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Guest Editors:

- Fabio Naselli
- Fabio Pollice
- Mahmoud Y. Ghoneem
- Mourad S. Amer

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The International Conference on:

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Acknowledgements

IEREK would like to express its appreciation to all the members of the staff, scientific committee, chairpersons, and editors for contributing to the tremendous growth of this institution and for making the Green Urbanism (GU) conference what it is today. IEREK would also like to thank conference chairpersons, Professor Paolo Desideri and Professor Henry W. Richardson, who are the core reason as to why this conference was transformed from a mere vision into an on ground success. This institution is greatly indebted to the conference guest editors, Professor Fabio Naselli, Professor Fabio Pollice and Professor Mahmoud Y. Ghoneem, your efforts and continuous support is what led to our success.

IEREK takes distinct pride in being an institution that amasses a highly qualified and competent team who restlessly worked for months to make this conference what it is today. With regards to the success of this conference, any step forward towards the ultimate goal of creating a well-rounded society was made possible by the highly reputable scientific committee that worked competently to prepare for and revise research papers. It would also like to give thanks to all the members of the Scientific Committee who made it their duty to help this institution spread knowledge to the masses.

Word from the Conference Chair

On behalf of the organizing committee, I am honored and delighted to welcome you to the International Conference on Green Urbanism (GU), Rome, Italy.

Our technical program is rich and varied with around 55 technical papers discussed throughout the conference sessions. Besides, there are 3 technical workshops. We also expect to provide technical demonstrations, and numerous opportunities for informal networking.

As a conference chair of the Green Urbanism, I know that the success of the conference depends ultimately on the many people who have worked with us in planning and organizing both the technical program and supporting social arrangements. In particular, we thank the Organizing Committee for their wise advice and brilliant suggestion on organizing the technical program; the Reviewing Committee for their thorough and timely reviewing of the papers. Recognition should go to the Local Organizing Committee members who have all worked extremely hard for the details of important aspects of the conference programs and social activities.

Professor Paolo Desideri,

Conference Chair of Green Urbanism

Word from conference Co-Chair

I am very pleased and honored that you will participate in the international Conference on Green Urbanism (GU) 2016.

In this conference, will be raised variant and various topics with the presence of a group of the most experienced professors throughout the world.

The conference is designed in such a way that it could be useful in scientific advancement of all activist groups seeking education and practical experience.

Sustainability professionals, urban planners and architects will be presenting the findings and experiences arising from their researches and practical works in around 56 papers, which will be presented in this conference.

Finally, I declare my special thanks to the Scientific Committee, the conference organizers, *IEREK for research enrichment*, and all academic colleagues and professors who were our friend and helper in this scientific movement.

Professor Henry W. Richardson

Conference Co-Chair of Green Urbanism

A Word from the editor of the conference

Now we reap the benefits of our efforts, and our continuous hard work for preparing for this International Conference on "Green Urbanism".

I have participated in the selection of our reputable reviewing committee, where very special professors were attracted to this great event. We have followed a very specific and accurate system that helped in creating a very successful revision process. I thank the scientific committee that participated in preparing for this conference, and I can't thank enough the reviewer's committee who have reviewed many abstracts and so many full papers, they were the support pillar for this conference.

One of the main aspects that assisted in the success of this conference is the variety of the counters that participated in this event. Diversity is one of the main aspects that ensures the success of this conference. I could almost see the diversity in the ideas, the differences between each and every culture in every paper that was submitted to the reviewing committee to get reviewed, and it is when I realized that this is the success that all future conference should be aiming for.

The reviewing process might have been much harder than the writing process itself, but I cannot deny that I have honestly enjoyed reviewing the papers with my colleagues in the reviewing committee.

The revision process of this conference followed very high standards, organized, were the papers would be related to check if it's eligible to fit in this conference standards, or not, once it passes it goes to a full revision process, that once a paper passes we ask of the author to apply the reviewers' comments on the paper to increase its scientific value.

I give my thanks to the University of Roma Tre and its rector Professor "Mario Panizza" and Professor "Paolo Desideri" and Professor "Henry W. Richardson" The conference chairmen.

Special Thanks to IEREK's team, who've made it easier for us to run the revision process, as I would also like to give my thanks again to the reviewers' committee, and all the authors. I wish to meet you all on many future events.

Professor Fabio Naselli,

Guest Editor of the Conference

A Word from the editor of the conference

It is an honor to be a Guest Editor for the international conference on "Green Urbanism" that is hosted at the university of Roma Tre

I am proud to be tasked by the university's chairman, and by IEREK to look after the editing of this great event.

I took it on myself to handle this responsibility, for I felt the sincerity and seriousness of this event, where I recognized its success, and I was never only scientifically involved, I was involved in all the details for the preparation of this event and the publication of its proceedings. For almost a whole year we've been preparing and planning for this event, by communicating with all of the representatives of the organizing committee to finalize the programme for this wonderful event, and include all of its details, and activities, whether scientific, cultural, or social.

I can't begin to describe the hard work, and effort that IEREK have exerted in the promotion and the organization of this conference, where they have proven their skills to manage and receive well with the scientific committee and the reviewers' committee.

I specially thank the university of Roma Tre's rector, professor Mario Panizza and Professor Paolo Desideri & Professor Henry W. Richardson, the conference Chairmen for the full support that they've shown to this event. I also thank every one of my colleagues, professors, organizers and everyone who assisted and participated in helping this event.

My dearest thanks to all of the key speakers, and all the lectures, who have assisted in helping with this events. I thank the session moderators who managed to keep the conference strong by defining the aims and reaching them, they gave the conference its own character, and thank to thank to that we are here today, happy to contributing to this event.

Finally, I'd like to thank all the authors, audiences, and everyone who was interested in this event and couldn't make it, for they are a big part of our success, they are our success.

Sincerely,

Professor Fabio Pollice

Conference Guest Editor

A word from the Chairman of the Board of IEREK

I am honored and filled with joy to launch a conference in the Roma Tre University, Rome, Italy, which will be holding the **"International Conference on Green Urbanism (GU)"**, having Professor Paolo Desideri and Professor Henry W. Richardson as the conference chairs.

IEREK – International Experts for Research Enrichment and Knowledge Exchange is a startup institution that started its activities in 2013 and since then has been trying to achieve success and excellence in all its endeavors. Building international relationships with prestigious universities and institutions worldwide is one of the main goals that IEREK seeks to fulfill in order to spread knowledge and enhance research in its homeland, Egypt, and everywhere in the world through collaborating with trustworthy partners who share the same goals.

Through its scientific committee that includes distinguished professors and researchers from a wide variety of international universities, IEREK hopes to present to the world of research a successful conference that adds to the body of knowledge and gives the chance to scholars in the field to meet and find beneficial and creative solutions to the issues presented in the conference.

Personally, I hope that the conference succeeds in delivering its message to the world of professionals in the field of urban planning and sustainability so that the conclusions reached at by distinguishing researchers and the results of their work are put into effect. I also hope that a large audience of undergraduate and postgraduate students benefit the most out of this conference.

I am looking forward to meeting you all in this successful conference.

IEREK CEO

Mourad S. Amer

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Prof. Mario Pisani, *Second University of Napoli, Italy*

Introduction

The world is in the midst of a disturbance of a growing, consuming population, and environmental degradation, which produces many environmental challenges such as global climate change, excessive fossil fuel dependency and the growing demand for energy, all likely to be major challenges of the 21st century and one of the greatest problems facing humanity.

In this context, urban design is the fundamental principle of how to shape our cities. Because almost half of the energy consumed is used in cities and urban built-up areas, it is necessary to avoid mistakes in urban design at early stages in order to own more sustainable cities. The 1st international conference on **Green Urbanism** reflects upon practical strategies focusing on increasing sustainability beyond and within the scope of individual buildings.

The conference provides a context for a general debate about the regeneration of the city center and discusses how urbanism is affected by the paradigms of ecology.

This book is divided into 16 sections, each section discusses a manifesting problem that we are currently facing, appearing important enough to be discussed as one of the topics to be brought up in this edition. The 16 sections are to be discussed through this book cover all the required aspects of this issue categorizing it as a very important matter that needs to be discussed.

Chapter 02

City Urban Form and Natural Resources

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Efficiency of Ground Cover Types under *Samanea saman* on Reducing Outdoor Thermal Environment in Urban Parks of Bangkok, Thailand

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Abstract

This research was investigated outdoor thermal environment under *Samanea saman* based on 2 types of ground covers during January 2015 in 2 urban parks of Bangkok, Thailand. Outdoor temperature was evaluated during 10 am to 2 pm under *Samanea saman* which were representative of asphalt and grass covering. Average temperature was evaluated at 2 meters far from the stem in north south east west directions, and at 0 and 100 centimeters above the ground. The results revealed that, grass covering at 0 centimeter was the highest ground cover type which can be reduced air temperature by 1.23% compared with other types of ground covers whereas the results were not difference statistically in both different types of ground cover and height. Additionally, *Samanea saman* were recommended as the suitable tree for planting in urban environment as this species can be reduced outdoor temperature for all types of ground covers.

Peer-review under responsibility of the organizing committee of GU 2016.

Keywords: urban parks; outdoor temperature; ground cover; *Samanea saman*

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1. Introduction

Nowadays, a well-known effect of urbanization is the warming of the local climate relative to surround rural area. Factors that contribute to the temperature include the thermal properties, height, and spacing of building, the production of waste heat, air pollution, and differences in land cover and albedo. To reduce the effect of environmental degradation is an important issue for natural forest conservation [1]. In addition, vegetation also has a important role to play in contributing to the overall temperature regulation to the cities. Trees and green infrastructure can cool the air by between 2°C and 8°C [2], [3], [4]. Vegetation can be very effective as it delivers several mechanisms of cooling simultaneously such as evaporative cooling and evaportranspiration, reflectance, and shading. Magnitude of cooling form a shade tree depends upon crown shape and density. It was found that, dense trees block more incoming solar radiation, reducing solar warming, reduce light and infiltration. Magnitude of cooling also depends on tree growth rate and longevity.

Moreover, for urban park, the role of greenspace size by cooled area is influenced by the type and composition of vegetation. In suburban park, mature canopies indicated daytime air temperature 1.7-3.3°C lower than in the areas with no trees [3]. Potcher et al. [5] studied that high and wide canopy trees and higher tree/ shrub coverage resulted in cooler parks compared to the surroundings. Therefore, tree selection is very important for urban park as not all tree species have the same cooling effect. The lower the foliage temperature the greater the cooling, and canopy size, structure and density also influence the extent of shading. Leaf temperature depends on various factors which are anatomical (leaf mass, size, shape, angle, reflectance), physical (incoming energy, air temperature, wind), and physiological (transpiration, stomata conductance [6].

Generally, small-leafed species tended to be more effective at cooling by maintaining lower crown temperature than those of larger-leafed species [7]. Levermore et al studied impact of vegetation types on air and surface temperatures and found that even in suburban areas in temperate cities at 5% increase in mature deciduous trees can reduce mean hourly surface temperatures by 1°C over the summer's day. In contrast, the extreme worst case scenario of replacing all green space with asphalt was found to increase surface temperatures by up to 4.7°C and air temperatures by up to 3.2°C [8].

In Bangkok, Thailand, *Samanea saman* is one of the prominent species which are selected from the policy makers and government to plant in many urban parks with many reasons. This research was investigated efficiency of ground cover types under *Samanea saman* by evaluated outdoor thermal environment under *Samanea saman* based on 2 types of ground covers in 2 urban parks of Bangkok, Thailand. Outdoor temperature was evaluated under *Samanea saman* which were representative of asphalt and grass covering.

2. Materials and Methods

This research was investigated outdoor thermal environment under *Samanea saman* based on 2 types of ground covers during January 2015 in 2 urban parks of Bangkok, Thailand which are Lumpini Park in Patumwan District with the area 360 Rai (°13.730631N,°100.539064E) and Vachirabenchatas Park in Chatuchak District with the area 375 Rai (13.817034°N, 100.555838°E).

Outdoor temperature was evaluated during 10 am to 2 pm under *Samanea saman* which were representative of 10 asphalt and 10 grass covering.

In addition, average temperature was evaluated at 2 meters far from the stem in north south east west directions, and at 0 and 100 centimeters above the ground.

Calculate efficiency of reducing outdoor temperature by equation:

$$\text{Reducing Temperature Efficiency (\%)} = \frac{(\Delta T) \times 100}{\overline{X}\ \text{outdoor temperature}} \quad (1)$$

Where as

$$(\Delta T) = \overline{X}\ \text{surround tree temp } (^{\circ}C) - \overline{X}\ \text{under tree temp } (^{\circ}C)$$

$$\overline{X}\ (\text{mean}) = \frac{x_1 + x_2 + x_3 + \ldots\ x_n}{N}$$

3. Results

3.1. Evaluated outdoor thermal environment based on 2 types of ground cover

Average outdoor thermal environment under *Samanea saman* based on different types of ground cover was presented in Table 1.

Table 1. Average outdoor thermal environment under *Samanea saman* based on different types of ground cover and height.

Type of ground covers	ΔT (C°)			Reducing temperature efficiency (%)		
	Min	Max	Average	Min	Max	Average
Grass at 0 Cm	0.07	1.57	0.43	0.20	4.30	1.23
Grass at100 Cm	0.00	1.40	0.28	0.00	4.23	0.81
Asphalt at 0 Cm	0.00	1.00	0.39	0.00	2.85	1.11
Asphalt 100 Cm	0.00	1.40	0.26	0.00	4.21	0.80

The results revealed that, grass covering at 0 centimeter was the highest ground cover type which can be reduced air temperature by 1.57 °C and reducing temperature efficiency was 1.23% compared with other types of ground covers.

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3.2 Statistical analysis to compare the different of ground covers for reducing outdoor thermal environment

The results of statistical analysis to compare different ground cover types for reducing outdoor thermal environment at 2 height levels from the ground by T – test (Independent Samples test) was presented in table 2.

Table 2. Statistical analysis to compare different of ground cover types for reducing outdoor thermal environment by T – test

Height from ground cover	Ground cover's type	N	Mean	SD	t	Sig.
0 Cm	Glass	30	1.2347	.88019	1.944	.283
	Asphalt	30	.8093	.81312		
100 Cm	Glass	30	1.1087	.64900	1.476	.520
	Asphalt	30	.7997	.94520		

From Table 2, the statistical analysis was applied to compares the different of ground cover types for reducing outdoor thermal environment at o Cm from the ground floor which were indicated by Sig. = .283, and at 100 Cm were indicated by Sig. = .520 [Sig. = .283 > α(0.05) and Sig. = .520 > α(0.05)]. Result was able to explain that, at both height levels, different ground cover types for reducing outdoor thermal environment was not statistically different at 0.05 significantly.

3.3 Statistical analysis to compare the different of height levels for reducing outdoor thermal environment

The results of statistical analysis to compare different 2 height levels for reducing outdoor thermal environment by T – test (Independent Samples test) was presented in table 3.

Table 3. Statistical analysis to compare different of height levels for reducing outdoor thermal environment by T – test

Ground cover's type	Height from ground cover	N	Mean	SD	t	Sig.
Grass	0 Cm	30	1.2347	.88019	.631	.254
	100 Cm	30	1.1087	.64900		
Asphalt	0 Cm	30	.8093	.81312	.042	.490
	100 Cm	30	.7997	.94520		

From Table 3, the statistical analysis was applied to compares the different of height level for reducing outdoor thermal environment of grass at o and 100 Cm from the ground cover floor which were indicated by Sig. = .254, and asphalt at o and 100 Cm were indicated by Sig. = .490[Sig. = .254 > α(0.05) and Sig. = .490 > α(0.05)]. Result was able to explain that, at both ground cover types at each height level from ground, the reducing outdoor thermal environment was not statistically different at .05.

4. Conclusion and Discussion

This research was investigated outdoor thermal environment under *Samanea saman* based on 2 types of ground covers at two different levels from the ground during January 2015 in 2 urban parks of Bangkok. The results revealed that the highest ground cover type which can be reduced air temperature was grass covering at 0 centimeter. The highest reduced temperature was reduced at 1.57 °C and reducing temperature efficiency was 1.23%.

In addition, statistical analysis was applied in order to compares the different of ground cover types and different level of height from the ground for reducing outdoor thermal environment. The result was able to explain that, at both height levels and different ground cover types for reducing outdoor thermal environment was not statistically different at .05 significantly. This may be based on the period of study which was conducted during winter, so outdoor thermal temperature was less different. The results were related with Rahman et al studied [9] that a comparision of the growth and cooling effectiveness of commonly planted urban tree species which indicated combining the higher leaf area index (LAI) and higher stomatal conductivity provided more cooling. Effected factors in decreasing temperature on the shade of large tree were efficiency of piercing light, the total height of trees, the height of canopy [10]. An implementation research of physical and physicological variables were needed to be conducted together.

However, in the tropical zone, *Samanea saman* were recommended as the suitable tree for planting in urban environment as this species can be reduced outdoor temperature for all types of ground covers.

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