Cawangan Perak

# ISCU 2025

# 17TH RISM INTERNATIONAL SURVEYING CONFERENCE FOR UNDERGRADUATES

## Embracing Construction Revolution 4.0 (CR4.0): Transforming Malaysia's Built Environment

**16th - 17th May 2025 I Friday - Saturday**

# E-ISBN PROCEEDING

VOLUME I

Published by
Royal Institution of Surveyors Malaysia
3rd Floor, Bangunan Juurukur
64 & 66, Jalan 52/4
46200 Petaling Jaya
Selangor

E- PROCEEDING 17th RISM ISCU 2025 Volume 1

Editors: Lizawati Abdullah, Nor Suzila Lop, Nor Nazihah Chuweni, Suriani Ngah Abdul Wahab, Hasnan Hashim



eISBN 978-629-94789-0-4

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(online)

# WELCOME SPEECH FROM THE CHAIRMAN

*RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)*

**بسم الله الرحمن الرحيم السلام**

**عليكم ورحمة الله وبركاته**

Greetings to all,

It is with great pleasure that I welcome you to the 17th RISM International Surveying Conference for Undergraduates (ISCU 2025), themed *"Embracing Construction Revolution 4.0: Transforming Malaysia's Built Environment."* On behalf of the Royal Institution of Surveyors Malaysia (RISM), I also wish to express our sincere appreciation to Universiti Teknologi MARA (UiTM), Perak Campus, for graciously hosting this significant event.

As we navigate the era of the Fourth Industrial Revolution (IR4.0)—or in our context, Construction Revolution 4.0 (CR4.0)—we are witnessing transformative advancements across the global construction sector. Technologies such as Building Information Modelling (BIM), the Internet of Things (IoT), artificial intelligence (AI), robotics, big data analytics, and cloud computing are redefining the way we build, manage, and interact with our built environment. For Malaysia, embracing CR4.0 is a strategic imperative to achieve our socio-economic and environmental goals.

This conference serves as a vital platform to unite surveying undergraduates from various disciplines, fostering critical dialogue on industry challenges, enhancing professional networking, and preparing a new generation of talent for the rapidly evolving construction landscape. It is also an opportunity for employers to engage with and inspire our future professionals.

I would like to extend my heartfelt thanks to all industry speakers, paper presenters, judges, and participants for their time, contributions, and support in making ISCU 2025 a success. I also commend the organising committee for curating a meaningful and dynamic conference experience.

May the knowledge gained, connections formed, and ideas exchanged during this event inspire all participants to lead and innovate in their future endeavours.

Wishing everyone a productive and memorable conference.

**Prof. Ts Sr Dr. Adi Irfan Bin Che Ani'**
Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

# WELCOME SPEECH FROM CO-CHAIRMAN

*RISM 17th International Surveying Conference for Undergraduates (ISCU 2025)*

Bismillahirrahmanirrahim.

**السلام عليكم ورحمة الله وبركاته** and greetings to all.

It is my great pleasure to welcome everyone to the 17th International Surveyor Conference for Undergraduates (ISCU 2025), proudly hosted by Universiti Teknologi MARA (UiTM) Perak Branch in collaboration with the Royal Institution of Surveyors Malaysia (RISM). This event is a meaningful platform for students in the built environment to share ideas, showcase innovations, and build professional networks. We are honoured by your presence and enthusiastic participation, with 135 accepted papers and 78 poster presentations this year.

UiTM Perak, home to the College of Built Environment, has long been a hub for academic excellence in architecture, planning, and surveying. Our commitment remains strong in nurturing competent graduates who meet industry demands and contribute to nation-building.

While you're here, we invite you to experience the heritage and culture of Perak Tengah from the architectural richness of Rumah Kutai to the historical towns of Pasir Salak, Bota, and Kampung Gajah.

To all presenters and winners, congratulations on your achievements. Let your work today be a catalyst for future success and academic growth. We hope this conference will inspire you to explore new ideas, foster collaboration, and make lasting memories.

My deepest thanks to the Royal Institution of Surveyors Malaysia (RISM) and the organising committee for making this event a success.

We hope your experience here will be rewarding and unforgettable.

Thank you. Selamat datang dan selamat berjaya.

**Associates Professor Dr. Nur Hisham Ibrahim, *PMP***
Co-Chairman, Universities' Partnering Committee
RISM Session 2024/2025
May 2025

# WELCOME SPEECH FROM THE PROJECT DIRECTOR

*RISM 17th International Surveying Conference for Undergraduates 2025*

Alhamdulillah, all praise to Allah S.W.T. for His guidance and blessings in making the RISM 17th International Surveying Conference for Undergraduates (ISCU) 2025 a reality.

It is with great honour and gratitude that I welcome all participants, guests, academicians, and industry professionals to this prestigious event, proudly organized under the Royal Institution of Surveyors Malaysia (RISM). This 17th edition of ISCU stands as a proud testament to our collective dedication toward academic excellence, professional collaboration, and youth empowerment in the field of surveying.

I extend my heartfelt appreciation to RISM for its unwavering support, to the hardworking ISCU 2025 Organising Committee, and to all 16 partnering universities across Malaysia for their commitment and contributions. Your efforts have shaped this conference into a dynamic platform for knowledge exchange, innovation, and professional growth.

To the academicians and practitioners present, your insights are invaluable in bridging the gap between academic theory and real-world practice. To our undergraduate participants, your passion, curiosity, and commitment are the very foundation of our future. May this conference not only deepen your academic journey but also ignite a spirit of leadership, integrity, and sustainable thinking.

Let this gathering serve as more than an academic milestone. May it foster lifelong networks, inspire transformative ideas, and chart new directions in our shared professional journey.

Wishing everyone a rewarding and inspiring conference experience.

**Sr Dr. Nurul Fadzila Zahari**
*Project Director*
*RISM 17th ISCU 2025*

# A REVIEW: OVERCOMING OBSTACLES IN GREEN ROOF MAINTENANCE IN UNIVERSITI TEKNOLOGI MARA CAMPUS SERI ISKANDAR

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## ABSTRACT

Green roofs have gained significant attention as a sustainable solution for mitigating urban environmental issues. They offer benefits such as reducing heat flux, optimizing energy efficiency, and improving stormwater management. However, despite these advantages, green roof maintenance remains a critical challenge, particularly in Malaysia's tropical climate. This study aims to explore the obstacles associated with green roof maintenance at Universiti Teknologi MARA (UiTM) Seri Iskandar and propose effective maintenance strategies. This study's methodology includes identifying, analyzing, and synthesizing pertinent research data via literature studies from journals, books, websites, guidelines, and regulations. The study highlights the importance of implementing proper maintenance strategies tailored to Malaysia's climate, including improved drainage systems, selective plant species, routine inspections, and structured maintenance policies. By addressing these obstacles, the research contributes to enhancing the sustainability of green roofs and promoting their adoption in Malaysia's green building initiatives.

Keywords: Green roof, Building Maintenance, Challenge, Strategies

## I. INTRODUCTION

One sustainable approach to minimizing environmental issues is the use of vegetation or plant material on rooftops, commonly known as green roofs. Green roofs are gaining popularity in urban cities due to their numerous benefits for sustainable development. As part of green building criteria, green roofs help reduce heat flux, optimize energy efficiency, and improve stormwater management (Berardi et al., 2014). On the other hand, by utilizing natural characteristics to control the dynamics of interior temperature, green building materials provide a viable way to lessen these difficulties (Somasundaram et al. 2020) stated that in glazed, green-certified office buildings in Malaysia inclined glazing with double low-emissivity (Low-E) glass keeps interior air temperature within the Malaysia Standard's 23–26 °C range. Other green building materials like BIO-GREEN PANELS effectively decrease the expenses associated with heating and cooling buildings while minimizing carbon emissions (Almusaed et al., 2023). Despite these benefits, challenges related to the enhancement of green roof installation and maintenance remain underexplored, significantly impacting their long-term viability (Getter & Rowe, 2006).

## II. LITERATURE REVIEW

### *A. Characteristics of Green Roof*

Green roof technology dates back to 500 BC, referencing Babylonian hanging gardens (Li and Yeung, 2014). Green roofs are specifically enfolded with a growing medium, waterproofing membrane, and vegetation either partially or wholly. In other words, it is the installation of vegetation on a rooftop (Getter and Rowe, 2006). The number of high-rise buildings is increasing at an astronomical rate in the current scenario due to the demand for a metropolitan lifestyle and urbanization. This change in the trend of construction has resulted in a drastic loss of forest coverage, water resources, flora and fauna. As a result of the existing environmental, economic, and social concerns, urban construction mechanisms have been forced to introduce new technologies for the mitigation of harmful environmental consequences (Rowe et al., 2012; Pianella et al., 2017). The green roof concept was

revitalised with highly endorsed research projects in developed countries like Germany (Thuring and Dunnett, 2014) and United States (Bousselot et al., 2020) during the last four decades to utilise it as a tool to mitigate urban environmental pollution.

*B. Types of Green Roof*

Intensive green roofs and extensive green roofs are the two major types currently practised in the construction industry. Intensive green roofs can support large trees and shrubs, and they require a high-depth substrate layer of more than 15 cm (Cascone, 2019; Pandey et al., 2021), and these types of green roofs need frequent maintenance (Molineux et al., 2009; Jaffal et al., 2012). However, extensive green roofs are designed to equip with ecological function rather than an anaesthetic (Ampim et al., 2010). The plants laid on extensive green roofs are soft-stemmed species like herbs, grasses, and mosses (Getter and Rowe, 2006). Due to that, the substrate depth used is less than 15 cm, requiring lower maintenance than the intensive green roofs (Jaffal et al., 2012). Therefore, extensive green roofs are cheaper than intensive ones, and they require less maintenance. These inherent benefits of extensive green roofs have made them the most significant green roof type in use in the world compared to intensive green roofs.

The conventional roofs allow rainwater to run off rapidly from their surfaces, which would aggravate flooding, escalate erosion, and affect the combined sewer overflows that could discharge untreated or partially treated sewage straight into waterways. In solving this matter, green roofs are considered to be of greater importance as they absorb rainwater by delaying its run-off and promoting evapotranspiration (Fanwort et al., 2005; Blank et al., 2013; Stovin et al., 2013) and enhance the efficacy of storm water management (Stovin et al., 2013). Green roofs make a significant contribution to the reduction of carbon footprint as they reduce the emission of greenhouse gases, which leads to an atmosphere with mitigating air pollution and also with reduced noise pollution (Jaffal et al., 2012). The green roof also provides long-term benefits, such as helping to reduce the UHI effect (Dunnett, 2011; Kolokotsa et al., 2013; Yang et al., 2018) through facilitating indoor thermal comfort where the requirement for a cooling system has also become lessened, offering energy benefits as well (Dareeju et al., 2010; Pianella et al., 2017).

Furthermore, the incidence of high-intensity solar radiation is controlled with a strong roofing membrane (Parizotto and Lamberts, 2011). The sophisticated amount of green roof vegetation in cities has increased floral availability and established animal diversity (Jaffal et al., 2012), thus demonstrating the importance of green roofs over conventional roofs. The green roof is made up of several layers, including a waterproofing layer, insulation, drainage layer, geotextile or filter layer, growing medium, and vegetation (Cascone, 2019). Several research studies have used various prototypes. In a research study to distinguish between the variation of temperature and moisture content over extensive green roofs (Baryła et al., 2019), the green models were designed using a wooden base, protective membrane, root-resistant hydro isolation, filtration layer, 15 cm thick layer of mineral substrate, drainage mat, and a 2.5 cm thick prefabricated vegetation mat. This prototype was successfully executed with sedum plant vegetation.

## III. METHODOLOGY

This uses a clear and well-structured approach, combining a systematic literature review (SLR) and semi-structured interviews to provide strong and reliable findings. The SLR follows PRISMA guidelines to carefully examine studies from trusted databases like Google Scholar, ResearchGate, Research Paper, and Web of Science, using specific keywords to cover all important information on the topic. To add to this, semi-structured interviews with carefully chosen participants bring unique, real-world insights that go beyond what literature can offer. By combining these two methods, the research creates a complete and well-rounded understanding of the topic, ensuring it is thorough, relevant, and valuable.

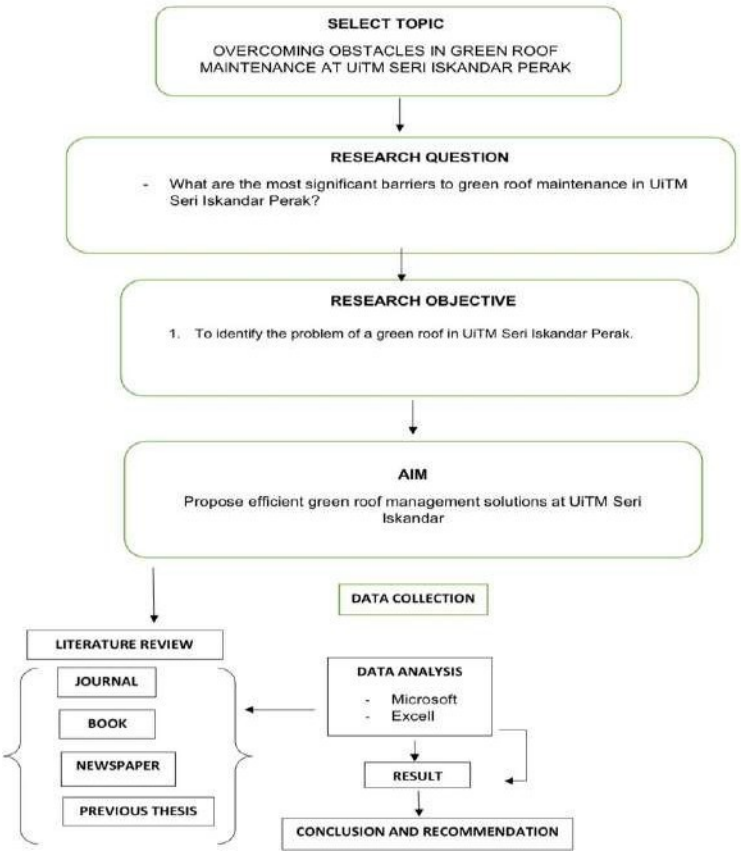


**Figure 1.0** Flow diagram of methodology

## IV. FINDINGS AND DISCUSSION

To optimize the impact of environmentally friendly building materials on temperature dynamics within a structure, many strategies should be addressed throughout design, construction, and operation. Table 1 presents the overcoming obstacles in green roof maintenance on studied literature review.

**Table 1.0** Overcoming Obstacles in Green Roof Maintenance on Studied Literature Review

| OVERCOMING OBSTACLES IN GREEN ROOF MAINTENANCE ON STUDIED LITERATURE REVIEW | AUTHORS | CONTEXTUAL SCOPE |
|---|---|---|
| Structural Reinforcement Strategies | Williams et al. (2010), Getter & Rowe (2006), Theodosiou (2009), Berndtsson (2010), Fioretti et al. (2010) | Using lightweight soil media and modular green roof solutions to decrease structural stress. |
| Smart Plant Selection | Dunnett & Kingsbury (2004), Butler & Orians (2011), Kohler (2006), Speak et al. (2013), Van Mechelen et al. (2015) | Selecting native and climate-resilient species to reduce maintenance requirements. |
| Efficient Irrigation Systems | Nagase & Dunnett (2012), VanWoert et al. (2005), Mentens et al. (2006), Dunnett et al. (2008), Fernandez-Canero et al. (2013) | Implementing drip irrigation and moisture-retentive substrates to optimize water use. |
| Economic Incentives and Policies | Carter & Keeler (2008), Oberndorfer et al. (2007), Susca et al. (2011), Vijayaraghavan (2016), Shafique et al. (2018) | Introducing tax incentives and grants for green roof adoption and maintenance. |

### *A. Structural Reinforcement Strategies*

Williams et al. (2010) suggest utilizing lightweight soil media and modular green roof systems to reduce structural load. Getter & Rowe (2006) highlight the importance of structural reinforcements to support additional weight, while Theodosiou (2009) emphasizes integrating high-strength materials to ensure building stability. Berndtsson (2010) and Fioretti et al. (2010) discuss innovative structural frameworks that can accommodate extensive green roof installations without significant retrofitting.

### *B. Smart Plant Selection*

Dunnett and Kingsbury (2004) emphasize the selection of native species that are well-adapted to the local climate and require minimal upkeep. Butler and Orians (2011) analyze the benefits of drought-resistant plants in reducing irrigation dependency. Köhler (2006) suggests a combination of perennials and succulents to maintain aesthetic appeal and functionality. Speak et al. (2013) and Van Mechelen et al. (2015) recommend selecting plants with deep root systems to enhance soil stabilization and water retention.

### *C. Efficient Irrigation Systems*

Nagase and Dunnett (2012) propose implementing drip irrigation systems that optimize water use and reduce maintenance needs. VanWoert et al. (2005) investigate moisture-retentive substrates, which help maintain soil hydration. Mentens et al. (2006) advocate for rainwater harvesting systems integrated into green roof designs. Dunnett et al. (2008) and Fernandez-Cañero et al. (2013) explore the effectiveness of smart irrigation controls that adjust based on real-time weather conditions.

### *D. Economic Incentives and Policies*

Carter and Keeler (2008) highlight the financial benefits of tax incentives and grants for green roof adoption. Oberndorfer et al. (2007) suggest that government subsidies can encourage wider implementation of green roofs. Susca et al. (2011) examine economic models that predict long-term savings on energy costs. Vijayaraghavan (2016) and Shafique et al. (2018) analyze policy frameworks that support green infrastructure development and maintenance.

## CONCLUSION

Green roofs offer numerous environmental benefits, but their maintenance remains a significant challenge. By addressing structural limitations, optimizing water management, selecting suitable plant species, implementing integrated pest control, and leveraging financial incentives, these obstacles can be effectively mitigated. Future research should focus on developing cost-effective maintenance models and technological advancements, such as automated irrigation and real-time monitoring systems according to Nagase and Dunnett (2012), to improve green roof sustainability.

## ACKNOWLEDGMENT

We acknowledge the contributions of researchers and institutions that have provided valuable insights into green roof maintenance strategies.

## AUTHOR CONTRIBUTION

The authors have contributed to increasing awareness of green roof maintenance challenges and solutions by synthesizing existing research, promoting sustainable practices, and highlighting policy interventions to support widespread adoption.

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eISBN 978-629-94789-0-4

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(online)