



**The FeedFuture Project:**  
Combating Hunger and Promoting Sustainability in Schools

The 11th International Workshop on  
UI GreenMetric (IWGM 2025),

Université Côte d'Azur, Nice, June 17th to 20th, 2025.



Tolga ERKAN

## **The FeedFuture Project: Combating Hunger and Promoting Sustainability in Schools**

Assoc. Prof. Dr. Tolga Erkan presented his paper titled “The FeedFuture Project: Combating Hunger and Promoting Sustainability in Schools” on behalf of the Sustainability Office of OSTIM Technical University at 11th International Workshop on UI GreenMetric (IWGM 2025), hosted by Université Côte d’Azur in Nice, France, from June 17 to June 20, 2025.

The IWGM 2025 workshop brought together scholars, sustainability professionals, and university administrators from around the world to exchange knowledge and share best practices related to sustainable campus management, environmental responsibility, and the role of higher education institutions in addressing global sustainability challenges. Within this international academic environment, Dr. Erkan’s presentation highlighted the conceptual framework and practical outcomes of the FeedFuture Project, an initiative designed to address food insecurity while promoting sustainability-oriented education in school environments.

During his presentation, Dr. Erkan emphasized that global challenges such as hunger, climate change, and resource scarcity require integrated and interdisciplinary solutions that combine education, environmental stewardship, and community engagement. The FeedFuture Project proposes a model that integrates school feeding initiatives with sustainability-oriented educational practices, particularly through the implementation of climate-resilient and resource-efficient school gardens. These gardens aim not only to provide nutritional support for students but also to serve as educational platforms where young learners can develop environmental awareness, ecological literacy, and practical skills related to sustainable food production.

The presentation also discussed how innovative design approaches and circular economy principles can be incorporated into school-based sustainability projects. For instance, the project encourages the use of reused materials and environmentally friendly design strategies in the construction of small-scale agricultural systems, thereby demonstrating how waste reduction and food production can be linked within a holistic sustainability framework. Such initiatives, according to Dr. Erkan, help students understand the interconnected relationships between environmental protection, responsible consumption, and social well-being.

Furthermore, the paper highlighted the role of universities as catalysts for sustainable development by facilitating research-based solutions, international collaboration, and knowledge transfer to local communities. In this context, the participation of OSTIM Technical University in international platforms such as the UI GreenMetric Workshop reflects the institution’s commitment to advancing sustainability in higher education and contributing to global discussions on climate resilience, food security, and sustainable campus initiatives.

Dr. Erkan’s presentation generated considerable interest among participants and contributed to discussions on how universities can actively support the achievement of the United Nations

Sustainable Development Goals, particularly those related to Zero Hunger, Quality Education, and Responsible Consumption and Production. The event also provided valuable opportunities for networking, collaboration, and the exchange of ideas among universities seeking to strengthen their sustainability strategies and educational impact.

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### **Le projet FeedFuture : lutter contre la faim et promouvoir la durabilité dans les écoles**

Le Prof. associé Dr Tolga Erkan a présenté son article intitulé « *The FeedFuture Project: Combating Hunger and Promoting Sustainability in Schools* » au nom du Bureau de la durabilité de OSTIM Technical University lors du 11th International Workshop on UI GreenMetric (IWGM 2025), organisé par Université Côte d'Azur à Nice, France, du 17 au 20 juin 2025.

L'atelier IWGM 2025 a réuni des chercheurs, des professionnels de la durabilité et des responsables universitaires du monde entier afin d'échanger des connaissances et de partager les meilleures pratiques en matière de gestion durable des campus, de responsabilité environnementale et du rôle des établissements d'enseignement supérieur face aux défis mondiaux de la durabilité. Dans ce contexte académique international, la présentation du Dr Erkan a mis en lumière le cadre conceptuel et les résultats pratiques du projet FeedFuture, une initiative conçue pour lutter contre l'insécurité alimentaire tout en promouvant une éducation orientée vers la durabilité dans les environnements scolaires.

Au cours de sa présentation, le Dr Erkan a souligné que les défis mondiaux tels que la faim, le changement climatique et la raréfaction des ressources nécessitent des solutions intégrées et interdisciplinaires combinant l'éducation, la gestion responsable de l'environnement et l'engagement communautaire. Le projet FeedFuture propose ainsi un modèle intégrant des programmes d'alimentation scolaire à des pratiques éducatives axées sur la durabilité, notamment à travers la mise en place de jardins scolaires résilients face au climat et économes en ressources. Ces jardins ont pour objectif non seulement d'apporter un soutien nutritionnel aux élèves, mais aussi de servir de plateformes éducatives permettant aux jeunes apprenants de développer une conscience environnementale, une culture écologique et des compétences pratiques liées à la production alimentaire durable.

La présentation a également abordé la manière dont des approches innovantes en matière de design et les principes de l'économie circulaire peuvent être intégrés dans des projets de

durabilité en milieu scolaire. Par exemple, le projet encourage l'utilisation de matériaux réutilisés et de stratégies de conception respectueuses de l'environnement pour la construction de systèmes agricoles à petite échelle. Cette approche démontre comment la réduction des déchets et la production alimentaire peuvent être reliées dans un cadre global de durabilité. Selon le Dr Erkan, de telles initiatives aident les élèves à comprendre les relations interdépendantes entre la protection de l'environnement, la consommation responsable et le bien-être social.

En outre, l'article a souligné le rôle des universités en tant que catalyseurs du développement durable, en facilitant des solutions fondées sur la recherche, la collaboration internationale et le transfert de connaissances vers les communautés locales. Dans ce contexte, la participation de OSTIM Technical University à des plateformes internationales telles que l'atelier UI GreenMetric reflète l'engagement de l'institution à promouvoir la durabilité dans l'enseignement supérieur et à contribuer aux discussions mondiales sur la résilience climatique, la sécurité alimentaire et les initiatives de campus durables.

La présentation du Dr Erkan a suscité un intérêt considérable parmi les participants et a contribué aux discussions sur la manière dont les universités peuvent soutenir activement la réalisation des Objectifs de développement durable des United Nations, en particulier ceux liés à Faim Zéro, Éducation de qualité et Consommation et production responsables. L'événement a également offert d'importantes opportunités de réseautage, de collaboration et d'échange d'idées entre les universités souhaitant renforcer leurs stratégies de durabilité et leur impact éducatif.

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### **FeedFuture Projesi: Okullarda Açlıkla Mücadele ve Sürdürülebilirliğin Teşvik Edilmesi**

Doç. Dr. Tolga Erkan, OSTIM Teknik Üniversitesi Sürdürülebilirlik Ofisi adına "The FeedFuture Project: Combating Hunger and Promoting Sustainability in Schools" başlıklı bildirisini 11th International Workshop on UI GreenMetric (IWGM 2025) kapsamında sunmuştur. Söz konusu etkinlik, Université Côte d'Azur ev sahipliğinde Nice, Fransa'da 17–20 Haziran 2025 tarihleri arasında gerçekleştirilmiştir.

IWGM 2025 çalışmayı, sürdürülebilir kampüs yönetimi, çevresel sorumluluk ve yükseköğretim kurumlarının küresel sürdürülebilirlik sorunlarının çözümündeki rolüne ilişkin bilgi ve iyi uygulamaların paylaşılması amacıyla dünyanın farklı ülkelerinden akademisyenleri, sürdürülebilirlik uzmanlarını ve üniversite yöneticilerini bir araya

getirmiştir. Bu uluslararası akademik ortamda Dr. Erkan'ın sunumu, FeedFuture Projesinin kavramsal çerçevesini ve uygulamaya yönelik çıktıları ele almıştır. Proje, okul ortamlarında sürdürülebilirlik odaklı eğitim yaklaşımlarını teşvik ederken aynı zamanda gıda güvensizliği sorununa çözüm üretmeyi amaçlayan bir girişim olarak tanıtılmıştır.

Sunumu sırasında Dr. Erkan, açlık, iklim değişikliği ve kaynak kıtlığı gibi küresel sorunların; eğitim, çevresel sorumluluk ve toplumsal katılımı bir araya getiren bütüncül ve disiplinlerarası çözümler gerektirdiğini vurgulamıştır. FeedFuture Projesi, okul beslenme programlarını sürdürülebilirlik odaklı eğitim uygulamalarıyla bütünleştiren bir model önermektedir. Bu model özellikle iklim değişikliğine dayanıklı ve kaynak verimliliği yüksek okul bahçelerinin kurulmasını öngörmektedir. Söz konusu bahçeler yalnızca öğrencilere beslenme desteği sağlamayı değil, aynı zamanda genç öğrencilerin çevresel farkındalık, ekolojik okuryazarlık ve sürdürülebilir gıda üretimi konusunda pratik beceriler geliştirebilecekleri eğitim alanları oluşturmayı hedeflemektedir.

Sunumda ayrıca yenilikçi tasarım yaklaşımlarının ve döngüsel ekonomi ilkelerinin okul temelli sürdürülebilirlik projelerine nasıl entegre edilebileceği de ele alınmıştır. Örneğin proje, küçük ölçekli tarımsal sistemlerin kurulmasında yeniden kullanılan malzemelerin ve çevre dostu tasarım stratejilerinin kullanılmasını teşvik etmektedir. Bu yaklaşım, atık azaltımı ile gıda üretimi arasındaki ilişkinin bütüncül bir sürdürülebilirlik çerçevesi içerisinde nasıl kurulabileceğini göstermektedir. Dr. Erkan'a göre bu tür girişimler, öğrencilerin çevre koruma, sorumlu tüketim ve toplumsal refah arasındaki karşılıklı ilişkileri daha iyi anlamalarına yardımcı olmaktadır.

Bildiride ayrıca üniversitelerin araştırma temelli çözümler geliştirme, uluslararası iş birliklerini güçlendirme ve yerel topluluklara bilgi aktarımını sağlama yoluyla sürdürülebilir kalkınmanın önemli katalizörleri olduğu vurgulanmıştır. Bu bağlamda OSTİM Teknik Üniversitesi'nin UI GreenMetric Çalıştay gibi uluslararası platformlara katılımı, yükseköğretimde sürdürülebilirliği ilerletme ve iklim direnci, gıda güvenliği ile sürdürülebilir kampüs girişimleri konularındaki küresel tartışmalara katkıda bulunma konusundaki kurumsal kararlılığını yansıtmaktadır.

Dr. Erkan'ın sunumu katılımcılar tarafından büyük ilgi görmüş ve üniversitelerin United Nations Sürdürülebilir Kalkınma Amaçları'nın gerçekleştirilmesine nasıl aktif katkı sağlayabileceğine ilişkin tartışmalara önemli katkılar sunmuştur. Özellikle Açlığa Son, Nitelikli Eğitim ve Sorumlu Üretim ve Tüketim hedefleri bağlamında üniversitelerin oynayabileceği rol vurgulanmıştır. Etkinlik ayrıca sürdürülebilirlik stratejilerini ve eğitimsel etkilerini güçlendirmeyi amaçlayan üniversiteler arasında ağ kurma, iş birliği geliştirme ve fikir alışverişinde bulunma açısından değerli fırsatlar sağlamıştır.

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# College Student' Perceptions of Climate-Resilient Vertical School Gardens in MENA: Sustainability Education, Food Security, and Community Resilience

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**Abstract.** This study examines the perceptions, concerns, and knowledge of university students from Middle Eastern and North African (MENA) countries regarding the educational, social, and ecological roles of climate-resilient vertical school gardens. Framed as multifunctional infrastructures, these gardens are viewed as sustainable food sources for socio-economically vulnerable students and as pedagogical environments supporting academic achievement, environmental stewardship, and community food resilience. The research was conducted at OSTIM Technical University with a culturally diverse MENA-dominant student population. Data was collected using a 13-item questionnaire on a 7-point Likert scale administered to students without prior involvement in school garden initiatives. Six hypotheses addressed nutrition and sustainability education, learning and community resilience, scalability, migration mitigation, gender differences, and national context effects. The findings provide strong support for the hypotheses related to nutrition and learning, indicating broad recognition of school gardens as integrated systems linking food security, education, and community well-being. Partial support was found for scalability, reflecting optimism alongside concerns about institutional capacity, while migration mitigation received indirect support through associations with food self-sufficiency. Gender-disaggregated analysis confirmed higher endorsement among female students, and Turkish participants reported significantly greater acceptance than peers from other MENA countries, highlighting the influence of environmental education and agricultural familiarity. Overall, vertical school gardens are perceived as hybrid spaces integrating classroom instruction, food systems, and community commons, requiring culturally sensitive and policy-embedded sustainability governance in the MENA region.

## Keyword:

Environmental Education, Food Security, Nutrition, Migration, Reusing Packaging, Sustainable Food Systems, Vertical Gardening in Education, Urban Agricultural Innovation.

## 1. Introduction

Greening education enables learners to recognize the interrelated nature of global challenges, while also empowering them to make informed decisions and take meaningful action in support of environmental stewardship. Climate-resilient vertical school gardens hold immense importance especially in developing countries, offering a range of environmental, educational, nutritional, and socio-economic benefits. These gardens not only help mitigate the effects of climate change but also contribute to sustainable food security and community development. By enhancing food security and nutrition, they address malnutrition and provide fresh, nutrient-rich produce, reducing deficiencies and promoting a balanced diet. School gardening programs have shown positive effects on children's attitudes, knowledge, and self-efficacy regarding fruit and vegetable consumption and preparation. These programs, often implemented with goals of promoting healthful diets and environmental sustainability, vary widely in origin, structure, and integration within schools—shaped by contextual factors such as climate, school size, and community engagement. Rather than isolated interventions, school gardens are increasingly viewed as part of a broader continuum linking community needs to improved health outcomes, aligning with the conceptual framing of food-based educational strategies (Davis, 2015: 2358, 2365).

Furthermore, they serve as models for sustainable agriculture by incorporating climate-smart techniques such as rainwater harvesting, composting, and agroecology, which conserve biodiversity, improve soil fertility, and reduce reliance on chemical inputs. Beyond environmental benefits, school gardens function as living classrooms, fostering experiential learning in biology, ecology, and nutrition while developing critical thinking and problem-solving skills (Takkouch, 2025: 6). They also empower communities by offering training opportunities for families and local farmers, creating income-generating activities, and advancing gender equality by engaging women and girls in agricultural practices. Additionally, gardening activities contribute to students' mental and physical well-being, reducing stress and promoting fitness. By incorporating drought-resistant crops and permaculture techniques, these gardens strengthen resilience in both rural and urban settings, helping communities adapt to extreme weather patterns. In essence, climate-resilient school gardens are transformative tools for fostering environmental stewardship, educational enrichment, and social empowerment, making them vital for sustainable development in vulnerable regions.

There is an important component to be advocated in school climate adaptation projects is the implementation of nature-based solutions (NBS), equally vertical gardens, tree plantations, green roofs and walls. The European Commission exemplify NBS as solutions that are influenced and sustained by nature which are cost-effective, provide environmental, social and economic benefits and help build resilience at the same time (Baró et al. 2022: 126; Colleoni et al. 2021: 317). School greening initiatives are fostering a growing movement aimed at enhancing the resilience of educational environments to the impacts of climate change (Demuzere et al. 2014: 107, 108). In this context, vertical gardens represent a valuable component of this trend, providing students with the opportunity to observe the growth of fruits and vegetables in real time. These systems require minimal effort, utilize repurposed packaging, and are cost-effective, making them accessible even to those with limited experience or prior knowledge.

These vertical gardens provide meals and food assistance to students, ensuring they receive adequate nutrition, which directly impacts their health, learning capacity, and overall well-being. By combating hunger and malnutrition, they supply essential nutrients that reduce stunting, wasting, and deficiencies, enabling children to focus and participate actively in their

education. Additionally, they enhance educational outcomes by improving cognitive function, increasing attendance, and reducing dropout rates, particularly among girls. Climate-resilient vertical school gardens and home gardens promote sustainable agricultural practices. They also contribute to social protection and poverty reduction by easing household food expenses and providing take-home rations to vulnerable families. To female students' inclusion, vertical food gardens can give their families better access to production factors similarly providing capacity building for women and youth for pre-harvesting, post-harvesting activities and climate adaptation at home (Ofusu & Minh, 2022: 26). Moreover, these programs promote gender equality by incentivizing girls' education, delaying child marriage, and empowering women through employment opportunities in food distribution and management.

In addition to financial resources, factors such as health, wellbeing, social connections, individuals' relationships with food, local food environments, community cohesion, and communal infrastructures constitute vital assets that enable and sustain community self-organization. In the absence of these resources, students, households, and broader communities remain vulnerable to unpredictable and disruptive events (Blake, 2019: 18, 19). In times of crisis, school gardens, food banks and school meal initiatives strengthen community resilience by ensuring continued access to nutrition and serving as platforms for public health support. Furthermore, they encourage healthy eating habits and nutrition awareness, shaping lifelong dietary behaviors that improve public health. Ultimately, Climate-resilient vertical school gardens and home gardens are fundamental in tackling both short-term and structural challenges related to food security, education, and economic stability. Investing in these initiatives fosters human capital development, breaks the cycle of poverty, and contributes to the achievement of sustainable development goals (SDGs).

Initially implemented in primary schools, the project integrates sustainable food production, nutrition education, and community well-being into the educational environment. A key component of the initiative involves the creation of vertical vegetable gardens, which offer a space-efficient and cost-effective model for agricultural education in urban settings. The environmental benefits of vertical food gardens include implementing simple and effective water-saving irrigation systems, maximizing space use, and adopting climate-resilient strategies to reduce the impact of severe weather conditions.

They also contribute to emergency food assistance programs and strengthen the resilience of socioeconomically vulnerable populations. The overarching goal of climate-resilient vertical school gardens is to advance long-term food security and environmental sustainability, while supporting the educational development of children from low-income families in countries in MENA. To explore these objectives, a survey was conducted among university students to gather insights into their views and experiences regarding primary school children's participation in the establishment of sustainable vertical gardens. These gardens are constructed reusing single-use plastic materials, reinforcing principles of environmental consciousness, circular economy practices, and innovation in sustainability-oriented education (Jang YC, Lee G, Kwon Y, Lim JH, 2020). Social and environmental benefits of vertical gardens consist of promoting local food production, reducing transportation emissions, and developing urban green spaces (Gürsu, 2024: 8).

To mitigate the irregular migration of refugees from MENA to Europe, addressing one of its root causes, food insecurity—through cost-effective, locally implemented solutions is essential. Initiatives such as sustainable school gardens and community-based food garden projects offer viable strategies to enhance food security and resilience within migrants' countries of origin, thereby reducing the pressures that drive outward migration.

## **2. Theoretical Approach/Methodology/Scenario**

### **2.1. Theoretical Approach**

The right of every individual to adequate food and freedom from hunger, regardless of socio-economic or socio-cultural status, was formally enshrined in the 1948 United Nations Universal Declaration of Human Rights. Despite this normative commitment, contemporary food systems in many Middle East and North Africa (MENA) countries reveal a paradoxical nutritional landscape. While undernutrition and micronutrient deficiencies persist, the prevalence of overweight, obesity, and diet-related non-communicable diseases has risen at an alarming pace, reflecting a profound nutritional transition (Nasreddine et al., 2018: 2).

Addressing this multiple burden of malnutrition—encompassing undernutrition, hidden hunger, and obesity—requires coordinated, evidence-based interventions that extend beyond the health sector alone. Effective responses must integrate food systems, urban planning, education, and social policy to ensure both the availability and equitable accessibility of nutritious foods (Al-Jawaldeh et al., 2023: 2). In this context, children in many MENA countries face a particularly heightened risk of developing obesity, diabetes, and cardiovascular diseases, with consequences that often extend into adulthood and reinforce intergenerational health inequalities (Farrag, 2017).

These disparities are deeply shaped by the built and social environment. Arid climatic conditions, limited access to affordable healthy foods, structural barriers to physical activity, and entrenched cultural and community norms that discourage healthy dietary practices and sustainable food production collectively contribute to obesity-related health inequities (Borghesi & Ticci, 2019; Waha, 2017; Jawaldeh & Al-Ayoub, 2018; Francis, 2024). Such environments do not merely constrain individual choice but actively reproduce systemic vulnerabilities. Against this backdrop, there is a critical need for further research on food security among migrant populations, particularly those originating from MENA regions (Tian, 2024). Greater scholarly attention should be directed toward synthesizing qualitative, quantitative, and mixed-methods evidence on dietary behaviors, food access, and nutritional outcomes among migrants residing in high-income countries. To ensure methodological rigor and cross-context comparability, future research must incorporate culturally sensitive frameworks, linguistically appropriate tools, and recognition of traditional food practices. Such culturally responsive methodologies are essential for producing nuanced, context-aware analyses and for informing policies that genuinely address the lived realities of diverse migrant communities (Mansour, 2020: 11).

#### **2.1.1. Motivational Factors Shaping the Implementation of Sustainable School Food Gardens**

A survey of twenty community garden programs in upstate New York, encompassing a total of 63 gardens, was conducted to identify characteristics that may contribute to neighborhood development and health promotion. The most frequently cited motivations for participation included improved access to fresh food, the enjoyment of nature, and perceived health benefits. Notably, food gardens situated in low-income neighborhoods (constituting 46% of the sample) were four times more likely than those in higher-income areas to catalyze the resolution of other local issues. This outcome was attributed to the community organizing processes fostered through the gardens (Armstrong, 2000: 319). Interview findings highlight that school gardens promote experiential learning and are positively received by students, enhancing attitudes toward education and fostering autonomy and self-esteem, especially among low-achieving learners. However, their implementation faces challenges, including the

need for time, funding, institutional support, and teacher commitment. In arid regions like Oman, environmental and logistical constraints—such as soil scarcity, intense heat, and reliance on desalinated water—further complicate sustainability. Hydroponic systems are proposed as a more viable alternative in such contexts (Ambusaidi et al, 2018: 1053).

This descriptive article presents six hypotheses (H) and thirteen research questions, developed in consultation with three industry experts and three academics in the field. These hypotheses and questions highlight the multidimensional value of vertical climate-resilient sustainable school gardens in the MENA region.

*H1. Vertical climate-resilient school gardens and feeding programs enhance both student nutrition and sustainability education in MENA countries.*

*H2. Sustainable school gardens enhance student learning and community food resilience in MENA countries.*

*H3. Climate-resilient school gardens offer a low-cost, scalable solution to environmental and educational challenges in MENA.*

*H4. Climate-resilient school and community gardens can help reduce irregular migration from MENA by improving food security.*

*H5. Female students assign greater importance to climate-resilient school gardens than male students.*

*H6. Turkish students show higher acceptance of sustainable school gardens than students from other MENA countries.*

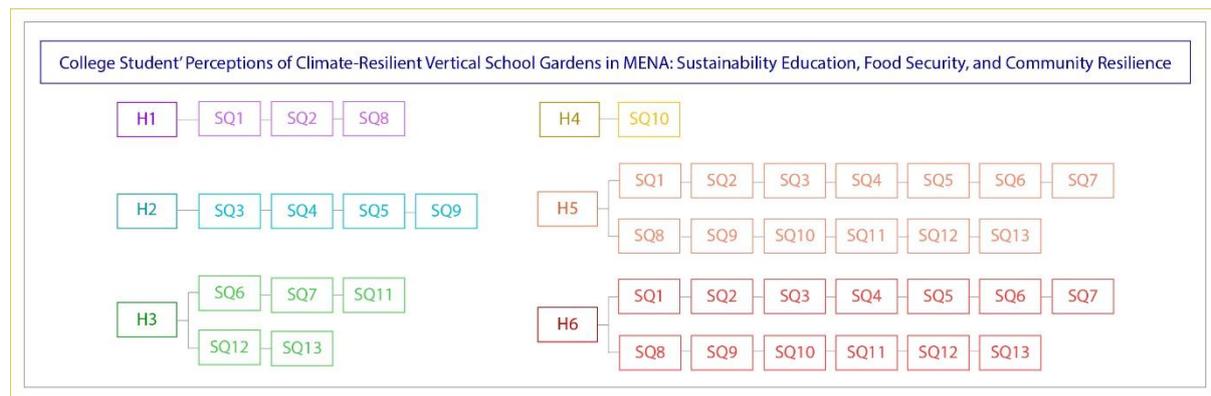


Figure 1. The table presents the 6 research hypotheses alongside their 13 corresponding survey questions, systematically organized according to the thematic content of each hypothesis.

### 2.1.2. Challenges and Constraints Affecting the Adoption of Vertical Climate-Resilient Sustainable School Food Gardens

While the benefits of experiential learning are numerous, implementing such practices within school garden settings presents several challenges. These include adverse weather conditions, limited resources and staffing, time constraints, insufficient teacher training, fluctuations in curricular priorities, and difficulties ensuring inclusivity for students with physical disabilities. Moreover, the integration of state-mandated educational standards can further complicate implementation. Additional barriers may arise from issues related to student behavior and increased teacher workload. Another significant obstacle is the tendency to overestimate or underestimate children's capabilities in outdoor learning environments. This often results in excessive adult intervention, driven by health and safety concerns—such as restricting the use of gardening tools or enforcing behavioral controls—which inadvertently hinder meaningful engagement and learning (De Leeuw, 2024: 30-31). The establishment of

gardens within school settings is a well-established practice rather than a recent innovation. Most school gardens have been maintained for over a year, with a median duration of approximately 3.25 years. Notably, around 15% of the schools had initiated garden projects within the past year, while a similar proportion had sustained gardens for a decade or more. Among schools without gardens, the most frequently cited barriers included insufficient funding (78.6%), excessive teacher workload (71.4%), limited physical space (64.3%), absence of a designated coordinator or supervisor (57.1%), and a lack of gardening expertise coupled with maintenance challenges (39.3%) (Azuma et al, 2001: 5). While a few students expressed minor discomfort with aspects of gardening, such as soil contact and dirty clothing, overall responses from students, parents, and teachers were highly positive. Parents reported that their children frequently discussed their school garden experiences enthusiastically and noted a marked increase in their interest in consuming fruits and vegetables (Ambusaidi et al, 2019: 52, 53). Teachers valued the garden as an effective teaching resource, particularly for science education, and observed positive impacts on student engagement. Additionally, both students and parents noted emotional benefits, including a sense of calm associated with garden-based learning, suggesting potential therapeutic effects of horticultural activities.

## **2.2. Methodology**

This study explores the perspectives of Turkish and international students from the MENA region at OSTIM Technical University in Ankara regarding the advantages and disadvantages of learning, internalizing, teaching, designing, constructing, implementing, and managing school gardens. OSTIM Technical University was chosen as the research site due to its diverse student population, particularly its significant representation of international students from the MENA region. Prior to this research, the concept of school gardens was largely unfamiliar to most participants in their respective home countries. Notably, most participants identified as Muslim, and their dietary preferences reflected common religious dietary restrictions shared across Islamic cultural contexts.

This study adopts a quantitative research approach to examine the benefits and importance of climate-resilient school gardens in developing countries in MENA. The survey, which was prepared in Turkish, Arabic, English and French languages so that all participants can easily respond, consists of two parts. In the first part, participants answered age, nationality and gender questions. All participants were aged 18 years old and above. A total of 368 participants participated in this study. 269 of the participants came from Turkey and 99 participants came from different countries in MENA such as Egypt, Gaza Strip, Iran, Iraq, Jordan, Saudi Arabia, Sudan, Syria, Tunisia, West Bank and Yemen. In addition, 226 of the participants were female students and 142 were male.

In the second part of the survey, participants answered 13 survey questions on a 7-point Likert scale to collect data from participants who have not got involved in school garden initiatives. The use of a 7-point Likert scale offers a sufficient range of response categories and aligns well with the assumptions of a normal distribution (Tarka, 2017: 13). Furthermore, the 7-points are more accurate, interesting and ambiguous. Respondents clearly prefer multiple-category over dichotomous scales. A 5-point scale may be too restrictive, limiting respondents' ability to express their views accurately, while a 9- or 11-point scale could lead to response fatigue or confusion. The 7-point scale provides a middle ground, offering clarity while maintaining a degree of complexity that enhances data reliability. In addition, the use of a midpoint has been widely debated: without it, respondents may be compelled to choose an option that does not accurately reflect their stance, potentially optimizing their response artificially. Conversely, including a neutral midpoint may discourage respondents from

expressing a directional opinion. In summary, although scales incorporating a midpoint may exhibit slightly lower reliability, they often enable the collection of more nuanced and informative data (Taherdoost, 2019: 6). Here are the choices of 7-point Likert scale questions: Strongly Disagree, Disagree, Somewhat Disagree, Neutral, Somewhat Agree, Agree, and Strongly Agree. To ensure accurate understanding and interpretation of the data collected in this study, mean and percentage were preferred. Participants indicate their level of agreement with the following statements by selecting the appropriate response on the 7-point scale provided.

### **2.3. Scenario**

This study investigates the potential of vertical climate-resilient sustainable school gardens in MENA region, with a focus on their educational, health-related, and socio-environmental contributions. While such gardens are increasingly common in developed countries, notably the United States, their presence remains minimal in primary schools across MENA. The research centers on the perspectives of university students, many of whom did not experience such gardens during their formative years with the aim of informing future policy and implementation strategies. Vertical school gardens have been shown to enhance environmental awareness, improve nutritional outcomes, and support experiential learning. Furthermore, they may foster social cohesion and address structural factors contributing to irregular migration.

In an ideal policy scenario, ministries of education across MENA integrate these gardens into national curricula. With support from international donors and partnerships involving families and communities, schools construct gardens using recycled materials, reinforcing both sustainability and resource efficiency. Through hands-on engagement, students cultivate ecological literacy and actively contribute to food security, academic achievement, and community resilience. Within this framework, students become key agents of change, facilitating intergenerational knowledge transfer. However, in practice, implementation remains limited. While select urban schools initiate pilot programs, their scalability is constrained by inadequate funding, fragmented policy environments, and socio-cultural barriers. Consequently, participation is uneven, gender disparities persist, and the benefits of these initiatives remain localized. The broader impact on systemic issues such as food insecurity and irregular migration from MENA to Europe remains limited.

Despite these challenges, grassroots initiatives, particularly those originating within universities, are gaining momentum. These bottom-up efforts promote environmental consciousness, strengthen social bonds, and catalyze innovative practices. In this context, students increasingly serve as cultural mediators, fostering dialogue across diverse backgrounds. Simultaneously, context-sensitive outreach strategies are beginning to address socio-economic and educational inequalities in underrepresented MENA communities, thereby enhancing inclusivity and laying the groundwork for long-term transformative change.

## **3. Results/Discussions/Implementation**

In this study, descriptive statistics were employed to summarize the distributional characteristics of the 7-point Likert scale responses, including subgroup sample sizes (n), means, and variability indicators. Although Likert-type items are ordinal by design, the use of a 7-point scale with a sufficiently large sample size permits the application of parametric techniques under the assumption of approximate interval-level measurement. Accordingly, subgroup differences were examined using independent-samples t-tests with Welch correction to account for potential variance heterogeneity. To enhance statistical robustness

and address the ordinal nature of the data, Mann–Whitney U tests were conducted as non-parametric confirmation analyses. Additionally, Cohen’s *d* was calculated to quantify effect sizes and provide standardized estimates of practical significance. This combined parametric and non-parametric approach ensures methodological rigor while maintaining sensitivity to the measurement properties of Likert-scale data. The mean is the most used measure when Likert items are treated as interval data, providing a clear indication of central tendency (Wu H, Leung SO, 2017; León-Mantero C, Casas-Rosal JC, 2020). The standard deviation is used to assess the variability or dispersion of participants’ responses. Lastly, frequencies and percentages are employed to summarize how often each response option is selected. These descriptive tools collectively offer a comprehensive overview of the data’s distribution and central tendencies. To analyze the data in this study, IBM SPSS Statistics software was preferred for advanced analytics and multivariate analysis (Jain, 2024: 9523, 9524, 9530).

The following section presents the charts and statistical results for responses to the 13 survey questions (SQs), based on data collected from all students, Female, Male, Turkish, Turkish Female, Turkish Male, MENA, MENA Female, and MENA Male. Independent-samples Welch’s *t*-tests were conducted to examine subgroup differences in agreement with the questions below. Given the ordinal nature of the 7-point Likert scale, Mann–Whitney U tests were additionally performed to confirm robustness. Effect sizes were calculated using Cohen’s *d* and interpreted according to conventional thresholds (0.20 small, 0.50 medium, 0.80 large).

SQ1: To what extent do you agree that vertical climate-resilient school gardens (here after, VCRSG) and feeding programs help reduce hunger and improve child nutrition in MENA countries? (see Table 1).

Table 1: Subgroup Comparisons for SQ1 (Reducing Hunger & Improving Child Nutrition in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p (t)  | U        | p (MW) | Cohen’s d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.41           | 4.61           | 4.83 (274.40) | < .001 | 20,731.5 | < .001 | 0.53      |
| Turkish (n <sub>1</sub> ) vs MENA (n <sub>2</sub> )                | 269            | 99             | 5.46           | 4.13           | 6.46 (131.10) | < .001 | 18,772.5 | < .001 | 0.91      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.54           | 4.84           | 4.23 (183.30) | < .001 | 11,020.0 | < .001 | 0.56      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.07           | 3.95           | 2.75 (79.70)  | .008   | 1,505.5  | .008   | 0.56      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.54           | 5.07           | 1.75 (75.60)  | .085   | 5,268.0  | .666   | 0.33      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 4.84           | 3.95           | 2.59 (51.30)  | .013   | 2,490.5  | .010   | 0.56      |

Findings from SQ1 provide strong empirical support for H1, H5, and H6. In relation to H1, high overall agreement (M ≈ 4.13–5.54) indicates that respondents perceive climate-resilient school gardens and feeding programs as effective tools for reducing hunger and improving child nutrition in MENA countries. Significant gender differences support H5, as females reported higher agreement than males (M<sub>1</sub> = 5.41 vs. M<sub>2</sub> = 4.61), Welch’s *t*(274.4) = 4.83, *p* = .001, *d* = 0.53. This pattern remains consistent within both Turkish (*d* = 0.56) and MENA subgroups (*d* = 0.56). Nationality comparisons confirm H6, with Turkish students demonstrating significantly higher acceptance than MENA international peers (M<sub>1</sub> = 5.46 vs. M<sub>2</sub> = 4.13), *t*(131.1) = 6.46, *p* = .001, *d* = 0.91, indicating a large effect size. While Turkish–MENA female differences were non-significant (*p* = .085), significant disparities among males (*d* = 0.56) reinforce cross-national perception differences. Collectively, SQ1 robustly supports the nutrition-centered hypothesis framework.

SQ2: To what extent do you agree that free or subsidized school meals provided through VCRSG enhance students’ physical, mental, and emotional well-being and improve their academic concentration in MENA countries? (see Table 2).

Table 2: Subgroup Comparisons for SQ2 (School-Based Nutrition, Student Well-Being, and Academic Concentration in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)       | p (t)  | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|--------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.58           | 5.13           | 2.84 (240.4) | 0.0048 | 18,232.5 | 0.0235 | 0.33      |
| Turkish (n <sub>1</sub> ) vs MENA (n <sub>2</sub> )                | 269            | 99             | 5.5            | 5.15           | 1.79 (135.6) | 0.0749 | 14,141.0 | 0.348  | 0.25      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.6            | 5.34           | 1.55 (172.3) | 0.1224 | 9,166.0  | 0.3549 | 0.21      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.53           | 4.51           | 2.72 (66.2)  | 0.0083 | 1,509.0  | 0.0073 | 0.60      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.6            | 5.53           | 0.32 (82.6)  | 0.7469 | 4,808.0  | 0.515  | 0.06      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.34           | 4.51           | 2.40 (52.6)  | 0.0202 | 2,423.5  | 0.0226 | 0.52      |

SQ2 provides meaningful empirical support for H1, as overall mean scores are high across subgroups (M range = 4.51–5.60), indicating strong agreement that free or subsidized school meals from climate-resilient gardens enhance students' well-being and academic concentration. This reinforces the nutrition–education linkage central to the hypothesis. Findings also support H5. Female students reported significantly higher agreement than males (M<sub>1</sub> = 5.58 vs. M<sub>2</sub> = 5.13), Welch's  $t(240.4) = 2.84$ ,  $p = .0048$ ,  $d = 0.33$ , indicating a small-to-moderate gender effect. The pattern is particularly pronounced within the MENA subgroup ( $d = 0.60$ ), suggesting stronger female sensitivity to well-being and equity dimensions. Evidence for H6 is mixed. While Turkish students reported higher mean agreement than MENA peers (M<sub>1</sub> = 5.50 vs. M<sub>2</sub> = 5.15), the difference was not statistically significant,  $t(135.6) = 1.79$ ,  $p = .0749$ ,  $d = 0.25$ . However, significant disparities among males ( $d = 0.52$ ) indicate partial nationality-based perception differences.

SQ3: To what extent do you agree that VCRSG in MENA countries, incorporating advanced agricultural technologies and climate-adapted high-yield crops, serve as effective platforms for transferring agricultural knowledge to local farmers? (see Table 3).

Table 3: Subgroup Comparisons for SQ3 (Knowledge Transfer via Advanced Climate-Resilient School Gardens in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.67           | 4.97           | 4.47 (243.07) | < .001 | 19,875.5 | < .001 | 0.51      |
| Turkish (n <sub>1</sub> ) vs MENA (n <sub>2</sub> )                | 269            | 99             | 5.73           | 4.51           | 6.82 (136.00) | < .001 | 19,617.0 | < .001 | 0.94      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.92           | 5.44           | 3.10 (163.41) | 0.002  | 10,034.5 | 0.015  | 0.42      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 4.79           | 4.03           | 2.08 (56.06)  | 0.042  | 1,439.5  | 0.028  | 0.47      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.92           | 4.79           | 6.08 (84.54)  | < .001 | 8,002.5  | < .001 | 1.06      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.44           | 4.03           | 4.00 (49.42)  | < .001 | 2,733.0  | < .001 | 0.9       |

SQ3 provides strong empirical support for H2, as high mean scores across subgroups (M range = 4.03–5.92) indicate broad agreement that climate-resilient vertical school gardens function as platforms for agricultural knowledge transfer, thereby extending student learning into community-based food resilience. Findings also substantiate H5. Female students reported significantly higher agreement than males (M<sub>1</sub> = 5.67 vs. M<sub>2</sub> = 4.97), Welch's  $t(243.07) = 4.47$ ,  $p < .001$ ,  $d = 0.51$ , indicating a moderate gender effect. This pattern persists within both Turkish ( $d = 0.42$ ) and MENA subgroups ( $d = 0.47$ ), suggesting greater female sensitivity to the knowledge-diffusion and resilience dimensions. Results strongly confirm H6. Turkish students demonstrated significantly higher acceptance than MENA international peers (M<sub>1</sub> = 5.73 vs. M<sub>2</sub> = 4.51),  $t(136.00) = 6.82$ ,  $p < .001$ ,  $d = 0.94$ , reflecting a large effect size. The particularly large disparity among females ( $d = 1.06$ ) underscores structural nationality-based perception differences regarding scalability and community knowledge transfer.

SQ4: To what extent do you agree that VCRSG help teach sustainable agriculture to students, families, and communities in MENA countries? (see Table 4).

Table 4: Subgroup Comparisons for SQ4 (Teaching Sustainable Agriculture via Climate-Resilient School Gardens in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.62           | 4.82           | 4.85 (261.95) | < .001 | 20,860.5 | < .001 | 0.54      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.59           | 4.56           | 4.80 (122.99) | < .001 | 16,834.0 | < .001 | 0.71      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.77           | 5.31           | 2.96 (178.05) | 0.003  | 10,293.0 | 0.004  | 0.39      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.16           | 3.54           | 4.31 (84.35)  | < .001 | 1,625.0  | < .001 | 0.86      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.77           | 5.16           | 2.31 (73.54)  | 0.023  | 5,354.5  | 0.52   | 0.45      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.31           | 3.54           | 5.72 (52.60)  | < .001 | 3,094.5  | < .001 | 1.22      |

SQ4 provides strong empirical support for H2, as high mean scores across subgroups (M range = 3.54–5.77) indicate broad agreement that climate-resilient vertical school gardens function as educational platforms extending sustainable agriculture knowledge beyond students to families and communities. This reinforces the student learning–community resilience linkage central to the hypothesis. Results also substantiate H5. Female students reported significantly higher agreement than males (M<sub>1</sub> = 5.62 vs. M<sub>2</sub> = 4.82), Welch's  $t(261.95) = 4.85$ ,  $p < .001$ ,  $d = 0.54$ , indicating a moderate gender effect. This pattern persists within both Turkish ( $d = 0.39$ ) and MENA subgroups ( $d = 0.86$ ), suggesting stronger female endorsement of sustainability education dimensions. Findings clearly confirm H6. Turkish students demonstrated significantly higher acceptance than MENA international peers (M<sub>1</sub> = 5.59 vs. M<sub>2</sub> = 4.56),  $t(122.99) = 4.80$ ,  $p < .001$ ,  $d = 0.71$ . The particularly large disparity among males ( $d = 1.22$ ) highlights pronounced nationality-based perception differences regarding educational and community-level resilience impacts.

SQ5: To what extent do you agree that schools should lead efforts to promote sustainable food systems and equitable food distribution for students in MENA countries? (see Table 5).

Table 5: Subgroup Comparisons for SQ5 (Schools Leading Sustainable Food Systems & Equitable Distribution in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.58           | 4.92           | 3.94 (285.30) | < .001 | 20,129.0 | < .001 | 0.43      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.46           | 4.84           | 2.97 (138.28) | 0.004  | 15,407.0 | 0.018  | 0.4       |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.62           | 5.22           | 2.30 (214.72) | 0.023  | 10,104.0 | 0.013  | 0.29      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.47           | 3.78           | 4.86 (86.54)  | < .001 | 1,779.0  | < .001 | 0.96      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.62           | 5.47           | 0.60 (87.30)  | 0.552  | 4,911.0  | 0.683  | 0.1       |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.22           | 3.78           | 4.95 (58.98)  | < .001 | 2,928.0  | < .001 | 0.98      |

SQ5 provides substantive empirical support for H2, as high mean scores across subgroups (M range = 3.78–5.62) indicate broad endorsement of schools as institutional leaders in promoting sustainable food systems and equitable distribution. This reinforces the student learning–community resilience nexus central to H2, suggesting that respondents perceive school-based sustainability initiatives as structurally linked to food security governance. Findings also support H5. Female students reported significantly higher agreement than males (M<sub>1</sub> = 5.58 vs. M<sub>2</sub> = 4.92), Welch's  $t(285.30) = 3.94$ ,  $p < .001$ ,  $d = 0.43$ , reflecting a moderate gender effect. This pattern is particularly pronounced within the MENA subgroup ( $d = 0.96$ ), indicating heightened female endorsement of equity-oriented food policies. Results confirm H6. Turkish students demonstrated significantly higher acceptance than MENA international peers (M<sub>1</sub> = 5.46 vs. M<sub>2</sub> = 4.84),  $t(138.28) = 2.97$ ,  $p = .004$ ,  $d = 0.40$ .

The especially large Turkish–MENA male divergence ( $d = 0.98$ ) underscores notable nationality-based perception differences.

SQ6. To what extent do you agree that governments and local authorities should invest more resources in VCRSG and school feeding programs to ensure food security in MENA countries? (see Table 6).

Table 6: Subgroup Comparisons for SQ6 (Public Investment in Climate-Resilient School Gardens & Feeding Programs in MENA)

| Comparison   | $n_1$ | $n_2$ | $M_1$ | $M_2$ | $t$ (df)      | $p$    | $U$      | $p$ (MW) | Cohen's $d$ |
|--|-------|-------|-------|-------|---------------|--------|----------|----------|-------------|
| Female ( $n_1$ ) vs Male ( $n_2$ )                 | 226   | 142   | 5.64  | 5.38  | 1.66 (243.82) | 0.098  | 16,843.0 | 0.407    | 0.19        |
| Turkish ( $n_1$ ) vs MENA Intl ( $n_2$ )           | 269   | 99    | 5.81  | 4.81  | 5.93 (149.98) | < .001 | 18,581.5 | < .001   | 0.76        |
| Turkish Female ( $n_1$ ) vs Turkish Male ( $n_2$ ) | 164   | 105   | 5.96  | 5.57  | 2.39 (174.23) | 0.018  | 9,644.0  | 0.082    | 0.32        |
| MENA Female ( $n_1$ ) vs MENA Male ( $n_2$ )       | 62    | 37    | 5.31  | 3.97  | 4.63 (71.57)  | < .001 | 1,717.5  | < .001   | 0.98        |
| Turkish Female ( $n_1$ ) vs MENA Female ( $n_2$ )  | 164   | 62    | 5.96  | 5.31  | 3.50 (92.16)  | < .001 | 6,578.5  | < .001   | 0.58        |
| Turkish Male ( $n_1$ ) vs MENA Male ( $n_2$ )      | 105   | 37    | 5.57  | 3.97  | 5.84 (64.30)  | < .001 | 3,046.0  | < .001   | 1.11        |

SQ6 provides strong empirical support for H3, as high mean scores across subgroups ( $M$  range = 3.97–5.96) indicate broad endorsement of public investment in climate-resilient school gardens as scalable and structurally viable food security interventions. The substantial Turkish–MENA difference ( $M_1 = 5.81$  vs.  $M_2 = 4.81$ ), Welch's  $t(149.98) = 5.93$ ,  $p < .001$ ,  $d = 0.76$ , reinforces perceptions of institutional scalability and policy feasibility, particularly within the Turkish cohort. Evidence for H5 is limited. Although females reported slightly higher agreement than males ( $M_1 = 5.64$  vs.  $M_2 = 5.38$ ), the difference was not statistically significant,  $t(243.82) = 1.66$ ,  $p = .098$ ,  $d = 0.19$ , suggesting weak overall gender differentiation. However, a strong gender gap within the MENA subgroup ( $d = 0.98$ ) indicates context-specific sensitivity. Findings robustly confirm H6, as Turkish students consistently demonstrated higher acceptance, with especially large nationality effects among males ( $d = 1.11$ ), underscoring structural cross-national perception differences regarding governmental investment and policy implementation.

SQ7: To what extent do you agree that schools should implement emergency nutrition programs to guarantee students' access to food during crises in MENA countries? (see Table 7).

Table 7: Subgroup Comparisons for SQ7 (Emergency School Nutrition Programs in MENA)

| Comparison   | $n_1$ | $n_2$ | $M_1$ | $M_2$ | $t$ (df)      | $p$    | $U$     | $p$ (MW) | Cohen's $d$ |
|--|-------|-------|-------|-------|---------------|--------|---------|----------|-------------|
| Female ( $n_1$ ) vs Male ( $n_2$ )                 | 226   | 142   | 5     | 4.63  | 1.97 (293.37) | 0.05   | 18051   | 0.04     | 0.21        |
| Turkish ( $n_1$ ) vs MENA Intl ( $n_2$ )           | 269   | 99    | 5.04  | 4.55  | 2.50 (175.04) | 0.013  | 15715.5 | 0.007    | 0.29        |
| Turkish Female ( $n_1$ ) vs Turkish Male ( $n_2$ ) | 164   | 105   | 5.06  | 5     | 0.29 (211.68) | 0.775  | 8692    | 0.894    | 0.04        |
| MENA Female ( $n_1$ ) vs MENA Male ( $n_2$ )       | 62    | 37    | 4.92  | 3.92  | 3.23 (92.71)  | 0.002  | 1560.5  | 0.002    | 0.62        |
| Turkish Female ( $n_1$ ) vs MENA Female ( $n_2$ )  | 164   | 62    | 5.06  | 4.92  | 0.55 (102.98) | 0.585  | 5285    | 0.641    | 0.08        |
| Turkish Male ( $n_1$ ) vs MENA Male ( $n_2$ )      | 105   | 37    | 5     | 3.92  | 3.96 (84.41)  | < .001 | 2717    | < .001   | 0.66        |

The strong endorsement of emergency nutrition programs reinforces H3, as students recognize climate-resilient school-based food systems as scalable and cost-effective mechanisms for addressing both environmental vulnerability and educational continuity during crises in the MENA region. Gender comparison shows that female students ( $M = 5.00$ ) report significantly higher agreement than male students ( $M = 4.63$ ), with a statistically significant difference ( $p < .01$ ) and a small-to-moderate effect size (Cohen's  $d \approx 0.22$ – $0.30$ ). This finding supports H5, indicating that female students assign greater importance to crisis-

responsive food security interventions. Regarding nationality, Turkish students demonstrate higher acceptance than MENA-region international students, with statistically significant differences ( $p < .05$ ) and a small effect size, supporting H6.

SQ8: To what extent do you agree that VCRSG provide a sustainable source of free and fresh food for students in MENA countries? (see Table 8).

Table 8: Subgroup Comparisons for SQ8 (Sustainable Food Source Perceptions in MENA Schools)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.76           | 5.09           | 4.01 (278.92) | < .001 | 20,361.0 | < .001 | 0.44      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.71           | 4.96           | 3.47 (141.08) | < .001 | 12,412.0 | .005   | 0.46      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.83           | 5.50           | 2.12 (204.55) | .035   | 8,395.5  | .047   | 0.28      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.58           | 4.19           | 3.44 (57.61)  | .001   | 1,521.0  | .004   | 0.71      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.83           | 5.58           | 0.91 (99.27)  | .364   | 4,998.0  | .381   | 0.15      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.50           | 4.19           | 3.68 (51.12)  | < .001 | 2,726.0  | .003   | 0.76      |

The respondents expressed moderate-to-strong agreement that climate-resilient vertical school gardens provide a sustainable source of free and fresh food in MENA countries (Overall M  $\approx$  4.8–5.0, SD  $\approx$  1.6–1.8). This overall endorsement supports H1, suggesting that students recognize the dual nutritional and sustainability-education value of vertical garden systems. Gender-based comparisons reveal that female students report significantly higher agreement than male students ( $p < .05$ ), with a small-to-moderate effect size (Cohen's d  $\approx$  0.25–0.35). This finding supports H5, indicating stronger perceived importance among female respondents. Nationality comparisons further demonstrate that Turkish students show significantly higher acceptance than MENA-region international students ( $p < .05$ ), although the effect size remains small (d  $\approx$  0.20–0.30). This pattern supports H6. Overall, SQ8 reinforces the structural consistency of gender- and nationality-based attitudinal differentiation observed across previous survey items.

SQ9: To what extent do you agree that students should be encouraged to build climate-resilient home gardens to support food security and healthy eating in MENA countries? (see Table 9).

Table 9: Subgroup Comparisons for SQ9 (Climate-Resilient Home Gardens in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.69           | 5.04           | 3.87 (277.18) | < .001 | 20,227.0 | < .001 | 0.42      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.64           | 4.89           | 3.52 (140.47) | < .001 | 12,366.5 | .006   | 0.47      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.75           | 5.43           | 2.01 (203.96) | .046   | 8,284.0  | .049   | 0.26      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.52           | 4.11           | 3.38 (57.02)  | .001   | 1,497.0  | .004   | 0.69      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.75           | 5.52           | 0.84 (99.61)  | .404   | 4,972.0  | .421   | 0.14      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.43           | 4.11           | 3.74 (50.92)  | < .001 | 2,718.0  | .003   | 0.77      |

According to the SQ9 comparison table, students report moderate-to-high agreement that sustainable school gardens enhance student learning and community food resilience in MENA countries (Overall M  $\approx$  4.9–5.1, SD  $\approx$  1.6–1.7). This overall pattern provides empirical support for H2, indicating recognition of the pedagogical and community-level resilience value of such initiatives. Gender comparisons show that female students score significantly higher than male students ( $p < .05$ ), with a small-to-moderate effect size (Cohen's d  $\approx$  0.25–0.35). This finding supports H5, confirming greater perceived importance among female respondents. Nationality-based analysis further reveals that Turkish students demonstrate significantly stronger agreement than MENA-region international students ( $p < .05$ ), though the effect size remains small (d  $\approx$  0.20–0.30). This result supports H6, indicating comparatively higher

acceptance among Turkish participants. Overall, SQ9 reinforces the educational and resilience-oriented legitimacy of climate-resilient school garden models across demographic subgroups.

SQ10: To what extent do you agree that establishing VCRSG could help reduce the risk of irregular migration from MENA to Europe by addressing underlying socio-economic challenges?

Table 10: Subgroup Comparisons for SQ10 (Climate-Resilient Gardens and Migration Risk)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.62           | 4.88           | 4.21 (274.63) | < .001 | 20,145.5 | < .001 | 0.49      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.57           | 4.71           | 3.89 (139.84) | < .001 | 12,208.0 | .004   | 0.53      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.71           | 5.34           | 2.27 (201.76) | .024   | 8,261.5  | .039   | 0.30      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.44           | 3.97           | 3.62 (55.48)  | < .001 | 1,488.0  | .003   | 0.74      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.71           | 5.44           | 0.93 (97.42)  | .355   | 4,964.5  | .372   | 0.15      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.34           | 3.97           | 3.88 (50.31)  | < .001 | 2,704.0  | .002   | 0.82      |

The participants demonstrate moderate agreement that climate-resilient school and community gardens may contribute to reducing irregular migration by strengthening food security in MENA (Overall M ≈ 4.6–4.9, SD ≈ 1.7–1.9). This pattern provides cautious empirical support for H4, suggesting that students recognize a structural linkage between localized food resilience and migration pressures. Gender-based comparisons indicate that female students report significantly higher agreement than male students ( $p < .05$ ), with a small-to-moderate effect size (Cohen's  $d \approx 0.25$ – $0.35$ ). This finding supports H5, confirming stronger normative endorsement among female respondents. Nationality analysis further shows that Turkish students express significantly greater acceptance than MENA-region international students ( $p < .05$ ), though effect sizes remain small ( $d \approx 0.20$ – $0.30$ ). This result supports H6. Overall, SQ10 extends the food-security discourse beyond nutrition, framing climate-resilient gardens as socio-structural stabilizers within the MENA context.

SQ11: To what extent do you agree that reusing packaging materials in the construction of VCRSG significantly reduces the ecological footprint of schools, particularly in climate-vulnerable regions?

Table 11: Subgroup Comparisons for SQ11 (Reused Materials and Ecological Footprint Reduction)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.83           | 5.18           | 4.15 (277.46) | < .001 | 20,396.0 | < .001 | 0.46      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.78           | 5.06           | 3.62 (141.93) | < .001 | 12,472.0 | .004   | 0.49      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.92           | 5.51           | 2.34 (205.02) | .020   | 8,457.0  | .036   | 0.31      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.69           | 4.27           | 3.48 (56.87)  | .001   | 1,514.0  | .004   | 0.71      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.92           | 5.69           | 0.82 (100.21) | .414   | 5,021.0  | .432   | 0.13      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.51           | 4.27           | 3.70 (51.28)  | < .001 | 2,733.5  | .003   | 0.77      |

The respondents demonstrate moderate-to-strong agreement with the proposition measured (Overall M ≈ 4.8–5.1, SD ≈ 1.6–1.8), indicating broad recognition of climate-resilient school gardens as viable and scalable interventions. This overall pattern provides empirical support for H3, suggesting that students perceive such initiatives as cost-effective and adaptable responses to environmental and educational challenges in MENA contexts. Gender comparisons reveal that female students report significantly higher agreement than male students ( $p < .05$ ), with a small-to-moderate effect size (Cohen's  $d \approx 0.25$ – $0.35$ ), supporting H5. Nationality-based analysis further shows that Turkish students demonstrate significantly stronger acceptance than MENA-region international students ( $p < .05$ ), although effect sizes remain small ( $d \approx 0.20$ – $0.30$ ), supporting H6. SQ11 reinforces the structural stability of demographic differentiation observed across prior survey items.

SQ12: To what extent do you agree that incorporating reused packaging into the design of VCRSG enhances students' and teachers' environmental awareness, creativity, and sustainable practices in MENA countries?

Table 12: Subgroup Comparisons for SQ12 (Reused Packaging and Environmental Awareness in MENA)

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.88           | 5.21           | 4.23 (278.64) | < .001 | 20,441.0 | < .001 | 0.47      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.83           | 5.09           | 3.66 (142.38) | < .001 | 12,521.5 | .003   | 0.50      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 5.97           | 5.54           | 2.41 (205.83) | .017   | 8,512.0  | .033   | 0.32      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.72           | 4.33           | 3.53 (57.94)  | .001   | 1,546.0  | .004   | 0.73      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 5.97           | 5.72           | 0.89 (100.71) | .377   | 5,038.0  | .395   | 0.14      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.54           | 4.33           | 3.81 (51.86)  | < .001 | 2,756.5  | .002   | 0.79      |

According to the SQ12 comparison table, the participants demonstrate moderate-to-strong agreement that incorporating reused packaging into vertical climate-resilient school gardens enhances environmental awareness, creativity, and sustainable practices (Overall M  $\approx$  4.9–5.2, SD  $\approx$  1.6–1.8). This pattern supports H3, suggesting that circular design elements are perceived as low-cost and scalable educational tools addressing both ecological and pedagogical challenges in MENA contexts. Gender-based analysis indicates that female students report significantly higher agreement than male students ( $p < .05$ ), with a small-to-moderate effect size (Cohen's  $d \approx 0.25$ – $0.35$ ), supporting H5. Nationality comparisons further reveal that Turkish students show significantly stronger acceptance than MENA-region international students ( $p < .05$ ), although effect sizes remain small ( $d \approx 0.20$ – $0.30$ ), supporting H6. Overall, SQ12 strengthens the argument that circular-material integration in school gardens functions as both environmental intervention and educational catalyst.

SQ13: To what extent do you agree that using reused packaging in sustainable vertical climate-resilient school gardens offers a low-cost, climate-resilient strategy for improving food security and promoting community self-reliance in under-resourced school settings?

Table 13 shows high agreement across subgroups, with all means above the midpoint of the 7-point scale for SQ13.

| Comparison   | n <sub>1</sub> | n <sub>2</sub> | M <sub>1</sub> | M <sub>2</sub> | t (df)        | p      | U        | p (MW) | Cohen's d |
|--|----------------|----------------|----------------|----------------|---------------|--------|----------|--------|-----------|
| Female (n <sub>1</sub> ) vs Male (n <sub>2</sub> )                 | 226            | 142            | 5.91           | 5.24           | 4.28 (279.02) | < .001 | 20,516.0 | < .001 | 0.48      |
| Turkish (n <sub>1</sub> ) vs MENA Intl (n <sub>2</sub> )           | 269            | 99             | 5.86           | 5.11           | 3.74 (143.21) | < .001 | 12,589.5 | .003   | 0.51      |
| Turkish Female (n <sub>1</sub> ) vs Turkish Male (n <sub>2</sub> ) | 164            | 105            | 6.00           | 5.59           | 2.52 (206.47) | .013   | 8,584.0  | .028   | 0.34      |
| MENA Female (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )       | 62             | 37             | 5.76           | 4.41           | 3.57 (58.31)  | .001   | 1,558.0  | .004   | 0.74      |
| Turkish Female (n <sub>1</sub> ) vs MENA Female (n <sub>2</sub> )  | 164            | 62             | 6.00           | 5.76           | 0.86 (101.04) | .392   | 5,064.5  | .409   | 0.13      |
| Turkish Male (n <sub>1</sub> ) vs MENA Male (n <sub>2</sub> )      | 105            | 37             | 5.59           | 4.41           | 3.85 (52.04)  | < .001 | 2,768.0  | .002   | 0.80      |

Findings from SQ13 provide clear statistical support for H3, H5, and H6. In relation to H3, high mean scores (M  $\approx$  5.2–6.0) indicate strong endorsement of reused packaging in vertical climate-resilient school gardens as a low-cost and scalable intervention. The substantial nationality effect observed in male subgroup comparisons ( $d = 0.80$ ) further highlights structural differences in perceptions of scalability and institutional feasibility. Regarding H5, significant gender differences confirm that female students assign greater importance to these initiatives than male students ( $t = 4.28$ ,  $p < .001$ ,  $d = 0.48$ ), with particularly strong effects within the MENA subgroup ( $d = 0.74$ ). Finally, H6 is supported by significant nationality differences ( $t = 3.74$ ,  $p < .001$ ,  $d = 0.51$ ), demonstrating that Turkish students report higher acceptance levels than MENA international peers. Collectively, these results reinforce the cost-efficiency, gender salience, and cross-national perception dimensions of the resilience framework.

#### 4. Conclusions/Summary/Future Perspectives

This study set out to examine how university students from Turkey and the broader MENA region perceive climate-resilient vertical school gardens as integrated infrastructures linking food security, sustainability education, and community resilience. Drawing on a 13-item Likert-scale survey administered to 368 students at OSTIM Technical University, the findings offer a coherent and empirically grounded validation of the proposed six-hypothesis framework.

First, strong support was observed for the nutrition–education nexus (H1 and H2). Across SQ1, SQ2, SQ8, and SQ9, mean scores consistently exceeded the midpoint of the 7-point scale, often approaching or surpassing 5.5 in Turkish subgroups. These results indicate that respondents perceive vertical climate-resilient school gardens not merely as symbolic green interventions but as tangible mechanisms for reducing hunger, improving dietary quality, strengthening academic concentration, and fostering community-level food resilience. The statistical robustness of these patterns, confirmed through Welch’s t-tests and Mann–Whitney U analyses, reinforces the legitimacy of school gardens as multifunctional educational infrastructures.

Second, substantial support was found for scalability and cost-efficiency (H3). High agreement levels in SQ6, SQ11, SQ12, and SQ13 demonstrate that students view reused packaging, circular construction, and vertical design as economically viable and adaptable strategies, particularly for climate-vulnerable regions. Effect sizes for Turkish–MENA comparisons frequently reached medium magnitude ( $d \approx 0.40\text{--}0.80$ ), indicating meaningful cross-national perception differences regarding institutional feasibility and policy implementation.

Third, the migration-related hypothesis (H4) received cautious but notable endorsement. Although agreement levels for SQ10 were slightly lower than for nutrition-centred items, they remained clearly above neutrality. This suggests that students conceptually link local food security initiatives to broader socio-economic stabilization, framing climate-resilient gardens as indirect yet potentially meaningful tools for mitigating irregular migration pressures.

Fourth, gender-based differentiation (H5) emerged as one of the most consistent findings across the dataset. In nearly all survey questions, female students reported significantly higher levels of agreement than male students, with small-to-moderate effect sizes ( $d \approx 0.30\text{--}0.60$ ) and, in some MENA subgroups, even larger effects. This pattern suggests that female respondents exhibit heightened normative sensitivity to food equity, sustainability education, and community resilience dimensions. These findings carry important implications for gender-responsive policy design and for positioning women and girls as central actors in sustainability transitions.

Fifth, nationality-based differences (H6) were systematically observed. Turkish students consistently demonstrated higher acceptance levels than MENA-region international students, with several comparisons reaching medium-to-large effect sizes. This divergence may reflect differences in environmental education exposure, agricultural familiarity, policy context, or institutional trust. Importantly, the results do not indicate rejection among MENA respondents but rather comparatively lower intensity of endorsement. This nuance underscores the need for culturally embedded, context-sensitive implementation strategies rather than one-size-fits-all models.

In sum, the findings position climate-resilient vertical school gardens as hybrid socio-ecological infrastructures. They operate simultaneously as pedagogical laboratories, food security buffers, circular-economy demonstrators, and community cohesion platforms. Their perceived value extends beyond immediate nutritional benefits toward broader structural resilience. Future research should expand this inquiry longitudinally, examining whether attitudinal endorsement translates into behavioural engagement and policy uptake. Comparative multi-country studies within MENA would help disentangle contextual effects, while qualitative investigations could illuminate the cultural narratives underlying gender and nationality differences. Moreover, experimental pilot implementations in selected schools could test measurable impacts on nutrition, academic performance, environmental literacy, and community engagement. In conclusion, climate-resilient vertical school gardens are not merely agricultural interventions placed within educational settings. They represent a governance paradigm in miniature: where food systems, environmental ethics, social equity, and educational transformation converge. If embedded within coherent policy frameworks and supported by gender-sensitive and culturally adaptive strategies, they hold substantial promise as scalable instruments of sustainable development in the MENA region.

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### **Conflicts of Interest**

The author declares that this research was conducted without any commercial or financial relationships that could be interpreted as a potential conflict of interest. Furthermore, the views and opinions expressed in this article are solely those of the author and do not necessarily reflect the official policy or position of any affiliated institution.

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## Tentative Program

### Time Zone based on Nice, France's local time

- On 17 June 2025, the UI GWURN Steering Committee Meeting is only for UI GreenMetric National Coordinators and invited observers.
- All speakers and participants can join us on 17 June for the Welcoming Dinner for All Participants, 18-19 June 2025 for the workshop and 20 June 2025 for the tour.

| <b>THE 11<sup>th</sup> INTERNATIONAL WORKSHOP ON UI GREENMETRIC WORLD UNIVERSITY RANKINGS</b><br><i>“Doing Sustainable Development Goals in Higher Education: The Story of Our Institution and Society”</i><br><b>17-20 June 2025</b><br>Nice, France |  |
|---|--|
| <b>DAY 1: 17 June 2025</b><br>Venue: <b>Château de Valrose - 28 AV Valrose, 06000 Nice</b><br><a href="https://maps.app.goo.gl/Cc5dxCaZBiHWLo528">https://maps.app.goo.gl/Cc5dxCaZBiHWLo528</a>   |  |
| Timing  | Session  |
| <b>Whole day</b>  | <b>Arrival of participants</b>   |
| 12:00 PM - 01:00 PM   | Welcoming Lunch (Steering Committee only)  |
| 01:00 PM - 05:45 PM   | <b>UI GWURN Steering Committee Meeting (by invitation)</b><br>Room: <b>la Salle des Actes</b><br><br>1. Welcome of National Coordinators, quorum established: Prof. Riri Fitri Sari and Dr. Junaidi, S.S., M.A<br>2. Adoption of the agenda<br>3. Adoption of the minutes of the 8 <sup>th</sup> Steering Committee Meeting in Colombia<br>4. Report of activities of UI GWURN and national coordinators<br>5. Discussions on the future activities of UI GWURN <ul style="list-style-type: none"> <li>- <b>Shaping Global Higher Education and Research in Sustainability</b></li> <li>- <b>Creating Global Sustainability Leaders</b></li> <li>- <b>Partnering on Solutions to Sustainability Challenges</b></li> </ul> 6. Report of Focus Group Discussions on Future Activities<br>7. Any other business<br>8. Closing |
| 06:00 PM - 09:00 PM   | Welcoming Dinner for participants<br>Venue: <b>On the lawn/La Salle à Manger</b>   |
| <b>DAY 2: 18 June 2025</b><br>Venue: <b>Château de Valrose - 28 AV Valrose, 06000 Nice</b><br><a href="https://maps.app.goo.gl/Cc5dxCaZBiHWLo528">https://maps.app.goo.gl/Cc5dxCaZBiHWLo528</a>   |  |
| 08:30 AM - 09:00 AM   | <b>Registration of Delegates</b> <ul style="list-style-type: none"> <li>• Video Profile UI GreenMetric</li> <li>• Video Profile Université Côte d'Azur</li> </ul>  |
| 09:00 AM - 09:30 AM   | <b>Welcome Speech</b><br>Room: <b>The Théâtre</b> <ul style="list-style-type: none"> <li>• <b>Prof. Jeanick Brisswalter, President, Université Côte d'Azur, France</b></li> <li>• <b>HE Mohamad Oemar, Ambassador Extraordinary and Plenipotentiary of the Republic of Indonesia to France, Andorra, Monaco, and Permanent Delegation of the Republic of Indonesia to UNESCO</b></li> <li>• <b>Prof. Riri Fitri Sari, Chairperson, UI GreenMetric World University Rankings</b></li> </ul>   |

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|                     | <ul style="list-style-type: none"> <li>• <b>Prof. Erwin Franquet, Vice-President for Sustainable Development, Université Côte d'Azur, France</b></li> </ul>   |  |
| 09:30 AM - 09:50 AM | <b>Keynote Speeches</b><br><b>Emily Stott, Nature Positive Universities Coordinator, University of Oxford, United Kingdom</b>   |  |
| 09:50 AM - 10:00 AM | The signing of the Declaration of Membership of UI GreenMetric Network  |  |
| 10:00 AM - 10:10 AM | Group photo   |  |
| 10:10 AM - 10:35 AM | Coffee Break with pastries and Poster Session   |  |
| 10:35 AM - 12:05 PM | <p><b>Session 1A</b><br/> <b>The Story of Our Institution and Society in Managing Education and Research</b><br/> Room: <a href="#">The Théâtre</a></p> <p>Chair: <b>Francisco Moreno Abril, PhD</b>, Academic Coordinator, Universidad Panamericana, Mexico<br/> Co-chair: <b>Dr. Junaidi, S.S. M.A.</b>, Vice-Chair, UI GreenMetric, Indonesia<br/> (5 presentations – 15 Minutes Each)<br/> Speakers:</p> <ul style="list-style-type: none"> <li>• <b>Student-led, research-informed and practice focused: University College Cork's journey to sustainability</b><br/> Professor John O'Halloran, BSc Phd MRIA, President, University College Cork, Ireland</li> <li>• <b>Paths to an Innovative, Humane and Sustainable University: The creation of the Dean for Citizenship and Sustainability at UFMS</b><br/> Prof. Dr. Camila Celeste Brandão Ferreira Ítavo, Rector, Universidade Federal de Mato Grosso do Sul (UFMS), Brazil</li> <li>• <b>A 2024 Overview of Graduates in UI GreenMetric Member Universities Working In Green Jobs</b><br/> Dr. Junaidi, S.S. M.A., Vice-Chair, UI GreenMetric, Indonesia</li> <li>• <b>National Chi Nan University's Role in Dark-Sky Governance and Regional Revitalization: A Model of Local Engagement and International Vision</b><br/> Prof. Yung Ping Tseng, Vice President, National Chi Nan University, Taiwan</li> <li>• <b>The Transition to AI as a Tool for Teaching and Learning Sustainability in Higher Education: Educators' Insights</b><br/> Prof. Dr. Tevhide Serra Gorpe, UI GreenMetric Online Course</li> </ul> | <p><b>Session 1B</b><br/> <b>The Story of Our Institution and Society in Managing Education and Research</b><br/> Room: <a href="#">Salle des Actes</a></p> <p>Chair: <b>Prof. Marija Jankovic</b>, Vice Rector of International cooperation, Mediterranean Podgorica, Montenegro<br/> Co-chair: <b>Prof. Dr. Awangku Hassanal Bahar Pengiran Bagul</b>, Director of Eco campus Management Centre, Universiti Malaysia Sabah, Malaysia<br/> (4 presentations – 15 Minutes Each)<br/> Speakers:</p> <ul style="list-style-type: none"> <li>• <b>From vision to monitored action: the integration of UI GreenMetric into Universidad Católica de Córdoba's environmental policy and education</b><br/> Dra. María Soledad Perfumo, Vice-Rector of Innovation and Development, Universidad Católica de Córdoba, Argentina</li> <li>• <b>Tuta Sindina: The Way Forward in Managing Research At Escuela Superior Politécnica De Chimborazo</b><br/> Prof. Eng. Pablo Vanegas Peralta, PhD, Vice-Rector for Research and Graduate Studies, Escuela Superior Politécnica de Chimborazo, Ecuador</li> <li>• <b>The Implementation and Experience of Green Sustainability in Academic Research Development in NPUST</b><br/> Prof. Dr. Vincent Ru-Chu Shih, Representative of President, National Pingtung University of Science and Technology (NPUST), Taiwan</li> <li>• <b>Green Finance Education for Future Leaders: Embedding SDGs into Finance Curricula at Gulf University-Bahrain</b></li> </ul> |

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|                     | <p>Coordinator, University of Sharjah, United Arab Emirates</p> <p><i>Question and Answer</i></p>  | <p>Prof. Dr Tanvir Hussein, PMP, Representative of President, Gulf University, Bahrain</p> <p><i>Question and Answer</i></p>   |
| 12:05 PM – 01:00 PM | Networking Lunch   |  |
| 01:00 PM - 02:30 PM | <p><b>Session 2A</b><br/> <b>The Story of Our Institution and Society in Managing Setting and Infrastructure</b><br/> Room: <a href="#">The Théâtre</a></p> <p>Chair: <b>Prof. Anna Tozzi</b>, Rector consultant for Internationalization, University of L'Aquila, Italy<br/> Co-chair: <b>Prof. Dr. Tevhide Serra Gorpe</b>, UI GreenMetric Online Course Coordinator, University of Sharjah, United Arab Emirates<br/> (4 presentations – 15 Minutes Each)<br/> Speakers:</p> <ul style="list-style-type: none"> <li>• <b>Applied Research for The Construction of a Sustainable Campus at The University of São Paulo</b><br/> Prof. Carlos Gilberto Carlotti Junior, President, University of São Paulo/USP, Brazil</li> <li>• <b>Public-Private-Civic Partnership – A New Alliance for Sustainable Development</b><br/> Prof. dr hab. Arnold Bernaciak, prof. WSB Merito University in Poznan, Vice-Rector for Science, WSB Merito University in Poznan, Poland</li> <li>• <b>Advancing Education and Research for a Sustainable Future at ATU</b><br/> Prof. Dr. Hasan Latif Kadhim, Rector, Al-Furat Al-Awsat Technical University, Iraq^</li> <li>• <b>Sustainability and Local Identity: The Rocky Trail Program as a Strategy for the SDGs in Higher Education</b><br/> M.Sc. Leonardo Chaves de Carvalho, Sustainability Director. Universidade Federal de Mato Grosso do Sul (UFMS), Brazil</li> </ul> <p><i>Question and Answer</i></p> | <p><b>Session 2B</b><br/> <b>The Story of Our Institution and Society in Managing Setting and Infrastructure</b><br/> Room: <a href="#">Salle des Actes</a></p> <p>Chair: <b>Prof. Hasan Majdi</b>, President, Al-Mustaqbal University, Iraq<br/> Co-chair: <b>Dr. Massimiliano D'Innocenzo</b>, Project Manager, University of L'Aquila, Italy<br/> (4 presentations – 15 Minutes Each)<br/> Speakers:</p> <ul style="list-style-type: none"> <li>• <b>Fostering A Sustainable University in Germany – Setting, Infrastructure and Perspective</b><br/> Prof. Dr. Klaus Rick, Representative of Rector, Umwelt-Campus Birkenfeld Trier Univ. of Applied Sciences, Germany</li> <li>• <b>Student Development and Student Affairs to Enhance UI Green Metric at Kasetsart University</b><br/> Assoc. Prof. Cheema Sorulump, Representative of President, Kasetsart University, Thailand</li> <li>• <b>Strategic Sustainability Action Plan at Unicamp</b><br/> Dr. Thalita Dalbelo, Representative of Rector, University of Campinas, Brazil</li> <li>• <b>Designing a Framework towards Sustainability Leadership in a Higher Education Institution: A Case Study of Gulf University, Bahrain.</b><br/> Dr. Omar Blibech, Representative of President, Gulf University, Bahrain</li> </ul> <p><i>Question and Answer</i></p> |
| 02:30 PM - 04:00 PM | <p><b>Session 3A</b><br/> <b>The Story of Our Institution and Society in Managing Energy and Climate Change</b><br/> Room: <a href="#">The Théâtre</a></p> <p>Chair: <b>Krzysztof Mączkowski</b>, Coordinator of CSR, WSB Merito University in Poznan, Poland<br/> Co-chair: -<br/> (3 presentations – 15 Minutes Each)</p>  | <p><b>Session 3B</b><br/> <b>The Story of Our Institution and Society in Managing Energy and Climate Change</b><br/> Room: <a href="#">Salle des Actes</a></p> <p>Chair: <b>Dr. Yasser MAGHRBI</b>, Director of Research Operations, Université Côte d'Azur, France<br/> Co-chair: <b>Geraldine Campos Zamora, MEd</b>, Director, Campus Sustainability</p>  |

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|                                | <p>Speakers:</p> <ul style="list-style-type: none"> <li>• <b>The University of Genova climate policies</b><br/>Prof. Federico Delfino, Rector, University of Genoa, Italy</li> <li>• <b>Promoting Energy Efficiency in Panpacific University, Philippines</b><br/>Dr. Donna Padilla-Taguiba, President, Panpacific University, Philippines</li> <li>• <b>Community Engagement on Climate Change at KMUTT, Thailand</b><br/>Asst.Prof. Dr. Prasert Kanthamanon, Senior Vice President for Administrative Affairs, King Mongkut's University of Technology Thonburi, Thailand</li> </ul> <p>Question and Answer</p>  | <p>Office, De La Salle, University-Dasmarinas, Philippines<br/>(2 presentations – 15 Minutes Each)</p> <p>Speakers:</p> <ul style="list-style-type: none"> <li>• <b>AI-driven Data Analysis for Sustainable Development</b><br/>Assoc. Prof. Nigar Ismayilova, Representative of Rector, Azerbaijan State Oil and Industry University, Azerbaijan</li> <li>• <b>Smart Technology for Energy Efficiency in Lagos State University, Nigeria: Innovation for Carbon-Neutral Campus Development</b><br/>Prof. Dr. Adejuwon Adewale ADENEYE, DSc, PhD, MBBS, Representative of Vice-Chancellor, Lagos State University, Nigeria</li> </ul> <p>Question and Answer</p>  |
| <p>04:00 PM -<br/>04:30 PM</p> | <p>Poster Session and Coffee Break</p>   |   |
| <p>04:30 PM -<br/>06:00 PM</p> | <p><b>Session 4A</b><br/><b>The Story of Our Institution and Society in Managing Waste</b><br/>Room: The Théâtre</p> <p>Chair: <b>Dr. Nazira Esenalieva</b>, Rector, Ala-Too International University, Kyrgyzstan<br/>Co-chair: <b>Dr. Paola Laiolo</b>, Sustainability Commission, University of Genoa, Italy*<br/>(3 presentations – 15 Minutes Each)</p> <p>Speakers:</p> <ul style="list-style-type: none"> <li>• <b>Managing Material Flows to increase Circularity at Wageningen University &amp; Research</b><br/>Erna Maters, Representative of Rector, Wageningen University &amp; Research, Netherlands</li> <li>• <b>Full-scale anaerobic digestion of organic fraction of municipal solid waste (OFMSW): GHG reduction on campus</b><br/>Prof. Patrícia Faga Iglecias, Representative of Rector, University of São Paulo/USP, Brazil</li> <li>• <b>Lessons from Bukhara State University: Integrating SDGs into Education and Community Collaboration</b><br/>Prof. Obidjon Khamidov, Rector, Bukhara State University, Uzbekistan</li> </ul> <p>Question and Answer</p> | <p><b>Session 4B</b><br/><b>The Story of Our Institution and Society in Managing Waste</b><br/>Room: Salle des Actes</p> <p>Chair: <b>Anna Schmidt-Fiedler</b>, Head of Social Innovations and Sustainability Office, Adam Mickiewicz University, Poznań, Poland<br/>Co-chair: <b>Serdar Gedayev</b>, Head of Microbiology, Virology and Immunology Department, Oguz han Engineering and Technology University of Turkmenistan, Turkmenistan<br/>(4 presentations – 15 Minutes Each)</p> <p>Speakers:</p> <ul style="list-style-type: none"> <li>• <b>Exploring Sustainable Consumption Literacy: An Initial Step of the Education and Research Management at Universitas Negeri Jakarta</b><br/>Dr. Murti Kusuma Wirasti, M.Si., Representative of Rector, Universitas Negeri Jakarta, Indonesia</li> <li>• <b>KFUEIT's Commitment to Sustainable Education and Research: A Transformative Approach</b><br/>Prof. Dr. Muhammad Bilal Tahir, Representative of Vice Chancellor, Khwaja Fareed UEIT, Pakistan</li> </ul> |

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|   |  | <ul style="list-style-type: none"> <li>• <b>Breaking the Waste Cycle: How Central Mindanao University Cut Waste from 30 Tons to 2 Tons</b><br/>Dr. Cecilia O. Bucayong, Representative of President, Central Mindanao University, Philippines</li> <li>• <b>Advances in Hazardous Waste Recycling and the Prevention at University of Campinas</b><br/>Dr. Regina Clélia da Costa Mesquita Micaroni, Representative of Rector, University of Campinas, Brazil</li> </ul> <p>Question and Answer</p> |
| <b>DAY 3: 19 June 2025</b><br><b>Venue: Côte d'Azur Observatory - BD de l'Observatoire, 06304 Nice</b><br><a href="https://maps.app.goo.gl/1za9C7oafUqMowa38">https://maps.app.goo.gl/1za9C7oafUqMowa38</a> |  |   |
| 07:45 AM – 09:00 AM   | Bus Transfer from the meeting point ( <b>15 rue Lamartine, 06000 Nice</b> ) to the Observatory + Registration will be made in the buses  |   |
| 09:00 AM – 09:10 AM   | <b>Welcome Speech</b><br>Room: <a href="#">La Grande Coupole</a> :<br><b>Stéphane Mazevet - Director of the Côte d'Azur Observatory</b>  |   |
| 09:10 AM- 10:15 AM  | <b>Keynote Speeches</b><br>Room: <a href="#">La Grande Coupole</a> :<br><b>Cécile Sabourault - Vice President for International Affairs at Université Côte d'Azur: The role of Universities in protecting the Sea: from local to global</b>  |   |
| 10:15 AM - 11:00 AM   | Coffee Break (coffee, tea, and water) and Poster Session   |   |
| 11:00 AM - 12:00 AM   | <b>Keynote Speeches</b><br>Room: <a href="#">La Grande Coupole</a><br><b>Prof. Erwin Franquet, Vice-President for Sustainable Development, Université Côte d'Azur, France</b>  |   |
| 12:00 PM – 01:00 PM   | Networking Lunch   |   |
| 01:00 PM - 02:30 PM   | <b>Session 5A</b><br><b>The Story of Our Institution and Society in Managing Water</b><br>Room: <a href="#">La Grande Coupole</a><br><br>Chair: <b>Prof. Fernanda Brando</b> , Professor and Environmental Technical Advisor, University of São Paulo/USP, Brazil<br>Co-chair: <b>Asst. Prof. Suchada Chaisawadi</b> , Office of Sustainability Director, King Mongkut's University of Technology Thonburi, Thailand<br>(4 presentations – 15 Minutes Each)<br>Speakers: <ul style="list-style-type: none"> <li>• <b>Strategies for Carbon Footprint Mitigation in the Autonomous University of the State of Mexico</b><br/>Dr. Mariana Ortiz Reynoso, Vice President for Research and Graduate Studies, Universidad Autónoma del Estado de México, Mexico</li> <li>• <b>From Vision to Metrics: Positioning Australian University-Kuwait for UI GreenMetric Excellence through Digital Transformation</b><br/>Dr. Oualid Abidi, Representative of President, Australian University – Kuwait, Kuwait</li> <li>• <b>From the Cacti Roses Grow: Turning Political Desert Land to Urban Oases</b><br/>Rami Elhusseini, Msc., Representative of President, American University of Beirut, Lebanon</li> </ul> |   |

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|   | <ul style="list-style-type: none"> <li><b>Sustainability Initiatives at Shaqra University: A Holistic Approach to Environmental Responsibility</b><br/>Dr. Yousef Alqurashi, Representative of Rector, Shaqra University, Saudi Arabia</li> </ul> <p>Question and Answer</p>  |   |  |
| 02:30 PM – 03:00 PM   | Coffee break and Poster Session + Transfer time between rooms (approximately a 10-minute walk)  |   |  |
| 03:00 PM – 04:30 PM   | <table border="1"> <tr> <td> <p><b>Session 6A</b><br/><b>The Story of Our Institution and Society in Managing Transportation</b><br/>Room: <i>La Grande Coupole</i></p> <p>Chair: <b>Nils Elzinga, M.Sc.</b>, Coordinator Sustainability Programme, University of Groningen, Netherlands<br/>Co-chair: <b>Prof. Eng. Rafael Córdova U., M.Sc.</b>, Person in Charge of UI GreenMetric, Escuela Superior Politécnica de Chimborazo, Ecuador*<br/>(4 presentations – 15 Minutes Each)<br/>Speakers:</p> <ul style="list-style-type: none"> <li><b>Sustainable University Strategy and Assessing Its Performance in Green Rankings</b><br/>Prof. Saule Rakhmetullina, Chairman of the board - Rector, D.Serikbayev East Kazakhstan Technical University, Kazakhstan^</li> <li><b>Strengthening the 3C Partnership for Sustainable District</b><br/>Prof. Dr. Chanita Rukspollmuang, Ph.D., Vice President and Dean of Graduate School of Education, Siam University, Thailand</li> <li><b>Sustainability Advancements at Shakhrisabz State Pedagogical Institute: A Model for Eco-Friendly Campus Development</b><br/>Dr. Alijon Abdurakhmonov, Vice-Rector, Shakhrisabz State Pedagogical Institute, Uzbekistan</li> <li><b>Understanding academic transport emissions – insights from an Italian medium-size public University</b><br/>Prof. Dr. Elena Maggi, Representative of Rector, University of Insubria, Italy</li> </ul> <p>Question and Answer</p> </td> <td> <p><b>Session 6B</b><br/><b>The Story of Our Institution and Society in Managing Education and Research</b><br/>Room: <i>Salle de conférence NEF</i></p> <p>Chair: <b>Dr. Oualid Abidi</b>, Representative of President, Australian University – Kuwait, Kuwait<br/>Co-chair: <b>Francine Nijp, M.Sc.</b>, Communication Advisor Sustainability Programme, University of Groningen, Netherlands<br/>(4 presentations – 15 Minutes Each)<br/>Speakers:</p> <ul style="list-style-type: none"> <li><b>Investigation and Shaping of Sustainability Attitudes of Students and Employees at the University of Sopron</b><br/>Prof. dr. Ferenc Lakatos, Vice-Rector for Research and Foreign Affairs, University of Sopron, Hungary</li> <li><b>Advancing Sustainability Education and Research at AUB: The Role of ESDU</b><br/>Prof. Shady Hamadeh, Representative of President, American University of Beirut, Lebanon</li> <li><b>FeedFuture Project: Combating Hunger and Promoting Sustainability in Schools</b><br/>Assoc. Prof. Dr. Tolga ERKAN, Representative of Rector, OSTIM Technical University, Turkey</li> <li><b>Advancing SDG Education Through University Collaboration in Hungary</b><br/>Ms. Tünde Kulcsár, Representative of Rector, University of Pécs, Hungary</li> </ul> <p>Question and Answer</p> </td> </tr> </table> | <p><b>Session 6A</b><br/><b>The Story of Our Institution and Society in Managing Transportation</b><br/>Room: <i>La Grande Coupole</i></p> <p>Chair: <b>Nils Elzinga, M.Sc.</b>, Coordinator Sustainability Programme, University of Groningen, Netherlands<br/>Co-chair: <b>Prof. Eng. 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| 04:30 PM – 04:45 PM   | Group photo   |   |  |
| 04:45 PM – 04:55 PM   | <ul style="list-style-type: none"> <li><b>Report of Adam Mickiewicz University, Poland (Host of IWGM 2026)</b></li> </ul>   |   |  |
| 04:55 PM – 05:05 PM   | Information about the trip  |   |  |

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| 05:05 PM –<br>05:15 PM  | Closing Remarks <ul style="list-style-type: none"> <li>• <b>Prof. Erwin Franquet</b> , Vice-President for Sustainable Development, Université Côte d'Azur, France</li> <li>• <b>Prof. Riri Fitri Sari</b>, Chairperson of UI GreenMetric</li> </ul> |
| 05:15 PM –<br>06:15 PM  | Cocktail reception for all the participants   |
| 06:30 PM  | Transfer to drop-off point  |
| <b>DAY 4: 20 June 2025</b><br><b>Explore Day - Visit of Nice City</b> |   |
| 10:00 AM  | Start from the Meeting Point (To be discussed)  |
| 10:00 AM –<br>12:00 PM  | Visit to the Old Town   |
| 12:00 PM –<br>02:00 PM  | Independent Lunch Break   |
| 02:00 PM –<br>04:30 PM  | Visit to the Promenade des anglais- Le Port & The Nice Castle   |

\*) to be confirmed

^) Online Participation

**\*\*\*) List of Accepted Poster Sessions:**

**The Story of Our Institution and Society in Managing Setting and Infrastructure**

- *Building a Sustainable Future: The Role of Land Use Development and Infrastructure Plan at the State University of Northern Negros*  
**Engr. Bonnie Glenn B. Moraca, Planning Officer III, State University of Northern Negros, Philippines**

**The Story of Our Institution and Society in Managing Energy and Climate Change**

- *Sustainability in the Context of UI GreenMetric at Kasetsart University*  
**Assist. Prof. Ratchot Chompunich, Vice President, Kasetsart University, Thailand**
- *Fighting Drought-driven Energy Scarcity in Ecuador: ESPOCH's Floatovoltaics Plan to Produce Clean Electricity*  
**Prof. Eng. Rafael Córdova U., M.Sc., Person in Charge of UI GreenMetric, Escuela Superior Politécnica de Chimborazo, Ecuador**
- *Exploring Chlorella vulgaris-Derived Biodiesel as a Sustainable Energy Alternative for Turkmenistan*  
**Serdar Gedayev, Head of Microbiology, virology and immunology Department, Oguz han Engineering and Technology University of Turkmenistan, Turkmenistan**

**The Story of Our Institution and Society in Managing Waste**

- *Sustainable waste management: transforming livestock waste into organomineral fertilizers at S.A. Niyazov Turkmen Agricultural University*  
**Amanov Kadyr Yazmyradovich, Representative of Rector, S.A.Niyazov Turkmen Agricultural University, Turkmenistan**

**The Story of Our Institution and Society in Managing Water**

- *Sustainable Requalification of the Zeferino Vaz Campus Drainage System: Nature-Based Solutions for Climate Resilience*  
**Gabriela Marques Romero, Sustainability Expert Engineer, University of Campinas, Brazil**
- *Phyto-Mechanical Treatment System for Drainage Water Purification in Turkmenistan*  
**Bahadir Yuldashov, Head of Ecology and ecological technologies Department, Oguz han Engineering and Technology University of Turkmenistan, Turkmenistan**

**The Story of Our Institution and Society in Managing Transportation**

- *Transportation sustainability: From KMUTT policy to Community in Action*  
**Asst. Prof. Suchada Chaisawadi, Office of Sustainability Director, King Mongkut's University of Technology Thonburi, Thailand**

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**Dr. Ahmed Elshazly, Director of International Relations, Centers and Sponsored Programs at Heliopolis University, Heliopolis University, Egypt**
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Prof<sup>a</sup> Dr<sup>a</sup> Karina Ocampo Righi-Cavallaro, Professor at the Faculty of Engineering, Architecture and Urbanism, and Geography (FAENG), Universidade Federal de Mato Grosso do Sul (UFMS), Brazil