their maintenance plan and conservation & management, and thereby, determine the factors of the CPTED (Crime Prevention Through Environmental Design) applicable to their conservation and presentation, while assessing their importance. First of all, this study surveyed the details of CPTED in reference to the Guideline and Criteria for the Comprehensive Maintenance and Conservation & Management for the Cultural Properties, and thereupon, determined 24 factors of CPTED based on its 5 principles: natural surveillance, natural control of access, and reinforcement of the territoriality, enhancement of availability and maintenance & management. Then, a questionnaire survey was conducted for 96 experts at administration, spot management, planning and design, maintenance, etc., to evaluate the applicability and importance of each CPTED factor. This study would be conducive to the conservation and availability of the cultural properties being protected from the crime and thus, to the improvement of citizens' right to appreciate them.

Keywords: Cultural properties, CPTED (Crime Prevention through Environmental Design), AHP (Analytic Hierarchy Process)

1. Introduction

The cultural properties, spirits of national culture in tandem, are also nation's valued assets that need to be inherited intactly to our descendants. However, the cultural properties are usually exposed to various natural and artificial risks, and in danger of being damaged or extinguished.

Furthermore, many cultural assets of Korea are vulnerable to fire because of the wooden cultural heritage. If disaster is not responded immediately, it will bring a significant national loss.

Through arson case of Sungnyemun Gate (Republic of Korea Cultural Properties No. 1) in 2008, importance of the maintenance and management of cultural heritage was recognized. However, still, large and small

careless accidents and arsons are taking place constantly.

In order to conserve cultural properties with their entirety, an environmental design that which would warrant their conservation and people's convenient access is required.

With such basic conception in mind, this study was aimed to review the patterns of crime in regard to the cultural properties, and thereupon, it analyzed the guidelines and criteria for the maintenance plan and conservation and management, then, it determines the factors of CPTED (Crime Prevention Through Environmental Design) that are applicable to the conservation and presentation, while assessing their importance.

2. Literature Review

In order to categorize types of cultural heritage, this study reviewed the guidelines of heritage administration in South Korea. Then, this study also identified its Comprehensive Maintenance, Conservation Management, planning guidelines, instruction, installation criteria. Then, to find applicable elements of CPTED that can be used for cultural heritage, this study went over the existing CPTED published by Cultural Heritage Administration, guidelines produced by national police agency and the ministry of land, infrastructure and transport of South Korea. First of all, through a literature review, this study determined.

3. Research Methods

First of all, this study reviewed the details of CPTED in reference to the Guideline and Criteria for the Comprehensive Maintenance and Conservation and Management for the Cultural Properties, and thereupon, determined 24 factors of CPTED based on its 5 principles: natural surveillance, natural control of access, reinforcement of the territoriality, and enhancement of availability and maintenance and management. Then, a questionnaire survey was conducted on 96 experts in department administration, spot management, planning and design, maintenance, and more, to evaluate the applicability and importance of each CPTED factor.

Lastly, this study examined a statistical applicability by using S.P.S.S. v.18.0, and, using Expertchoice 2000, it analyzed importance of cultural property through AHP (analytic Hierarchy Process).

4. Discussion and Conclusion

This research, it was found that such factors as CCTV, guide, reinforced safety personnel's patrol, visitors' circulation, clear distinction of visitors' circulation, maintenance and management, and more, scored higher in both terms of applicability and importance.

Since the cultural properties cannot well be reinstated once they have been damaged, it would be efficient to watch them by means of both manpower and equipments, and furthermore, it has been confirmed through this study that clear distinction of visitors' circulation and maintenance & management are the important factors conducive to conservation and availability of the cultural properties.

However, some factors were found less applicable and important: proper layout of planted trees, minimum height of such facilities as stonework, natural fences (bush clover, hardy orange tree, etc.), outdoor exhibition space and the like. Tree planting, fence, stonework, etc., require high budget, while being less efficient than manpower and equipment in terms of surveillance. As conservation of the cultural properties is deemed less important than their availability, outdoor exhibition space is deemed less applicable and important.

Based on the results, the following reformed measures for crime prevention in regard to the cultural properties have been suggested. First, it is necessary to arrange guidelines or criteria a CPTED conducive for conservation and availability of the cultural properties in detail. Secondly, it is required to have such guidelines or criteria reflected in a comprehensive cultural properties maintenance planning. Thirdly, it is necessary to apply the guidelines and criteria preferentially to the maintenance and management works, while setting their priorities in consideration of applicability and importance. Fourthly, it is also necessary to monitor the conditions before and after the project reflecting the CPTED factors and thereby, to identify the problems and their solutions to be suggested to the guidelines or criteria on a continual basis.

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LAND RIGHTS IN CRISIS: FINDINGS AND LESSONS FROM IRAQ

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Abstract

The land administration is considered a key element for achieving economic growth and has a direct impact with respect to land tenure and end-user's rights on the overall development of a society. This Paper was carried out in Iraq, and was motivated considerably by the current insecurity situation; it represents an attempt to evaluate the essential features of the land administration in relation to the end-user's rights. Its objective is to understand the changing aspects of Land conceptions, user's rights, key elements and their restrictions in history and recent Iraqi. This paper focused on the Iraqi rural and urban reforms implemented over previous periods, including the granting of title to land, legislation on joint titling, and other changes in the Iraqi land law; and exploring what was happening as a result of the emergence of an unstable and the insecurity situations in Iraq following the fall of regime in 2003. From the extensive literature review in the Iraqi case study, the main outlines of the land administration and legal framework were presented, and the paper ended with a summary of the key factors and useful assessing to help the Iraqi land authorities in urban and rural development..

Keywords: Land Rights, End-User's Rights, Iraqi Land, Land Administrations

1. Introduction

Located in the Middle East between the Euphrates and Tigris Rivers, Iraq became the centre of the ancient empires as the Mesopotamia land. As an Islamic country, Iraqi Land Tenure Administration (LTA) is ruled and managed according to a set of permit forms controlled by the specific religious authorities.

Therefore, a comprehensive reviewing of the theoretical aspects of the LTA in Iraq is needed; historically the Islamic rules of ownership and inheritance continue to regulate a large part of the land tenure system within the region. The Iraqi current land tenure systems are increasingly fighting an important issue as the urbanisation and number of users grows and age-old problems in relation to the Iraqi traditional conceptions in order to develop an effective LTA. However, the Iraqi independent country was under the Ottoman Empire boarded upon modern reforms under the influence of the Nationalism and Socialism ideologies after the independence. Administratively, land

tenure systems in Iraq have codified by the Ottoman administration within a set of regulations that were derived essentially from the Islamic Shari'a (law of Islam) of ownership and inheritance as tenure religious aspects, and there also exist customary and tribal conceptions/guidelines accepted by the majority of the Iraqi land users. Throughout the country, Iraq is facing an overwhelming amount of conflicted situation and lack of administrative roles in land and property policies. Providing secure, safe, and affordable tenure is a top Problem for the Iraqi land authorities. Due to the tension and lack of personal security in Iraq, this problem is increased sharply within the national crisis. The most recent sectarian violence and ethnic tension in the Iraqi post-war state have resulted in a large insecurity situation with increased unstable establishments. The succeeding conflict has deepened conditions within the nation and further increased state supervision. It is clear that the rapid rate at which Iraq's Land tenure Crisis is being established exceeds the rate in which Iraq's Land

Authorities (ILAs) are forming their policies and monitoring them in the ground. At these changes, land use, planning, and zoning policies had all been centrally and tightly controlled by the government. Today, after more than one decade, there is continued political and religious tension, unstable political governance with rooted bureaucratic corruption, semi-civil war and constant terrorist attacks. Moreover, the Iraqi refugee crisis still presents a national humanity problem. During these periods, Iraq faced a housing shortage that required the utilization of a high percentage of land, provision of housing units, development of utility networks and urban services, and access to employment. Unfortunately, these conflicts left the country isolated from the international community and financially and socially exhausted; due to these unstable conditions the Iraqi's future is unknown.

2. Literature Review

The concept and practices of the 'land tenure' are varied elements. As a result of specific historical, political, cultural and religious influences, the tenure term has been varying widely between countries and even cities. In general, there is a common diversity of the land tenure existing theoretical explanation, applications and systems worldwide, and not surprisingly, the local influences can be distinguished. [1] (p87) defined the land tenure as an individual right and responsibility with respect to the land "...the way in which the rights, restrictions and responsibilities that people have with respect to land are held". While [2] and then [3] have emphasized it as an integral element that deals with economic, political, social and even environmental issues. Other definitions adopting the same perspective include those of [4] (p12), that observed the term "*land tenure*" to convey the multiple legislation elements involved in the rules regulating access to land and its use and management by different groups and

individuals. Therefore, in a brief word; the term of the land tenure can be defined as the various relationships that land users' right establish in order to access and manage land. In this context, the [4] (p5) also defines this relationship as "*the way land is held or owned by individuals and groups, or the set of relationships legally or customarily defined amongst people with respect to land*". It has suggested that 'Tenure' is a matter of awareness; it can be held under various forms in order to secure the users' rights [1]; [5]. Also, a useful summary of the land tenure is provided by [6] that observed that it as an issue of varying elements created to manage land right within the registry titles within the institutional authorities. In practical terms, land tenure is the relationship, whether legally or customarily defined, among people as individuals or groups, with respect to land [5]. According to [6] Formal tenure systems can be identified within national institutions. Consequently, this formal system can work as a protection to tenure rights against the multiple ownership claims regarding the land, and thus the official agreement forms should be approved between the community and the person receiving the rights. The land tenure is variable and linked with urban land crises. [6] (pp:279–290), for example, stated; "*the secure land tenure also recognizes one's legal residency status in urban areas and it is a key characteristic of slum. Slum dwellers don't have legal title to the land and thus are usually marginalized and ignored by the local governments.*", and thus, as protection against arbitrary forced eviction. According to previous definitions; [6] & [7] captured this picture and emphasis that the irregular/informal tenure system is the form of tenure in which occupants of land /homes have no formal right to do so, in which planning was unauthorized, in which there was no official consent to build, or some combination of all of these issues. In other words, the tenure as the individuals and group rights is protected by

the state institution policy against the multiple claims from others. More specifically, though it is a site of struggle ideologies, it is well known that the some religious form of property rights framework conceives of its religious view as a sacred trust to the land tenure with adequate promotion of individual ownership. For example, [7] (p6) emphasised that *“it argues that an engagement with Islamic dimensions of land may potentially support land rights initiatives in Muslim societies and has implications for programmes relating to land administration, land registration, urban planning and environmental sustainability”*. That was echoed also by [8] and [9] that the Tenure under the religious arrangements can be realized in various ways and forms of collective ownership. For instance, the Islamic land arrangements showed wide ranges of land classifications , it reflects of Islamic flexibility guardianship in this framework arrangements such as ‘*Molk*’ (as a private full ownership), ‘*Miri*’ (as state’s lands), ‘*Waqf*’:(as endowment lands),and ‘*Metruke*’:(as Common lands), and ‘*Musha*’ (as Communal land),and other forms of collective ownership that were based on the doctrine of custom of the Islamic, [8]; [9];[10]. Therefore, there is a brief that land tenure should be presented as a set of legal relationships that enable the land users, as individuals or groups, to use and benefit from the land resources with respect to land regulations, and that in such a context, there is the promise of achieving this human beneficial right officially under defined rules and managements with which the end users’ rights are saved.

2.1 Iraq's land tenure crisis

It has seen that the land authorities were struggling in addressing LTA needs for effective managing and monitoring the end-users’ rights. The Iraqi situation is not different, as it is a Muslim majority population and a Middle Eastern country,

and effective administration of land tenure are not fully grasped. A brief outline of Iraq's legal roots of land tenure is required for any complete discussion of LTA. It was determined in chapter 3 that the LTA to be effective, Key institutional & regulatory framework must operate suitable role in meeting the LTA effectively, evaluation of the Success indicators, comprehensible factors affecting the Success, and bring end-user’s satisfaction. These basic criteria will be used as cornerstone to attempt to assess the Iraqi recent situations and to evaluate the Iraqi level of development in the LTA aspects.

Throughout the country, Iraq is facing an overwhelming amount of conflicted situation and lack of administrative roles in land and property policies. Due to an administrative corruption and consecutive wars, over 3 million Iraqis are currently displaced and over 110,000 displaced families and 700,000 displaced people in Baghdad alone [12].Meanwhile, rural families have migrated in large numbers to the urban areas for working or due to the security crisis. According to [13];the migration within and into the Al-Nassiriya city alone, which has a population of 2 million, has furthered the crisis.

The Insufficient housing is a problem throughout Iraq, presently, there is a shortfall of up to three million dwellings in Iraq, Due to compounded previous wars, The Iraq's Land tenure Crisis was further exacerbated by the American coalition’s war on Iraq in 2003[14]. With the fall of the Baath’s regime, due to the poor political legacy of the previous regime, there had been a large proliferation of conflicted administrations with increased violence and displacement waves throughout Iraq. In general, the Iraq's Land tenure Crisis has been influenced since the start of the 2003 conflict.

This situation can be especially characterized by the 2003 war, the

subsequent internal conflict that followed, and general urban migrations. Due to these three triggers, millions of Iraqi had been forced to leave their possessions and to migrate internally or to the refugee camps in the neighbored countries, or in most events into illegally inhabiting public government lands. Meanwhile, due to declined livelihoods situations, large fluxes of people from the countryside and rural areas were migrated to the urban areas in hopes of better incomes.

On a larger scale, according to [10]; [11], Iraq is currently three million units deficient of the current housing demand. Furthermore, report daily problems with sewage, and 24% of Iraqi households are not connected to a sewerage system at all, and thirty-four percent of Iraqi households have raw sewage in the Iraqi streets and around their houses due to the sporadic waste collection [15]. The State of Iraqi Cities Report (2006/2007,p177) found that 79% of Iraqi households have access to treated water supply, half of all urban households in Iraq experience problems with water at least once a week [14]. Moreover, Electricity supplying is also cited as a large problem in all Iraqi cities, as the public electricity supply is usually only for an intermittent amount of hours per day, particularly during the extremely hot summer when electrical systems are overloaded with high energy consumption.

With eroded trust in the Iraqi authorities, the ILAs claim that they have written strategy to address the land tenure crisis in Iraq. The Iraqi Ministry of Planning, and the Ministry of Housing and Constructure, for example, have even offered free plots of lands in their national strategies [12]. However, these strategies have not implemented large-scale solutions to address the recent crisis yet. This is likely a result of security concerns, which is a primary priority for the Iraqi authorities of land policies in general. In practice, the general influence has resulted from a series

of disastrous wars. In addition, a long period of a highly centralized system of governance, that has further exacerbated the decline. All that have contributed to the deterioration of Iraq's Housing and Constructure stock a lack of maintenance and infrastructure.

Recently, after the ISIS's terrorist attacks between 2014 and 2016, Iraq's Land Authorities (ILAs) are in a more challenging position now than they ever have been in responding to issues of displacements and Migration and to their administrative roles.

Also, the Iraq's government has only met 15% of its social housing needs and also there is a substantial unmet demand for housing [14]. Recently, the chaos of looting and destruction of public records has also increased [15].

Following the regime changes in Iraq, Iraq's government turned from the feudal to the socialistic and then to nationalistic policies [16]; [17] [18]. At these changes, land use, planning, and zoning policies had all been centrally and tightly controlled by the government. During these periods, Iraq faced a housing shortage that required the utilization of a high percentage of land, provision of housing units, development of utility networks and urban services, and access to employment [19]. The contentious Violence, insecurity, and chaos grabbing complex problems, and the deficiency of awareness about peoples' rights and misunderstanding about how / what legal documentations that they should have, it can lead to grave consequences such as the forced eviction. Insufficient land/ housing law, management, informal squatters, livelihoods deprivation, and inadequate system are all consequences related to the weakness of legal and ineffective institutional frameworks, the weak and slow implementation of land policies, legal regulations, and law enforcement have contributed immensely

to unfair rights and actual tenure insecurity in Iraq

3. Research Methods

The research method section covers elaborations about the background reviewing to the Iraqi case- geographical, historical, political, social, religious, and population, and discuss the Iraqi's key institutional & regulatory framework, and introducing the administrative authorities of land and giving a brief details of its hierarchy and responsibilities in this respect. Accordingly, this paper explores the historical development the LTA in Iraqi within four different periods of time starting from the ottoman period to the present time by focusing on the main phases and changes during the implementation of the Iraqi national development. The discussion progresses to deal with the Iraqi current crisis in order to assess the role of Iraqi Land Authorities (ILAs) focusing on their efficiency under the influence of the recent situations.

4. Discussion and Conclusion

The discussion and conclusion section draws attention to the key findings of the study, interpreted recommendations and ultimate concluding remarks as well as the knowledge contribution of LTA in Iraq. Findings reviewed in this paper that evaluation of lands key elements and constraints in Iraq could indeed be a valuable community factors:

- The Iraqi land tenure is controlled by dual system formed from Islamic religious and local society/tribal forms, and the modern system of state that are broadening what is accepted as proof for land claims.
- All forms of tenure: public, private, communal, indigenous, and customary are Governed by customary laws and divided into types of private and collective purposes in accordance of land end-users rights.

- The Constitution Law on managing land affairs authorized the state to govern and protect directly the public and private right in accordance with the law.

- In Iraq, administrative failure to develop accepted principles governing refugee's problems rights has folded the problem. This tendency is aggravated by land scarcity, the State's weak capacity, land restructuring programmes, and fast growth of urbanization;

- Wars and post-war spheres folded Refugees crisis and led to increased tenure insecurity for widows and orphans, who suffer more incidences of property grabbing'

- As long as the conflict in the persists, it is not likely that the government will address tenure issues; the complex land transactions and monitoring of formal land registration are influenced.

- In most cases, there were avoidances of a set of multiple unresolved interests over the land rights, including rights of women, and with indigenous and minority rights;

- Communities are influenced by the traditional system, rigid and old laws and regulations, and the complexity of property bureaucratic procedures;

- The inequity view of local conceptions in regarding the women and vulnerable groups is still triggering the discrimination rights.

- Insecurity of tenure can potentially hinder the successful engagement of land tenure and property rights in LTA implementation.

As a result of weakness of governments, most people in the rural or semi-nomadic areas transfer land by oral agreements as informal deeds.

- One of the greatest needs is awareness raising about how the land administration system functions, most people in the rural

or semi-nomadic areas often do not know their rights and registration procedures.

- It should be acknowledged that Islamic land laws (*Shari'a*) have a vital, dynamic existing with active, systematic evolution in a deep background in Islamic ownership's concepts.
- The Iraqi triangular relationship between Land, People and Policies impacts on users' rights are often severe when they occur on a societal scale or when not prepared for. This triangular relationship, therefore, is viewed as a complex set of community factors that governs end-users and their rights in land/property ownership in Iraq.

Therefore, these local lessons will help to underpin the exploration of the role of land authorities in achieving the LTA in Iraqi case.

4.1 Inquired actions:

- Obtaining ownership has to be simply through Land institutions procedures within documented forms.
- Concerning on the quality and efficiency in land administration and strong employability skills in this system.
- Diversity of pathways which are available in Islamic rules that have developed a wide range of regulations in relation to ownership and inheritance rights.
- Linking between the Islamic heritage experiences of land rules and the international experience included adequate quality corporative forms.
- Changes to law and custom have strengthened women's claim to the right, therefore to ensure women tenure security, it is important that they obtain titles in their own names.
- Developing the local data registration systems and providing high technical systems regarding the land tenure and users' rights.
- Registrars at land registries should be progressed and trained on modern

approaches, and registration procedures should be specifically designed to enable fast and effective process.

- Specific strategies and mechanisms may therefore be needed to support the land inheritance rights of women/widows, including financial support, legislative reviews and land registration procedures.
- Refugees crisis is still influence on national systems; dispute resolution/mediation mechanisms can play a vital role in protecting displaced people rights.

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STUDY ON THE PHENOMENON AND FEATURES OF ANCIENT CHINESE CITIES AND ARCHITECTURES AFFECTED BY THE TRADITIONAL CONCEPT OF TIME AND SPACE

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Abstract

Chinese ancestors interpret and understand things around them with the macroscopic heaven and close-level nature. They apply this experience to people and things around them with vivid analogy and direct simulation. The human body, a building, a courtyard and even a city is a complete picture of the universe which integrates heaven, earth and man. They are homogeneous and isomorphic. This differentiation from the biggest to the smallest will not alter its intrinsic structures with scale changes. During the processes of site selection, layout, architectural design and engineering construction of ancient cities, the method of symbolism is often adopted. It simulates the structure of the model of time and space to build small universal space and time. Accordingly, cities and architectures have obvious spatiotemporal schema.

Keywords: Concept of time and space, Ancient Chinese cities, Ancient Chinese architectures

1. Introduction

Time and space are the most basic elements in human beings' cultural activities. Different nationalities' time and space concepts reflect their cultural difference. China's traditional time and space concept reveals ancient Chinese's unique cultural experience, way and angle to learn the world. Unique inspiration and experience of time and space have affected Chinese ancestors in depicting the world, scientific exploration, philosophical thinking, artistic creation, building cities and construction and so on. ^[1]

2. Literature Review

Studies of ancient city construction thoughts have made great development in recent years. In *The History of Ancient Chinese City Planning* (1996), He Yeju used current theory, concept and terminology of city planning to explain, analyze and evaluate ancient Chinese city planning. In *Cultural Thoughts of Ancient Chinese City Planning* (1997), Wang Dehua made research on ancient Chinese city planning from the perspective of cultural thoughts. *Theory and Practice of Ancient Chinese Feng Shui—Recognition*

of Theory of Ancient Chinese Feng Shui, Yu Xixian devote himself to the study of Fengshui theory and combined with modern science to give explanation. *The Pivot of the Four Quarters ----A Preliminary Enquiry into the Origins of the Chinese City*, (Aldine Publishing Company, Chicago 1971) of Paul Wheatley studied ancient Chinese city development and unique oriental thoughts.

3. Research Methods

The first one is the method of combining affective thinking with empirical study.

Traditional Chinese thinking lays emphasis on image and is characterized by sensibility and experience. This study adopts the method of combining affective thinking with instance analysis to understand the time and space concept revealed by architectural form and city space. ^[3]

The second one is the method of combining reference carding with field experience.

On the one hand, seeking, verifying and carding enormous ancient Chinese

documents are the premises of the study. On the other hand, field experience and investigation can help gain accurate and precise data.

The third one is the method of combining graphic analysis with explanatory note. Graphic analysis helps researchers to understand their feelings towards traditional architectural features in contemporary context to express key points of the study more accurately.

4. Discussion and Conclusion

Main conclusion includes three aspects: cognition process of traditional Chinese time and space concept, design concept of using universe diagram to construct city and building and the impact of time and space concept such as “round sky with square earth”, “space-time unification” and “center-oriented principle” on architectural design and city planning.^[4]

1. The cognition process of traditional Chinese time and space concept can be divided into intuitive time and space, myth time and space, experience time and space and scientific time and space. Ancient Chinese concept held the view that heaven, earth, God and all things of human beings were composed of the same universe diagrams. Ancestors used the method of image analogy to understand things around us through macro heaven and micro nature. Corresponding city and building should be echoed with time and space diagram of the universe, namely building the national capital in the pattern of heaven and constructing buildings based on the diagram of universe. Ancient people imitated the universe diagram of “round sky with square earth” to build city and building.^[5]

2. In traditional Chinese time and space is closely linked to time and space concept. Traditional Chinese city and building space certainly has the element of time.

3. Advocacy of “center” is a great feature of Chinese culture. The site of important

building will be the center of city, and important room is in the center of building. In the planning of empire city, north-south central axis is generally the main axis of the whole city, and main buildings are listed on the main axis. Such structure reveals strict etiquette, hierarchy and orderly capital planning system.

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ANALYSIS ON ELEMENTS IN PEDESTRIAN ENVIRONMENTS TO REVITALIZE THE COMMERCIAL STREET

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Abstract

In the past, rapid economic growth in South Korea led to urban spaces that lack street planning and inconvenient environment for pedestrian. However, in recent times, efforts to resolve existing urban issues and enhance pedestrian environments through urban regeneration increased, and efforts to create pleasant pedestrian environment and vitalize streets are mostly applied into commercial streets. The purpose of this study is to examine analysis on elements in pedestrian environments to revitalize the commercial street. This study selected two streets as vitalized and unvitalized streets and conducted statistical analysis. As a result, first of all, different determinants of pedestrian environment between vitalized and unvitalized streets are deducted as entrance, lot area, building set-back, street width, total ground area, and perchable space. Second, determinants in terms of accessibility are deducted as street parking spaces, local integration, and connection. Third, the determinants of lower-level businesses are deducted as clothing and miscellaneous goods, beauty shops, and vendors. Finally, variables that give positive impacts on street commercial vitalization are drawn as perchable space, and local integration, whereas variables that give negative impacts are drawn as lot area and beauty shops.

Keywords: Urban regeneration, Pedestrian, Commercial street vitalization, Pedestrian environment, Depthmap

1. Introduction

In these days, urban regeneration projects are putting efforts to vitalize streets and form pleasant pedestrian environment in order to regain the right of streets that has been divested by vehicle after industrialization. As commercial street vitalization through walking activity promotion exerts profound influence on vitalizing overall urban area, streets that accommodate people's needs are preferentially revitalizing, and discovering the characteristics of those streets is regarded as an important emphasis to develop and improve commercial streets. Therefore, this study aims to identify elements of pedestrian environment that contribute to make commercial street vitalize.

2. Literature Review

The efforts to revitalize streets and form pleasant pedestrian environment received attention with urban regeneration. These efforts mainly take places in commercial

streets, and it looks forward to promote regional economic vitalization and form commercial streets that consists of various types of pedestrian activities. This study considered theoretical reviews to examine the importance of commercial streets on urban regeneration, spatial syntax measuring the accessibility in urban space, and physical pedestrian environment elements that form commercial streets.

3. Research Methods

This study proceeded following stages to investigate pedestrian environment factors for commercial street vitalization.

First, through literature review, it studied the role and importance of commercial streets in urban regeneration and physical pedestrian environment elements that form commercial streets.

Second, in order to select study area, it chose 10 potential commercial streets that are located within 400 meters away from subway stations. Then, it selected 2

commercial streets as one for vitalized and the other for unvitalized street through examination of floating population and land values.

Third, it compared differences between the vitalized and unvitalized street, and, to examine the elements of physical environment that give influences on commercial street vitalization, it conducted statistical analysis by using IBM SPSS 21 and Depthmap Software which has been utilized as Smart City spatial analysis.

4. Discussion and Conclusion

Through the T-test, this study analyzed that the pedestrian environment factors that determine whether the street is vitalized or unvitalized are total of 13 factors; the following factors are: number of entrance, lot area, building set-back, street width, total ground area, perchable space, local integration, connection, street. Parking spaces, clothing and miscellaneous goods, beauty shops, and vendors, whereas length of shrub, the number of tree, eatery, café, and pub were not included in those factors. Through regression analysis, it analyzed the factors that give either positive or negative influence on commercial street vitalization. Positive factors are drawn as perchable space and local integration, and negative factors are drawn as lot area and beauty shops.

As the result, this study concluded that the lot area, perchable space, and local integration bring coinciding result with the preceding research, but beauty shops are not. It is probable that the result is drawn because cosmetic shop is row-oriented type of business, and it has low destination to visit the place. Also, these types of businesses have relatively high reliance on the characteristics of streets, and it tends to anticipate accidental and impulsive visits of pedestrian passing through streets with

other purposes. However, because the interpretation of cosmetic shops were interpreted with subjective researcher's position, it should be supplemented through additional case analysis.

Acknowledgement

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STUDENTS PERCEPTION ON SUSTAINABLE IN CREATING ECO CITY LIVING COMMUNITY: CASE STUDY AT BANDAR CASSIA, BATU KAWAN, PENANG, MALAYSIA

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Abstract

Nowadays, the sustainable living is important in urban community to socially interact and to live safely. The community and urban design involves with a vital role in creating environments that support community sustainability by successfully integrating urban spaces into businesses, living and leisure. Besides, the ecological planning approach, that consider the sustainability of natural resources and addresses the interaction between man and the environment, have gained importance. Therefore, ecological neighborhoods and eco cities have started to be designed. This paper study about the Eco-City living concept and principles based on students perceptions on sustainable community living at Bandar Cassia, Batu Kawan, Penang. The research methodology are based on a site survey and using questionnaire by conducted with 50 students as respondents. The importance of this study as a key development in Eco City living strategy to promote sensitive community and urban development that preserves ecological integrity and balance of city living.

Keywords: *Eco City, Living, Sustainable, Community, Ecological*

1. Introduction

The concept of Eco City living is most popular strategy in sustainable development in urban and cities area. At present in the 20th century, the awareness of eco city is integration in environmental aspects such as biodiversity conservation, mitigation of climatic change, economic growth and as well as livability in cities. Today, the sustainability context, the community sustainability and the community belonging have been affected in the process of globalization (Butterworth Iain, 2000). According to Maureen Williams (2003), the socially sustainable communities have the capacity to deal with the change and to adapt to new situations, attributes that are now becoming increasingly essential in a globalized world.

In 1970 barely a quarter of Malaysia's population lived in cities. Today three out of four Malaysians live in an urban environment, and the proportion continues to increase. Recently, Malaysia is move in

implementation on Eco City Living to create a good and healthy living community. However, the development on Eco City Living is still new and trying to move on established economic and social development. An eco-city is developed as an aid to mainstreaming sustainability in urban development at the neighborhood level (Kulshrestha, 2007). Though early days yet, through its eco-precinct and eco-town planning, Malaysia is seeking to plan to develop more sustainable.

The site study located at Bandar Cassia, Batu Kawan, Penang, Malaysia with 6,326 acre area. It is a new Eco City residents and community living development in Penang. Batu Kawan is the third satellite town of George Town, Penang after Bayan Lepas and Seberang Jaya. With the development concept is a self contained integrated township concept of live, work, learn and play (Penang Development Corporation, January 2016). Bandar Cassia is first design in Penang, Malaysia with using the environmental control by

following of Green building Index (GBI) requirements. The community design at Bandar Cassia is promoting in green development, safety, healthy and also promotes neighborliness.

The objectives of this study are (i) to examine the students' understanding of Eco City living concept, (ii) to determine the students' awareness on sense of environmental and ecological aspects in sustainable community and (iii) to analyze the design implementation of Eco City living development at Bandar Cassia, Batu Kawan, Penang, Malaysia. The papers later discuss detail on the important of sustainability in creating Eco city living at site and Malaysian context. Discussion based on a survey and students' perception.

2. Literature Review

The eco-city concept is part of the criteria of the sustainable communities. The eco-city concept is either "define" by people who deals with eco-city, or "adapt" through existing classification (Fleischer, 2002, p. 8). The eco-city movement started in 1975 when "Richard Register and a few friends founded Urban Ecology [now known as Eco-city Builders], a civil organization" (Fleischer, 2002, p. 8).

One of their main aims is to achieve the eco-city environment. After 15 years, in 1990, they managed to organize the First International Eco-city Conference in Berkeley, California, with several hundreds of papers and speakers" (Fleischer, 2002, p. 8). Since then, the similar conferences were held almost every year in different countries. Richard Register (1984) highlighted "the eco-city functions according to four principles":

- i) **"Small scale – highly qualified:** The issue of optimum or maximum size of an eco city has hardly been broached because most thinking on ecologically healthy alternative communities has

focused on villages and small towns. But at whatever population, the scale of material consumption and waste should be much smaller than in today's cities and villages".

- ii) **"Access by Proximity:** is an important principle of ecological city building which is being popularized in small circles by Urban Ecology, an education/action organization in Berkeley. The idea is to design maximum access right into the city structure."
- iii) **"Small scale recentralization:** From the eco city point of view, cities, towns and even villages should be recentralized physically and decentralized in terms of participation in community life and politics."
- iv) **"Diversity is healthy:** This is perhaps the largest, broadest principle of all. In cities, as in agriculture and most natural ecological areas, diversity is healthy." (Register, 1984, p. 33)

Based on the these principles, Register believed that it will create a happier people in a healthy surrounding (Register, 1984, p. 35). The concept of eco-city began to develop after the introduction of the concept by Register. However, in a real life, practitioners found that this concept is still vague with lack of guidance (Roseland, 1998, p. 200). Thus new terms started to derived from the "neo traditional town planning" and 'pedestrian pockets' to 're urbanization,' 'post-industrial suburbs' and 'sustainable cities' (Roseland, 1998, p. 200).

Even with a various terms applied; the main aim is still the same; to visualize a good eco-city environment especially in a context of 'living'. Eco-city "represents a goal, a direction for community

development - not simply a marketing slogan" (Roseland, 1998, p. 200).

Hence, in a context of living in an eco-city, the relationship between 'eco-city' and

'sustainable communities' are importance as they related to each other. The 'eco-city' could not stand alone. It needs 'communities' to strengthening the concept. Most importantly, it must be interpreted from a local perspective to ensure it could be achieved (Roseland, 1998, p. 201).

In Malaysia, again, this concept is still new. Kuala Lumpur (KL) Eco City is considered to be one of the eco-city project with the "largest integrated mixed commercial and residential developments in Malaysia" ("KL eco city, Kuala Lumpur, Malaysia," 2016).

Classified as an eco-city project in its master plan, this development aims to gain recognition from the Green Building Index (GBI) and Leadership in Energy and Environmental Design (LEED) from the United States (Ibrahim, 2011). Although this project is build according to the 'eco-city' concept, however, the real successful of the project especially on the impact on the local community is still too early to discuss. The result gained from the local communities are importance as they are the "most resilient and able to grow stronger as they endure these changes are those that have clearly articulated visions for where they are headed and that periodically revisit and revise these visions"(Fleischer, 2002, p. 10).

Thus, the eco-city living in this area could only be debated once the project is completed and occupied. This project is aim to complete in 2021.

3. Research Methods

The selected area of study is Bandar Cassia, Batu Kawan, Penang. This selection was made due to the aim of Bandar Cassia, Batu Kawan, Penang is to become a first Eco City Living model at Penang, with concerns for design with environmental control (Penang Development Corporation, January 2016).

The study commenced with a visit to the office of Penang Development Centre (PDC) where to collect all the primary data of Bandar Cassia, Batu Kawan, Penang. The research only focuses only on the student's perception. 50 students Diploma of Landscape Architecture were selected as respondents. A mixed methodology by combining the qualitative and quantitative methods, with using Bandar Cassia, Batu Kawan, Penang as case study.

The main research techniques include a survey using questionnaire, content analysis of primary and secondary documents and also field observation (site inventory and analysis). The data will analyze by using of SPSS and also Microsoft Excels. The student's perception is enquired through their understanding (Eco city living and sustainable concepts and principles), recognition, opinion and evaluation of the physical elements (community sense on environmental and ecological aspects) and frequency of what they noticed on application and innovations for sustainability awareness and practices by communities of Bandar Cassia, Batu Kawan, Penang.

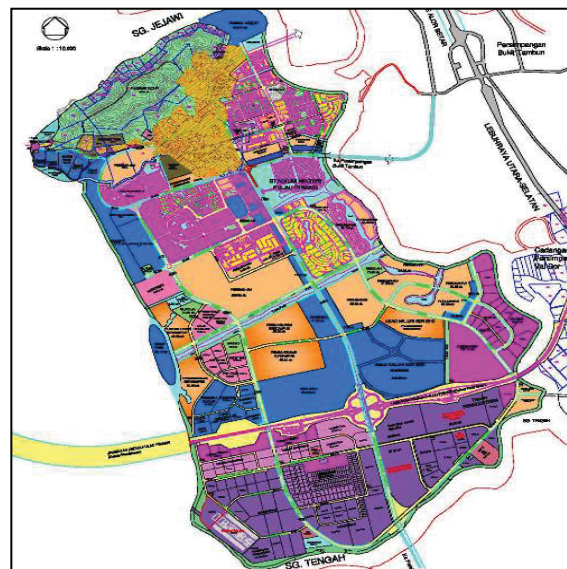


Figure 1. Master plan of Bandar Cassia, Batu Kawan, Penang, Malaysia

Source: (Penang Development Corporation, January 2016)

4. Data Analysis and Findings

The findings from the survey reveal that 90% student's age is 18 to 20 years and of the 50 respondents, 54% is male students and 46% is female students.

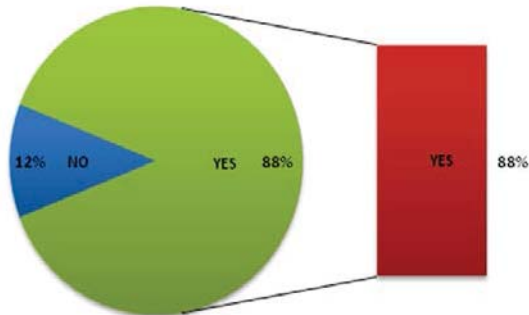


Figure 2.(a): Students understanding on Eco City Living and Sustainable

According examined students' perception on sustainable and Eco city living, the findings reveal that the majority of the respondents are understand the concept and principles of Eco City Living and Sustainable Concept (88%). The data was supported by frequency of 54% students' agreed that Bandar Cassia, Batu Kawan, Penang is implement on sustainable concept in their natural resources. While only (2%) is four students than 50 students are not really understand with the application of Eco City Living and Sustainable Concept at site study.

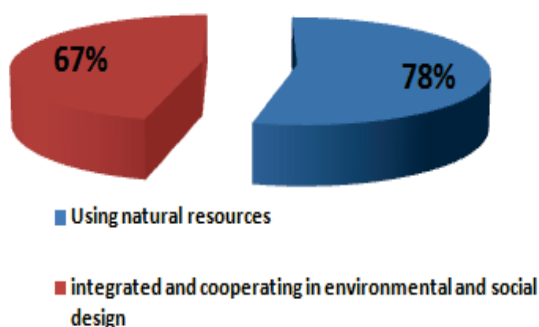


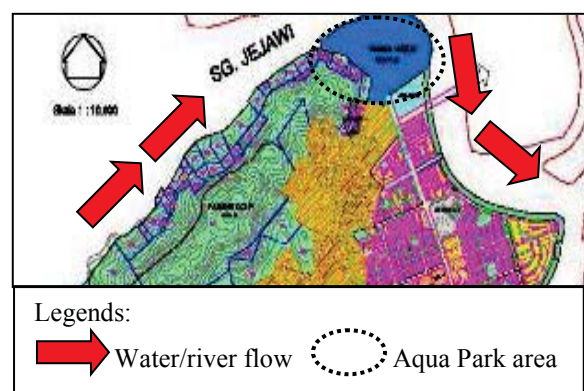
Figure 2.(b): Students Evaluation on Community Sense in Environmental and Ecological Aspects

The students' level evaluation on community sense in environmental and ecological aspects also was examined. The findings show that 78% students' of the total respondents satisfied and agreed with

the overall development of Bandar Cassia, Batu Kawan, Penang is using a natural resources as main attraction in their sustainable and Eco City living concept. According to Anil Laul, (2002), the respect of the natural elements is important in creating the 'living with nature' in sustainable community. It was control and created integrated development with the social and environmental design in well-regarded in its cultural, social a local context (Glasbergen P. and Blowers A, 1996).

As to supported this finding, the correlation data shows that 67% student's were satisfied and give high priority agreed that Bandar Cassia was integrated and cooperating in environmental and social design. Which were protected their natural resources and ecosystems. The main river of Sungai Jejawi and Aqua Park were protected as greenery and reserved area.

According to (Penang Development Corporation, January 2016), this area was significant to Batu Kawan as a bird's migration and as a main attraction site in creating ecological tourism. As well as maintained as neighborliness of green development concept.



Plan 2.(c): The zoom in area of Aqua Park and Sungai Jejawi (Jejawi River) at Bandar Cassia, Batu Kawan, Penang, Malaysia

Source: (Penang Development Corporation, January 2016)

Table 1. Application and Innovations in Smart Transport Systems

<i>Transport System</i>	<i>Disagreed</i>	<i>Not Satisfied</i>	<i>Suggested</i>
Systematic & easy accessibility	72%	50%	14%
Provided bikeways and walking tracks			

Besides focusing on the part of ecological and natural resources, this study also survey on the conducive mobility between living quarters and work place by using cycling and walking track and appropriate public transport.

Eco city Builders (2012), mentioned that good linkages of walk able city or community need to support with the efficient of public transport systems and provided with mix of uses and services. However, the data showed seventy two percent (72%) of the students' felt and approved that the components of sustainable in public transport at Bandar Cassia, Batu Kawan, Penang is worst and not easy to access as well as lacking of systematic connection between each others.

The correlation of data reveal that 50% students' suggest that proper and friendly linkage of pedestrian and vehicle needs to segregation and need to provide safety of bikeways and walking path at Bandar Cassia, Batu Kawan, Penang. Designing great places for the comfort and enjoyment of the pedestrian is one of the most important aspects in Eco city living (United Nation, 2007).

Among the small numbers, 14% respondents were not sure and not satisfied with the overall of application and innovations of sustainability and Eco city living at Bandar Cassia, Batu Kawan. They cited that, the overall application and innovation was not done properly, there is

limited cycling and bicycle tracks, not users friendly and not support local services and facilities.

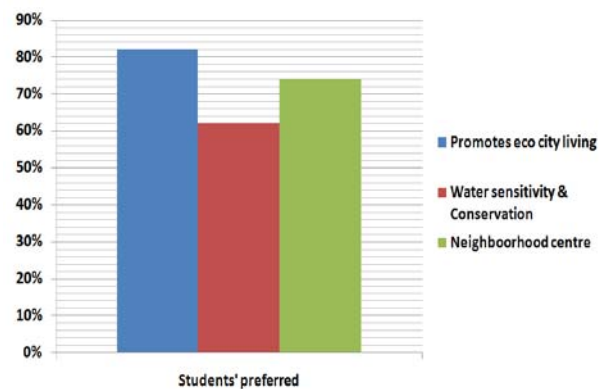


Figure 2.0(d): The Important of Sustainability in Eco City Living

As displayed in figure 2.0(d), the study focuses on the important of sustainability in Eco city living that students' preferred in the development at Bandar Cassia, Batu Kawan. The findings reveal the most of the respondents (82%) cited Bandar Cassia is promotes of eco city living by respect the indigenous people were inhabitant in land. Besides, is also creating a '*sense of welcoming*' in ecological environment and is live ability for well being.

The findings show that the community at Bandar Cassia, Batu Kawan, Penang is drive ecological development. The water sensitivity and conservation was preferred next (62%) followed by the 74% respondents supported Bandar Cassia is neighborhood centre accessibility. The location of Bandar Cassia are provided of CBD (Centre Business District), manufacturing, institutional and education and also nearest with the second bridge of Penang, Malaysia (Penang Development Corporation, January 2016).

5. Discussion and Conclusion

The research has shown that Bandar Cassia, Batu Kawan, Penang is lacking on integrated of the facilities and social needs. The findings indicate the important of sustainable concept in creating on Eco City

community not just for focusing on environment but for the whole of the social, cultural and economic development. Eco city concepts should meet local economic, social and cultural priorities and involve with stakeholders at levels: local community, private and state sectors (Gehl, J, 2012).

This study concludes that most of the respondents understand the concept of Eco City Living. Therefore, most of the respondents are able to evaluate the development of Bandar Cassia. Majority of the respondents agreed that the overall development of Bandar Cassia meets the characteristics of Eco City living concept where the natural resources is highlighted as main attraction, environmental and social aspects are considered in the overall design, local community is respected and water is conserved in the development. However, the respondents are mostly unsatisfied with the public transportation, pedestrian system and cycling tracks which is lack of connectivity and safety. These perceptions of respondents are parallel with author's observation on site. As Bandar Cassia claims to implement the concept of Eco-City Living, it is hoped that the development would have considered holistic planning which includes adequate public transportation service and highly connected and conducive pedestrian and bicycle system.

According to Leadership in Energy Efficient Design 2009 for Neighborhood Development, part of the requirements to be qualified as a Green Neighborhood are to be situated at transit oriented locations, to have walk able streets and to reduce automobile dependence by strategically placing land use and facilities, to provide pedestrian-friendly and bicycle-friendly design, reducing parking footprint, and providing tree-lined and shaded streets. Nevertheless, these requirements are found lacking in Bandar Cassia.

This study contributes to a better understanding of the importance of planning and implementing the Eco-City Living concept in a holistic way. It also contributes to the need to educate and train future landscape architects about Eco-City Living concept in order for them to implement it in the future. The study already shows that landscape architecture students' perceptions are reliable as they have basic knowledge in Eco-City Living concept. As landscape architecture students seem to be more sensitive to environmental issues, they are good respondents to assess Eco-City Living in Bandar Cassia.

In the future, further study on perceptions of different educational levels of landscape architecture students can be studied to see the difference of perceptions between them and how their understanding has evolved.

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A COMPARATIVE ANALYSIS OF PERIOD DETERMINANTS IN NEWTOWN PROJECT AND HOUSING REDEVELOPMENT PROJECT OF SEOUL

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Abstract

The purpose of this study is to compare the features of Newtown project and Housing Reconstruction project carried out by Seoul and analyze the difference of determinants according to the project periods. To compare the factors influencing the project periods of Newtown and Housing Reconstruction, the regression model was used. By reviewing the former studies, the factors to construct the model were selected, and then some other factors appropriate for this study were added to establish the estimation model for project period.

According to this study, the plan factors have great influence on the period of Newtown Projects and therefore the policy for systematic development must be established and executed. As the Newtown projects can fill up the insufficient and unbalanced urban infrastructures systematically, the promotion of Newtown Project may be a solution in the old urban core with high land price.

Keywords: *Newtown Project, Urban Rearrangement Project, Housing Redevelopment projects, Housing Reconstruction projects, Urban Improvement Promotion*

1. Introduction

The Newtown Project was a comprehensive development project to secure sufficient urban infra for the appropriate size of life zone. Despite of such positive goals, there have been no sufficient reviews about the mistakes and problems in the first Newtown project. So the 2nd and 3rd Newtown zones are suffering so many problems that some zones could not even organize the promotion committee. In this background, the periods of Newtown projects and Housing redevelopments are getting longer and longer, causing a lot of social and economic problems. Therefore, it is necessary to analyze the determinants for project periods and compare the Newtown and Housing redevelopment projects for finding out their difference. With this, it could give policy deciders the material to determine how to use the determinants efficiently according to project periods.

2. Literature Review

Many studies were made on influential factors of redevelopment project period as preceding researches.

Lee Dogil(2011)[1] analyzed the variables broadly examine the reasons reducing and retarding the project period. The introduction of joint redevelopment type and the establishment of basic plan shortened the project period, and the dual use of permitted floor space index and planned floor space index gave a positive influence to securing the basis facilities. Meanwhile, the mandatory ratio of rental houses and small-size houses retarded the project period.

Oh Munheon(2013)[2] classified Housing Redevelopment Projects into those carried out during the booming days and ones during the slump days of real-estate market to find out the influential factors to the project period during each age. As the result of analysis, the common influential factor in both booming and slump ages was the increment of producer price index.

Meanwhile, the ratio of association members and the increment of producer price index had significant influence on the project period during the booming days, and the district area was significant. Thus, the influential factors were different according to ages.

3. Research Methods

The temporal range was set as October, 2014. The object areas of this study were confined to Newtown Project districts and Housing Redevelopment Project districts. The districts with deficient data or different tendency from general cases were excluded and finally 30 Newtown Project zones and 92 Housing Redevelopment Project districts were chosen as the object areas. To compare the factors influencing the project periods of Newtown and Housing Reconstruction, the regression model was set up. By reviewing the former studies, the factors to construct the model were selected first, and then some other factors appropriate for this study were added to establish the estimation model for project period.

4. Discussion and Conclusion

The results of this study are as follows: First, the project period of Urban Rearrangement turned out to be influenced by situation features, plan features and economy features. And some significant difference was found in the factors between Newtown and Housing Reconstruction projects.

Second, the plan factor was the most influential on the Newtown Project period while the economy factor was the most influential on the Housing Reconstruction project period. It seems because the Newtown project has a clearer policy goal and more thorough planning and reviewing process than the Housing Reconstruction project in planning the infrastructure and project. To resolve the problems in the former housing redevelopment projects that the projects used to be promoted and

stopped repeatedly by the project resident members who pursued the more profits and that the infra structures were improved only in the project areas, the Newtown project was planned. In the respect, it is right and natural for the plan feature to be the most influential in the Newtown Projects.

Third, of the situation features which have been supposed to be influential on the project period based on the experience of former Urban Rearrangement Projects, some factors turned out to be insignificant in this study. This limit may come from the fact that the project period set up in this study is not until the construction completion point but the approval point of management disposition plan.

Presently, Seoul is cancelling the former designation of Newtown zones let along not designating additional Newtown Project zones. The overheated applications to Newtown designation and the reckless promotions of projects without proper evaluations of project effects and problems must have caused this result. According to this study, the plan factors have great influence on the period of Newtown Projects and therefore the policy for systematic development must be established and executed. As the Newtown projects can fill up the insufficient and unbalanced urban infrastructures systematically, the promotion of Newtown Project may be a solution in the old urban core with high land price.

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URBAN CONTEXT OF CHURCH ARCHITECTURE & SPATIAL RECONFIGURATION AIMED FOR IMPROVING UTILITY IN USING ARCHITECTURAL SPACE

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Abstract

The goal of the present study is to analyze the spatial utility of Korean church buildings, as well as cost efficiency in their construction, while interpreting the urban context they are associated with, by exploring the spatial placement within buildings and their use rate and calculating construction cost by section. A key finding of this study is that there has been a significant deviation from the ministry of Christianity in the architectural spatial layout of church buildings. Architectural space of church must be recomposed so as to meet the nature of ministry of gospel, of which direction is that the space of church buildings must be allocated in a balanced manner according to the purpose and weight of church missions such as worship, regional society, education. Setting aside the current design tendency that is excessively focused on having a worship-oriented space around a main chapel, architectural spaces must be redesigned to allow for ministry-oriented spaces inclusive of interactions with the community, education, culture and human intercourse, which highlights the need to reduce worship space while enlarging the spatial ratio toward intercommunicative, cultural and fellowship interactions with the community. Considering that small groupings for church activity are expected to be a dynamic force in the future, the physical space of churches must be sectioned into smaller ones so that a variety of demands within a church can be absorbed, and this flexible spatial configuration can accommodate gatherings by small groups. Protestant churches in Korea must significantly reduce their gross areas. Protestant churches was analyzed determined as 3.8~5.4 m^2 , which is two times higher than that of Catholic churches, 1.0~2.6 m^2 . This means that protestant churches use excessive space compared to catholic churches, and the gross area of present protestant churches can be reduced to half. The core of this indicates the change in the conventional concept about church architecture as well as spatial reconfiguration and multi-functionalization of church architecture, which is the essence and key implication of this study.

Keywords: Church, Urban Context, Reconfiguration of Architectural Space, Utility, Multi-functionalization

1. Introduction

The objective of this study is to grasp understanding of spatial efficiency by analyzing architectural spatial configuration associated with Korean Christianity among religious facilities within Korean cities as well as actual Service rate by spatial section and construction cost by spatial section, and further propose the novel spatial reconfiguration based on the result thereof, consequently rendering meaningful suggestions for preventing hollow facility use and rehabilitating sustainable growth in Korea's protestant churches. This is the time to carry out researches with diversified angles to expanding/strengthening interactions with

the communities and concretizing the sense of co-existence, a fundamental concept of church, by getting rid of waste elements in church's architectural space and leaving apart from cliques of own members and exclusivity in architectural spaces. To summarize the objectives of this study, the first relates to analysis on the context of church architecture linked with urban spaces, the second to interpretation on historicity of church architecture, the third to analysis on construction cost versus use efficiency (utility) via case study, and the fourth to understanding, based on the survey, of what the architectural space of church must be in the future.

2. Literature Review

The sustainable development is widely implemented over the world and many research papers regarding it have been published. Among them is a paper of Mak-joong Choi, outlining the need of sustainable development in cities by stating, "The keyword of the times applicable throughout the whole world in the aspect of city planning is sustainability. It is a concept requiring the city development by taking into account environmental, economic and social impacts in an integrated manner for the intergenerational equity, which is diversely progressed with the concept of ESSD (Environmentally Sound and Sustainable Development) in Europe and the concept of growth management or smart growth in the USA. As such, greatest attention in regard of city planning has been paid than ever on reuse of limited land resources along with efficiency and environment-friendliness in the use of land, cost saving associated with traffic and infrastructure, reduction of the use of fossil fuel and minimization of damaging the natural ecosystem and landscape." Mak-Joong Cho (2007), Syntax of super high rise buildings in the dimension of urban space structure-p3, policy discussion symposium by Korea Planners Association (2007-05)

3. Research Methods

Sampling process and reason of selecting a sample [1], Locations of churches for study, Magnitude of sampled churches, Construction year of churches, Number of samples, Space Syntax, Cause of incorporating Space Syntax, Space Syntax is a program enabling to analyze architectural churches of consideration under the urban context, being incorporated for the research for attempting to analyze the urban characteristics of churches. Objects to which the program was employed, Full application was made out of all 10 churches sampled. Scope implemented: Space Syntax for the outdoor space of

church and Space Syntax for the indoor space of church, the number of samples selected totals 10 consisting of 5 protestant churches and 5 catholic churches.

4. Discussion and Conclusion

It was also found that improvements are required with regard to excessive spatial volume in churches; in particular, the large spatial structure of main chapels must be reviewed in a wide spectrum. For example, the elevation of main chapels in a total of 10 churches surveyed by this study was around 9.0~15.1m, with 12.1m on average, which is 2~3 times higher than that of other spaces. Given that it sees little use except for weekend worships and other special events, the of the main chapel must be redesigned toward eliminating a mezzanine floor for the sake of reducing construction costs and making maintenance easier and more economical. There is no quantitative evidence linking high elevation of the main chapel and any concept of sanctity, so its floor height must be reduced without reluctance. Moreover, the floor slope in the main chapel area must be configured to be flat to ensure multi-functionality in the future. The worship service can be practiced via multimedia screens, which we must know is the future trend.

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REPURPOSING UNDERUTILISED SPACE AS PUBLIC SPACE IN BANDUNG: LEARNING FROM LONDON BOROUGH REDESIGNING STUDY

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Abstract

There is few study on repurposing underutilised space in industrial-type landscape. This paper discussing the possibility of repurposing underutilised space in Bandung using approach applied in Valley Retail Park in London Borough of Croydon. Valley Retail Park, situated off the A23 Purley Way, an out-of-centre, car-based, Retail Park and surrounded by industrial landscape. It has a great amount of space used for surface car park that this study recognised as underutilised space. While large surface car parks are common in out-of-town retails, it provides hidden opportunity to have its public realm improved. The study mostly used visual research methodology where the photographs taken are used as key visual elements. The method was seen as valuable in urban research because they can convey something of the feel of urban places, space and landscapes, specifically those qualities that are in some way visible. The study generated a master plan for Valley Retail Park as an attempt to bridge the gap between pushing down the idea of out-of-town retail development and enhancing the underutilised space to be used for community activities. Key findings include three periods of time needed to initiate Valley Park as sustainable retail park into a new local centre as envisioned in the council's Core Strategy. Learning from the study, a proposal for repurposing underutilised space in Babakan Siliwangi Bandung is discussed.

Keywords: *Underutilised Space, Public Space, Retail Park, Master Plan, Croydon*

1. Introduction

There is a great chance that a city has a parcel or two of underutilised space, no matter how fast or slow the development goes. Underutilised space, or commonly generalised as vacant land, can be acknowledged as all properties that can be put to a higher and better use, whether it is from financial, community, social and/or economic standpoint¹. Those underutilised spaces conform to the term of Lost Spaces – the undesirable urban areas that are in need of redesign². Lost spaces could be the surface car parks that sever the connection between the commercial centre and residential area which offer incredible opportunities for urban designer to rediscover many hidden potentialities.

Babakan Siliwangi is one of the open green spaces remaining in Bandung. Its location around colleges, universities, and other education institutions make Babakan Siliwangi can be utilised in research and education functions, resembling the function of the arboretum. Arboretum is an urban forest that provides a collection of plants or botanical garden containing living collections of woody plants intended at least partly for scientific study. In 2011, Babakan Siliwangi was finally set as World Urban Forest after series of controversial issues in its land use conversion to commercial area. However, its current condition does not optimally serve its purpose as public space.



Figure 1. Surface car park in Valley Retail Park. Source: Personal documentation (2013)

Meanwhile in London Borough of Croydon, the council considers the area around A23 Purley Way as a relatively forgotten landscape that is characterised by a disjointed public realm³. Purley Way is an out-of-centre, car-based, retail and industrial park on the A23 that is immediately adjacent to the Croydon Metropolitan Centre. Although recent developments on the Purley Way have been such a commercial success, they have not been completely welcomed. The transformation from industry to retailing and leisure came through entrepreneurial initiative rather than conscious planning³.

The concept of 'retail parks' on the Purley Way was not formally recognised by the Council until the adoption of the 1997 Unitary Development Plan, and, in the meantime, there had been a number of debates over the details of the proposed developments³. The dispersion of stores (particularly the development of Valley Park) has led to a growing problem of traffic congestion, especially at weekends, on A23 Purley Way, which is still an important main road.

This study conducted in 2013 aimed to improve public realm in Valley Retail Park by knitting together the existing retail, surface car parks, and public transport spaces. The existing large space of surface car parks has the potential to be transformed into an open space (rather than an underutilised space as it was in 2013) where families and friends are able to relax

and appreciate the landscape. The main intention was to initiate the early stage of shaping a new local centre to bridge the gap between Croydon Metropolitan Centre and the surrounding Valley Retail Park neighbourhood so that, in the end, there would be promotional strategies to benefit both areas.

Because of the time constraint during the period this study was conducted, the scope of work was emphasised in physical output and not deeply explored in social and economic term. Although some social and economic consideration was definitely being taken into account towards the design generation. Based on Croydon study findings, ideas to repurpose the underutilised space as public space in Babakan Siliwangi emerges.

2. Defining Underutilised Space and Various Practices in Making Public Space

Lost spaces, in general, are defined as the underused and undesirable urban areas that are in need of redesign and make the least positive contribution to the surrounding or users. Those places offer great opportunities to the urban designer for rediscovering many hidden potentialities. Some cases of lost space include surface car parks that sever connection between the commercial centre and residential area⁴. Existing surface car parks in Valley Retail Park, which are presently less meaningful space, have the potential to be transformed into a viable open space.

Barton, Grant, and Guise⁵ distinguish three grades of sustainable retail catchment areas: first of all, the primary area – within easy walking distance; the secondary area – offering both a modest walk/cycle (<2 km), and a frequent, accessible bus/tram service; and the third area – which has either a frequent bus service or a modest walk/cycle.

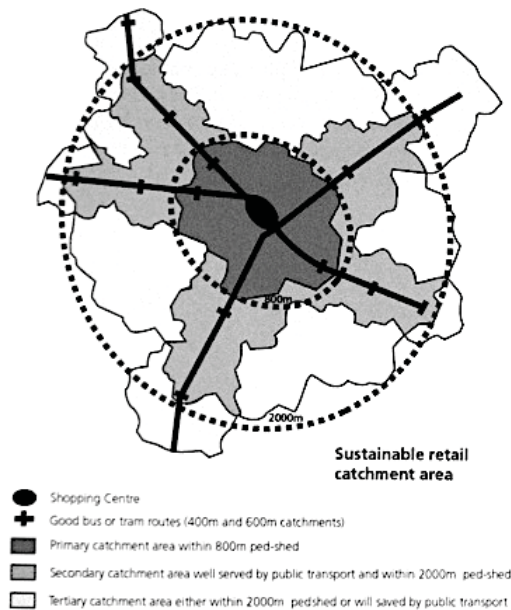


Figure 2. Sustainable Retail Catchment Area.
 Source: Barton, Grant, and Guise (2003)

The exact distance will vary depending on local circumstances. In practice, there is a fourth and wider catchment area that is based on car access and longer distance cycling. This is particularly relevant in terms of town hinterland. In some places the fourth catchment area may currently provide the majority of trade. But the object of good planning is to progressively extend the secondary area, or to create a situation where a new center is viable, so that fewer people have to depend on their private vehicles. Large stores, let alone the agglomeration of them, are commonly generators of local activity. When superstores are centrally located in neighborhood, they should encourage a substantial proportion of local access to public transport. Location and quality of access is important. Assuming Croydon

Metropolitan Centre is a central dot in the middle, Valley Park could act in between the third and fourth catchment areas that serve the surrounding neighborhood.

Many new kinds of retail space have emerged in recent decades. The traditional retail spaces, such as town centres and outlying shopping malls, are either increasing in size or disappearing, producing new urban types and whole environments totally dedicated to retail⁶. Kärholm pointed out that research has shown a tendency by which shopping seems to have less to do with just quality and price, and more with style and identity-making.

There are five factors as the cause for lost space: the highway, the modern movement in architecture, urban renewal and zoning, privatisation of public space, and changing patterns of land use in the inner city⁷. In order to address the lost space issue, the need to reclaim these spaces by transforming them into an opportunity for development is vital. Lost space, underused and deteriorating, provides exceptional opportunities to reshape an urban centre.

What makes a public space great is not solely rely on the physical attributes. Its function to serve people as gathering space must put ahead of its physical form. Designing a successful place involves bringing together the environmental, social and economic elements that are necessary for it to be truly sustainable. The definition of sustainable development extends the concept of equity to future generations; it introduces the idea of trans-generational equity. The sustainability of any place depends on a number of factors, which contribute to its liveability, quality and identity⁸.

The following are the things that must be considered in order to make a place to be sustainable:

- Active, inclusive and safe – fair, tolerant and cohesive with a strong local culture and other shared community activities;
- Well run – with effective and inclusive participation, representation and leadership of;
- Environmentally sensitive – providing places for people to live that are considerate of the environment;
- Well designed and built – featuring quality built and natural environment;
- Well connected – with good transport services and communication linking people to jobs, schools, health and other services;
- Thriving – with a flourishing and diverse local economy;
- Well served – with public, private, community and voluntary services that are appropriate to people's needs and accessible to all;
- Fair for everyone – including those in other communities, now and in the future.

Precedents in Redesigning Spaces

Spring Street, Los Angeles

One of the greatest challenges facing any dense city in the world is how to provide its citizens' needs for a proper amount of park and public open space. This challenge is complicated by demands and expectations that are always changing over time; these are caused by population growth, increased urbanisation and density, and shifting community demographic. To address the challenge of open space, Los Angeles' 50 Parks Initiatives was launched in August 2012 by then-Mayor Antonio Villaraigosa and aims to transform underutilised properties in areas lacking recreational space into parks.

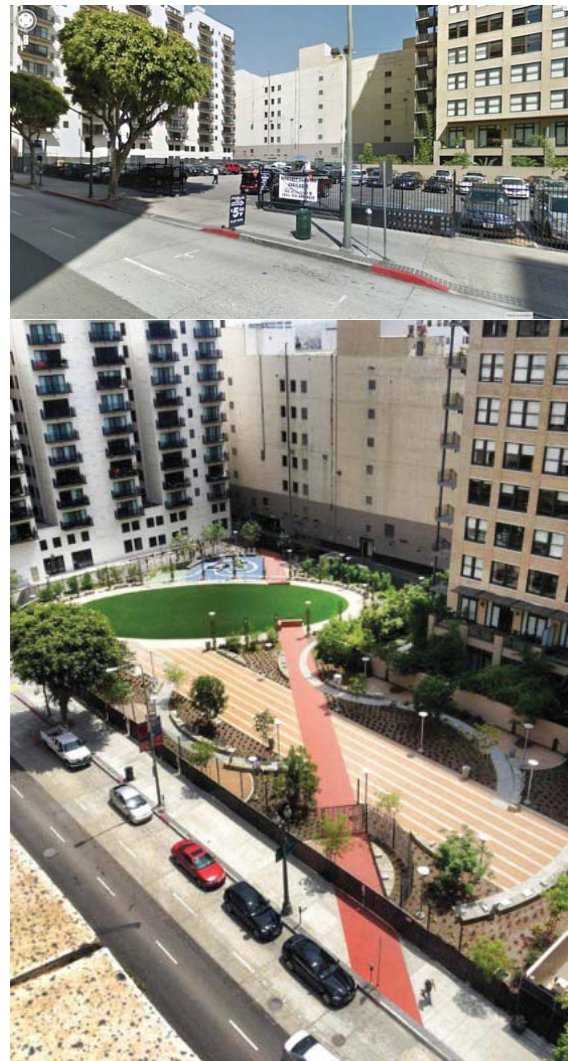


Figure 3. Before and after transformation.

Source: www.thebigcity.net

Lehrer Architects, partners on the project with the City of Los Angeles, envisioned the redevelopment as becoming part of the physiognomy of downtown Los Angeles and, particularly, the surrounding community. Furthermore, the project intends to become the community's outdoor living room, to balance the life at work and family⁹.

The High Line, New York City

The High Line is a public park built on a historic freight rail line elevated above the streets on Manhattan's West Side (www.thehighline.org). It is owned by the City of New York, and maintained and operated by Friends of the High Line (non-profit conservancy, private partner to the NYC Department of Parks & Recreation). Founded in 1999 by community residents, Friends of the High Line fought for the High Line's preservation and transformation at a time when the historic structure was under the threat of demolition.

The High Line was built in the 1930s as part of a massive public-private infrastructure project called the West Side Improvement¹⁰. The project lifted freight traffic 30 feet above street level, removing dangerous trains from the streets of Manhattan's largest industrial district. In the 1950s, the growth of interstate trucking led to a drop in rail traffic, nationally, and on the High Line; no trains have run on the High Line since 1980. Then, in early 2000, the Design Trust for Public Space provided a fellowship for architect Casey Jones to conduct research and outreach for "Reclaiming the High Line", which is a planning study jointly produced by the Design Trust and Friends of the High Line that lays out planning framework for the High Line's preservation and reuse.



Figure 4. The High Line: Before and After.
Source: www.thehighline.org (Iwan Baan)

3. Research Methods

Primary and secondary research were carried out in Croydon study to collect necessary data and information regarding the project. The primary source gathered from interview with Simon Bashford (Business Development and Liaison Officer, Croydon Council) and direct observation on site. Observation is a fundamental research skill that requires attention and the systematic recording of phenomena, including people, artefacts, environments, events, behaviours, and interactions¹¹. The type of observation used in this study was semi-structured (casual observation), where the researcher sets out guidance on what to observe, but primarily observes with an open mind; departures from the plan are allowed in response to unexpected events during observation. In the case of observing Valley Retail Park, it was about how people behave in using the space between car park and the retail boxes. This semi-structure type was also applied in the interview.

Both study in Croydon and Bandung were used visual research methodology where

the photographs taken were used as key visual elements. There are three methods applied: photo-documentation, photo-elicitation, and photo-essays. In photo-documentation, a researcher takes a carefully planned series of photographs to document and analyse a particular visual phenomenon¹². Originally, photo-elicitation asks research participants to take photographs, which are then discussed in an interview with the researcher. But given the time constraints for this study, the photographs were taken by the researcher instead and then used as the interview material. The last are photo-essays that include a series of photographs put together, usually with some text, to interpret a social situation or problem.

These visual methods have been selected for this study as photographs are seen as valuable in urban research because they can convey something of the feel of urban places, space and landscapes, specifically those qualities that are in some way visible. The layout, colour, texture, form, volume, size and pattern of the built environment can also capture people's behaviour.

Secondary research consists of information collected and synthesised from existing data rather than original material sourced through primary research with participants¹¹. The sources including books, research papers, journal articles, conference papers, records and statistics from government, nongovernmental organisations (NGOs), or any number of other sources or archives. This is an excellent method of establishing the definitional boundaries of the design project because it identifies existing precedents and what may be opportunity gaps. In this study, the secondary research was gathered from literature reviews and case studies.

Former study in Babakan Siliwangi on 2010 carried out by interviewing experts

from architecture, landscape architecture, and biology. Site observations to Babakan Siliwangi and precedents in other universities have also been done.

4. Discussion and Conclusion

Croydon has been designated in the London Plan (2012) as an Opportunity Area; therefore Croydon Council regards it as critical that the borough addresses the implications of this growth through the Core Strategy. Solid urban design policies are necessary for Croydon to encourage significant levels of growth in a sustainable way, and to ensure new development respects local character and the historic and natural landscape, including established suburban residential areas and open spaces.

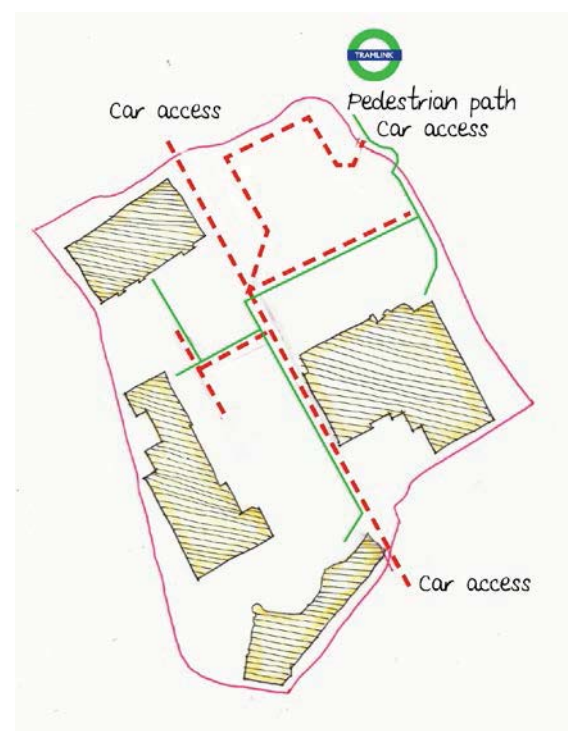


Figure 5. Accessibility car-users vs. non car-users.
Source: Personal documentation (2013)

Public transport available to support Valley Park is the tram link network with one adjacent bus stop. To prepare the site as a future local centre, Valley Park needs more public transport link for accessibility. Based on observation, visitors came with families and friends. This implies that Valley Park has something to offer to bring

people together (restaurants, cinema, and high street fashion retail), which is a good start to initiate a local centre. The missing link is providing space that still brings people together without the urge to spend money.

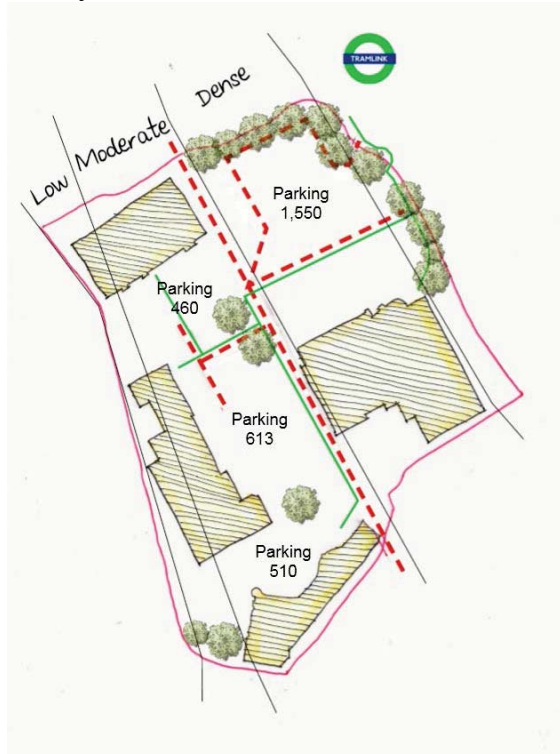


Figure 6. Landscape density. Source: Observation (2013)

The site is potential to become a local centre because it would serve as a catchment area for surrounding neighbourhood. Forming a local centre in Valley Park with appropriate public transport link can be expected to maintain low level of car movements, thus help to address traffic issue.

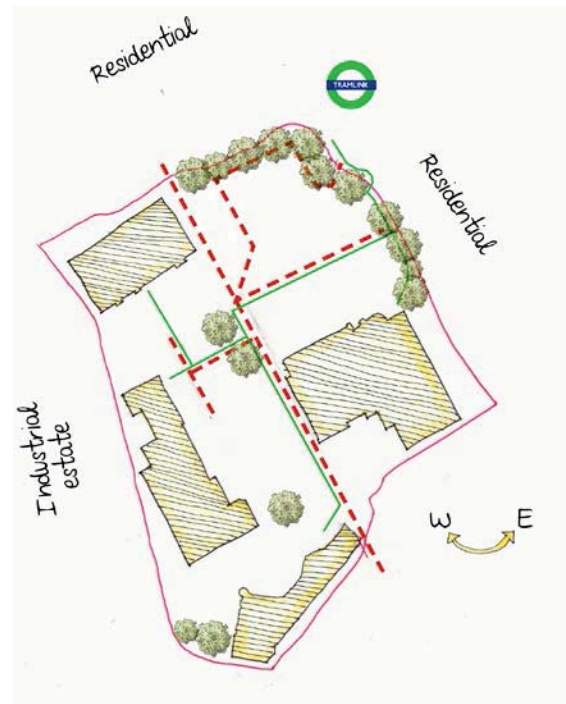


Figure 7. External land use. Source: Observation (2013)

Interview with the Business Development and Liaison Officer of Croydon Council has established the idea of mixed-use development. Valley Park has unique character where it is surrounded by residential and light industrial unit. There used to be a separation between residential and industrial area. However, it has been regarded that the advantage to have residential and industrial units grows hand in hand is that both will keep an eye on each other's property. The main reason for the Council to envisioned Valley Park as a potential future local centre is based on the need of surrounding residential areas. Forming a local centre in Valley Park could also help to reduce the need to travel by cars. The discussion with members of Broad Green Residents Association (BGRA) developed from how the site was under the impression of only designed for car users, how it was not human-friendly, and how it took ages to walk from one place to the other side. It can be concluded that the main issue from the residents' perspective was internal accessibility.

Based on previous observation, public consultation and interview with the Council below are the SWOT analysis from the site.

Strengths

- Almost no development constraints (no conservation area);
- Tram link access to the site;
- Whole package of retail and leisure activities for families and friends (cinema, high street fashion stores, restaurants, and warehouse retailer).

Weaknesses

- Not pedestrian friendly – the site is under the impression of designed for car-user only;
- Lack of signage within the site to the tram link when it is the only public transport within walking distance (no public bus pass through the site);
- Underused space, only for parking.

Opportunities

- Strengthen public transport link to Croydon Metropolitan Centre and London;
- Provide connecting bus from tram link station or provide bus stop within the site;
- Enhance physical features/public realm;
- Reanimate the surface car park – not reducing the amount of parking space- so that the place will be lively in every season;
- For long-term vision: shaping a local centre – with residential and offices provided in the site.

Threats

- Traffic congestion;
- As an out-of-town retail, often seen as a threat to local market/the high street.

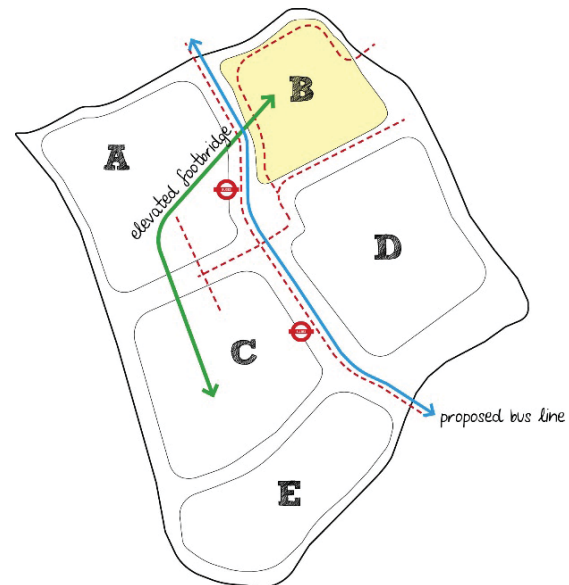


Figure 8. Design Concept. Source: Analysis (2013)

Table 1. Development Programs

A	Public realm enhancement
	Maintain surface parking
B	Proposed multi-storey parking that can be raised for future residential needs
C	Public realm enhancement
	Provide parking for blue badge holders Local market/incidental outdoor kitchen
D	Maintain surface parking
E	Maintain surface parking
	Pedestrian path improvement for better connection

Table 2. Development Vision

Planning Term		Vision
Short-term	5 Years	Sustainable retail park
Medium-term	10 Years	Local centre initiation
Long-term	15 – 20 Years	Mixed-use development: new local centre

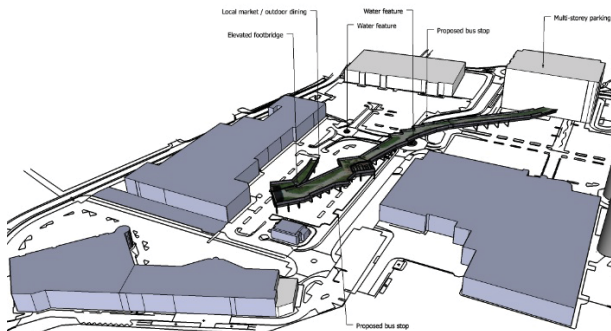


Figure 9. Master Plan and street views from the site. Source: Own (2013)

The study in Croydon established the idea of mixed-use development in an underutilised space within Retail Park. The findings in conclusion are:

- 1) Surrounding land use will determine demand for a new local centre

- 2) To initiate a new land use, it will need development stages in certain amount of time
- 3) Appropriate facilities should be added or upgraded to support transition process to form a new land use or activities

Meanwhile in Babakan Siliwangi, the surrounding land uses are education institutions and densely populated settlements along the Cikapundung riverbank. Therefore it is only natural that the underused space should be made public space, as there is limited space for this needs.



Figure 10. Current conditions of Babakan Siliwangi Bandung. Source: Personal documentation (2016)

Although some feature has been added to the site since the last research in 2010, it is evident from current site observation that Babakan Siliwangi could perform better as

public space. As can be seen in Fig. 10, the general situation does not really encouraging and welcoming people to come by and linger around for some time.

There are several suggestions based on reflection from Croydon for Babakan Siliwangi to perform in its optimum performance as public space:



Figure 11. (Top) Teras Cikapundung and Babakan Siliwangi Orientation. (Bottom) Teras Cikapundung View From Above.

Source: Google Maps 2016

and <http://majalahkartini.co.id/sites/default/files/cikapundung5.jpg>

- 1) With the new space introduced as Cikapundung Riverspot/Teras Cikapundung just a few minutes' walk from Babakan Siliwangi, it is important to get these two spaces better connection.
- 2) Babakan Siliwangi utilisation can be directed towards creating a balance between the built environment and the natural environment and to improve the environmental compatibility based spatial aspects. At least there are three functions that can be made use of this area is a function of ecological, socio-cultural, and aesthetic. Further study needs to be conducted to test this idea

and evaluate Babakan Siliwangi's performance in current condition.

- 3) New feature should be introduced in Babakan Siliwangi as to encourage people to visit the urban forest without feeling unsafe.



Figure 12. One of The Main Entrance to Babakan Siliwangi Forest used as Landfill. Source: Personal documentation (2016)

- 4) The underutilised land outside the forest area should be regarded as an asset for land banking for future development. Existing utilisation appears to be landfill area which is not really suitable to be located in between emerging public spaces. This is important for area image/branding because the landfill area is one of the main entrance to Babakan Siliwangi. As for land banking, currently there is a research lead by Dr Haryo Winarso aimed to develop a model of policy to manage land banking in Indonesia which this paper is a part of.

In conclusion, to make best use of Babakan Siliwangi Urban Forest as public space is a great challenge as we need to maintain its very natural appearance while at the same time encourage people to spend time and gather around with families and friends. There will need stages of time and careful planning consideration for that.

Acknowledgement

Part of this paper is based on dissertation written for MA degree in Sustainable for Place Making and Urban Design at Kingston University London under supervision of Dr Silvia Gullino. This paper is also part of Higher Education Research of Excellence funded by Ministry of Research Technology and Higher Education of the Republic of Indonesia entitled Land Banking Model for Land and Infrastructure Development in Indonesia.

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ASSESSMENT OF EGYPTIAN NEIGHBORHOOD SPATIAL CONFIGURATIONS AFTER THE REVOLUTION, USING SPACE SYNTAX THEORIES

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Abstract

After the 25th of January revolution, many buildings have been erected without proper urban planning causing neighborhoods to lack their definitions resulting in being shapeless and configured in non-understandable manner. Hence, lacking individual's spatial cognition can have major negative effects on individuals dwelling in any built neighborhood. Thus people either abandon, or confusingly traverse the urban spaces that are spatially not configured in a well cognitive morphological order. Based on the direct correlation between the spatial configuration, individual's cognition and physical activity, the research, objectively, approach a neighborhood that is adjacent to the area where crowds used to gather to protest. Point down its spatial configurational problems and how the revolution impacted the neighborhood via surveys, graphs and observation. Aided by space syntax theories, a set of revitalization checklist is achieved to be applied on Egyptian neighborhoods for better intelligible spatial configurations and better spatial cognition, to enhance the individual's physical activity.

Keywords: Spatial Cognition; Spatial Configuration; Urban Intelligibility; Space Syntax; Physical Activity

1. Introduction

The problem this paper spots a light on dwells in the Egyptian neighborhoods. Where after the revolution, urban problems piled up due to the increase of illegal built-up area where buildings are erected without prior planning. Causing a major loss of sense of place in the urban spaces, which in the first place is caused due to the disorder in the spatial configuration that resulted from the ill-planning.

The research's aim is to: Achieve a set of revitalization principles that can make a built neighborhood more intelligible for better spatial cognition to enhance pedestrian physical activity and experience, using the space syntax theories and technique, whilst trying as much as possible avoiding tearing it down.

2. Literature Review

Space syntax is a set of theories and techniques that are used in a manner to analyze different patterns and configurations of architectural and urban spaces, of all kinds. Hence, establishing

objective methods to evaluate and investigate the relationship between the morphological structure of man-made environments and social structures. Objectively, explaining human behaviors, movement patterns and social activities from a spatial configurational point of view [1]. As a starter; the term *Cognitive mapping* usually refers to human's mental representations that store the spatial knowledge of the surrounding environments [2]. It is argued that "*Human mind may in effect be a correlation detector searching for perceptual information from the local spatial configuration in order to predict global location.*" [3]. And that is what intelligibility of urban spatial configuration is all about, how easily the global integration can be read from the small parts of the local configuration. Moreover, it is the easiness by which people understand the route choices offered to them by the design, and how they perceive the surrounding built areas correctly with less confusion [4] and organize this information into a comprehensible pattern [3]. To measure integration; If the number

of spaces that must be passed through to go from a specific space to all other spaces, was counted, and it was found that it comes to a total which is less than for any other space, hence, it has less depth than any other space in the complex. The less the depth the higher the integration value, i.e. the more integrated the space is, the better the quality of the urban space. [1].

Space syntax theories prove that people's spatial activities in different urban spaces can be easily predicted within the alliance created between street networks and programmatic attractors. Attractors like retail stores and commercial businesses, are more likely to base themselves on hierarchical important destinations that are reached in the least costly manner and change of angular routes. Moreover, one of the main targets in spatial design is to urge people to explore unfamiliar spaces, and one of the strong ways to take them from their routine activities to experiencing spontaneous encounters in any urban space is to create dense, less homogeneous street networks and avoid rigid street grid networks [5].

3. Research Methods

"Masaken Elzobat" neighborhood is adjacent to the area where the crowds used to gather for demonstrations during the 25th of January revolution. On this case study, two methods have been used, obtrusive and non-obtrusive survey methods. First the non-obtrusive survey method; Lynch's checklist of elements is used to stimulate the space syntax analysis [4]; hence, the factors that are observed include the following:

Paths: there are four main routes that cross or adjoin the neighborhood, and their intensity of usage by users is minimal. The neighborhood has a unified, rigid street grid network, jeopardizing the natural surveillance, playing a role in significantly decreasing the physical activities, resulting

in a "dead" neighborhood, fully dwelled in though.

Nodes: The neighborhood has four main nodes apart from each other, in which paths intersect with the neighborhood edges. Those are the only vital spaces in the neighborhood.

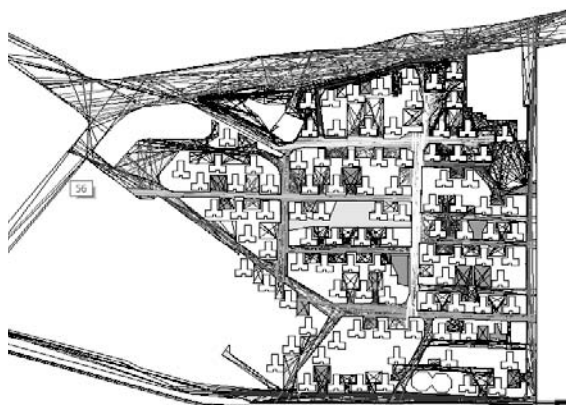
Landmarks: the neighborhood entrance from the North West side towards the seaside is occupied with large, shell-structured, theater, followed by two large buildings, one owned by two well-known restaurants and the other is a place for indoor games such as bowling and other activities. As for the neighborhood entrance from the North East side, a huge chain hotel takes place. In addition to; two famous coffee shops situated in the heart of the neighborhood, overlooking large parking areas that usually witness various and large numbers of social groups (usually of age groups 16-30) arriving in cars for a quick grab of bite or drink.

Edges: The neighborhood is defined by the Mediterranean Sea on the north as a natural edge, and the tramway as a man-made edge on the south. Moreover, two of the most important streets in Alexandria City, besiege the neighborhood from both sides, which carry out the job of arterial roads. Along with: "Moaskar ElRomany" street on the east and "El-Mosheer" street on the west (where crowds used to gather during the revolution).

Districts: The neighborhood is mono-characteristic (no sense of identity); that is all the buildings are of unvarying forms, cloned materials and details of the same manner along with worn out landscape. All the spaces, streets and paths are significantly similar with marginal differences in their size, shapes i.e. spatial configuration to the extent that pedestrians disengage easily from the routes they take and lose their paths. The neighborhood is mainly residential with minimal other uses,

such as few kiosks randomized across the neighborhood, few medical clinics and limited offices. This brings up the issue of the insignificant physical activities that take place throughout the neighborhood's districts, away from its landmarks and nodes. Hence, the neighborhood paths and districts are usually deserted.

Figure 1. Axial map for case study area (Source: Researcher with aid of depthmap computer



program)

As shown in the axial map, the highly segregated neighborhood caused by poor connectivity between spaces, coupled with several intervening lines to be passed while traveling from space to another. The darker the shades on the map, the more integrated the space is. As the integration values in axial maps are highly important as they crucially determine the density of movement through the whole urban grid structure. Hence, the neighborhood is only integrated around the edges and segregated at the heart. Consequently, hike in angular changes due to route impedances. Leading to high depth values, in role result in low integration values, thereupon, discouraging intelligibility of neighborhood.

Second, the obtrusive survey method; a sample of 20 to 30 people were requested to sketch a mental map for their normal errands or homes, balancing age groups, sexes, people who regularly use the neighborhood and dwellers. It was observed that orientation clarity is significantly disfigured. Cognition of mental map was observed to be dwarfed along with

inadequate sense of place and direction. Nodes and landmarks, mentioned above, are classified as the only areas frequently visited by users and of high value. Corridors and paths throughout the neighborhood are considered of low value due to, low integration levels, loss of identity and perplexing spatial configuration which by role is in responsible of confusion among users. Landscaping was not mentioned due to the lack of it.

4. Discussion and Conclusion

In quest of answers this research reaches bottom line proving that a tremendous part of intelligibility of spatial configurations depends on the connectivity and integration of spaces in the area. Along with justifying that perception and spatial cognition are boosted in the presence of intelligible, well connected, spatial configurations, facilitating mental mapping, subsequently enhancing physical activities. The following table includes some of neighborhoods revitalization checklist for enhancing Intelligibility and Physical Activity:

- Outward oriented homes with active frontages towards streets. Including active functions on ground floor and removal of blind walls.	- Enhance human activities - increase degree of natural surveillance
- Destinations should be reached with least angular changes. Hence, better integration of spaces.	- Enhance spatial cognition through intelligibility of spaces and various human route choices
- Mixed use of functions in the neighborhood - Creating routes between vital functions in the neighborhood that acts as magnets, and embedded in this route different secondary activities and uses Connect the neighborhood with its adjacent one through a common area containing vital	- Generates complex movements routes between various functions - Expand the neighborhood's accessibility on both local and global level

buildings and open spaces	
- Avoid unified rigid urban grids	- Discourage physical activity
- Avoid embedding industrial infrastructure elements within urban patterns such as : power canals and railroad lines	- They hinder the connectivity within the neighborhood
- Avoid huge bulky buildings acting as obstacles against formation of places for social encounters	- This obstructs the permeability to attractive sites
- Main route, going through the neighborhood, should be fully accessible and well-connected from other corresponding streets. with a clear street network	- Increase integration and vitality of urban spaces together.
- building blocks should be delineated to define a sense of enclosure	- they maintain density of movement in their urban spaces
- Placement of informational signage wherever needed.	- Decrease Informational gap.

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AN ARCHITECTURAL-MORPHOLOGICAL ANALYSIS OF THE MUGHAL GARDENS OF THE 16TH AND 17TH CENTURIES: ENGAGING CULTURAL FORMS AS STRATEGIES FOR PASSIVE DESIGN FOR URBAN SUSTAINABILITY

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Abstract

There have been discussions on how sustainability must eventually imply 'back to basics' and relive lessons from the past approach rather than employing 'high technology' add-on features. With that, there has been a resurging interest in the role of water in urban design and how it may have an impact on the climatical situation of an area rather than only for aesthetic and recreational activities. The paper summarises the outcome of a series of morphological ('shape and form') studies to analyses the 2D and 3D archetypes of enclosed Mughal Gardens during the 16th and 17th century of the Mughal period; and assess these in terms of links and relationships with sustainability parameters such as sustainable urban water design and passive cooling impact. The aim is to relook onto the use of Mughal models for both cultural and climatic strategies in the urban design of cities in hot climates. Historically the 16th-century Mughal design achieved its peak in the urban design phase and assumed a more monumental role with proportionate rules and hierarchical order. The paper goes into the detail description of such archetypes especially based on Shish Mahal in Lahore Fort and links with critical passive cooling impact as an urban mechanism and lessons learned for the modern context of cities that has the plaza and open spaces in between blocks. It is argued that the garden constituted not only a cooling but symbolic mechanism evolving from open to closed type. Significantly, the need to identify the structural relationship between garden archetypes and its role in cityscapes are very much crucial to the modern world in context. Through the abstraction analytical and descriptive relational morphology of the spatial configurations, the studies can suggest the idealized spatial system that can be used in urban design and complexes which later became a methodological and abstraction tool of sustainability to suit the modern contemporary world.

Keywords: Archetype, Mughal Gardens, Water features, Morphology, Urban Sustainability

1. Introduction

It is increasingly realized that sustainability includes both a response to the climatic and cultural context of a place. To assess the cultural context, a morphological analysis of urban patterns from heritage legacies is necessary. While the climatic form is derived from an analysis of meteorological data, the cultural patterns and forms must be abstracted from a typological and morphological study. The interactions between architectural morphology or 'form' and environmental performance alone have been discussed in the various literature (Ratti, Raydan, & Steemers, 2003) however, to advance sustainability to the level of design practice, there is a need to analyses the link between form and

environmental performance in its specifics climatic context.

Hence, a systematic and deep study of heritage complexes in general and Mughal architectural morphology, in particular, are needed. This is due to the agenda of transformation to a more holistic concept and approach to urban water systems and urban water design. The present engineering and rational approach of urban water systems have to be re-looked in order to reconceptualise them towards sustainable agenda. Conceptually, elements from physical structures must be integrated holistically in the abstracted 3 dimensional of architecture morphology and urban space from the onset of design and planning.

2. Literature Review

Looking back to at Islamic civilizations, and ever since the origin of cities, man has used water not only for essential purposes but also for display (Cross, 1996) and in general, water elements which have different characters are used for two main purposes; "aesthetic" and "functional". The practices of everyday life in the traditional world must at present, constitute an area of 'urban' research which should be focused upon and relooked in terms of the supply, circulation, and use of water as conditioning elements to the urban context. (Swyngedouw, 2004)

Historically, Mughal gardens originated in Central Asia and extended into South Asia in the sixteenth through eighteenth century (Wescoat Jr, 1999) begin with the idea of creating a man-made reflection of the paradise as per vividly portrayed in the Quran. It has been a source of inspiration throughout the Islamic world and the provision of cool pavilions, flowing springs, rivers, gushing fountains, shady and fruits trees are part of the elements that appear in Mughal garden and many Islamic gardens. Since the paradise had eight divisions and based on this the concept the garden were divided into various eight numbers of terraces, lawn or quadrant divisions.

Literally, the Charbagh or Chahar Bagh means rectangular gardens cross-axial divided into four parts by pathway or water channels. According to Dickie, (1985) as he referred to the booklet entitled 'Some ancient garden of Lahore' by Dr. Dar, courtesy of Lahore Museum, distinguishes four kinds of gardens: (a) gardens attached to palaces or *havelis*; (b) gardens which serve as substitute royal residences, for the emperor to put up at when on a journey; (c) funerary gardens surrounding purpose-built mausolea; and, lastly, (d) pleasure gardens with baradari in the middle, the commonest category. (Dickie, 1985) further elaboration on the Mughal garden

mentioned that at the peak of Mughal power, there are some 50 gardens at Lahore which one was the largest garden in the world. Since the irrigated vegetation may have a profound impact to the Mughal gardens in terms of its aesthetic and religious value, it also plays an integral role in controlling the micro-climate conditions via the process of evapotranspiration.

Water architecture in India emerged from the ancient Indic practices connected with the spiritual embodiment with the water especially with its rivers in all forms but later developed within the rapid emergence of the urbanization and widespread of Islamic rule in India. In the Hindu interpretation of the sacred mountain Meru, rivers flow in all cardinal directions forming a "cosmic cross", similarly, the Mughals saw the Charbagh as a physical manifestation of the four rivers flowing from paradise (Krusche, Aijian, Anders, Dokonal, & Kapadia, 2010). This evolution also appeared in the Charbagh archetypal design. The use of water incorporated in the axial formation of the Charbagh which usually leading and ending at the central node of the garden itself in a form of a shallow pool (Figure 1).



Figure 1. In Shish Mahal courtyard, the axial water channel formation that leading to a central shallow pool reflects the actual manifestation of the original Mughal Charbagh. (Picture courtesy of <http://www.orientalarchitecture.com>)

Some but not all, Mughal build the garden near the river sources and create a systematic hydraulics irrigation structures to sustain the garden greenery and keep the gardens hydrated. As for the gardens that build far from the riverside, significance hydraulic systems for elevating the water are created associating with the distribution mechanism. This mechanism can be either the provisions of water raising houses, aqueducts and baolis.

In the case of Fatehpur Sikri the water are lifted in multiple elaboration stages as the prime sources of water came from the baolis (step-wells) located down the ridge (Figure2). According to (Sumra, 2012) the system for elevating water is an elaboration of the Persian rehant system, sometimes called the Persian wheel. Chambers within the baolis and water raising houses contained wheels with shafts driven either by humans or cattle. These wheels, in turn, rotate shafts that drive a belt of earthenware water-filled pots, up to the next stage of the waterworks. This is an elaboration of the rehant system which is frequently seen in medieval, and contemporary, India village wells and agriculture, where a bullock is used to raise water from the well to ground level.

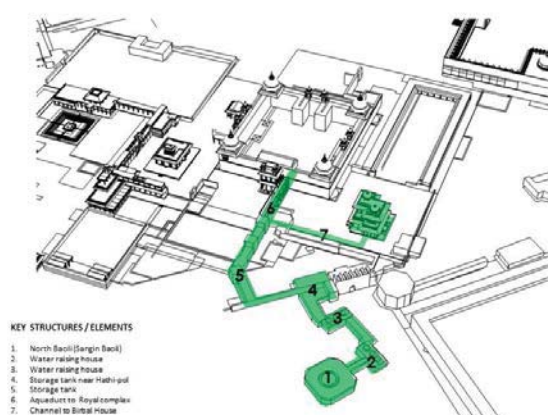


Figure 2. Multiple stages of water elaboration mechanism that lifted the water from the baoli in the lower ridge to the upper level of Fatehpursikri palace.

In the present day, provision of water as a cooling agent has been empirically proven in various literature. According to (Bagneid, 1989), during a one week period, the courtyard with the evaporative spray had a slightly cool to cool Predicted Mean Vote (PMV) 15% of the time. The results show the courtyard as being an effective microclimate generator. Apart from that, an integrated passive cooling strategies that apply in an enclosed space also play significant role in mitigating the heat retention as (Reynolds & Carrasco, 1996) concluded that a retractable shading over the courtyard, watering the patio's absorbent floor (i.e., evaporative cooling), opening the windows for night ventilation, and high thermal mass contributed significantly to the passive thermal cooling of the house.

In hot arid climate, it is necessary to control the flow of ambient air inside the courtyard in order to maintain the internal temperature of the building. The correlation between aspect ratio and cross ventilation is crucial in courtyard housing as demonstrated by (Das, Coates, & Gabbard, 2005). In his findings, aspect ratio calculated as the sum of an area of the courtyard floor over the average height of the surrounding wall. In hot humid climate, design consideration for thermal comfortability for courtyard design lies in the building proportion by making the courtyard deeper with thicker surrounding room wall. This methodology is preferred in calculating the water surface to courtyard ratio in analyzing the relative dimensional difference of water elements in the selected Charbagh.

3. Research Methods

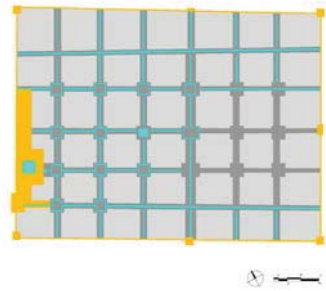
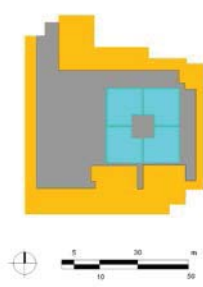
Selections of the Mughal gardens are based on the past literature on types of Charbagh under different Mughal ruler from 16th to 17th century. A collection of measured drawings is obtained from the past research and mapped as architectural morphology. Satellite images are also taken into account

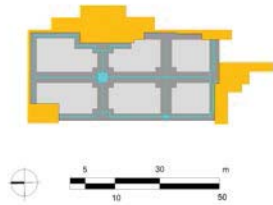
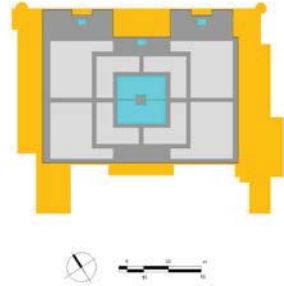
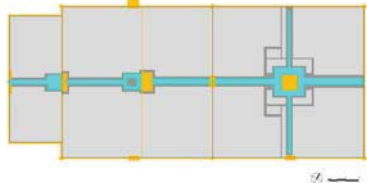
if the subject measured drawings are not available before convert into the simplified morphology map. (Table 1)

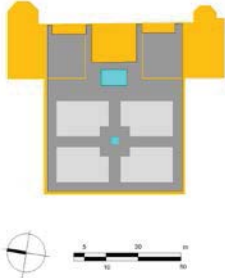
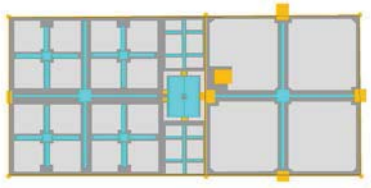
The spatial organization of the garden is labeled into 4 different colorized patterns which indicate to the subject's structures, pavements, vegetation and water features.

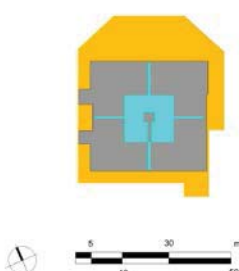
The relationship of sustainable urban water design and architectural morphology of each garden are analyzed via calculating the ratio of the water surface to the site context.

Table 1 Mughal Charbagh and its morphology characteristics

Name of Mughal Emperor	Name of Charbagh /Date of Construction	Site Plan	Morphology Analysis
Babur	Aram Bagh (1526)	 (Agra)	
	<i>Aram Bagh</i> Mughal oldest garden and built by the founder of Mughal ruler Babur in 1526. Situated on the bank of river Yamuna, the water is drawn directly from the river itself and store in the tank which later flowed down to the second and third terrace through a series of canals and cascades. Charbagh Architecture: Designed in three descending terraces, the water is funneled into network canals, cascades, and tanks/pool. Each cascade channeling the water to the pool and has stairs on both sides for circulation usage.		
Akbar	Anup Talao Courtyard (1576)	 (Fatehpur Sikri, Agra)	
	<i>Anup Talao Courtyard</i> It is known for its decorated central pool platform and built by sandstone and surrounded by stone <i>jali</i> balustrade. The pool was once filled with gold, silver and copper coins during the Mughal times to create a reflective effect in the pool. Charbagh Architecture: The courtyard is surrounded by the Khas Mahal, Khwabgah (Royal apartment) and Turkish Sultana house. The pool is made of red sandstone, square in shaped and has four narrow bridges that lead to the central platform.		

	Turkish Sultana Bagh (1571-1585)	 (Fatehpur Sikri, Agra)	
	<i>Turkish Sultana Bagh</i> Situating in the heart of Fatehpur Sikri, Turkish Sultana Bagh is built opposite the residence of Akbar Turkish queens called Salima Sultan Begum and Ruqayya Begum. □ Charbagh Architecture: The oblong char bagh situated in front of the Turkish Sultana Pavilion measuring 65m x30m and lies immediately behind the Diwani Am (court of Public Audiences). The garden is divided by three intersecting <i>Khiyabans</i> (paved walkways) into six plot of unequal size.		
	Jehangir Quadrangle (1618)	 (Lahore Fort, Lahore)	
Jehangir	<i>Jehangir Quadrangle</i> The construction began with Akbar rules but completed under Jehangir in 1618. It consists some of the earliest structures in Lahore Fort. The size of quadrangle approximately 113m x 75m and considered the largest of all quadrangles in Lahore Fort. Strictly used for the imperial suites, it consists of Bari Khawabagh (Emperor sleeping chamber), royal apartments, haramsara (ladies apartments), Dalans and char bagh with fountains. The quadrangle also has Imperial subterranean retreat chamber underneath which built during Akbar times. Charbagh Architecture: In the quadrangle, a subdivision of many charbagh is designed with parterres and pathway with a large pool located at the center of the quadrangle with central <i>mah tabi</i> (platform) in the middle. The pool is accessed by a narrow bridge on the east and west side. The pool has an array of fountains aligned that provides a refreshing atmosphere to the quadrangle.		
	Shalimar Bagh, Srinagar (1619)	 (Srinagar, Kashmir)	

	<i>Shalimar Bagh, Kashmir</i> ‘Adobe of Love’ as it is called; Shalimar Bagh is the largest Mughal garden in Kashmir built by Jehangir for his wife Empress Nur Jahan. Situated on the banks of Dal Lake, the garden covers approximately 35 acres with three major terraces layout. Charbagh Architecture: Conceptually, the garden laid out into three major terraces dominating by the axial water channel that runs from the top of the terraces to the lower part before dispersing into lake Dal. All three terraces are in lined with Chinar trees and fixed with water fountains. Decorated pathways are planted with Aspen trees alongside the main water channel. The first terrace (lower) is the public garden where the Diwani Am (public audience hall) built over the waterfall leading to the second terrace. The second terrace (middle) is much bigger in scale than the lower terrace has Diwani Khas (Private Audience Hall) on its center. Each hall is designed on the pool which axial channel passes through it. The third terrace is located at the higher ground restricted for the royal harem. The Zenana garden is full of Chinar trees and at the centre of the pool stands a black pavilion made of black marble surrounded by the water fountains. From the Black pavilion, two narrow water channels lead to the end of the wall of the garden to the small Baradari.		
Shah Jahan	Anguri Bagh (1637)	 (Agra Fort, Agra)	
	<i>Anguri Bagh</i> The ‘Grape Garden’ built in Agra Fort was used by the harem and become one of the many examples of the Mughal garden within the compound of royal residence/apartment. The three sides are built for the woman attendant and household. The Khas Mahal (Private Palace) located at the Northeastern part is the residence of the empress. Designed for a complete privacy and pleasant retreat, the garden is planted with grapes and flowers throughout the year. Architecture: The garden has two marble water tank which located the front of the Khas Mahal and another at the center of the char bagh itself which in a form of marble paved platform tank with a fountain at its centre, the steps leading to it on the east and west sides. From the tank in front of the Khas Mahal, a shallow channel leads the water to the center tank via cascade and decorated miniature pool. The garden is divided into four and planted only with a variety of shrubs and flowers with geometrical patterns.		
	Shalimar Bagh, Lahore (1637-1641)	 (Lahore)	

	<i>Shalimar Bagh, Lahore</i> The garden was constructed by Shah Jahan and originally had seven ascending terraces. Located near the Grand Trunk Road 5km northeast of the Lahore city. Charbagh Architecture: The garden measured approximately 600m north to south and 270m east to west and made on the concept of Charbagh. The garden has been laid on three terraces and elevated 4m on each other and each was named as Farah Bakash (upper terrace), Faiz Bakash (middle terrace) and Hayat Bakash (lower terrace).The concept of floating pavilion where water flows and cascades down over a carved marble slab are built like those in Shalimar Bagh in Kashmir. Across the waterfall on each terrace are built with iwan (pavilion) and at the end of the second terrace there's a marble structure called 'Sawan Bhadon'. The lower terrace constitutes of 16 smaller char bagh division where the higher terrace are built with single char bagh in a massive scale. A large central pool with dimensions of 50m x 68m has a royal platform in the middle connected with a causeway on the east and west.	
Shish Mahal Courtyard (1632)	 (Lahore Fort, Lahore)	
<i>Shish Mahal Courtyard</i> Shah Burj Quadrangle also known as Shish Mahal Courtyard located at the northwest corner of Lahore Fort served as a residence of the Empress. A simple form of rectangle courtyard with central shallow pool at the middle. The pool is surrounded by the Shish Mahal Palace, Naulakha pavilion, Musamman Burj (watchtower) and dalans (galleries). Subterranean sleeping chamber located underneath the courtyard floor with numerous water wall/cascade can be found. Charbagh Architecture: The courtyard resembled manifestation of the actual char bagh without any vegetation planted in it. The courtyard is subdivision by four narrow water channels runs from the southern dalan to the center shallow pool. The royal platform at the center of the shallow pool is bedecked with pietra-dura craftsmanship. The Courtyard surface is made of abri-stone (variegated) inlaid with imaginary of vegetation are based on the floral themes embedded on the facades of surrounding building.		

4. Discussion

The Basically in the context of Fatehpur Sikri, the urban water system can be read in line with the framework of the urban design of Sikri which is essentially made of a continuous and compact pattern of squares and courtyards which are highly serviced (according to this time) so as to ensure complete comfort for the king and his royal courtiers. The hydraulic system was specifically built for this monumental complex and the system was holistically

fused with 'thermal' strategies such as 'pools of water' strategically placed in the path of incoming wind during dry seasons in order to optimise the evaporative cooling impact of water elements. At Sheesh Mahal the same strategy is employed, but there are not detailed and complex vertical water elements that contribute partially and totally to the achievement of thermal comfort for the ruler and members of his royal court.

Based on the water morphological analyses of these two predominantly architecture of Mughals, one can relate the forms and functions of each water structures in its own place. The vertical and horizontal water structures have its own implications and effects not only to the psychological but also to the physiological impacts. To the vertical water structures.

That found mostly indoor or semi-outdoor (corridor/loggia) and in the sleeping chamber tends to work as a dramatic cooling effects by the continuous flow of water on the wall through the chevron shaped waterwall. The tiny splashing creates fast evaporative cooling impact and by optimizing the wind induced ventilation strategy, it allows the summer winds to funnel natural breeze throughout the living spaces thus cooling off space in no time. Visual delights of the water splashing create psychological calmness to the occupant and symbolically adding movement effects inside the building. A movement effect usually makes the building look much more alive and celebrated.

Horizontal water morphology is known to be the oldest water features in the northern India. The function is more towards the storing and supply of water throughout the inhabitant area (city/fort). Large reservoir tends to serve the water supply and sometimes for recreational needs. The creation of step well is sometimes associated with the annexation of multiple summer retreat chambers with a series of flight of staircase from ground to the water source. These chambers are often designed custom for royal purposes. Others are merely a series of steps towards the water sources. A simple step well without any chambers is for public usage. As for the small tanks, it is built for aesthetics and religious purposes. In Lahore fort, massive tanks and pools are scattered around the fort for the purposes of lowering the surface temperature. Every corner of the

fort is designed with either a well, pool or water tank in variable sizes, shapes and volumes. Mughal emperors are often participated in the event involving music, art, and literature, thus indulged themselves by listening or watching it on the platform surrounding a pool. Although the platform is raised in the middle of the courtyards, surrounding by the only man-made pool, the mini comfort zone can still be achieved surrounding that sitting platform. This gives a clear picture of the importance of horizontal water morphology trust in combating the extreme heat in both regions by scattering water structure throughout the area.

5. Conclusion

The basically sustainability requires a mindset that needs a paradigmatic shift from the completely empirical to a more holistic approach. To achieve sustainable goals, urban systems need to incorporate and include urban water systems which have a wide range of benefits including both environmental and socio-cultural and the very conceptualisation of urban design and architecture must relook at not only how water systems are functional but are aesthetic and symbolic as well. Both Islamic world view and hence its heritage put water as a central pivot role in the cultural mindset and urban life. There is an immaculate and vivid reference to the fountains in the Quran, *"The righteous are amidst shades and fountains (of Heaven)"*, Al-Marsala: 41, there is also a reference to the four rivers of paradise and one of these four rivers is that of pure water, *"Is the description of Paradise, which the righteous are promised, wherein are rivers of water unaltered, rivers of milk the taste of which never changes, rivers of wine delicious to those who drink, and rivers of purified honey, in which they will have from all (kinds of) fruits and forgiveness from their Lord, like (that of) those who abide eternally in the Fire and are given to drink scalding water that will sever their intestines"*, Muhammad: 15

Hence a systematic and deep study of heritage complexes are needed due to the agenda of transformation to a more holistic concept and approach to urban water systems and urban-water design- from the present engineering and rational approach of urban water systems in order to reconceptualise towards sustainable agenda, there is an urgent need for a more holistic water urban approach, there must be a transformative change and outlook whereby urban water systems should no longer be considered as 'leftover' elements from physical structures but elements which must be integrated holistically in the 3 dimensional concepts of architecture and urban design from the onset of design and planning. This new approach must even be inclusive of and broaden to, see water with a symbolic meaning which are integrated into an architectural solution. These may need abstract geometrical basis and references which are essential to the more spiritual and social aspects of water elements which constitute many communities and cultures throughout the world. These should include not only looking at 'water systems' and elements per se but should be reconceptualised into 'water –garden' systems , the garden landscape, the alignment with waterfronts and the symbolic and socio-historical meaning of rivers, including the strategic and symbolic significance of water.

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A NEW APPROACH TO URBAN HEAT ISLAND ASSESSMENT IN THE CONTEXT OF GREATER KUALA LUMPUR

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Abstract

Urban heat island (UHI) has become a growing concern for Kuala Lumpur (KL) as many studies reported a significant increase of air temperature in highly densed urban areas compared to its surroundings. A critical review of the recent UHI studies revealed the insufficiency of field measurements to apprehend the severity of UHI magnitude in the consecutive years. Few studies comprehensively reported the influence of urban fabrics on the development of UHI in KL. Many fundamental studies just reported the alteration to natural surfaces as the main factor while the introduction of green spaces in urban areas as a good initiative to reduce the UHI effects. This creates a gap for the future studies to investigate the overall scenario of UHI by exploring more factors and mitigation strategies. The use of Local Climate Zone (LCZ) scheme in future studies will allow the researchers to include the effects of urbanization in quantifying UHI magnitude as many studies in the past failed to account the contribution of urban fabric towards the development and mitigation of UHI. This study also highlights the expert stakeholders sharing sessions on UHI phenomenon in University of Malaya as an initial initiative to devise more advanced UHI studies in the upcoming years as a move towards sustainable KL city as stipulated in Tenth Malaysia Plan (RMK 10).

Keywords: UHI, Greater KL, LCZ, Urban microclimate, Sustainable city

1. Introduction

Rapid urbanization and population explosion is of particular concern for KL which consists of 21.96% of the total current population in Malaysia that results in a distinctive urban microclimate. Being a tropical metropolitan city with a very small variation in the monthly temperatures, KL is facing a significant elevated air temperature compared to its surrounding areas that results in UHI as highlighted in the previous studies [1]. However, there is a sensible paucity in the assessment of UHI in KL in the past before it gains its momentum recently. Therefore, tracking the association of temperature increase with urbanization is hardly attainable due to data inadequacy. Hence, this paper presents the findings of the review of past UHI studies in KL and suggests the employment of newly developed LCZ classification system [2] to describe the urban fabrics of the study areas

in KL as the first and most suitable attempt to provide an authentic assessment for the development of UHI in the city centre.

2. Literature Review

UHI phenomenon is the most obvious climatic manifestation of urbanization and defined as a 'reverse oasis' where the urban area is usually warmer than the surrounding countryside due to the lack of transpiring vegetation, use of non-evaporating dark surfaces in roofs and pavements and also due to excess generation of anthropogenic heat [3]. UHI assessment in KL was pioneered by Sham and other researchers in the early 70s-90s and they found that temperatures were normally higher in the central district than in the rural areas which became the first account to the occurrence of UHI phenomenon in KL [1]. However, successive studies over the years are not conducted and all the studies expressed

UHI magnitude similarly as the temperature difference between urban and rural areas. Technically, the term ‘rural’ does not apply into the vernacular of KL landscapes and questions the authenticity of the results produced by the previous studies. Besides, there is very limited studies accounted urbanization effects in the development of UHI in the context of KL. Hence, the LCZ classification to characterize the study sites into 17 zones according to built types, land cover types and land cover properties that influence air temperature at a screen height of two metres above ground can give a better quantification to the UHI magnitude interpretation by providing special consideration to the urban effects on UHI in KL [2].

3. Research Method

This paper reports the findings of the literature review of the previous UHI studies in KL to track down its history and to identify the potential prospects for future studies. UHI studies published from early 70s till 2014 are identified from online databases and included in the analysis. This study also elaborates on the ‘Expert stakeholders sharing sessions on UHI phenomenon towards cooling KL city’ which was conducted on March 2016 in University of Malaya as an early initiative and a driving force for more advanced studies in KL by providing an insight of existing research gaps in this subject.

4. Discussion and Conclusion

UHI phenomenon in KL is studied less intensively while it is a relatively hot topic in many tropical countries. Assessing UHI magnitude in the city centre is the main concern of the studies in the past [4,5]. However, a growing number of studies started to focus more on the contributing factors, impacts on both human health and environment as well as on the mitigation to alleviate the adverse effects of UHI. Land use and land cover changes (LULC) are reported as the main reason of UHI while the introduction of green spaces or parks in

urban areas are majorly studied as the best initiative to potentially reduce the effects of UHI in Malaysia. This creates a gap for the future studies to investigate the overall scenario of UHI by exploring more factors and mitigation strategies. Besides, many studies also failed to account the contribution of urban fabric, materials and configurations towards the development of UHI. Hence, the use of LCZ scheme in future studies will allow the researchers to include the effects of urbanization in quantifying UHI magnitude. The expert stakeholder sharing session also provided an input from experts regarding UHI phenomenon in KL and an insight of existing research gaps or what needs to be done towards sustainable KL city as stipulated in Tenth Malaysia Plan. The future studies should emphasize more on holistically exploring the impacts of UHI on many other parameters such as relative humidity, Mean Radiant Temperature and Physiological Equivalent Temperature instead of explaining it as mere temperature variations over time in order to develop pragmatic mitigation practices through modelling and simulations.

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AN ASSESSMENT OF TRAINING AND PROGRAM PRACTICES IN ADOPTION OF HYDROGEN FUEL CELL VEHICLES (HFCV) IN MALAYSIA: A STUDY IN BANGI INDUSTRIAL AREA, BANGI, SELANGOR

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Abstract

This paper presents the results of a study on the assessment of training and development practices in adoption of hydrogen fuel cell vehicles (HFCV) in Malaysia with Bangi Industrial Area as focused of the study area. The results showed that overall total score the training and development strategy driven is 38%, overall score of training and development program is 33% and overall score of training and development evaluation practices is 35%. Therefore, the study gave a good signal that the adoption of HFCV will be accepted if the training and development practices can be improved for better operation management of HFCV in Malaysia.

Keywords: T&D Strategy Driven, T&D Development Program, T&D Evaluation

1. Introduction

A **hydrogen vehicle** is a vehicle that uses hydrogen as its onboard fuel for motive power. Hydrogen vehicles include hydrogen fueled space rockets, as well as automobiles and other transportation vehicles. The power plants of such vehicles convert the chemical energy of hydrogen to mechanical energy either by burning hydrogen in an internal combustion engine, or by reacting hydrogen with oxygen in a fuel cell to run electric motors. Widespread use of hydrogen for fueling transportation is a key element of a proposed hydrogen economy (Romm and Tesla, 2014).

Malaysia is still in a stage of development of Hydrogen Fuel Cell Vehicles (HFCV) and many of the engineering stage process will take place on adoption of HFCV including the training and program that is very essential to be adopted for successful of HFCV adoption in Malaysia specifically. The training and development in adoption of HFCV in Malaysia specifically need to be explored with the main objectives as following:

1. Explores opportunities in “design” and skills of HFCV and identifies knowledge gaps towards establishing a range of collaborative projects with industry, professional associations, firm education and training institutions and government.
2. Identifies experts in HFCV in areas of design, and to conduct a range of education and training activities such as workshops, lecturers and exhibitions.
3. Participations at the “Hydrogen and Fuel Cell Futures” conferences and exhibition as to impart knowledge and technology transfer in HFCV.
4. The need to gain comprehensive understanding in the field of Renewable Energy specifically related to Hydrogen Fuel Cell Technology.

The areas of training and development practices for HFCV are very much concerned on the following:

- Hydrogen Production, Separation and Storage
- Fuel Cell technology
- Optimizing Fuel Cell Performance
- Installation, Maintenance and Repair
- Safety, Codes and Standards

▪ Fuel Cell Education Program

Training is one of the alternatives in producing competent, knowledgeable and skillful work force. Blanchard, P.N and Thacker J.W (2014) stated that training is a systematic process in providing opportunity to learn skill, knowledge and certain ability to complete current or future work. In heading towards successfully implementing training and development, in adoption of HFCV in Malaysia, the following criteria of T&D should be enforced for the success of HFCV adoption practices.

2. Literature Review

1. HFCV Training and Development Strategy Driven:

- Long-term Development
- Investment and Incentive

HFCV Training and Development Strategy Driven and Long-Term Development: According to Carneiro and Heckman (2003), human capital investment in an organization is very important from an individual's perspective because most individual human capital is accumulated the whole life, whether at work or outside. With this importance, it will create bigger incentive for organization to invest in their organization or particular work training sector. Employee's training and development doesn't mean only to obtain new knowledge, skill and ability, but also introduce employee to change, encouraging employee's attitude change, introducing employee to important business decision and involving them actively in making decision.

HFCV Training and Development Strategy Driven and Investment and Incentives: Training requires time, energy and money. It is a critical investment in a strategy that leads to internal promotion,

substitution plan and employee's development.

HFCV Training and Development Program:

- Comprehensive Program
- Career Development
- Improve Performance

Organizations need to design an effective training program that employees benefit from the training provided by increasing confidence in the ability of their employees in performing their duties.

Career development is a process and activity to prepare employee for position in organization, which will be conducted in the future. Career development for an individual has to be done because an employee does not only want what he has but also expecting changes, advancement and opportunity to advance further.

2. HFCV Training and Development Evaluation:

- Employees Evaluation

Evaluation of training and development means assessment of the impact of training on trainee's performance and behavior. The effectiveness of each step must be continually assessed. Generally a good training and development programs start with identification of training and development needs and will be end with evaluation of training. Training and development evaluation is an important aspect in training program. In general, all good training and development program starts with identifying training and development needs and ended with training evaluation.

3. Research Methodology

a. Research Objective

This objective of the study is to assess the Training and Development practices in adoption of the HFCV in Malaysia with focused study in Bangi Industrial Area in Bangi, Selangor.

b. Research Instrument

Training and Development practices consists of 31 items of questions and measured using a 5-point Likert-scale ranging from (1) Strongly Disagree, (2) Disagree, (3) Moderately Agree, (4) Agree and (5) Strongly Agree. The researcher adapts the questionnaire and adjusted according to the requirements and need of HFCV training and development practices. There are three dimensions to measure the HFCV training and development practices as follows:

A. HFCV Training and Developments Strategy Driven

- The organization emphasizes on HFCV long-term development for employee training plans.
- The organization offers HFCV behavioral training which helps to teach employees about corporate culture and its values
- **Investment and Incentives**
The organization incentive for employee's development has encouraged employees to commit themselves to perform better.
(Kaplan, R.S (2001)

B. HFCV Training and Development Program

Comprehensive Program

1. The organization develops and traces, HFCV employee training plans.
2. The organization HFCV training activities for the employees are comprehensive.
3. The training HFCV activities for the employees are continuous.
4. Availability of HFCV comprehensive training policies and programs.

(Source: Usha Tiwari, 2014)

HFCV Career Development

1. The training offered by the organization provides career development opportunity.
2. Employees are strongly encouraged to develop their skills in green management

HFCV Improve Performance

1. The HFCV training helps improve employees' performance.
2. The employees are properly trained when there is a new piece of HFCV quipment.

C. HFCV Training and Development Evaluation

1. The organization frequently evaluates employee training programs.

c. Pilot Study

Reliability refers to the consistency and stability of the set of items that are used to measure review. The pilot study has been conducted and the researcher used

Cronbach's Alpha Value to ensure validity of the items statement. A pilot study was conducted among 15 students at post-graduates level and 10 lecturers from Universiti Tenaga Nasional (UNITEN). The result of Pilot Study is presented in Table 1 below:

Table 1: The Alpha Cronbach Value of Pilot Study

Independent Variables	Items	Alpha Cronbach Value
HFCV Training & Development Practices		
• HFCV T&D Strategy Driven		
• HFCV T&D Program	31 items	0.947
• HFCV T&D Evaluation		

4. The Research Findings

The findings were presented as follows:

a. Section A – Demographic Profile

The number of respondents that involved in the study was 150 respondents in Bangi Industrial Area. The respondents of the study consists of employees in automobiles-related industry like mechanics, technicians, engineers and operational staff in engineering. The respondents' demographic profile of respondents was summarized in majority of respondents as per shown in Table 1.

Table 1: Summary of Demographic Profile of Respondent

No	Demographic Variable	Majority	Percentage (%)
1	Gender	Male	54.2
2	Citizen	Citizen	100.0
3	Age	21-30 Years	51.5
4	Race	Malay	86.5
5	Religion	Muslim	88.9
6	Education Level	Diploma	31.5
7	Job Category	Administration	31.8
8	Monthly Income	RM 1,001 – RM 5,000	81.2

The results as shown in Table 1 shows the majority of respondents who participated in this study found that there are 54.2 percent more male respondents in this survey than female respondent, and all the respondent is a citizen of Malaysia (100 percent). The survey respondents are composed primarily of age

between 21-30 years, accounting for 51.5 percent of the respondents. In term of race, 86.5 percent of respondent are Malay and 88.9 percent are Muslim respondent. 31.5 percent majority respondents have their diploma in education level and 31.8 is made up of clerical job for respondent job category. More than 81.2 percent of the of the sample population have a monthly income from RM 1,001- RM 5,000 in Bangi Industrial Area, Bangi, Selangor.

b. Section B: Training and Development Initiatives

Question 1:

What is the HFCV essential knowledge areas needed for training (non-engineering)?
The response from respondents are listed and rank accordingly as per listed in Table 2.

Table 2: The HFCV Essential Knowledge Areas Needed for Training

Knowledge Areas	Mean	Rank
Schedule management and planning	4.28	1
Cost management	4.17	2
Quality management	4.15	3
Risk management	4.05	4
Human Resource Management	4.00	5
Supply chain management	3.96	6
Claims management	3.89	7
Knowledge management	3.75	8
Health and safety management	3.65	9
Ethical management	3.60	10
Conflict and dispute management	3.45	11
Information technology management	3.33	12
Communication management	3.12	13
Material resources management	3.00	14
Financial management	2.98	15
Plant and equipment resources management	2.86	16

Question 2:

What is the HFCV management skills areas needed for training (non-engineering)?
The response from respondents are listed and rank accordingly as per listed in Table 3.

Table 3: The HFCV Management Skills Areas Needed for Training

Management Skills Areas	Mean	Rank
Decision making	4.45	1
Delegation	4.27	2
Analytical	4.15	3
Team working	4.00	4
Problem solving	3.89	5
Leadership	3.74	6
Negotiation	3.65	7
Human behavior	3.55	8
Presentation	3.41	9

Question 3:

What is the HFCV Development Initiatives needed for employees?
The response from respondents are listed and rank accordingly as per listed in Table 4.

Table 4: The HFCV Development Initiatives needed by employees

Development Initiatives	Mean	Rank
Salary and Benefits	4.65	1
Promotion and Recognition	4.55	2
Compensation	4.25	3
Learning Program	4.06	4
Motivation	3.75	5
Training and Supervision	3.54	6
Employee Record for Evaluation	3.40	7
Research and Development	3.33	8
Mobility of work	3.25	9

Based on the research findings in Section B, its showed that the essential knowledge areas, management skill areas and development initiatives are required for HFCV adoption.

Section C: Training and Development Initiatives Practices

Based on the research findings in Section C that consists of HFCV T&D Strategy Driven, HFCV T&D Program and HFCV T&D Evaluation, results of the finding were presented as follows:

No	Statement Item	% of Agreement
PART A		
HFCV T&D STRATEGY DRIVEN		
ITEMS STATEMENT		
1	The HFCV organization emphasizes on long-term development for employee training plans.	Agree (32%)
2	The HFCV organization frequently evaluates the employee training programs.	Agree (29%)
3	The HFCV organization develops and traces employees training plan.	Agree (40 %)
4	The HFCV organization maintains adequate budget for employee training.	Agree (34%)
5	The HFCV organization training activities for the employees are comprehensive.	Agree (37%)
6	The HFCV training activities for the employees require extensive investments of time/money	Agree (35%)
7	The HFCV training activities for the employees are continuous.	Agree (38%)
8	The organization incentive for employee's development has encouraged employees to commit themselves to perform better.	Agree (41%)
9	The HFCV training offered by the organization provides career development opportunity.	Agree (40%)
10	The HFCV organization offers behavioral training which helps to teach employees about corporate culture and its values.	Agree (38%)
11	The HFCV training helps improve employees' performance	Agree (41%)
12	The employees are properly trained when there is a new piece of HFCV equipment.	Agree (39%)
13	Employees are strongly encouraged to develop their skills in management.	Agree (50%)
14	Availability of comprehensive HFCV training policies and programs.	Agree (37%)
AVERAGE TOTAL SCORE		AGREE (38%)
The average total score of all the 14 items in HFCV T&D Strategy Driven was 38% agreed to the item statement.		
SECTION B: HFCV TRAINING & DEVELOPMENT PROGRAM ITEMS STATEMENT		
% of Agreement		
1	HFCV T&D policy applicable to all employees	Agree (25%)
2	HFCV supervisors train employees on the right way of doing the job well	Agree (34%)
3	HFCV supervisors encourage the employees to share what they have learned with other employees	Agree (42%)
4	HFCV links T&D program with the company business strategy	Agree (30%)
5	The HFCV supervisors support the use of techniques learned in training that employees bring back to their jobs.	Agree (37%)
6	The HFCV supervisors give employees the chance to tryout their training on the job immediately.	

		Agree (37%)
7	The HFCV training aids (resources or technology) are available on the job support what employees learned in training.	Agree (38%)
8	The HFCV team members are efficient and effective to deal with HFCV operations and construction	Agree (30%)
9	The HFCV equipment use in training is similar to the equipment found on the job	Agree (28%)
AVERAGE TOTAL SCORE		AGREE (33%)
The average total score of all the 9 items in HFCV T&D Program was 38% agreed to the items statement.		
SECTION C: HFCV TRAINING & DEVELOPMENT EVALUATION		
		% of Agreement
1	The HFCV T&D methods is suitable for employees as per required	Agree (29%)
2	The HFCV T&D instructors are well experienced and full of knowledge on HFCV	Agree (29%)
3	The HFCV course of contents fit and suits well with the HFCV requirements	Agree (32%)
4	The HFCV organization and preparation are well documented	Agree (38%)
5	The HFCV trainer is well prepared, highly skilled and motivated on the training	Agree (30%)
6	The HFCV T&D is helping the employees to enhance their career in industry as per required.	Agree (38%)
7	The HFCV T&D assessment is fair and justice to participants for development	Agree (37%)
AVERAGE TOTAL SCORE		AGREE (35%)
The average total score of all the 7 items in HFCV T&D Evaluation was 35% agreed to the items statement.		

5. Recommendations and Conclusions

The result shows that the respondents involved agreed with the constructive element of every dimension as per in the questionnaire. Based on the results of the entire study found that employee perception level in the Team-Based Practices are at the level agreed of overall the four dimension of team based practices are 32 percent.

For employee training and development of HFCV to be successful, the management should:

1. Provide a well-crafted job descriptions on HFCV foundation upon which employee training and development activities are built
2. Provide training required by employees to meet the basic HFCV competencies

- for the job and it is a supervisor's responsibility.
3. Develop a good understanding of the HFCV knowledge, skills and abilities that the organization will need in the future.
 4. Look for learning opportunities in HFCV every-day-activity.
 5. Explain the employee development process and encourage staff to develop individual development plan specifically in their involvement in HFCV
 6. Support staff when they identify learning HFCV activities that make them an asset to the organization

For HFCV employee development to be success, the individual should:

1. HFCV Self-Assessment review performance assessment to look over the skills, abilities and knowledge.
2. Identify the development activities in HFCV on methods and resources to be practices.
3. Committees made up of staff from different areas of the organization that will enhance learning by allowing members to see issues of HFCV from different perspectives.
4. Conferences and forums in HFCV where employees can attend conferences that focus on topics on relevance to their position and the organization
5. Critical incident notes on day-to-day activities are always source of learning in HFCV
6. Field trips to organizations serving similar HFCV can provide a valuable learning experience
7. Job aid are very useful for new employees on new responsibilities in HFCV specifically

8. Job expanding on HFCV when the employees already mastered the requirements of his or her job.

On the job experience for cost effective in HFCV:

1. Job rotation keeps his or her existing job but fill in for or exchange responsibilities with another employees to avoid boredom at work.
2. Coaching and mentoring needed continuously as to guide and advice professionally on HFCV practices
3. Networking to be built to meet professional development to discuss issues and environmental impact on HFCV
4. Endorse employees attending classes and activities that support the development plans and goals to be achieved in HFCV.
5. Offer opportunities for promotion and/or lateral moves contributes to the employee's career satisfaction in HFCV

6. References

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