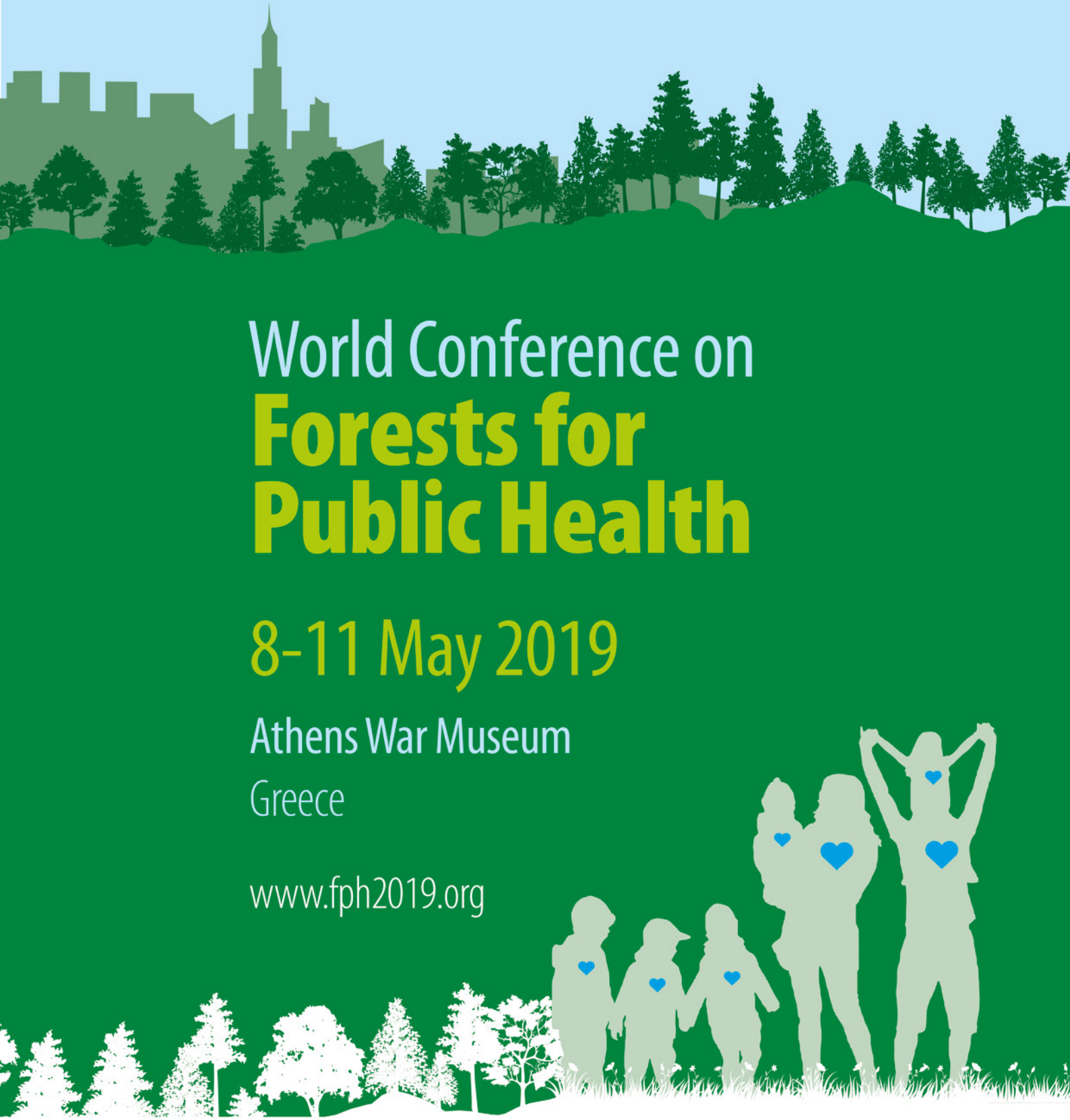

World Conference on
Forests for Public Health

8-11 May 2019

Athens War Museum

Greece

www.fph2019.org

Under the Auspices of
H.E. the President of the Hellenic Republic Mr. Prokopios Pavlopoulos

Abstract Book

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PRESIDENT'S WELCOME ADDRESS

Urbanization and modern lifestyle changes have diminished possibilities for human contact with nature in many societies. At the same time, many societies today face increasing incidence of poor physical and mental health associated with chronic stress, insufficient physical activity and exposure to anthropogenic environmental hazards that cannot be addressed by medicine and technology alone.

Contributing factors include increasingly sedentary occupations and lifestyles, increasing levels of mental stress related to urban living and contemporary work practices, and hazardous urban environmental conditions such as noise, heat stress, and air-pollution. They contribute not only to public health problems and increased expenditures for health care systems, but also lower productivity at work, increased work absenteeism, and other costly outcomes.

Natural elements and spaces such as trees, forests, urban and peri-urban forests, urban parks, gardens and green spaces have been seen as providing opportunities to ameliorate such trends. There is a growing body of evidence on positive relations between exposure to such natural environments and diverse human health indicators. One key message emerging is that contact with nature improves psychological health by reducing pre-existing stress levels, enhancing mood, enabling the recovery of cognitive abilities like directed attention, and in other ways supporting restorative processes and protecting them from the effects of future stressors.

Additionally, urban and ex-urban forests and green spaces may provide walkways and spaces for nature-based activities that may have not only preventive effects on the life-style related diseases but also enhance people's health in general.

Walking and other nature-based activities are related to positive mood, increased sustained attention and cognitive function as well as reduced physiological stress (e.g. heart rate, blood pressure, blood sugar, stress hormones, depression, anxiety etc.) and improved physiological functions (e.g. NK cells activity, immune system, cardiovascular etc.).

Air pollution may affect the respiratory system, cardiovascular system, nervous system, urinary system, digestive system, and detrimentally affect a developing foetus during pregnancy. Urban forests may absorb a part of this urban air pollution and thus contribute to improving public health. For these and other reasons, then, public health interventions should consider the value of forests and green spaces in urban planning and design. A key message is that cities can enhance public health through urban green Planning.

In sum forests, urban forests and other green spaces may be incorporated into public health systems and policies to promote mental and physical health and reduce morbidity and mortality in residents by supporting relaxation and stress alleviation, stimulating social cohesion, encouraging physical activity, and reducing exposure to air pollutants, noise and excessive heat.

The aim of this conference is to bring together well-known scientists from different countries and disciplines to present research and state-of-the-art knowledge and theories on:

- The significance of the role of forests and green spaces in improving the health and wellbeing of a population.
- Challenges the urban and landscape planning fields face in designing green infrastructure that benefits physical activities both in urban space and in forest/nature.

Human health and wellbeing are vital socio-political and public health issues for today and for the future. They vitally define our lives. Forests, urban forests, and green spaces can have a significant influence on the health and wellbeing of many people. We might look at them as a kind of health insurance!

I warmly welcome you in Athens and in Greece!

Dr. Christos Th. Gallis, PhD(Dr.For.).
(Δρ. Χρίστος Θ. Γαλλής)

President of the Organizing and Scientific Committee,
World Conference on "Forests for Public Health".

Research Director, Forest Research Institute, Hellenic Agricultural Organization "Demeter", Thessaloniki, Greece.

8-11 May 2019, Athens, Greece

CO-ORGANISER'S PRESIDENT'S WELCOME ADDRESS

Distinguished Guests,
Ladies and gentlemen,

On behalf of the Korean government, as president of National Institute of Forest Science (NIFoS), Korea Forest Service (KFS), it is my great pleasure to co-host and congratulate this meaningful international conference on "Forest for Public Health" with Greece Forest Research Institute.

As you well know, the forest has a much longer history than we have. The human race has evolved with the forest while looking for the ways to survive in the forest. I think our inspiration for coexistence with forests may have long been inherited from this process.

Though cities became highly industrialized and urbanized over time, modern people still try to make the time to feel their connection with nature, by going to forests just like going home. And in this aspect, I believe forest environments can promote both of human's mental and physical health in many aspects.

Ladies and Gentlemen,

I myself have travelled far from Korea to come to Greece and attend the conference, looking forward to meeting with experts from all over the world who diligently study, thinking hard how much forests can provide us with benefits for health and happiness.

First, I would like to give special thanks to President of Greece, **Prokopis Pavlopoulos, Mr. Soo-Seok Lim,** the Ambassador of Embassy of the Republic of Korea in Greece, and **Dr. Marco Martuzzi** at World Health Organization (WHO) who have honored us with your presence.

My thanks also go out to our distinguished keynote speakers, including: **Dr. Terry Hartig** from Sweden, Professor **Won-Seop Shin,** the former Minister of Korea Forest Service, **Dr. Ging Li** from Japan, **Dr. Liisa Tyrvainen** from Finnland, **Dr. Fabio Salbitano** from Italy. Your presence here increases our impact and assures the event's value with your special expertise.

I also thank and welcome the resource persons representing a variety of forest and public health organizations, including governments, research institutions, other stakeholder - who have come to share their knowledge and experience with the international experts here today, and of course to Greece Forest Research Institute (FRI) for the indispensible support in co-hosting this wonderful event.

Ladies and Gentlemen,

Since 1990s, Korea Forest Service has actively put together a series of policies and programs to facilitate the concepts of **"Forest Healing and Therapy, Forest Culture, Forest Education",** with the clear legal and public health mandates to promote the therapeutic use of forest resources.

As an integral part of such efforts, we researchers at NIFoS have also actively supported by providing research findings on the corelation between human health and forests. In particular, about the impact of some forest factors, such as terpene, on human health.

To fully exploit the full potential of the scientific findings, we all experts will need to increase cooperation in all fields, through multi-disciplinary collaborations among the fields of forest, health care, medical treatments, psychology and so on, which will also lead to greater benefits later, being spread throughout the whole society via multiple channels.

And to facilitate the public access to forest services on healing, therapy, culture and education, Korean government continues trying to expand the infrastructures and other platforms to the private sector.

This conference has been organized as part of our efforts to promote and encourage knowledge sharing on the latest research trends, and find the future direction for the field of forest and human health through active exchanges of your expertise, experience, methodologies and good practices. We are privileged to have in attendance so many distinguished experts and resource persons, as well as observers. I hope this conference will provide an important opportunities for us to lay foundation for institutional arrangement in conceptual, social and political aspects, for better forest therapeutic services.

I would like to conclude by again thanking all of you for your attendance. I wish you all a very successful time here, to assure your working on further activities to help many people carry on a happy and healthy life through forests.

Last but not least, I would also like to warmly thank **Dr. Christos Th. Gallis** and the organizers of this important conference for their supporting for this event.

Thank you.

Bom Kwon CHUN, Ph. D.

President
National Institute of Forest Science
Republic of Korea

ΧΑΙΡΕΤΙΣΜΟΣ ΠΡΟΕΔΡΟΥ

Η αστικοποίηση και οι σύγχρονες αλλαγές σήμερα στον τρόπο ζωής έχουν περιορίσει τις δυνατότητες του ανθρώπου για επαφή με τη φύση σε πολλές κοινωνίες. Ταυτόχρονα, πολλές κοινωνίες αντιμετωπίζουν αυξανόμενη συχνότητα κακής σωματικής και ψυχικής υγείας που συνδέεται τόσο με το χρόνιο άγχος και την ανεπαρκή σωματική δραστηριότητα όσο και με την έκθεση σε ανθρωπογενείς περιβαλλοντικούς κινδύνους, οι οποίοι δεν μπορούν να αντιμετωπιστούν μόνο από την ιατρική και την τεχνολογία. Ανάμεσα στους επιβαρυντικούς παράγοντες περιλαμβάνονται τα ολοένα και αυξανόμενα καθιστικά επαγγέλματα, η αλλαγή του τόπου ζωής (life style), τα αυξανόμενα επίπεδα ψυχικού άγχους ως απότοκα του αστικού τρόπου διαβίωσης και των σύγχρονων εργασιακών πρακτικών καθώς και των περιβαλλλοντικών συνθηκών. Η αύξηση του θορύβου, το θερμικό στρες και η ατμοσφαιρική ρύπανση πρακτικών συμβάλλουν και επιτείνουν στην επιβάρυνση της ψυχικής υγείας του σύγχρονου ανθρώπου.

Αποτέλεσμα της δράσης και συνέργειας των προαναφερθέντων επιβαρυντικών παραγόντων είναι μείζονα προβλήματα δημόσιας υγείας, αυξημένες δαπάνες για συστήματα υγειονομικής περίθαλψης, αλλά και μείωση της παραγωγικότητας στην εργασία, αυξημένη απουσία εργασίας και κακές κοινωνικές σχέσεις.

Τα φυσικά στοιχεία και οι χώροι όπως τα δέντρα, τα δάση, τα αστικά και περιαστικά δάση, τα αστικά πάρκα, οι κήποι και οι χώροι πρασίνου παρέχουν ευκαιρίες για τη βελτίωση αυτών των τάσεων. Από τη διεθνή επιστημονική έρευνα και βιβλιογραφία τεκμηριώνεται η θετική συσχέτιση της έκθεσης σε τέτοια φυσικά περιβάλλοντα και των διαφόρων δεικτών της ανθρώπινης υγείας. Το βασικό μήνυμα που αναδύεται από την τεκμηριωμένη έρευνα είναι ότι η επαφή με τη φύση, και γενικότερα με τους χώρους πρασίνου, βελτιώνει την ψυχική υγεία μειώνοντας τα προϋπάρχοντα επίπεδα άγχους, ενισχύοντας τη διάθεση, μειώνει την ένταση της κατάθλιψης, του θυμού, της κούρασης, αυξάνοντας τη ζωτικότητα και την ευεξία, επιτρέποντας την ανάκτηση των γνωστικών ικανοτήτων όπως η εστιασμένη προσοχή και με άλλους τρόπους υποστηρίζοντας τις αποκαταστατικές διαδικασίες και προστατεύοντάς τους από τις επιπτώσεις των μελλοντικών παραγόντων άγχους.

Ειδικότερα, τα αστικά δάση και οι αστικοί χώροι πρασίνου μπορούν να παράσχουν διαδρόμους και χώρους για δραστηριότητες που βασίζονται στη φύση, οι οποίες μπορεί να έχουν όχι μόνο προληπτικές επιδράσεις στις ασθένειες που σχετίζονται με τον τρόπο ζωής, αλλά και να ενισχύουν γενικότερα την υγεία των ανθρώπων.

Το περπάτημα και άλλες δραστηριότητες που σχετίζονται με τη φύση σχετίζονται με τη θετική διάθεση, την αυξημένη συνεχή προσοχή και τη γνωστική λειτουργία, με μειωμένο φυσιολογικό στρες (π.χ. καρδιακό ρυθμό, αρτηριακή πίεση, σάκχαρο αίματος, ορμόνες στρες, κατάθλιψη, άγχος κλπ.) και βελτίωση φυσιολογικών λειτουργιών (π.χ., προάγοντας τη δραστηριότητα και αυξάνοντας τον αριθμό των κυττάρων φυσικών φονέων (natural killers – NK και των επιπέδων των διακυτταρικών αντικαρκινικών πρωτεϊνών και ενζύμων) συμβάλλοντας έτσι σε ισχυρότερο ανοσοποιητικό σύστημα και υγιές καρδιαγγειακό σύστημα.

Η ατμοσφαιρική ρύπανση μπορεί να επηρεάσει πολλά συστήματα του ανθρώπινου οργανισμού όπως το αναπνευστικό, το καρδιαγγειακό, το νευρικό, το ουροποιητικό και το πεπτικό αλλά και να επηρεάσει δυσμενώς το αναπτυσσόμενο έμβρυο κατά τη διάρκεια της εγκυμοσύνης. Τα αστικά δάση μπορούν να απορροφήσουν ένα σημαντικό μέρος αυτής της αστικής ατμοσφαιρικής ρύπανσης και έτσι να συμβάλουν στη βελτίωση της δημόσιας υγείας. Για αυτούς και για άλλους λόγους, οι σύγχρονες στρατηγικές παρεμβάσεις στη δημόσια υγεία θα πρέπει να εξετάσουν και να αξιοποιήσουν την αξία των δασών και των χώρων πρασίνου στον πολεοδομικό σχεδιασμό και τον γενικότερο χωροταξικό σχεδιασμό. Ένα βασικό μήνυμα είναι ότι οι πόλεις μπορούν να ενισχύσουν τη δημόσια υγεία μέσω του αστικού σχεδιασμού πράσινων χώρων.

Τα δάση, τα αστικά και περιαστικά δάση και οι άλλοι χώροι πρασίνου μπορούν να ενσωματωθούν στα συστήματα δημόσιας υγείας και στις πολιτικές για την προώθηση της ψυχικής και σωματικής υγείας και τη μείωση της νοσηρότητας και θνησιμότητας των κατοίκων, υποστηρίζοντας τη πνευματική χαλάρωση και την άμβλυνση του άγχους, την τόνωση της κοινωνικής συνοχής, ενθαρρύνοντας τη φυσική άσκηση και δραστηριότητα, μειώνοντας την έκθεση σε ατμοσφαιρικούς ρύπους, θόρυβο και υπερβολική θερμότητα.

Ο στόχος του παγκόσμιου συνεδρίου World Conference on "Forests for Public Health" είναι να συγκεντρώσει γνωστούς ειδικούς με το αντικείμενο επιστήμονες από διάφορες χώρες και διαφορετικούς κλάδους να παρουσιάσουν την έρευνα και τις σύγχρονες γνώσεις και θεωρίες σχετικά με:

- Τη σημασία του ρόλου των δασών και των χώρων πρασίνου για τη βελτίωση της υγείας και της ευημερίας ενός πληθυσμού.
- Τις προκλήσεις που αντιμετωπίζουν οι αστικοί και χωροταξικοί χειρισμοί στο σχεδιασμό πράσινων υποδομών που ωφελούν τις φυσικές ανθρώπινες δραστηριότητες τόσο στον αστικό χώρο όσο και στο δάσος /φύση.
- Να αναδείξει μέσω των παράλληλων κοινωνικών εκδηλώσεων του συνεδρίου τους ισχυρούς διαχρονικούς δεσμούς της φύσης και της ανθρώπινης υγείας-ευεξίας στην αρχαία Ελλάδα (Ιπποκράτης, Ασκληπιεία κλπ).

Η ανθρώπινη υγεία και η ευημερία είναι ζωτικά κοινωνικοπολιτικά θέματα και ζητήματα δημόσιας υγείας για σήμερα και για το μέλλον. Τα δάση, τα αστικά δάση και οι χώροι πρασίνου μπορούν να επηρεάσουν σημαντικά την υγεία και την ευημερία πολλών ανθρώπων έτσι ώστε θα μπορούσαν κάλλιστα να θεωρηθούν ένα είδος ασφάλισης της υγείας!

Δρ. Χρίστος Θ. Γαλλής

Πρόεδρος της Οργανωτικής και Επιστημονικής Επιτροπής
του Παγκοσμίου Συνεδρίου «Δάση για την Δημόσια Υγεία»

Διευθυντής Ερευνών Ινστιτούτου Δασικών Ερευνών - ΕΛΓΟ ΔΗΜΗΤΡΑ, Θεσσαλονίκη

8-11 Μαΐου 2019, Αθήνα

CO-ORGANISERS' PRESIDENT'S WELCOME ADDRESS

신사숙녀 여러분, 반갑습니다.

저는 대한민국 산림청 국립산림과학원장입니다. 먼저 그리스 산림연구소와 공동으로 '국민건강을 위한 숲' 국제 컨퍼런스를 개최하게 되어 매우 뜻깊게 생각합니다.

잘 아시다시피 숲은 우리보다도 훨씬 오래된 역사를 지니고 있습니다. 우리는 숲 속에서 생존하는 법을 터득하고 숲과 함께 진화하면서 몸속에는 숲과 공존하는 DNA가 새겨졌습니다. 현재 우리는 숲을 떠나서 산업화와 도시화를 이루었지만 우리는 여전히 숲에서 어머니와 같은 고향의 숨결을 느끼고 있습니다. 저는 현대인의 많은 정신적 육체적 문제를 숲을 통해 해결할 수 있다고 생각합니다. 오늘 저는 숲이 인간에게 건강과 행복을 어떻게, 얼마나 주는지를 고민하고 연구하는 전 세계 연구자들을 직접 만난다는 설렘을 안고 이 자리에 왔습니다.

먼저, 본 국제 컨퍼런스의 성공적인 개최를 위해 함께해 주신 그리스 프로코피스 파블로플로스 (Prokopis Pavlopoulos) 대통령님과 ㈜그리스 대사관 임수석 대사님, WHO의 Marco Martuzzi 박사님께 감사드립니다. 그리고 기조강연을 해주실 스웨덴 Terry Hartig 교수님과 대한민국 신원섭 교수님, 일본 Ging Li 박사님, 핀란드 Liisa Tyrväinen 교수님, 이탈리아 Fabio Salbitano 교수님께 감사의 말씀을 드립니다. 더불어 숲과 보건분야 공공기관 및 대학, 연구기관의 모든 분들과 참석해주신 내외 귀빈께 감사의 말씀을 드립니다.

대한민국 산림청은 1990년대부터 산림휴양.문화.교육.치유 개념을 도입하여 숲의 국민복지적 활용에 대한 법.제도적 기반을 마련하고 관련 정책을 활발히 추진하고 있습니다.

최근 국립산림과학원은 숲이 인간 건강에 미치는 효과를 활발히 연구하고 있습니다. 테르펜과 같은 숲의 환경인자가 우리의 건강에 어떤 영향을 미치는지 등에 관하여 연구를 진행하고 있습니다. 숲이 인간의 신체적 정신적 건강에 미치는 영향을 과학에 기반을 두어 밝히려면 산림분야뿐만 아니라 보건의료, 심리학 등 다학제적 융합을 보다 활발하게 진행해야 합니다. 더불어 이러한 연구결과가 다양한 경로를 통하여 사회에 전달이 되고 확산이 되어야 합니다. 대한민국은 산림휴양.문화.교육.치유서비스를 국민들이 더욱 가까이서 손쉽게 누릴 수 있도록 정부나 공공기관이 제공하는 플랫폼을 과감하게 민간영역으로 확대시키고자 노력하고 있습니다.

오늘 이 자리는 숲과 인간건강분야의 최신 연구동향을 공유하고 발전방향을 논의하고자 하는 노력의 일환으로 마련하였습니다. 이 자리가 숲을 활용하여 사람들에게 더 좋은 휴양 및 치유서비스를 제공할 수 있는 정책 및 제도적 기반을 마련하는 소중한 자리가 되기를 바랍니다.

다시 한 번 이 자리를 빛내주신 여러분께 감사드리며 많은 사람들이 숲을 통해 행복하고 건강한 삶을 영위할 수 있도록 참석자 여러분들의 활발한 연구 활동을 응원합니다.

끝으로 본 국제 컨퍼런스를 준비하여 주시고, 수고를 아끼지 않으신 그리스 산림연구소 갈리스 (Christos Th. Gallis) 박사님과 관계자 분들께 진심으로 감사의 말씀을 전합니다.

2019년 5월 8일

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President of the Organizing Committee.

IUFRO Scientific officeholder, Division 6.06.00 – Forest, trees and human health and wellbeing, Vienna, Austria.

Vice-President of the International Association for Nature and Forest Welfare (NaFoW), Daejeon, Korea.

Board Member of the International Society of Nature and Forest Medicine, Tokyo, Japan.

Research Director, Forest Research Institute, Hellenic Agricultural Organization "Demeter", Thessaloniki, Greece.

Hellenic Agricultural Organization - DEMETER

Co – Organizers

Dr. Chun, Bom-kwon, Ph. D.

President of National Institute of Forest Science (NIFoS), Korea Forest Service (KFS), Republic of Korea

Korea Forest Service
National Institute of Forest Science

International Union of Forest Research Organizations (IUFRO) Division 6.06.00 – Forest, trees and human health and wellbeing, Vienna, Austria.

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(Δρα. Χρίστος Θ. Γαλλής)
President of the Organizing Committee.

IUFRO Scientific officeholder, Division 6.06.00 - Forest, trees and human health and wellbeing, Vienna, Austria.

Vice-President of the International Association for Nature and Forest Welfare (NaFoW), Daejeon, Korea.

Board Member of the International Society of Nature and Forest Medicine, Tokyo, Japan.

Research Director, Forest Research Institute, Hellenic Agricultural Organization "Demeter", Thessaloniki, Greece.

Members of the Scientific Committee

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Research Group: Nature, Health & Design, Dept. of Geosciences and Natural Resource Management, University of Copenhagen, Copenhagen, Denmark.

Professor Won Sop Shin, PhD.
Professor of Social Forestry, School of Forest Resources, Chungbuk National University, Cheongju, Korea. Chair of Committee on Forestry, United Nations Food and Agriculture Organization (FAO). Former Minister, Korea Forest Service, 2013-2017, Korea

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Dr Qing Li MD, PhD.
Physician-Immunologist at Nippon Medical School Hospital, Tokyo, Japan. The president of the Japanese Society of Forest Medicine, and the vice-president and secretary-general of the International Society of Nature and Forest Medicine, Tokyo, Japan.

Associate Professor Grete Patil, PhD.
Associate Professor and Chair of the Dept. of Public Health Science, Norwegian University of Life Sciences, Ås, Norway.

Dr. Kathryn Bowen, PhD.
Senior Scientist, Institute for Advanced Sustainability Studies e.V., Potsdam, Germany.

Dr. Takahide Kagawa, PhD.
Researcher, Forestry and Forest Products Research Institute, Tsukuba, Japan.

Professor Gunnar Tellness, MD., PhD.
Professor in Community Medicine, Head of Section for Social Medicine, Faculty of Medicine University of Oslo, Oslo, Norway.

Dr. Youngkyoon Yoon, PhD.
The President of the Korea Forest Welfare Institute, Daejeon, Korea.

Professor Francisco Javier Escobedo, PhD.
Professor, Dept of Biology, Universidad del Rosario, Bogotá, Colombia.

Professor Fabio Salbitano, PhD.
Professor of Landscape Ecology, Applied Silviculture, Forest and Landscape restoration, and Urban Forestry. Dept. of Agriculture, Food and Forest Systems Management, Univesity of Florence, Florence, Italy.

Assistant Professor Dongying Li. MLA., PhD.
Assistant Professor, Dept. of Landscape Architecture and Urban Planning, Texas A&M University, USA.

Professor Kalevi Korpela, Dr. Psychol., PsT.
Professor of Psychology, Faculty of Social Sciences, University of Tampere, Tampere, Finland.

Professor Terry Hartig, Ph.D., M.P.H.
Professor of Environmental Psychology, Institute for Housing and Urban Research and Department of Psychology, Uppsala University, Uppsala, Sweden.

Professor Bum-Jin Park, Ph.D.
Professor, Lab. of Forest Environment and Human Health, Dept. of Environment and Forest Resources, Chungnam National University, Daejeon, Korea.

Dr. Claire Henderson-Wilson, PhD.
Senior Lecturer and Deputy HDR Co-ordinator, Co-leader Health Nature and Sustainability Research Group, School of Health and Social Development, Faculty of Health, Deakin University, Melbourne, Australia.

Professor Oleg Glazachev, MD., PhD.
Professor of Normal Physiology, Dept. of Normal Physiology, School of Medicine, Sechenov First Moscow State Medical University, Moscow, Russia.

Professor Zhiqiang Zhang, Ph.D.
Professor and Dean of the College of Soil and Water Conservation, Beijing Forestry University, Beijing, P. R. China.

Professor William C. Sullivan, PhD.
Professor of Landscape Architecture, Dean of the Dept. of Landscape Architecture, University of Illinois at Urbana–Champaign, USA.

Professor Patrik Grahn, Agr. Dr.
Professor of landscape architecture with aim and direction in environmental psychology, Dept. of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, Uppsala, Sweden.

Dr. David J. Nowak, PhD.
Senior Scientist / i-Tree Team Leader, Urban forest structure, health, and change, and its effect on human health and environmental quality, USDA Forest Service ,Northern Research Station, Syracuse, USA.

Research Professor Liisa Tyrväinen, Dr.(For.).
Research Professor, Dept. of Economics and Society, Natural Resources Institute Finland (Luke), Helsinki, Finland.

KEYNOTE SPEAKERS

Research Professor Liisa Tyrväinen, Dr.(For.).
Research Professor, Dept. of Economics and Society, Natural Resources Institute Finland (Luke), Helsinki, Finland.

Professor Won Sop Shin, PhD.
Professor of Social Forestry, School of Forest Resources, Chungbuk National University, Cheongju, Korea. Former Minister, Korea Forest Service, 2013-2017, Korea.

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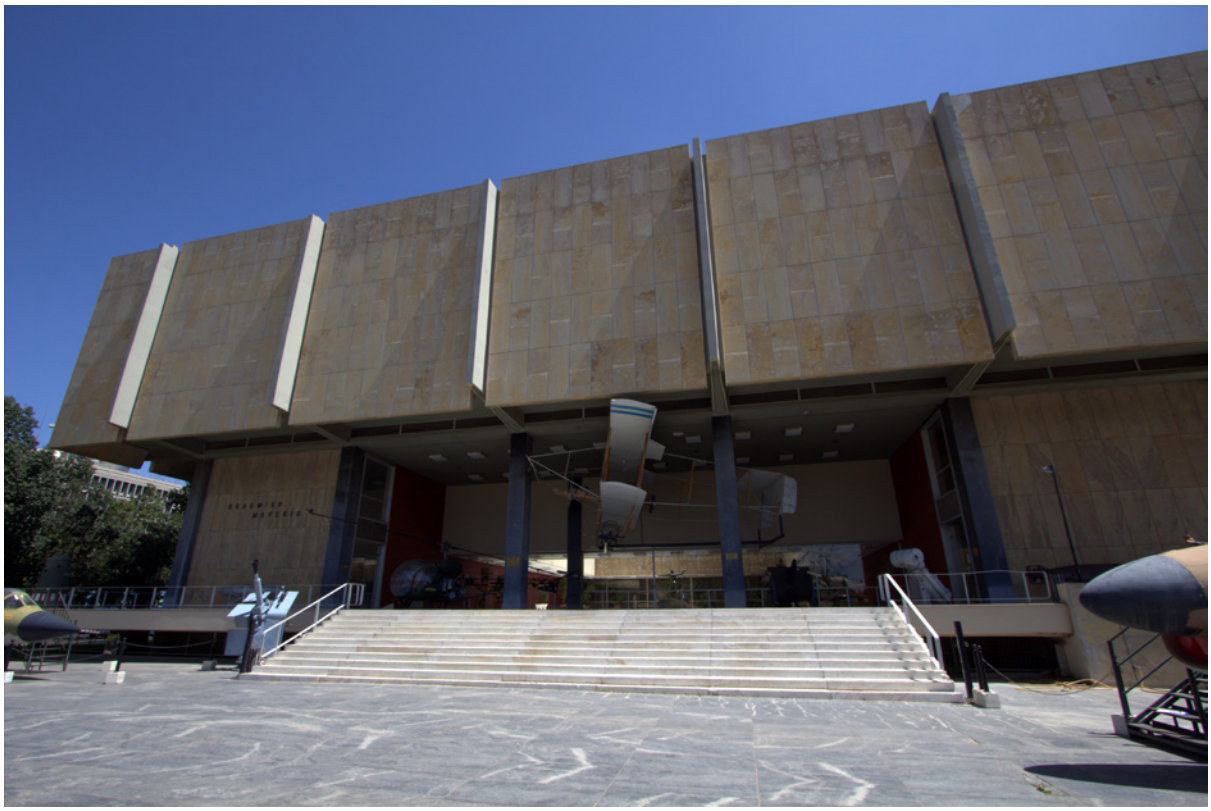
MAIN TOPICS

- Forest Medicine for Public Health.
- Mental Health benefits of exposure to Nature.
- Planning physical activities and human recreation in Forest/Natural environment for Public health.
- Urban Forests and their ecosystem services for Public Health.
- Urban forestry and Green spaces planning and design for human activity.
- Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health.
- Green care on public landscapes for public health.

INVITATION-VENUE

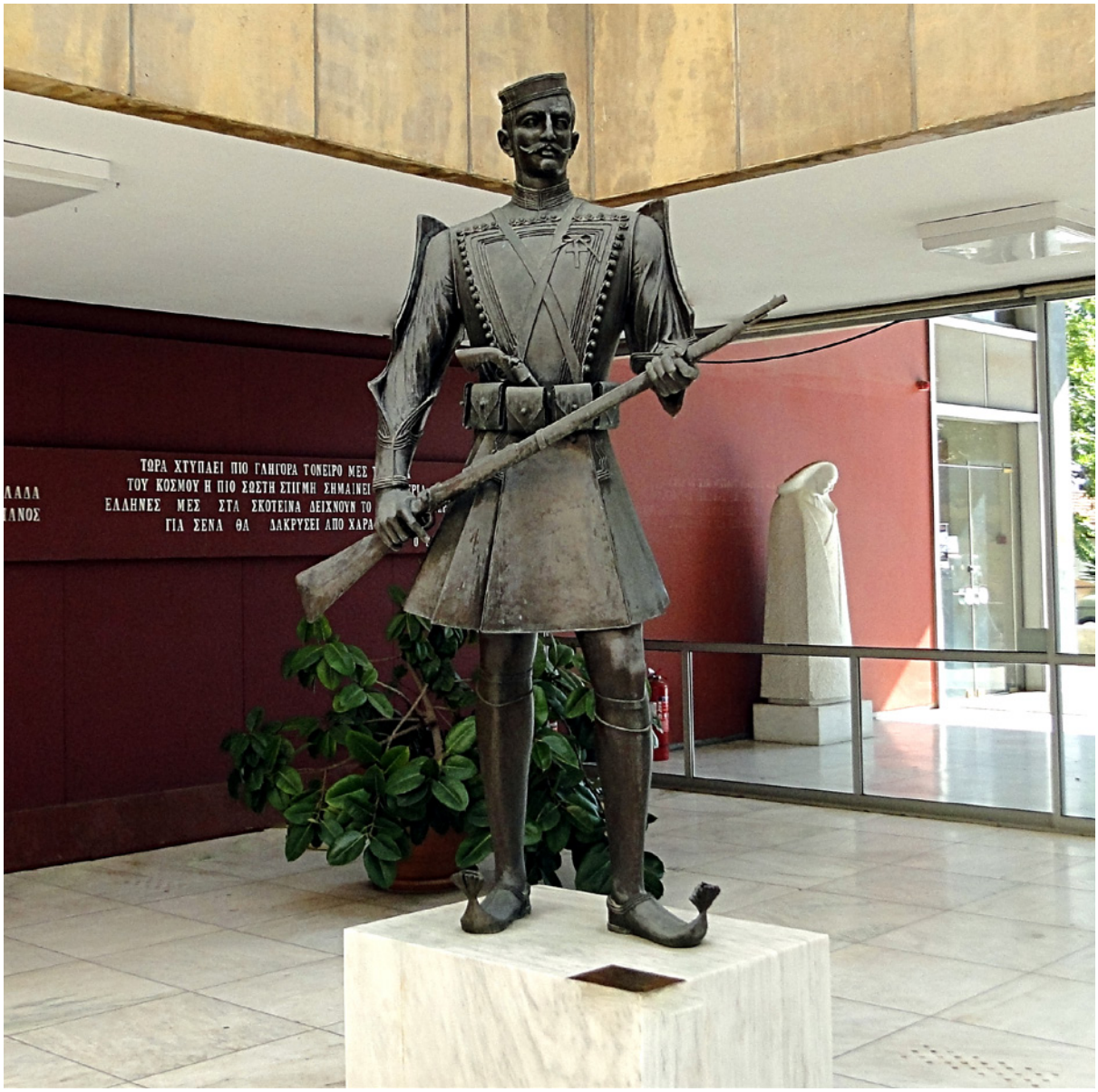


The Organizing and Scientific Committees have the pleasure of inviting you to Athens on May 8-11, 2019 for its World Conference on Forests for Public Health which will take place in the **War Museum.**

The War Museum was established by the Hellenic State in 1964 in order to honor all those who fought for the country's freedom. The relevant study was undertaken by a team of distinguished scientists, headed by Professor Thoukidides Valentis of the National Technical University of Athens (N.T.U.A). On July 18, 1975, the President of the Hellenic Republic H.E. Constantine Tsatsos and the Minister of National Defense Evangelos Averof-Tositsas inaugurated the Museum.

The Museum's mission, as this was determined by its Establishing Act, is to collect, preserve and exhibit military artifacts and memorabilia, and to study, document and project the sacred struggles of the Greek nation from antiquity to the present day, in order to preserve the national memory and promote the historic continuity of Hellenism. In addition to presenting various periods of our history, the War Museum also operates as a place for:

- Research, study and education.
- Conserving and safeguarding artifacts, memorabilia, etc.
- Organizing periodic exhibitions.



Its various activities include the publication of books, the establishment and maintenance of monuments and memorials all over Greece and abroad.
The Museum's exhibition areas are distributed over four levels (floors) and present images of Greek history from antiquity to the present. The War Museum has organized and operates the following:

- Photographic Archive. This Archive includes 20.000 historic photographs dating from 1897 until the Cypriotic Struggle for Independence (1955-1959), and the photographs are classified according to specific historic periods.
- Historic Archive, which comprises personal mail and diaries of officers and soldiers, newspapers, magazines, post cards and personal files.
- Film Archive, which includes films in which several historical events have been recorded.
- Collection of maps and engravings, mainly depicting the Greek state.
- A Library with thousands of books and prints mostly concerning the Greek history.
- A congress centre that hosts congresses, events, and exhibitions.

Besides all other activities, the War Museum has opened Branches at historical cities of Greece, such as Nafplion (1988), Chania (1995), Tripolis (1997) and Thessaloniki (2000), and intends to establish more throughout the country. The Museum's exhibition areas are distributed over four levels (floors) and present images of the Greek history from antiquity to the present.
Visitors are urged to start their visit from the first floor that hosts the hall of antiquities.

THE CITY OF ATHENS

Athens is the **historical capital of Europe,** with a long history, dating from the first settlement in the **Neolithic age.** In the 5th Century BC (the "Golden Age of Pericles") – the culmination of Athens' long, fascinating history – the city's values and civilization acquired a universal significance. Over the years, a multitude of conquerors occupied Athens, and erected unique, **splendid monuments** - a rare historical palimpsest. In 1834, it became the capital of the modern **Greek state** and in two centuries since it has become an attractive **modern metropolis** with unrivalled charm.

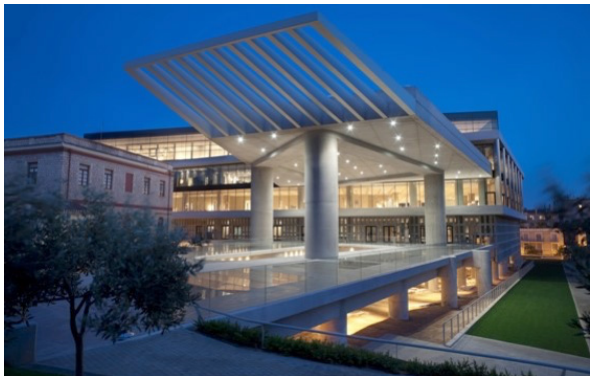
A large part of the town's **historic centre** has been converted into a 3-kilometre **pedestrian zone** (the largest in Europe), leading to the major **archaeological sites** ("archaeological park"), reconstructing – to a large degree – the ancient landscape.

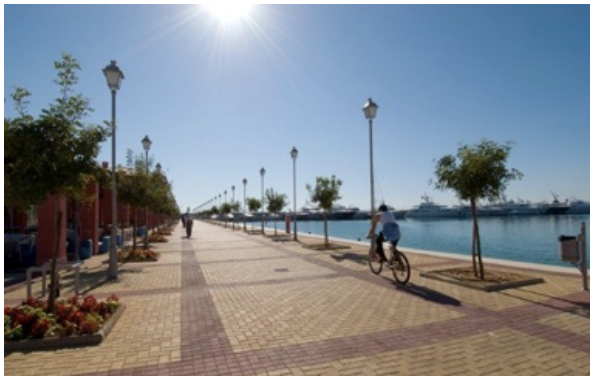
Around Acropolis

The tour starts at the temple of **Olympian Zeus** (6th c. B.C.), one of the largest in antiquity and close by **Hadrian's Arch** (131 A.D.), which forms the symbolic entrance to the city. From there, walking along **Dionysou Areopaghitou Street** (on the south side of the Acropolis) you pass the **ancient Theatre of Dionysos** (5th c. B.C.) where most of the works by Sophocles, Euripides, Aeschylos and Aristophanes were performed. Continuing, you will reach the **ruins of the Asklepieion** (5th c. B.C.) and the **Stoa of Eumenes** (2th c. B.C.) and from there the **Odeion of Herodes** Atticus, which was built in 161 A.D. and is nowadays the venue of the performances of the **Athens Festival.**

From there you climb up to the sacred rock of the Acropolis, the site of some of the most important masterpieces of worldwide architecture and art, the most renowned of which is the Parthenon temple. Apart from this, also impressive are the **Propylaea,** the **temple of the Athene Nike** and the **Erechtheion**, while you must not skip a visit to the Museum, located close to the Parthenon. Moreover, from the rock you have an impressive view of the city.

Only 300m away from the sacred rock of Acropolis stands the impressive **Acropolis Museum,** one of the most important contemporary works of **architecture** in Athens. It is made of steel, glass and concrete and it houses 4,000 priceless finds from the **Acropolis monuments** that represent its history and function as the most important religious centre of ancient Athens.





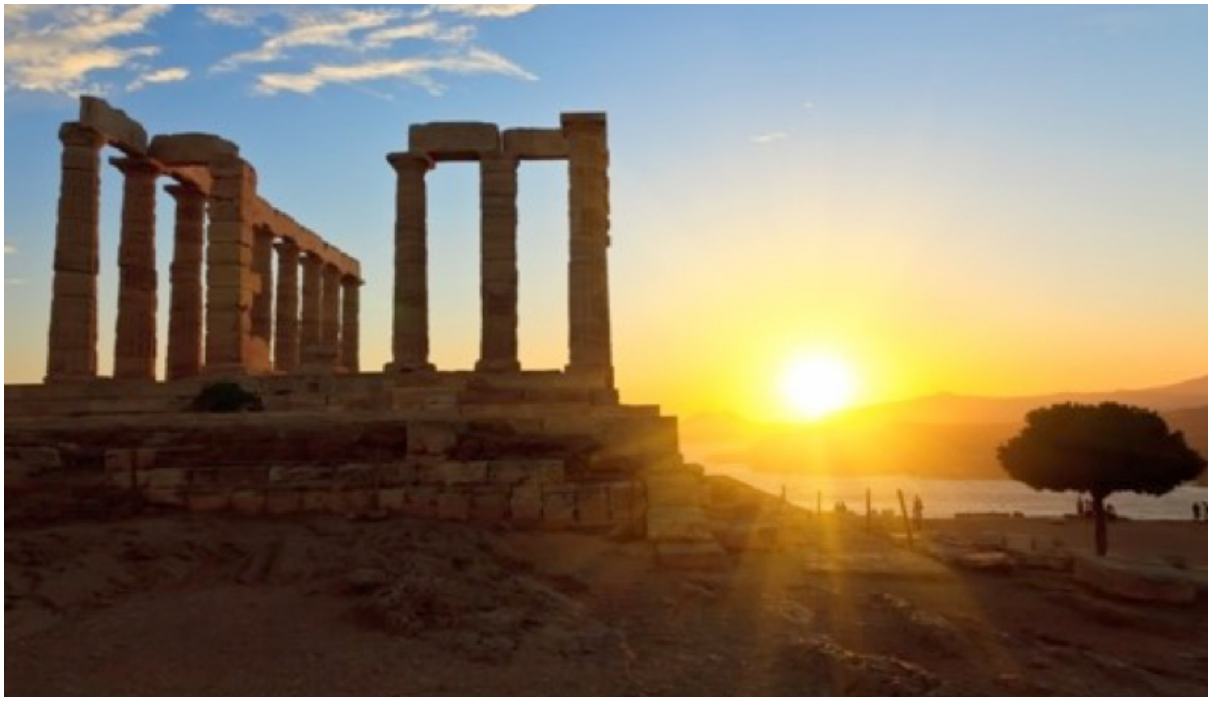
Breathtaking views over Athens

Thanks to its rich morphology Athens has plenty of places where you can admire stunning **panoramic views** of the city. Romantic or not, let yourself be captivated by the Athenian cityscape as seen from above.

Around suburbs

The **southern suburbs,** located on the coast of the **Saronic Gulf,** a recreational and **cultural park** is being planned, comprising the existing **sports** facilities. They offer many opportunities to take a walk along the **seaside**, while you will also find many beautiful organized and free **beaches,** large **shopping** centers and nightclubs (especially during the summer). In the **Maroussi suburb** (north of the centre) are the facilities of the Olympic Athletic Centre of Athens, where the majority of the athletic events were held during the 2004 Athens Olympic Games. **Kifissia** (north of Maroussi) is also worth a visit, with its beautiful villas and impressive **mansions**.

Moreover, if you wish to leave the centre behind you, you may visit, amongst others, the neighboring town of **Piraeus**, Greece's **main port** (which nowadays forms one big conglomerate with Athens), the **Daphni Monastery** (11 km. west), one of the most significant **Byzantine monuments** of the country (12th c.) with unique mosaics, the **Kaisariani Monastery** (5 km. east), which was founded in the 2nd century, the **Temple of Poseidon** (5th c. B.C.) on Cape **Sounion** (58 km. south), following a wonderful route along the coast, the area of the battle of Marathon (490 B.C.) with the Tomb of Marathon, the archaeological sites of **Eleusina** (23 km. west), of **Amphiareion** (48 km. northeast),



of **Vravron** (38 km. east) and **Ramnous** (close to Marathon), as well as the wonderful surrounding **mountain** massifs of **Parnitha, Penteli** and **Hymettos,** all suitable for hiking.

In Athens and the wider **Attica** area, you will find hotel **accommodation** of high standard, modern means of transportation, a wide choice of opportunities for shopping, dining and nightlife, good service but above all the hospitality and warmth of its inhabitants. In a nutshell, Athens is a city that fascinates every visitor, during all seasons.

CONFERENCE SECRETARIAT

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PROGRAM OVERVIEW

Wednesday 8 May 2019

10:00 - 12:00	**Walking in the Athens National Garden**
12:00 - 18:00	**Registrations**
18:00 - 20:00	**Opening ceremony and Welcome by local and international authorities** *Coordinator: Dr. Christos Th. Gallis, Greece*
	Introductory speech by the President of the Conference **"From Hippocrates to Forests for Public Health: A Global Innovative Prospective"** *Dr. Christos Th. Gallis*
	World Health Organization (WHO) **"Forests for Public Health and WHO"** *Dr. Marco Martuzzi, WHO*
	Keynote Lectures **"The further evolution of restorative environments theory: Integration, elaboration, extension"** *Prof. Terry Hartig - Sweden* **"Forest for Public Health and Welfare: Inroduction to Forest Policy in Korea"** *Prof. Won Sop Shin - Republic of Korea*
20:00	**Welcome cocktail**

Thursday 9 May 2019

07:30 - 08:30	**Registrations**
08:30 - 09:15	**Keynote Lecture 1.1** **"Introduction of Forest Medicine-Effects of Forest Bathing/Shinrin-Yoku on human health"** *Dr. Qing Li - Japan* ***Session Chair:*** *Bum-Jin Park - Republic of Korea*
09:15 - 10:30	**Oral Presentations 1.1 - Forest Medicine, Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health** ***Session Chairs:*** *Bum-Jin Park - Republic of Korea, Qing Li - Japan*
10:30 - 11:00	**Coffee break**
11:00 - 12:30	**Oral Presentations 1.2 - Mental Health benefits of exposure to Nature** ***Session Chairs:*** *Kalevi Korpela - Finland, Terry Hartig - Sweden*
12:30 - 13:30	**Lunch break**
13:30 - 14:15	**Keynote Lecture 1.2** **"Outdoor recreation and nature tourism for public health"** *Prof. Liisa Tyrväinen - Finland* ***Session Chair:*** *Liz O'Brien - United Kingdom*
14:15 - 15:15	**Oral Presentations 1.3 - Planning physical activities and human recreation in Forest/Natural environment for Public health** ***Session Chairs:*** *Patrik Grahn - Sweden, Ulrika Stigsdotter - Denmark*
15:15 - 15:45	**Coffee break**
15:45 - 17:00	**Oral Presentations 1.4 - Mental Health benefits of exposure to Nature** ***Session Chairs:*** *Kalevi Korpela - Finland, Terry Hartig - Sweden*

Friday, 10 May 2019

08:30 - 09:15	**Keynote Lecture 2.1** **"Urban Forest-based solutions for Health: opportunities and threats of Doctor Green in our future cities"** *Prof. Fabio Salbitano - Italy* ***Session Chair:*** *Laura Jackson - United States*
09:15 - 10:30	**Oral Presentations 2.1 - Urban Forests and their ecosystem services for Public Health** ***Session Chairs:*** *Kim Kyongha - Republic of Korea, Francisco Javier Escobedo - Colombia*
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11:00 - 12:00	**Oral Presentations 2.2 - Urban Forests and their ecosystem services for Public Health** ***Session Chairs:*** *Liisa Tyrväinen - Finland, Francisco Javier Escobedo - Colombia*
12:00 - 13:00	**Lunch break**
13:00 - 14:30	**Oral Presentations 2.3 - Urban Forests and their ecosystem services for Public Health** ***Session Chairs:*** *Kim Kyongha - Republic of Korea, Liisa Tyrväinen – Finland*
14:30 - 14:45	**Coffee break**
14:45 - 17:00	**Oral Presentations 2.4 - Urban forestry and Green space planning and design for physical activity** ***Session Chairs:*** *Dongying Li - United States, William C. Sullivan - United States*
17:00 - 17:15	**Coffee break**
17:15 - 18:30	**Oral Presenations 2.5 - Forest Medicine, Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health** ***Session Chairs:*** *Won Sop Shin - Republic of Korea, Christos Th. Gallis - Greece*
18:30 - 19:00	**Closing of the Conference - Awards - Closing Ceremony** ***Chair:*** *Dr. Christos Th. Gallis*
19:30	**Farewell Dinner**

E-Posters will be available in large screens, on a rotating basis.
Delegates will be able to access any e-Poster of their choice at any time and as often as they want, during the Conference.

Saturday, 11 May 2019

08:30 - 18:30	**Conference Official Scientific and Cultural All day Tour to Epidaurus Area**

PROGRAM

Wednesday 8 May 2019

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09:15 - 09:30	**EFFECTS OF RELAXATION IN THE FOREST MEDICINE PROGRAM OF THE MEDICAL SPA ASSOCIATION - CASE STUDY OF ROGAŠKA SLATINA, SLOVENIA** *Gorana Isailovic - Serbia*
09:30 - 09:45	**FOREST THERAPY: AN INTERVENTION FOR ADULTS WHO ARE EXPERIENCING STRESS** *Shirley Gleeson - Ireland*
09:45 - 10:00	**FOREST HEALING EFFECTS OF ADOLESCENTS USING PHYSIOLOGICAL INDICATORS** *Sujin Park - Republic of Korea*
10:00 - 10:15	**THE STATUS QUO AND PROSPECT OF FOREST THERAPY DEVELOPMENT IN BEIJING** *Furong Deng - China*
10:15 - 10:30	**NATIONAL HEALTH SERVICE GREENSPACE IN SCOTLAND: OPPORTUNITIES, BENEFITS AND CHALLENGES IDENTIFIED BY HEALTH SECTOR STAFF** *Liz O'brien - United Kingdom*
10:30 - 11:00	**Coffee break**

11:00 - 12:30	**Oral Presentations 1.2 - Mental Health benefits of exposure to Nature** *Session Chairs: Kalevi Korpela - Finland, Terry Hartig - Sweden*
11:00 - 11:15	**PHYSICAL ACTIVITY OUTDOORS AS A MECHANISM LINKING MENTAL HEALTH AND RESIDENTIAL GREEN AND BLUE SPACES IN ENGLAND** *Tytti Pasanen - United States*
11:15 - 11:30	**NATURE ENGAGEMENT FOR HEALTH: ENHANCED METHODS TO IMPROVE CONNECTION AND REDUCE STRESS** *Erik Luvaas - United States*
11:30 - 11:45	**CLINICAL AND DESIGN APPROACH FOR ASSESSING THE BENEFITS OF THE HORTICULTURE THERAPY PROGRAMME IN THE BELGRADE BOTANICAL GARDEN** *Maja Vujčić Trkulja - Serbia*
11:45 - 12:00	**A REMEDY FOR A DISEASE THAT IS NEEDED: THE EFFECTS OF FOREST THERAPY PROGRAM ON MENTAL HOSPITAL PATIENTS** *Ernest Bielinis - Poland*
12:00 - 12:15	**EXPOSURE TO NATURE AND CHILDREN WITH AUTISM SPECTRUM DISORDER** *Dongying Li - United States*
12:15 - 12:30	**ASSOCIATIONS BETWEEN NEIGHBORHOOD NATURAL FEATURES AND DEPRESSION: A U.S. NATIONAL ANALYSIS** *Wei-Lun Tsai - United States*
12:30 - 13:30	**Lunch break**
13:30 - 14:15	**Keynote Lecture 1.2** **"Outdoor recreation and nature tourism for public health"** *Prof. Liisa Tyrväinen - Finland* ***Session Chair:** Liz O'Brien - United Kingdom*
14:15 - 15:15	**Oral Presentations 1.3 - Planning physical activities and human recreation in Forest/Natural environment for Public health** *Session Chairs: Patrik Grahn - Sweden, Ulrika Stigsdotter - Denmark*
14:15 - 14:30	**FORESTS AND OTHER NATURE AREAS AS AN ENVIRONMENT FOR PHYSICAL ACTITIVITY: CASE STUDY FROM HELSINKI** *Marjo Neuvonen - Finland*
14:30 - 14:45	**MAINSTREAMING A FOREST BASED PHYSICAL ACTIVITY PILOT PROGRAMME: RESULTS AND LESSONS FROM THE ACTIVE FOREST PROGRAMME IN ENGLAND** *Liz O'Brien - United Kingdom*
14:45 - 15:00	**URBAN FORESTS CONTRIBUTING TO PHYSICAL ACTIVITY OF RESIDENTS IN HELSINKI, FINLAND** *Liisa Tyrväinen - Finland*
15:00 - 15:15	**Discussion**
15:15 - 15:45	**Coffee break**
15:45 - 17:00	**Oral Presentations 1.4 - Mental Health benefits of exposure to Nature** *Session Chairs: Kalevi Korpela - Finland, Terry Hartig - Sweden*
15:45 - 16:00	**SHORT-TERM EXPOSURE TO THE NATURAL ENVIRONMENT AND DEPRESSIVE MOOD: A SYSTEMATIC REVIEW AND META-ANALYSIS** *Hannah Roberts - Netherlands*
16:00 - 16:15	**SIX-STEP PROCESS MODEL OF FOREST HEALING** *Kyunghee Oh - Republic of Korea*
16:15 - 16:30	**DO DIFFERENT SCHOOL ENVIRONMENTS EFFECT MENTAL HEALTH OF PUPILS?** *Brigitte Allex - Austria*
16:30 - 16:45	**THE EFFECTIVENESS OF THERAPEUTIC RECREATION ON VISITORS' STRESS LEVEL IN SKYTREX ADVENTURE SHAH ALAM, SELANGOR** *Nor Akmar Abdul Aziz - Malaysia*

16:45 - 17:00	**Discussion - Closing of the day**

Friday, 10 May 2019

08:30 - 09:15	**Keynote Lecture 2.1** **"Urban Forest-based solutions for Health: opportunities and threats of Doctor Green in our future cities"** *Prof. Fabio Salbitano - Italy* ***Session Chair:*** *Laura Jackson - United States*
09:15 - 10:30	**Oral Presentations 2.1 - Urban Forests and their ecosystem services for Public Health** ***Session Chairs:*** *Kim Kyongha - Republic of Korea, Francisco Javier Escobedo - Colombia*
09:15 - 09:30	**POTENTIALS FOR PROMOTING HEALTH EQUITY THROUGH URBAN FORESTRY: A NATIONAL STUDY OF HISTORICAL INFLUENCES ON TREE CANOPY AND AIR QUALITY IN US CITIES** *Sima Namin - United States*
09:30 - 09:45	**RESIDENT´S ATTITUDES TOWARDS POTENTIAL GREEN AREAS INFLUENCE ON THEIR HEALTH – CASE OF THE CITY OF BELGRADE** *Jelena Tomićević-Dubljević - Serbia*
09:45 - 10:00	**U.S. ENVIROATLAS PROVIDES FINE-SCALE INDICATORS OF ECOSYSTEM SERVICES FOR PUBLIC HEALTH AND WELL-BEING** *Laura Jackson - United States*
10:00 - 10:15	**EXPLORING THE IMPACT OF THE RELATIVE ABUNDANCE OF ALLERGENIC TREES IN FORESTS ON HEALTH-RELATED ECOSYSTEM SERVICES AND DISSERVICES** *Michiel Stas - Belgium*
10:15 - 10:30	**Discussion**
10:30 - 11:00	**Coffee break**
11:00 - 12:00	**Oral Presentations 2.2 - Urban Forests and their ecosystem services for Public Health** ***Session Chairs:*** *Liisa Tyrväinen - Finland, Francisco Javier Escobedo - Colombia*
11:00 - 11:15	**DISTINCT ECOSYSTEM SERVICES MAY EXERT PROTECTIVE INFLUENCES ON RATES OF AUTISM VS. SUDDEN UNEXPLAINED DEATH** *Laura Jackson - United States*
11:15 - 11:30	**SPORTS EVENTS IN THE FORESTS AROUND WARSAW AND GDAŃSK - COMPARATIVE ANALYSIS** *Emilia Janeczko - Poland*
11:30 - 11:45	**RELATIONSHIP WITH NATURE, VISITS TO GREEN AREAS AND WELL-BEING** *Ann Ojala - Finland*
11:45 - 12:00	**AN INNOVATIVE NATURE INTEGRATION PROGRAMME FOCUSED ON INDIGENOUS SWEDES AND MIGRANTS: IMPACTS ON HEALTH AND WELLBEING** *Anna María Pálsdóttir - Sweden*
12:00 - 13:00	**Lunch break**
13:00 - 14:30	**Oral Presentations 2.3 - Urban Forests and their ecosystem services for Public Health** ***Session Chairs:*** *Kim Kyongha - Republic of Korea, Liisa Tyrväinen – Finland*
13:00 - 13:15	**DOES GREENSPACE MITIGATE AIR POLLUTION AND MOTIVATE PHYSICAL ACTIVITY?: A CASE STUDY OF FOUR EUROPEAN CITIES** *Will Mueller - United Kingdom*
13:15 - 13:30	**GO GREENER GO SAFER? THE IMPACT OF URBAN TREE COVER ON PERCEIVED SAFETY** *K. Mouratidis - Norway*
13:30 - 13:45	**A STUDY FOR MANAGING KOREAN URBAN FORESTS TO ENHANCE URBAN RESIDENTS' HEALTH AND MEET THEIR ACTIVITY DEMAND** *Hyun Deok Seok - Republic of Korea*

13:45 - 14:00	**PERI-URBAN VERSUS NON-URBAN FORESTS: VISITORS' BEHAVIOURS AND PREFERENCES IN CENTRAL ITALY** *Isabella De Meo - Italy*
14:00 - 14:30	**Discussion**
14:30 - 14:45	**Coffee break**
14:45 - 17:00	**Oral Presentations 2.4 - Urban forestry and Green space planning and design for physical activity** ***Session Chairs:*** *Dongying Li - United States, William C. Sullivan - United States*
14:45 - 15:00	**EARLY CHILDHOOD ADAPTIVE MICROFORESTS AS A HEALTH PROMOTION STRATEGY: A SYSTEM-CHANGE APPROACH** *Robin Moore - United States*
15:00 - 15:15	**DURATION OF ACTIVITY IN VARIOUS PARK ENVIRONMENTS AND PSYCHOLOGICAL BENEFITS AMONG OLDER ADULTS: A GPS TRACKING STUDY** *Dongying Li - United States*
15:15 - 15:30	**RECREATIONAL USES OF URBAN GREEN INFRASTRUCTURE: THE TOURIST'S PERSPECTIVE** *Theano S. Terkenli - Greece*
15:30 - 15:45	**THE IMPACT OF URBAN PRIVATE GREEN SPACE ON HEALTH AND WELL-BEING: A SCOPING REVIEW** *Grete Patil - Norway*
15:45 - 16:00	**EFFECTS OF URBAN GREEN SPACE ON HEAT-RELATED VULNERABILITY: A METHODOLOGY BASED ON THE INTEGRATION OF CENSUS AND REMOTE SENSING DATA** *Elena Barbierato - Italy*
16:00 - 16:15	**GENDER DIFFERS IN STRESS REDUCTION IN AN URBAN VR PARK: REGARDLESS ALTERED SOUNDSCAPES** *Marcus Hedblom - Sweden*
16:15 - 16:30	**HOW ROBUST ARE RELATIONSHIPS BETWEEN STREET GREENERY AND FITNESS MEASURES ACROSS DIVERSE COMMUNITIES?** *Wei-Lun Tsai - United States*
16:30 - 16:45	**RESTORATION EFFECTS IN DIFFERENTLY MANAGED FORESTS** *Jenni Simkin - Finland*
16:45 - 17:00	**INFLUENCE OF GREEN SPACE ON THE EFFECTS OF AIRBORNE PARTICULATE MATTER ON HOSPITALIZATION IN THE UNITED STATES** *Seulkee Heo - United States*
17:00 - 17:15	**Coffee break**
17:15 - 18:30	**Oral Presentations 2.5 - Forest Medicine, Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health** ***Session Chairs:*** *Won Sop Shin - Republic of Korea, Christos Th. Gallis - Greece*
17:15 - 17:30	**EVALUATION AND PLANNING OF PRIVATE FOREST THERAPY BASES IN TAIWAN** *Shyue-Cherng Liaw - Taiwan*
17:30 - 17:45	**THE POLICY PROGRAMME "GREEN CARE FOREST" IN AUSTRIA AS A SOCIAL INNOVATION FOR HEALTH SERVICES** *Benjamin Stadler - Austria*
17:45 - 18:00	**A PRELIMINARY REVIEW OF FOREST CARE INITIATIVES FOR HEALTH IN ITALY: IDENTIFYING MODELS AND SUCCESS FACTORS** *İlaria Doimo - Italy*
18:00 - 18:15	**FOREST THERAPY GROUP INTERVENTION FOR EXHAUSTION DISORDER, ANXIETY AND DEPRESSION** *Petra Ellora Cau-Wetterholm - Sweden*
18:15 - 18:30	**Discussion**

18:30 - 19:00	**Closing of the Conference - Awards - Closing Ceremony** *Chair: Dr. Christos Th. Gallis*
19:30	**Farewell Dinner**

E-Posters will be available in large screens, on a rotating basis.
Delegates will be able to access any e-Poster of their choice at any time and as often as they want, during the Conference.

Saturday, 11 May 2019

08:30 - 18:30	**Conference Official Scientific and Cultural All day Tour to Epidaurus area and to Ancient Asclepeion.** At the Epidaurus ancient theater, There we will have 2 oral presentation by: Prof. of Medicine Dr. Geroulanos about Hippocratic therapies in Ancient Asclepeion and, Prof. of Archaeology Dr. Labrinoudakis about the structure, functions and organization of ancient Greek Ancient Asclepeion.

E-POSTERS PRESENTATIONS

1. Forest Medicine, Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health.

THE THERAPEUTIC CONTRIBUTION OF FORESTS TO REHABILITATION CLINICS IN BAVARIA

L. Friedmann[1], A. Gaggermeier[1], M. Suda[1]
[1]Technical University Munich, Germany

FOREST BATHING COMBINED WITH TRADITIONAL KNEIPP THERAPY AS A NEW PUBLIC HEALTH APPROACH IN GERMANY

G. Immich[1], A. Schuh[1]
[1]Chair of Public Health and Health Services Research (IBE), Ludwig Maximilian University, 81377 Munich, Germany

SHINRIN YOKU – A QUALITATIVE DECRIPTIVE DEFINITION OF TERMS BASED ON A SEMANTIC CONTENT ANALYSIS

J.A. Jungmair[1], A. Arnberger[2], S. Pöchtrager[1]
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[2]University of Natural Resources and Life Science, Institute for Landscape Development, Recreation and Conservation Planning, Vienna, Austria

EFFECTS OF FOREST AND NATURE ON OLDER PEOPLE: A SYSTEMATIC REVIEW

J. Kim[1], W.S. Shin[2]
[1]Department of Forestry Therapy, Chungbuk National University, Cheongju, Republic of Korea
[2]Department of Forest, Chungbuk National University, Cheongju, Republic of Korea

FOREST THERAPY PROGRAM ASSOCIATED WITH TKM TO PREVENT COGNITIVE DECLINE FOR THE ELDERLY

J. Yi[1,2], T. Khil[1,2], Y. Lim[1,2], M. Shin[2], S. Jeon[2], J. Shin[1], B. Kang[1], J. Kim[1], B.Y. Kim[1], J.E. Lee[1], A.Y. Jeong[2], B. Ku[3], G. Kim[3], J.H. Park[3], J. Choi[4], W. Cha[4], C. Shin[1], W. Shin[1], J.U. Kim[3]
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[3]Korea Institute of Oriental Medicine, Yuseong-gu, Deajeon, Republic of Korea
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PRELIMINARY ANALYSIS OF PSYCHOLOGICAL AND PHYSIOLOGICAL BENEFITS FOR FOREST THERAPY IN TAIWAN

S.C. Liaw[1], W.M. Hsieh[1]
[1]Department of Geography, National Taiwan Normal University, Taiwan

THE ROLE OF CERTIFIED PHYSICIAN IN FOREST MEDICINE OF INFOM IN JAPAN

H. Ochiai[1], M. Imai[2], Q. Li[3], Y. Takase[4], T. Ochiai[5]
[1]Department of Plastic and Reconstructive Surgery, National Hospital Organization Tokyo Medical Center, Japan
[2]PrINFOM, Tokyo, Japan
[3] Department of Rehabilitation and Physical Medicine, Graduate School of Medicine, Nippon Medical School, Tokyo, Vice-President and Secretary General of INFOM, Tokyo, Japan
[4]General Manager of INFOM, Tokyo, Japan
[5]Forest Baubiologie Studio Inc. CEO, Tokyo, Japan

THE INFLUENCE OF A FOREST EDUCATION PROGRAM ON FAMILY STRENGTH

S.Y. Jeong[1], Y.H. Lee[1], S.J. Park[1]
[1]Forest Welfare Division, Forest Policy and Economics Department, National Institute of Forest Science, Republic of Korea

COMMUNITY AS KNOWLEDGE BUILDING AND SHARING SPACE IN FOREST THERAPY METHOD DEVELOPMENT AND PRACTICAL USE

P.E. Cau Wetterholm[1], I. Banyard[2], K. Berry[3], L. Desmet[4], K. Kilpi[5], H. Korhonen[6], S. Malve-Ahlroth[7], I. Nygårdsvik[8], H. Ohlsson[9], S. Malminiemi[10], V. Povilaityte-Petri[11], I. Simoens[12]

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[2]Cotswold Natural Mindfulness, United Kingdom
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[6]Co-Founder of Forest Therapy Days, Finland
[7]Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, SLU, Sweden
[8]Spekulatoriet as, Norway
[9]PhD Candidate, Södertörn University, Stockholm, Sweden
[10]MSc, University of Jyväskylä, Finland
[11]Université Libre de Bruxelles, Belgium
[12]Instituut voor Natuur- en Bosonderzoek, Brussels, Belgium

VISITORS' PERCEPTIONS AND RECREATIONAL VALUE OF PERI-URBAN FORESTS: AN EXPERIENCE FROM CENTRAL ITALY

E. Bianchetto[1], I. De Meo[1], A. Paletto[2], P. Cantiani[2], C. Fagarazzi[3], L. Lorenzini[3]

[1]Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Research Center Agriculture and Environment (CREA), Italy
[2]Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria, Research Centre for Forestry and Wood (CREA), Italy
[3]Department of Agricultural, Food and Forestry Systems (GESAAF), University of Florence, Italy

2. Mental Health benefits of exposure to Nature.

LEARNING BY PLANTING: EDUCATION FOR FUTURE CITIZENS

R. Amaral[1], G. Velasco[1], C. Souza[1], A. Tupiassu[2], P. Ielo[1], M. Solera[1]

[1]IPT - Institute for Technological Research of the State of São Paulo, Avenida Professor Almeida Prado, 532. Cidade Universitária, São Paulo - SP, Brazil
[2]Secretary of Health of the Municipality of São Paulo, São Paulo, Brazil

ECOPSYCHOLOGY AS A NEW GROWING FIELD IN PSYCHOLOGICAL COMMUNITY WORLDWIDE. BALANCING THE INTERRELATION OF HUMAN PSYCHE AND PLANETARY WELL-BEING

K. Apostolaki[1], M. Danon[2]

[1]International Ecopsychology Society, Chania-Crete, Greece
[2]International Ecopsychology Society, Osnago, Lecco, Italy

3. Planning physical activities in Forest/Natural environment for Public health.

GREEN CARE WALD AND FOREST PEDAGOGICS - A VIVID SYMBIOSIS

E. Johann

Verein Waldpädagogik in Österreich, St. Margareten, Austria

INFLUENCE OF FOREST CHARACTERISTICS AND SILVICULTURAL TREATMENT ON STRESS LEVEL: A NEUROSCIENTIFIC APPROACH

S. Sacchelli[1], L. Bambi[2], E. Barbierato[1], T. Borghini[2], I. Capecchi[1], G. Grilli[1], F. Pastorella[1]

[1]Department of Agricultural, Food and Forest System Management, University of Florence, Florence, Italy
[2]Department of Architecture, University of Florence, Florence, Italy

4. Urban forestry and Green spaces planning and design for human activity.

THE EFFECT OF THERMAL ENVIRONMENT OF THE FOREST ON HUMAN AUTONOMIC NERVOUS SYSTEM

D. Joung[1], J. Lee[1], S. Hong[1], D. Kim[1], B.J. Park[1]
[1]Department of Environment and Forest Resources, Chungnam National University, Daejoen, Republic of Korea

THE ROLE OF FORESTS IN THE CONTEXT OF ENVIRONMENTAL CITIZENSHIP: INSIGHTS FROM AUSTRIA

J. Oettel[1], K. Lapin[1], F. Leregger[2], J. Zöscher[3]
[1]Austrian Federal Research Centre for Forests, Vienna, Austria
[2]Institute for Environment, Peace and Development (IUFE), Vienna, , Austria
[3]Forest Training Centre, Ossiach, Austria

MICROCLIMATE DEPENDENCE OF ATMOSPHERIC PYHTONCIDE CONCENTRATION ABOVE THE MAIN EAST ASIAN FOREST TYPES

B.J. Park[1], G. Kim[2], D. Joung[1]
[1]Department of Environment and Forest Resources, Chungnam National University, Daejoen, Republic of Korea
[2]Department of Forest Welfare Research Center, National Institute of Forest Science, Seoul, Republic of Korea

EFFECTS OF FOREST THERAPY PROGRAM ON THE RECOVERY FROM FIREFIGHTERS' STRESS

B. Lee[1], D.W. Ko[1], D.S. Lee[1], M.Y. An[1], J.W. Lee[1], J.W. Kang[1], C.H. Park[1]
[1]National Center for Forest Therapy, Korea Forest Welfare Institute, Republic of Korea

INTRODUCTION TO KOREA FOREST WELFARE INSTITUTE

H.E. Oh[1], Y.K. Yoon[1], P.S. Kim[1], S.H. Yeon[1], B.G. Woo[1]
[1]Korea Forest Welfare Institute, Republic of Korea

5. Urban Forests and their ecosystem services for Public Health.

QUANTITATIVE ASSESSMENT OF LANDSCAPE QUALITY IN FOREST THERAPY GARDENS – A CASE STUDY IN BEIJING SUBURB

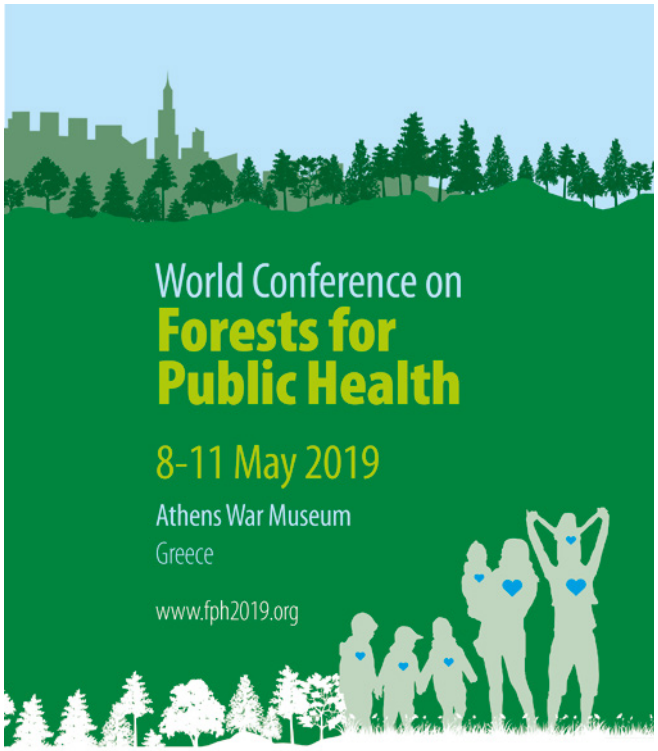
R. Dong[1], Xueqi Zhang[1,2], Yonglin Zhang[1,2], Tianxia Jia[1,2]
[1]State Key Laboratory of Urban and Regional Ecology, Research Center for Eco-environmental Sciences, Chinese Academy of Sciences, Beijing, China
[2]University of Chinese Academy of Sciences, Beijing, China

VOLATILE ORGANIC COMPOUNDS AND MICROMETEOROLOGY FACTORS IN URBAN FOREST

Y.S. Jo[1], S.J. Park[1]
[1]Forest Welfare Division, Forest Policy and Economics Department, National Institute of Forest Science, Republic of Korea

INTEGRATION OF MEDICINAL PLANTS KNOWLEDGE AND USE IN FOREST THERAPY

K. Kilpi[1], V. Povilaityte-Petri[2]
[1]Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, SLU, Sweden
[2]Museum of Medicinal Plants and Pharmacy, Faculty of Pharmacy, Université Libre de Bruxelles, Belgium



KEYNOTE SPEAKERS
PRESENTATIONS

RESTORATIVE ENVIRONMENTS THEORY: BEYOND THE CONVENTIONAL NARRATIVE

Terry Hartig
Institute for Housing and Urban Research, Uppsala, Sweden

Theory and experimentation on restorative effects of nature experience gave impetus to the epidemiological research on nature and health that has grown so dramatically in volume and scope over the past two decades. It did so by offering answers to questions about how forests, parks, urban green spaces and other seemingly natural settings could come to provide such a broad spectrum of cumulative health benefits. Over the first decades of its development in environmental psychology and allied disciplines, starting in the 1970s, research on restorative effects of nature experience has for many researchers consolidated around a narrative that emphasizes two contrasting theories: attention restoration theory, focused on a cognitive process of restoration, and stress reduction theory, focused on a psychophysiological process. In this presentation I will look beyond this conventional narrative. Specifically, I will address important gaps in the description of three of the main aspects of restoration: the condition from which a person can need restoration; characteristics of the environment that support restoration; and outcomes that allow inferences about restoration having occurred. With this further theorizing about the restorative effects of nature experience I aim to enhance our understanding of how forests can serve public health.

FOREST FOR PUBLIC HEALTH AND WELFARE: INTRODUCTION TO FOREST POLICY IN KOREA

Won Sop Shin
Social Forestry, Chungbuk National University, Republic of Korea

Like other countries, Korea in recent years, lifestyles have changed dramatically because of rapid urbanization and advances in technology. This has led to numerous lifestyle-related health problems in modern society. Despite advances in medical technology, the prevalence of chronic or untreatable diseases continues to increase. Further, the rising cost and side effects of medical treatments lead people to look for alternative ways to cope with their health problems. The prevalence of chronic diseases, lifestyle-related diseases, environmental diseases, and so on is constantly increasing, as is that of psychological disorders such as stress, depression, and addiction.

Since ancient times, humans have evolved within nature, modern health problems are believed to originate from their disconnect with nature. Forests are considered an effective healing method because of their relaxing environment, including beautiful scenery, phyton-cides, and the relaxing sound of birds. With increasing scientific evidence on the therapeutic effects of the forest environment, people's interest in and demand for forest healing have been rapidly rising.

Korea's forests account for about 2/3rd of the total land area. The Republic of Korea successfully transformed its denuded land into rich forests in less than half a century. There has been a continuous increase in the number of people visiting forests. The Korea Forest Service (KFS) facilitated 'Forest Healing' to utilize forests for enhancing health and quality of life. The KFS has legalized the concept of forest healing and launched a forest healing instructor system to develop and manage forest healing programs.

To expand the scope of forest healing, the KFS plans to establish 75 healing forests by 2022. The KFS plans to train over 900 forest healing instructors to provide specialized healing services to the public. Along with these aims, the KFS continues to perform research on forest - medicine, such as comprehensive medical research on forest healing through interdisciplinary approaches.

It is becoming increasing necessary to utilize forests to enhance public health and wellbeing. As the Republic of Korea has been rapidly aging and is anticipated to become one of the most aged countries by 2020, the government expects that medical expenses will increase continuously. Numerous studies show that forest healing can reduce stress, preventing it from developing into more severe illnesses. Widespread media coverage on the therapeutic function of forests has substantially increased public attention to forests. The private and public sectors both contribute to provide forest healing services to meet the rising public demand. Medical groups have started to use forest facilities in order to provide evidence of the therapeutic effect of forests. Additional studies are being conducted to develop scientific technology that can immediately contribute to improve people's quality of life. With the keynote presentation, the cases of implementation for utilizing forests as resources for public health and welfare in Korea would be shared.

INTRODUCTION OF FOREST MEDICINE - EFFECTS OF FOREST BATHING/ SHINRIN-YOKU ON HUMAN HEALTH -

Qing Li
Nippon Medical School Hospital
International Society of Nature and Forest Medicine (INFOM)
Japanese Society of Forest Medicine, Tokyo, Japan

Humans have enjoyed forest environments for ages because of the quiet atmosphere, beautiful scenery, mild climate, pleasant aromas, and fresh, clean air. In Japan, since 2004, serial studies have been conducted to investigate the effects of forest environments (Forest Bathing/Shinrin-Yoku) on human health. We have established a new medical science called Forest Medicine. The Forest Medicine is a new interdisciplinary science, belonging to the categories of alternative medicine, environmental medicine and preventive medicine, which studies the effects of forest environments (Forest Bathing/Shinrin-Yoku/Forest Therapy) on human health. It has been reported that Forest Bathing/Shinrin-Yoku (forest therapy) has the following beneficial effects on human health:

1 Forest Bathing/Shinrin-Yoku (forest therapy) increases human natural killer (NK) activity, the number of NK cells, and the intracellular levels of anti-cancer proteins, suggesting a preventive effect on cancers.

2 Forest Bathing/Shinrin-Yoku (forest therapy) reduces blood pressure and heart rate showing preventive effect on hypertension.

3 Forest Bathing/Shinrin-Yoku (forest therapy) reduces stress hormones, such as urinary adrenaline and noradrenaline and salivary/serum cortisol contributing to stress management.

4 Forest Bathing/Shinrin-Yoku (forest therapy) increases the activity of parasympathetic nerves and reduces the activity of sympathetic nerves to stabilize the balance of autonomic nervous system.

5 Forest Bathing/Shinrin-Yoku (forest therapy) increases the levels of serum adiponectin and dehydroepiandrosterone sulfate.

6 In the Profile of Mood States (POMS) test, Forest Bathing/Shinrin-Yoku (forest therapy) reduces the scores for anxiety, depression, anger, fatigue, and confusion, and increases the score for vigor, showing preventive effects on depression.

These findings suggest that Forest Bathing/Shinrin-Yoku (forest therapy) may have potential preventive effects on lifestyle-related diseases.

OUTDOOR RECREATION AND NATURE-BASED TOURISM FOR PUBLIC HEALTH

Liisa Tyrväinen
Natural Resources Institute Finland (Luke), Helsinki, Finland

Outdoor recreation and nature-based tourism in forests provide range of social and health benefits for European societies. Health benefits can be received from urban and peri-urban forests, recreation and protected areas as well as rural forests used for multiple purposes, such as timber production. Health benefits of forest recreation has recently climbed higher up both in the European policy as well as in national policy agendas. Health and well-being has been acknowledged as a rising trend also in tourism and, these benefits are increasingly integrated in nature-based tourism business models and products.

This presentation discusses the key research regarding health and well-being linked to outdoor recreation and nature-based tourism. The applied research methods include population surveys, qualitative studies, on-site field experiments measuring psychological and physiological health benefits, and combining GIS-based data regarding the supply of nature with use of the areas and health status of people. Increasing number of studies demonstrate that short visits to forests reducing stress and add recovery from work. Moreover, forests and other nature areas offer attractive and cost-effective opportunities for physical exercise and thus offer an economically sustainable approach for enhancing physical activity policies.

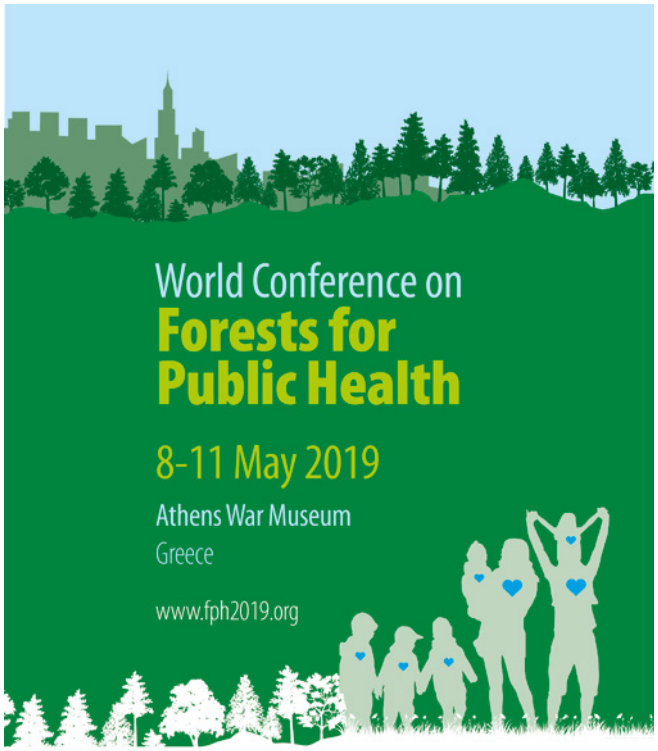
There are, however, individual and cultural differences how forest environments are perceived and used. The presence of a forest does not necessarily imply its use, but the site needs to meet the qualities appreciated by the users. Relatively little information is available regarding the health effects of different type and size of forests as well as effects of their management. More scientific evidence is also needed about individual differences in nature exposure. Connectedness with nature, for example, is recently shown to be linked to the personal need to visit forests and other natural areas. Today there is a lack of correlational studies analyzing long-term effects of living near a forest and of studies focusing on the curative effect of forests.

The presentation also discusses recent efforts in policy-science discussions on how the research knowledge have been implemented within various sectors such as public health and land-use planning. Increased research knowledge regarding health benefits of forests has inspired practical experiments and piloting work across Europe. The current research results encourage land-use planners to maintain larger forested areas and their accessibility, in particular in urban and peri-urban areas, as well as prevent further fragmentation of areas. Statistics regarding visits to nature and forests are poorly developed in Europe. Monitoring of outdoor recreation and nature-based tourism is conducted in very few countries. This prohibits forming also a comprehensive view of the role of forests in promoting public health in Europe. Moreover, gaps in scientific knowledge still hinder economic valuation of the health benefits of forests.

URBAN FOREST-BASED SOLUTIONS FOR HEALTH: OPPORTUNITIES AND THREATS OF DOCTOR GREEN IN OUR FUTURE CITIES

Fabio Salbitano
Department of Agriculture, Food, Environment and Forestry. University of Florence, Italy

We usually feel good when we are outdoor in a green space. Evidences and research show that the presence of, green spaces, trees and urban forests can positively influence our health and well-being. When compared to rural population, urban dwellers have a 40% higher risk of mood disorders, a 20 % higher of anxiety disorders, and a 50% higher tendency to develop schizophrenia. In 2005, Richard Louv firstly wrote about the nature-deficit disorder as a worrying non-communicable disease of contemporary urban societies. Since then, the number of studies looking at the benefits of (urban) nature and concerning the problems that can arise from being too isolated from the natural sphere grew and acquired scientific soundness and voice in the debate on our future cities and lives. In late years, thinking of urban forests and trees as a kind of green physician, improving our health directly and indirectly, and at little expense increased to be both a scientific and popular topic. Well-designed and managed urban forests and green spaces substantially contribute to healthy lives and well-being through disease prevention, therapy and recovery. But to what extent this growing awareness has supported the adoption of specific prescriptions and therapies by the "white" side of healthcare? As example, Park Rx America, founded by dr. Zarr in USA, encourages doctors to prescribe parks as therapy setting; advising physicians to search for parks near a family's home address, or with particular available amenities, and write specific prescriptions, with the name of the park, the activity, the duration, the frequency. The present study stresses some of the ongoing practices as well as *ante litteram* examples of nature prescriptions, aiming to evaluate the success and applicability of urban-forest based solutions to health and wellbeing. Literature search, social communication and reporting analysis were filtered to highlight the strengths and weaknesses of the approches implemented while trying to capture the gaps in introducing the "comfort of nature" as a evidence-based way of accompanying or solving some of the recurrent problems caused by non-communicable diseases. Furthermore, key informants' interviews with "white" physicians have been performed to focus the emerging topics of discussion, the gaps in knowledge, and limits of application. This results in a generally positive (if not already implemented) acceptance of programs that foresee prevention activities and prescriptions in green spaces. Some key limits are underlined, such as the resistance and distrust of patients, the lack of adequate preparation in specialization programs, the absence of consolidated protocols and certifications at the level of national health services. It emerges a need for a influential health governance overtaking impromptu cases (often felt as naives), decisively including prevention programs, prescriptions, and therapies based on solutions delivered by urban forests and green spaces.



ORAL
PRESENTATIONS

Forest Medicine, Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health

FOREST THERAPY GROUP INTERVENTION FOR EXHAUSTION DISORDER, ANXIETY AND DEPRESSION

P. Cau Wetterholm
Vidar Primary Mental Health Care, Järna City, Stockholm County, Sweden

INTRODUCTION: Shinrin-yoku is the Japanese wellness practice of "forest bathing" or immersing the senses in the atmosphere of the forest for relaxation and health care. It originated in Japan in 1982 as part of a national health program, to address stress related disorders. The practise of forest bathing and forest therapy has been scientifically suggested as a preventive health care intervention* that provide opportunities to lower stress levels and strengthen the immunal system, two major findings that account for several associated health and wellness experiences, and provide opportunities to move forest therapy from a preventive care practise to a clinical mental health intervention. This study assessed the feasability of a six week manualised, guided clinical forest therapy group intervention in primary mental health care, for adults diagnosed with medium to severe levels of exhaustion disorder, experiencing stress, anxiety and depression. The intervention consisted of two hour sessions once a week, guided by a licenced clinical psychologist and trained forest therapy guide, in a nearby urban forest. The study also aimed at investigating possible professional skills development (PSD) in relation to clinical forest therapy group guiding, adjusted to exhaustion disorder and related difficulties.

METHOD: This is a mixed method feasibility study using quantitative and qualitative research methodologies. Participants in both groups were assessed pre- and post intervention using individual semi structured interviews and self-reported measures on stress, anxiety and depression. The individual interviews were analyzed using thematic analysis. Investigation of PSD were conducted through clinical journaling after each session, through post intervention interviews and analyzed using thematic analysis.

RESULT: The qualitative results indicated lower levels of perceived stress, anxiety and depression during and immediately after a forest therapy session, lasting up to three days. Other reported experiences were divided into three themes: connectedness, wellbeing, recovery, social repair. The quantitative results were incomplete due to participants level of exhaustion and prohibited any valuable statistical outcome measures. Results regarding PSD were divided into three themes: clinician as guide, adjusted guiding skills and contextual considerations.

CONCLUSION: The findings of this study indicate that forest therapy, as a manualised, guided, six week program is a feasible and promising intervention in mental health care for those with moderate to severe levels of exhaustion, experiencing stress, anxiety and depression. The program design may be altered to two sessions per week with assessment pre and post each intervention as well as pre and post the six week program. PSD may prove important in order to adjust forest therapy group guiding to populations diagnosed with exhaustion disorder and related difficulties. These considerations will be suggested as manual development alterations. Further research is needed, preferably an RCT on a larger scale with an emphases on including appropriate quantitative outcome measures.

*Shinrin-Yoku (Forest Bathing) and Nature Therapy: A State-of-the-Art Review

M.M. Hansen, R.Jones, and K.Tocchini, Y.Miyazaki, Int J Environ Res Public Health. 2017 Aug; 14(8): 851.

A PRELIMINARY REVIEW OF FOREST CARE INITIATIVES FOR HEALTH IN ITALY: IDENTIFYING MODELS AND SUCCESS FACTORS

I. Doimo[1,2], P. Gatto[1], M. Masiero[1], D. Pettenella[1]

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[2] PhD Program Land, Environment, Resources and Health (LERH), Università degli Studi di Padova, Legnaro (PD), Italy

INTRODUCTION: Forest Care Initiatives (FCIs) – meant as organized initiatives supporting active and passive interaction with forest ecosystems aimed at increasing levels of human wellbeing and quality of life- are becoming increasingly popular in many countries. On the one side FCIs can be a cost-effective solution to the increasing societal demand for health and well-being services; on the other they can be an opportunity for valuing forest resources and supporting development and social innovation in marginal areas. While the positive effects of contact with trees and forest ecosystems on health are increasingly studied and confirmed by scientific literature, there is a general lack of knowledge about the FCIs management models and their economic and institutional framework. In order to contribute filling this gap, this paper considers the Italian context, where FCIs have been recently introduced and are rapidly growing. The paper aims to present a review of the FCIs for health (FCIH), identifying different management models and the success factors of selected case studies, to support the development of future initiatives and inform policies.

METHODS: Through an extended literature review encompassing scientific and grey contributions, formal and informal contacts with experts and practitioners, an updated state-of-the-art of the FCIH in Italy is developed, and representative case studies are selected. Quantitative and qualitative data are collected through interviews and participant observation. The contextual biophysical and institutional conditions and their interplay are presented through a conceptual framework, which helps identifying models and critical success factors (e.g. type and number of partnerships, type and number of services, type of forest ownership and management, target beneficiaries, business model, etc.).

RESULTS: FCIH in Italy are quite recent -the first registered project was started in 2013- and still poorly coordinated. At present, the only example of network at national level is *"Montagna Terapia"* that keeps in connection dozens of different initiatives where forests are used as set for rehabilitation and social inclusion initiatives. Within analysed FCIH the role of forest resources ranges from a simple frame for the activities, to an "active" instrumental function as a medium, and management activities vary accordingly. The target beneficiaries range from the general population, to people with very special needs and this heterogeneity reflects also on the organizational and business models. Common success factors among FCIH include the level of engagement of public sector agencies and key actors, and the value proposition.

CONCLUSIONS: Understanding success factors, business models and the institutional context of FCIs is critical for the replicability and successful implementation of novel solutions. This paper represents a preliminary analysis of selected FCIH in Italy and a testing of the assessment conceptual framework. Although these first results are promising, further research and tests are needed to fine-tune the framework and facilitate the assessment and eventual transfer, up-scaling and innovation of successful models. While supporting the development of FCIs and benefiting the management of forest resource, research in this field might contribute to enhance stakeholders' awareness about FCIs and get informed about new opportunities for job creation and income diversification.

FOREST THERAPY: AN INTERVENTION FOR ADULTS WHO ARE EXPERIENCING STRESS

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INTRODUCTION: The social, economic, and medical costs of stress are substantial. Stress negatively impacts mental health, physical health, wellbeing, and quality of life. Exposure to stress and stressful events causes disease through biological pathways (by damaging immune functioning) and behavioural pathways (by triggering negative behavioural responses such as an increase in alcohol consumption, unhealthy food choices, or a reduction in physical activity). There is an emerging evidence base demonstrating the efficacy of Forest Therapy (also known as forest bathing or Shinrin-yoku) in terms of stress reduction. Contact with nature can offer a practical approach for population-based mental health promotion. Evidence exists to support the use of nature for primary, secondary, and tertiary stress prevention. As well as promoting stress recovery and mental fatigue restoration, nature contact can act as buffer against the health impacts of stressful events.

METHODS: This is a mixed method feasibility study examining a standardised, six-week, Forest Therapy intervention for adults experiencing stress in Ireland. Acceptability, practicality, and implementation were assessed and limited efficacy testing was conducted. The intervention comprised a weekly two-hour Forest Therapy intervention delivered over six weeks. The effect of the intervention on stress levels, rumination and well-being was tested using self-reported measures administered pre and post intervention. Participants' experience of the intervention was explored using written reflections and a focus group. Feasibility was assessed using a focus group, outcome measure analysis, attendance rates, and process evaluation. Quantitative data were analysed in SPSS by available case analysis. Descriptive and inferential statistics were calculated. Qualitative data was analysed using thematic analysis.

RESULTS: Findings provide promising support for the intervention's feasibility and acceptability. Statistical significant improvements in stress levels, rumination levels, and well-being were found post intervention. The following themes regarding the experience of intervention participation were identified: Connectedness, Just Being, Awareness, Nature as Healer, Integration, Relaxation, and Support.

CONCLUSION: Forest Therapy is a feasible stress management intervention. Further research is required to establish the potential of Forest Therapy in the arena of mental health promotion. This will determine if health service providers and policy makers should consider integrating Forest Therapy into the health care system.

EFFECTS OF RELAXATION IN THE FOREST MEDICINE PROGRAM OF THE MEDICAL SPA ASSOCIATION - CASE STUDY OF ROGAŠKA SLATINA, SLOVENIA

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INTRODUCTION: The goal is of this research was to present and measure the effects of the authentic outdoor MEDICAL SPA program on the `Janina` Forest in Rogaška Slatina Spa, Slovenia. This forest complex is classified into 'special purpose forests' that provide priority social forest benefits. The program includes a set of activities performed in the forest environment with the aim of using the therapeutic effects of forests.

METHOD: We studied the ecological conditions, measured the health and sanitary potentials of the forest complex by determining the proportion between the forest-covered area and the quantitatively expressed sanitary and hygienic effects that these forests potentially produce per unit area. The landscape values were evaluated using Rupert`s method (1971) by calculating the natural equipment factor (N), on a scale of 1-6. The forest walk was conducted in September 2018. Out of 130 potential participants, after the introductory speech, 112 of them took part. There were both male and female participants, aged 24-65, and working as medical doctors specializing in pediatrics and pharmacy. Health effects were assessed before and after the stay in the forest using The Manchester Color Wheel Test, Likert`s scale of Happiness, The Short Warwick-Edinburgh Mental Wellbeing Scale and The Method of Active Imagination. Statistical data processing was performed using the descriptive statistics. At the beginning of the program, the participants were 'invited', *i.e.* instructed how to get into the state of physical and mental calmness and how to become aware of their presence at a particular site at the present moment and how to arise all the senses of the human body. At the beginning and at the end of the activities, the participants were asked to fill in questionnaires. Participants were divided in four groups guided by 3 forest therapy guides and 5 mediators of forest therapy. The groups performed identical activities: `Pleasure of the Presence`, Counseling, `What's in Motion`, 'It depends', `Bibliotherapy`, 'Cosmic Shower', `Laughter Yoga`, Tea Ceremony.

RESULTS: `Janina` Forest Complex covers 29.13 ha. It has orographic and climatic conditions suitable for the implementation of a forest medicine program. The forest community is classified as *Luzulo Fagetum*. The sanitary and hygienic effects of the forest are reflected in the filtration of 1.457 tons of dust, production of 320 tons of oxygen and binding of 437 tons of carbon dioxide annually, as well as in the production of 87 kg of phytoncides in 24 hours. Landscape values were rated with a total score of 4.90. The response rate was 86% of the total number of potential participants. A total of *92 questionaires* were successfully completed. After the program, the emotional state of the participants was improved by 20-40% on average.

CONCLUSIONS: The investigated forest complex represents a valuable natural resource which can be used to carry out successful forest medicine programs and gain valuable wellbeing tourist experience. Our pilot investigation showed that authentic MEDICAL SPA programs had measurable positive effects on the holistic health of the participants.

EVALUATION AND PLANNING OF PRIVATE FOREST THERAPY BASES IN TAIWAN

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Forest therapy is the application of local forest resources, forest activities and forest guides to enhance people's physical and mental health in order to achieve the function of preventive medicine. So far, forest therapy bases have been established in many countries in the world. However, there is a lack of research on forest therapy in Taiwan, especially for private forest. Therefore, this study aims to explore suitable indicators to evaluate whether Taiwan's private forests are suitable as forest therapy bases. Through the Fuzzy Delphi Method based on 17 expert questionnaires, this study provides 16 indicators for evaluating private forest therapy bases in Taiwan. Moreover, we apply the method of Analytic Hierarchy Process (AHP) to obtain the weight of each indicator, and to conduct consistency analysis. There are three private forests are selected for suitability evaluation of forest therapy based on the 16 indicators. Results show that these private forests are all suitable for establishing forest therapy bases. For the evaluation, the highest score of indicator for these three private forests is the "beautiful landscape and excellent environment" indicator. However, the lower score of indicators are the "Establish of forest therapy guides" and the "Training and capacity enhancement of staff" indicators. It is necessary to promote human resources in these three forest therapy bases.

KEY WORDS: Private Forest Therapy, Fuzzy Delphi Method, Analytic Hierarchy Process

THE POLICY PROGRAMME "GREEN CARE FOREST" IN AUSTRIA AS A SOCIAL INNOVATION FOR HEALTH SERVICES

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INTRODUCTION: Green Care Forest (GCF) was introduced in 2014 in Austria by the former Federal Ministry of Agriculture, Forestry, Environment and Water Management with the official aim to strengthen the social impact of Austrian forests. The programme is organised around 4 pillars, one of them is the pillar of **"Forestry and Health"**. Since its start, a number of activities have been organised. Some of these activities, but also some of the pillars of GFC itself, like "forest pedagogy", have been existing for many years in the country. Our approach to GFC originates in a "social innovation" perspective, especially in terms of its novelty, its social values and its normative impacts for regional development in rural areas. Hence, the aim of the paper is examine the value of the programme for health services in the forest sector through the lenses of its benefits for social innovation. Thus, the paper deals with the questions: How did GFC evolve? Which institutions and organisations are working with which resources in the field of GFC? How do they address health in forestry services? The results will shed light on understanding of the use of the policy programme Green Care Forest for socially innovative Health services in Austria.

METHOD: A literature research, text and document content analysis were conducted. Actors were identified within GCF and arranged in an actor's mapping. Policy and other external and GFC experts were interviewed in semi-structured interviews. Projects in GCF were looked up with an online and document search. Innovators and persons involved in the innovation process in four of the projects were also interviewed with in semi-structured interviews. All findings were analysed in a policy analysis.

RESULTS: The concept of the policy of GCF is built up on 4 pillars. In result the paper will assess and compare their different relevance and prospects for GFC as an overarching policy programme. *Forest and health* is the youngest pillar and coordinated by the Austrian Research Centre for Forests (bfw). The pillar is most of interest as it shows how the social functions of forests recently have been combined with the need for health care activities in Austria, at least in rhetoric. Within this pillar, the bfw is collecting and spreading knowledge about possible activities in the sector of GCF and supporting projects with a demonstration effect.

Amongst the other pillars, *forest pedagogic* is the oldest pillar with the most people working in it but has strong declined in 2016 because of a change in funding policy. *Forests and culture* has few people working in it but projects developed within it were often very innovative. *Forests and tourism* has very few activities because these two fields are mostly seen as competing.

CONCLUSIONS: Especially in the pillar of **"Forest and Health",** social innovation plays an important role. Voluntarism and idealism from diverse civil society actors and the Third sector can be found as strong supporting factors. However, throughout all pillars conflicts between different groups within and from outside the forestry sector have been identified as the major hindering factors. Financial and personal resources are another weakness of the overall programme, they are budgeted rather small. However, a major official goal in GCF is to create new jobs in forestry.

NATIONAL HEALTH SERVICE GREENSPACE IN SCOTLAND: OPPORTUNITIES, BENEFITS AND CHALLENGES IDENTIFIED BY HEALTH SECTOR STAFF

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INTRODUCTION: The Green Exercise Partnership (GEP) is a joint venture between Forestry Commission Scotland, National Health Service (NHS) Scotland and Scottish Natural Heritage. It was established in 2007 to improve links between the environment and health sectors. The focus of the partnership was a response to increasing evidence that public health can be improved through the use of the outdoors. The work of the GEP has involved setting up demonstration projects across Scotland in health care settings; and organising employment of a small number of Greenspace for Health project managers. Research was undertaken to explore the impacts of the demonstration projects from the perspectives of clinicians, public health staff, hospital estates managers, and corporate decision makers.

METHODS: The qualitative approach undertaken involved 25 telephone interviews with health sector staff across Scotland between 2013 and 2018, at five specific hospital sites, and with strategic health staff whose roles were not hospital specific.

RESULTS: The results highlight primarily positive views of NHS greenspace from the majority of interviewees. This is perhaps unsurprising given that all have been involved in a NHS greenspace demonstration project. However, most felt that greenspace would not be seen as core business for the NHS, but some felt it was the 'right thing to do', and that it was now part of the 'natural conversation' at many hospital sites. Interviewees stated that NHS greenspace can contribute across a range of policies such as health, biodiversity, energy, although many felt the focus should be on health. The key priorities that NHS greenspace can contribute to were identified as physical activity, mental well-being, reduction in length of hospital stay, contribution to creating less obesegenic environments.

CONCLUSIONS: The results illustrate that there is potential for greenspace design to be stipulated as an important requirement for retrofitting existing healthcare facilities and in the creation of any new hospital facilities. There are opportunities to publicise what has already been done through existing networks, and to take a strategic approach as there are clearly priority sites near large centres of population with an outdoor resource to work with, that the GEP can focus on.

FOREST HEALING EFFECTS OF ADOLESCENTS USING PHYSIOLOGICAL INDICATORS

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INTRODUCTION: In recent years, Korea has a higher interest in forest healing due to increase in aged population, a trend of well-being, higher income, and increased leisure time. Because of this interest, several studies were conducted and progressed to verify scientific effects of forest healing lately. There were some studies about short-term forest healing effect by using single or multiple physiological indicators. But to observe health effects of forest healing in multilateral ways and to verify the medical stability, several physiological indicators should be determined.

METHOD: Biomarkers are needed to identify and observe physiological variation in multilateral ways. Several forest healing factors related to human health were considered and analyzed to determine biomarkers. Biomarkers such as TNF-α, IL-8, 8-OHdG were selected to analyze effect of forest healing. Using the selected biomarkers, 89 adolescents had clinical survey before, after, and later forest healing program. Particularly, 89 adolescents were divided into three groups to take later clinical survey in 1 week, 2 weeks, and 4 weeks later for checking the effect of the forest healing program after returning to daily life.

RESULTS: Changes in IL-8, Serotonine, TNF- α, and eNO were observed before and after survey by forest healing program. Biomarkers such as TNF- α, IL-8 were maintained in later survey. Some biomarker such as glucose in saliva didn't show significant change before and after survey but it changed at later survey. However, difference of later survey between 3 groups didn't show a significant trend but showed variety changes. And there were no significant changes in the biomarkers such as 8-OHdG and CRP.

CONCLUSIONS: There were some biomarkers that show about human health improvements. But there were biomarkers that did not show meaningful change due to limitations such as the health status of adolescents and the limitation of the survey that it only proceeded one time. However, in this study, basic factors for physiological measurement of forest healing effects were selected, and it is expected to be used to carry out long-term follow-up research.

THE STATUS QUO AND PROSPECT OF FOREST THERAPY DEVELOPMENT IN BEIJING

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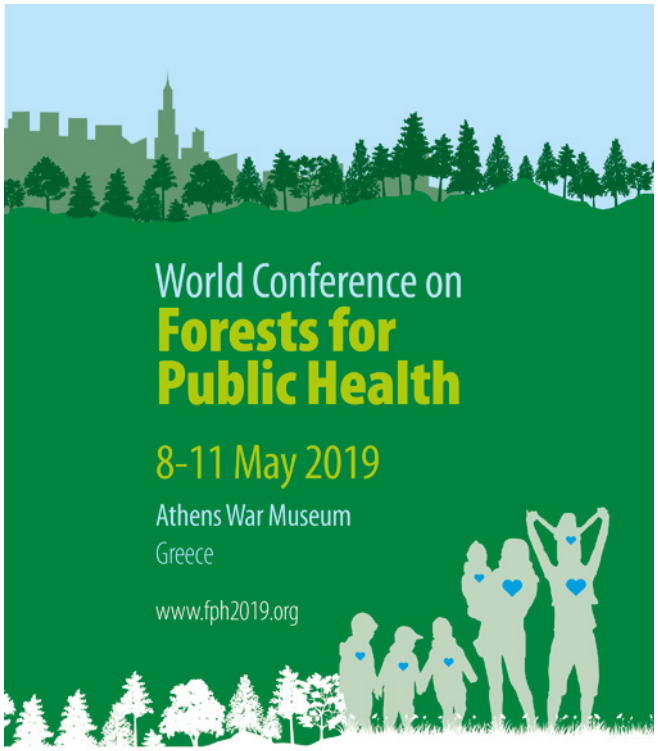
INTRODUCTION: Forest therapy is the activity of human health management through the use of forest resources and the environment. Since 2012, Beijing has taken the lead in introducing the concept of forest therapy in China, and has done a lot of work in client analysis, base construction, therapist training and courses development and so on.

METHOD: A thorough review was conducted to summarize what have done, the status quo and prospect of forest therapy development in Beijing.

RESULTS: First, on the aspects of forest therapy client analysis and public guidance, a survey on public needs and awareness of forest therapy showed that 17.5% of the citizens had a certain understanding of forest therapy, and 48% of the citizens were willing to participate in the forest therapy experience. In order to promote the concept, a promotional video was taken and played in public places. The total reading volume of the forest therapy WeChat public platform reached 1.036 million. Based on WeChat tweets, the books "Forest Therapy Talk I" and "Forest Therapy Talk II" were published. **Second**, in the construction of forest therapy bases, the Beijing local standard "Technical Guidelines for the Construction of Forest Therapy Bases" was drafted, which stipulated the site selection, facility construction, forest therapy curriculum preparation, operation and maintenance of forest therapy bases. Six forest therapy bases have been designed and constructed. In cooperation with the Japan Forest Therapy Association, in 2016, it took the lead in China to carry out certification demonstrations for the Songshan Forest Therapy Base in Beijing. The "Forest Therapy Base Alliance" was launched, and the number of members from all over the country has reached nearly 70. **Third**, In the training of forest therapists, it is divided into three stages: theoretical training, practical training, and on-the-job training. The training period is 2 years. Since 2015, it began to recruit students from the society. Three phases have been launched and 53 students have been qualified as forest therapists. The "Training Materials for Forest Therapists - Basic Knowledge" has been compiled and published, and 28 courses including Introduction to Forest Therapy, Rehabilitation Landscape Science, and Environmental Psychology have been established. Among them, Theory of Forest Therapy is online training, and the system (www.foresttherapy.cn) has 19 video lessons and 7 online readers. **Fourth**, In the development of forest therapy courses, cooperated with Medical Department of Peking University, China Rehabilitation Research Center and other institutions have carried out research on forest medicine, and launched the "forest therapy standards and key technology research and demonstration projects". In collaboration with institutions such as Beijing Forestry University, forest therapy courses such as relaxation, sleep improvement, and menopausal disorders, have been developed and conducted preliminary evaluations of the curriculum effects. Local standards such as the "Beijing General Forest Therapy Menu" are being drafted.

CONCLUSIONS: The elements of forest therapy are divided into parts: clients, bases, therapists and courses. Forest therapy will become a new emerging industry in Beijing and will promote forest welfare development in China.



ORAL
PRESENTATIONS

Mental Health benefits of exposure to Nature

THE EFFECTIVENESS OF THERAPEUTIC RECREATION ON VISITORS' STRESS LEVEL IN SKYTREX ADVENTURE SHAH ALAM, SELANGOR

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INTRODUCTION: The adequacy of nature in decreasing stress by doing amusement exercises yet to be deductively assessed far and wide. In Malaysia there are still lack of research on the association of green space and outdoor recreation in relation to stress reduction. There are many natural areas offering outdoor recreational activities such as white water rafting, hiking, high rope, and more. The purpose of this study is to measure the effectiveness of outdoor recreation on visitors' stress level at Skytrex Adventure Shah Alam, Selangor.

METHOD: This study was conducted at Skytrex Shah Alam in the months of November 2018. Questionnaire survey forms were handed out to 150 respondents. This is done during the weekend and weekdays. The sample size for distributing the questionnaire for this study was determined by using a Ryan (2013) formula. Applying the formula, the sample size calculated was 138. The convenience sampling method was utilized where subjects are chosen on account of their helpful availability and vicinity to the researcher.

The questionnaire consisted of the Profile of Mood States (POMS), Positive and Negative Affect Schedule (PANAS), Restoration Outcome Scale (ROS), Perceived Stress Scale (PSS) and some demographic questions. The questionnaire was designed in two languages which are English and Malay to cater for the multicultural background of Malaysians. The questionnaire was distributed to participants before and after undergoing the high rope activity at Skytrex Shah Alam. Beforehand, subjects who agreed to participate in the study were briefed about the experiment.

RESULTS: The participants of this study consisted of both genders with males being slightly higher in percentage (53.3%) compared to females. A majority of the participants were in the age group of 17-35 with a cumulative percentage of 82.67%. The PANAS evaluation showed a highly significant increase ($p < 0.001$) in positive attitudes among participants after undergoing the high rope course as well as a significant reduction ($p < 0.01$) in negative attitudes scores. The POMS test also showed a highly significant difference ($p < 0.001$) in Total Mood Disturbance among participants after going through the high rope course. This indicates that participants felt more restored and showed a reduction in tension and anxiety, depression, anger as well as confusion moods. However, there is a significant increase ($p < 0.01$) in participants fatigue after the undergoing the high rope course.

CONCLUSIONS: This study showed the restorative benefits of outdoor recreation in natural settings of Skytrex Shah Alam. The findings of this study reinforces that recreational activities in nature environments provide restoration benefits to participants and may be useful in stress reduction.

DO DIFFERENT SCHOOL ENVIRONMENTS EFFECT MENTAL HEALTH OF PUPILS?

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INTRODUCTION: School life challenges pupils' cognitive skills; concentration and learning difficulties are dominant topics in everyday school life. Therefore, the investigation of recreation opportunities in the school and the school environment are at the center of the project Green4brain. Previous studies have shown positive effects of staying in green spaces on human's health and wellbeing. However, the focus was primarily on adults or students, only few studies included adolescents and children. Within a multidisciplinary approach this study investigates the restorative effects of different indoor and outdoor places in schools and their environments on the psychological and cognitive health of adolescents.

METHOD: Between May and June 2018, standardized measurements concerning psycho-physiological health effects of environments (including d2 Test of Attention, self-condition scale by Nitsch, perceived restorativeness scale) were carried out in five area types (classroom, green classroom, school grounds indoor and outdoor, as well as nearby public parks with a higher forest cover). Pupils (n=78; 16-17 years) from three schools in Vienna took part in the measurements, spending a 30-minute recreation period in these places.

RESULTS: In all locations the subjective well-being significantly increased after the exposure. The forested parks were considered as better suited for recreation. The comparison of the classroom and the forested areas indicated that subjective perceived stress was significantly reduced at both sites, with a higher difference in the forested area than in the classroom. The participants perceived the forested parks more diverse, inviting, inspiring, more beautiful and calming, but less open compared to their own classroom. Furthermore, the comparison of the green and non-green classroom showed in the green classroom a higher well-being of the participants. As a positive influence on the recreational effect the adolescents mentioned the presence of friends (at all locations). As the project is still in the analysis phase at this time, further results will be presented at the conference.

CONCLUSION: It can be stated that school breaks are always appropriate to reduce stress, to restore the ability to concentrate and to increase the well-being of pupils - whether the break is held in a classroom or in a forested park. Overall, forested parks are seen as more relaxing places. Pupils suggested that the school break times should be redistributed by changing them to only few short breaks and after a few hours prolonging the "big breaks"; so they could spend some time outside (e.g. in the school garden).

This project is funded by the Austrian research programme "Sparkling Science" of the Austrian Federal Ministry of Education, Science and Research.

A REMEDY FOR A DISEASE THAT IS NEEDED: THE EFFECTS OF FOREST THERAPY PROGRAM ON MENTAL HOSPITAL PATIENTS

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INTODUCTION: The positive effect of forest bathing on the mental health and well being of those suffering from post-traumatic stress disorder or experiencing stress has been proven. However, it is not known how "forest therapy" affects the mental health of people who are treated in a psychiatric hospital. Potentially, "forest therapy" could bring many benefits to these people. To test the potential effectiveness of this therapy, a quasi-experiment was carried out in a psychiatric hospital in Olsztyn (north Poland). The hospital is surrounded by forest areas, which enabled this therapy to be carried out without the need of transporting patients. The study involved patients with affective disorders and patients with psychotic disorders.

METHOD: In the summer and autumn period, 2018, the patients of the psychiatric hospital in Olsztyn participated in the "forest therapy" interventions. The interventions consisted of participating in two-hour walks under the supervision of a therapist. The respondents took part in the study voluntarily and anonymously filled out the questionnaires. Only a psychiatrist - who classified patients into the group "affective disorder" or "psychotic disorder", knew the identity. The subjects filled out the Profile of Mood States Questionnaire (POMS) and the State Trait Anxiety Inventory (STAI-S) before and after the study. The obtained data was analysed using the Student's t-test for dependent trials with the Holmes correction, the group of patients with affective disorders and with psychotic disorders were analysed separately.

RESULTS: In the case of a group of patients with affective disorders, forest therapy had a positive effect on almost all POMS scale subscales, with the exception of the "anger-hostility" subscale, which did not change its values significantly after the intervention. In the case of these patients, the greatest impact was noted in the case of subscales "confusion" and "depression-dejection", the level of anxiety measured with the STAI-S scale also significantly decreased. In the case of patients with psychotic disorders, the values of the "confusion" and "vigor" subscales and the STAI-S scale changed the most. These changes were positive for the health of patients. In the case of the "fatigue" subscale, no significant changes were observed in patients with psychotic disorders.

CONCLUSIONS: The observed changes in psychological indicators in psychiatric hospital patients indicate that the intervention of "forest therapy" can positively affect their mental health. Various reactions were also observed depending on the group of diseases to which patients were classified. In the case of people with psychotic disorders, the greatest effect of therapy was observed in the case of the "vigor" trait, in the case of patients with affective disorders the largest reaction was observed in the case of the "confusion" and "depression-dejection" traits. Changes in psychological indicators are therefore appropriate to the characteristics of a given disorder.

GENDER DIFFERS IN STRESS REDUCTION IN AN URBAN VR PARK: REGARDLESS ALTERED SOUNDSCAPES

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Noise is the largest environmental problem in European cities leading to stress, lack of sleep, obesity and cardiovascular diseases. In planning decibel measures dominates although soundscapes are linked to what a person like or dislike. Natural sounds such as water and bird songs are considered more positive than anthropic sounds such as traffic. Some studies showed that natural sounds could mask noise. All previous studies linked to masking noise were based on self-evaluations.

We stressed participants (n= 120) using mild electrical chocks and put them into a visual 2D 360° environment of a typical Swedish park using a between-group design. One group only heard bird songs, one only heard traffic noise and a third a heard a combination of birds and noise.

Our hypotheses were that being in a park hearing bird song would reduce stress faster than hearing noise. We also hypothesized that bird "song + noise" would reduce stress faster than "noise only" but less than only "bird song". Interestingly we did not see any differences in stress reduction between the different soundscapes. However, there was a difference between genders. Men had lesser stress reduction than women. Women stress levels continued to decrease through the experiment while men's stress increased again after 5 minutes.

Previous studies showed that women and men differ in their perceptions of nature. No study previous showed physiological differences in gender linked to stress reduction in urban green areas. Adding bird songs into a noisy environment do not seem to mask the noise and reduce stress. However, men seem to find these environments more stressful than women. Planning need to take gender aspects into consideration.

EXPOSURE TO NATURE AND CHILDREN WITH AUTISM SPECTRUM DISORDER

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INTRODUCTION: Healthy aging is a public health priority globally. Urban parks and green space have been demonstrated to provide mental health benefits to older adults. Despite growing interest in prescribing nature and park visits by physicians, it remains unknown what type of park visit is most effective in psychological restoration. The lack of knowledge prevents planners and designers from making informed decisions to promote mental health.

METHOD: We collected data in the field from 200 visitors from 15 different parks in Shanghai, China. The participants completed pre-visit and post-visit surveys and wore a GPS and a pedometer while visiting the park. A multilevel latent class analysis (LCA) was conducted to examine subtypes of park use based on duration of activity in different park zones and total amount of physical activity.

RESULTS: The multilevel latent class analysis yielded a three-class structure of park use patterns: the active park lingerer, the active walker, and the passive scanner. Paired-sample t-test and ANCOVA tests showed that affective states (i.e., anxiety, depression, relaxation, contention) enhanced after park visits for all subtypes. However, the active park lingerer displayed significantly higher levels of relaxation and contention, compared to the active walker and the passive scanner.

CONCLUSIONS: As one of the first studies to examine the typologies of the patterns of older adults' use of parks and to link mental health benefits with these patterns, we show that although all users receive mental health benefits from visiting the parks, the magnitude of the benefits vary based on the environment they linger and the activities they engage. The findings offer insights into park design characteristics that could promote the mental health of older adults.

NATURE ENGAGEMENT FOR HEALTH: ENHANCED METHODS TO IMPROVE CONNECTION AND REDUCE STRESS

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INTRODUCTION: Guided by literature on wellbeing benefits of nature interactions, this research paper presents pilot study results from a quasi-experimental design examining the effects of natural versus urban environments crossed with a mindful sensory engagement with nature practice (experimental intervention) versus control. Previous research has not addressed the *way* people engage with natural environments.

METHOD: Fifty-five (55) undergraduate students participated in a non-crossover quasi-experimental design to examine the effects of two types of engagement: (1) a passive walk through an environment (i.e., a typical walk for transportation) or (2) a sensory engagement walk where participants are guided to actively seek out sensory stimulation from nature (e.g., touching plants and trees, listening for birdsong, or smelling the aroma of trees or flowers).

Each group was further divided into two groups (Natural vs. Urban environment) for four groups total: Natural-Sensory Engagement, Natural-Control, Urban-Sensory Engagement, and Urban-Control. Pre- and post-test measures of current perceived stress, and nature connection were collected along with post-test measures of perceived environmental restorativeness and focus of attention. Each of the four walks were approximately the same distance, pace, and duration.

RESULTS: A one-way ANOVA compared the effect of treatment condition on each of the relevant outcome variables. Simple linear regression was calculated to predict perceived stress of the total sample based on all other outcome variables. Analysis of variance showed that the effect of treatment condition on perceived stress was not significant, $F(3,51)=.79$, $p=.506$. However, paired sample t-tests conducted to compare perceived stress before and after the treatment condition show that each treatment condition reduced stress. All treatment groups, except Urban-Control group, exhibited a statically significant reduction in stress: Natural-Control pretest ($M=33.54$, $SD=9.45$), posttest ($M=27.62$, $SD=4.84$), $t(12)=3.39$, $p=.005$; Natural-Sensory Engagement pretest ($M=27.53$, $SD=8.93$), posttest ($M=22.20$, $SD=8.91$), $t(14)=2.73$, $p=.016$; Urban-Sensory Engagement pretest ($M=34.38$, $SD=10.35$), posttest ($M=28.23$, $SD=8.42$), $t(12)=3.19$, $p=.008$; Urban-Control pretest ($M=26.50$, $SD=10.91$), posttest ($M=23.79$, $SD=10.21$), $t(13)=1.92$, $p=.077$. Separate analysis of variance tests showed that treatment condition had a nonsignificant effect on nature connection $F(3,51)=1.45$, $p=.239$; and perceived environmental restorativeness $F(3,51)=1.96$, $p=.132$.

Separate simple linear regression calculations were utilized to predict pre-post changes in perceived stress. A significant regression equation was found for the following variables: perceived environmental restorativeness, $F(1,53)=10.954$, $p=.002$, with an R^2 of .171; nature connection, $F(1,53)=20.177$, $p<.000$, with an R^2 of .276; and focus of attention on the environment, $F(1,51)=6.013$, $p=.018$, with an R^2 of .105.

CONCLUSIONS: The results support previous research on the benefits of nature interaction. Although there was no significant difference across the four treatment groups on most variables (i.e., changes in connection, perceived restorativeness, or perceived stress), each group did experience a reduction in stress. The quality of the experience (nature connection, restorativeness, and attention) appears to predict reduction in stress, even in an urban environment. Future research should focus on alternative urban nature experiences (e.g., developing mindsets, guided city nature walks, or nature meditation practices) to reduce stress in mostly built urban environments. The pilot study was adjusted for a larger sample. Results will likely be available by February, if preferred.

SIX-STEP PROCESS MODEL OF FOREST HEALING

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INTRODUCTION: Several study results have confirmed the psychophysiological healing effects of forests. However, there are few studies on the steps leading to the healing that people go through in forests. Therefore, a theoretical model of forest healing process has not yet been clearly established. This study was conducted to derive a model of forest healing process from empirical data.

METHODS: A total of 180 essays about forest healing experiences from the Korea Forest Service were analyzed using grounded theory, a qualitative research methodology, to draw the paradigm of forest healing and it was restructured and classified into 6 steps according to the time flow and order.

RESULTS: It was found that the forest healing process comprises 6 steps: Stimulation, Acceptance, Purification, Insight, Recharging, and Change. The first step, Stimulation, is a psychophysiological phase of experiencing positive stimulation. On visiting the forest, people start feeling better and clearer-headed, as five senses are engaged by the forest. They experience positive stimulations such as refreshment, happiness, fascination, curiosity, and joy. In the second step, Acceptance, people experience receptive feelings and feel a sense of consolation and comfort in the forest, which seems to accept and embrace everything like a mother's arms. Their minds are opened and they are relieved from their tiring and exhausting life while emotionally interacting with the forest. The third step is Purification, in which people vent and release negative feelings in a quiet forest and experience that their mind and emotions are lightened and cleansed. This leads them to experience relief from stress, the pain and anger disappear, and they forget their worries. The fourth step, Insight, is the most meaningful phase in the forest healing process. People experience self-reflection, awakening, and introspection through contemplation and meditation in the forest. The affecting factors at this phase are the providence and principles of nature, the survival way and vitality of animals and plants, and the order of nature. The fifth step, Recharging, is a phase recharged with positive energy from the forest such as the will to live, hope, courage, confidence, and vitality. The last step is Change, the phase in which the health of body and mind are improved, the relationship is restored, the attitude to life and its value is changed, an active, purposeful life of self-realization is lived.

CONCLUSION: It was confirmed that the forest healing process does not comprise a single element or step, but is an integrated way of healing with emotional and cognitive changes.In other words, the forest healing process means that self-healing progresses as the mind and body interact with various elements of the forest. Forests are healing places where no only physical diseases and psychological problems are healed, but also holistic healing such as of oneself and others, and social and relational recovery can take place. Using this study's results could help to produce better, more effective forest healing programs.

PHYSICAL ACTIVITY OUTDOORS AS A MECHANISM LINKING MENTAL HEALTH AND RESIDENTIAL GREEN AND BLUE SPACES IN ENGLAND

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INTRODUCTION: Physical activity can explain associations between contact with natural environments and mental health gains. This applies to natural settings that are both 'green', such as forests, woodlands, and urban parks, and 'blue', such as seas, lakes, and rivers. Although empirical research examining this mechanism has yielded mixed results, systematic reviews have concluded that overall it seems that people who live closer to or have more green and/or blue spaces near their residence engage in more physical activity than those who live further away. Yet, we do not know whether this is due to physical activity in these natural outdoor settings in particular, or due to physical activity in indoor settings such as gyms. In this study, we examine the interrelationships between residential green and blue spaces, physical activity in different types of settings, and perceived general and mental health.

METHOD: We analysed two cross-sectional waves (collected in 2008 and 2012) of the Health Survey for England (n=21097) with path modeling using lavaan-survey package in R 3.3.3. All leisure-time physical activities conducted in the past four weeks were recorded and divided into watersports (that is, activities in/on/under water such as surfing or kayaking), on-land outdoor activities (such as walking and running) and indoor/other activities (such as going to the gym and dancing). Greenspace density, presence of freshwater, and coastal proximity were calculated at the residential area level. Mental health was measured with the 12-item General Health Questionnaire, and general health was evaluated by a single item. Analyses controlled for a range of area- and individual-level covariates identified as influential in previous research.

RESULTS: Respondents nearer the coast conducted more physical activity outdoors on-land, walking in particular, and this was connected to better mental and general health. Having freshwater in one's living area was also connected to better mental health but this was not due to physical activity patterns. Greenspace density showed no connections with mental health or physical activity.

CONCLUSIONS: Our results indicate that people living near the coast are healthier than those living more inland partly because they engage in more physical activity outdoors on-land, but not necessarily watersports or indoor physical activities. The mechanism connecting freshwater presence and better mental health requires more research. Regarding residential greenspace, more refined measures on the quality of the greenery may be more relevant in terms of both health and physical activity.

SHORT-TERM EXPOSURE TO THE NATURAL ENVIRONMENT AND DEPRESSIVE MOOD: A SYSTEMATIC REVIEW AND META-ANALYSIS

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INTRODUCTION: Depression is a major contributor to the global disease burden. The natural environment is increasingly understood to act as a potential buffer to poor mental heath. Growing evidence suggests that direct, short-term exposure to the natural environment can improve mood. Previous reviews into the effect of the natural environment on mood have been restrictive, for example in terms of the type of natural environment or type of study design considered. In this review we extend the scope to consider all types of 'green space'. We aim to develop a more comprehensive understanding of the effect of short-term exposure to the natural environment on depressive mood.

METHOD: A review protocol was developed and registered on PROSPERO. A systematic literature search was conducted across five databases to identify relevant studies published up to March 2018. Search terms were related to the natural environment (such as 'natural environment', 'green space', 'park'), and to depression or depressive mood (such as 'depression', 'depressive symptoms', 'mood disorder'). Participants must have been directly exposed to the natural environment, with the urban environment used as a control or comparator. Risk of bias was evaluated using the Cochrane Risk of Bias (ROB) tool 1.0 and the Risk of Bias in Non-Randomised Studies of Interventions (ROBINS-I) tool where appropriate. Studies were grouped by the type of activity performed by participants during exposure to the environment: active engagement (e.g. walk, run), passive engagement (e.g. sit, stand), or a combination of both. Study data from included studies was collected in order to perform meta-analysis. The effect size of interest was the standardized mean difference (Hedges' G) between experimental- and control conditions. We used multi-level meta-analysis to estimate the average effect of the intervention, while accounting for dependent effect sizes within studies (Van den Noortgate, López-López, Marín-Martínez, & Sánchez-Meca, 2015). Furthermore, we used the machine learning-based metaforest algorithm to conduct an exploratory search for relevant moderators of the effect size (Van Lissa, 2018).

RESULTS: 8958 references were retrieved in the database search, and 32 studies met the inclusion criteria. Nineteen studies asked participants to actively engage with the environment, 8 asked participants to passively engage, and 5 used a combined approach. All randomised studies were assigned a high or unclear risk of bias across most domains, and all non-randomised studies were given a serious risk of bias overall. This was largely due to lack of randomisation process explanation, bias in outcome measurement and incomplete outcome reporting. In total, 20 studies reported a significant reduction in depressive mood, whether this was comparing pre- and post-exposure within environments or post-exposure only between environments. The results of the meta-analysis will be presented.

CONCLUSIONS: 32 studies were identified that investigated the effect of natural environment exposure on depressive symptoms. Preliminary results suggest that short-term exposure to the natural environment is beneficial to relieving feelings of depression. However, risk of bias in current studies remains high. The use of appropriate reporting guidelines is recommended.

ASSOCIATIONS BETWEEN NEIGHBORHOOD NATURAL FEATURES AND DEPRESSION: A U.S. NATIONAL ANALYSIS

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INTRODUCTION: Globally, over 300 million people are estimated to suffer from depression. In the United States, approximately 16.2 million adults aged 18 and above have had at least one major depressive episode, and the prevalence in females is almost twice that in males. A growing body of research shows that natural features such as trees, gardens, and water are associated with better mental health; however, these relationships are underexplored at the national level in the United States. Much of the existing evidence draws from spatially-restricted samples which may not be generalizable. In addition, it is not clear if different types of natural features at varying neighborhood extents have the same effects on mental health, and if these effects are constant across geographic regions. This ongoing study explores relationships between depressive symptoms and natural features within multiple landscape buffers around residences.

METHOD: Depression was evaluated based on the 10-item Center for Epidemiologic Studies Depression Scale (CES-D-10) collected by the Sister Study, National Institute of Environmental Health Sciences. The cohort comprises 50,884 women aged 35 – 74 years old across the United States and Puerto Rico, and provides measures in multiple dimensions including physical, mental, and social health, sociodemographic factors, and lifestyles. Depression was defined as having a CES-D-10 score greater than ten. Tree canopy and a broader measure of naturalness, non-impervious cover, were derived using percent tree canopy and percent impervious cover at 30m resolution from the U.S. Multi-Resolution Landcover Characteristics Consortium. Euclidean buffers were applied at 250, 500, and 1000m to represent nearby, near, and distant neighborhoods from participants' residential addresses, and non-overlapping buffers were generated for the areas between 250 – 500 and between 500 – 1000 meters. Logistic regression was applied with adjusting for potential confounders and stratification to examine differences by geographic region.

RESULTS: Preliminary results include that both tree canopy and non-impervious cover are associated with lower odds of being depressed at all buffer sizes; the protective effects are stronger at greater neighborhood extents. In addition, the effects of non-impervious cover are triple those of tree canopy alone. However, significant associations were not observed within the non-overlapping buffers. Disparate results were observed across regions.

CONCLUSIONS: Neighborhood natural elements may benefit mental health through multiple pathways, including supporting aesthetics and biodiversity that may enhance outdoor venues for physical activity, engagement with nature, and social interaction, all of which can improve mental health. The observed statistical effects of natural features on depression are continuous and greater with increasing distances from homes. Further work will investigate effects of natural features measured at one-meter resolution, with finer classification of vegetation types, as well as their patterns within the built environment, to better understand critical neighborhood design elements to improve mental health. This abstract has been reviewed and approved for submission by the U.S. Environmental Protection Agency. Its contents do not necessarily reflect the views and policies of the Agency.

CLINICAL AND DESIGN APPROACH FOR ASSESSING THE BENEFITS OF THE HORTICULTURE THERAPY PROGRAMME IN THE BELGRADE BOTANICAL GARDEN

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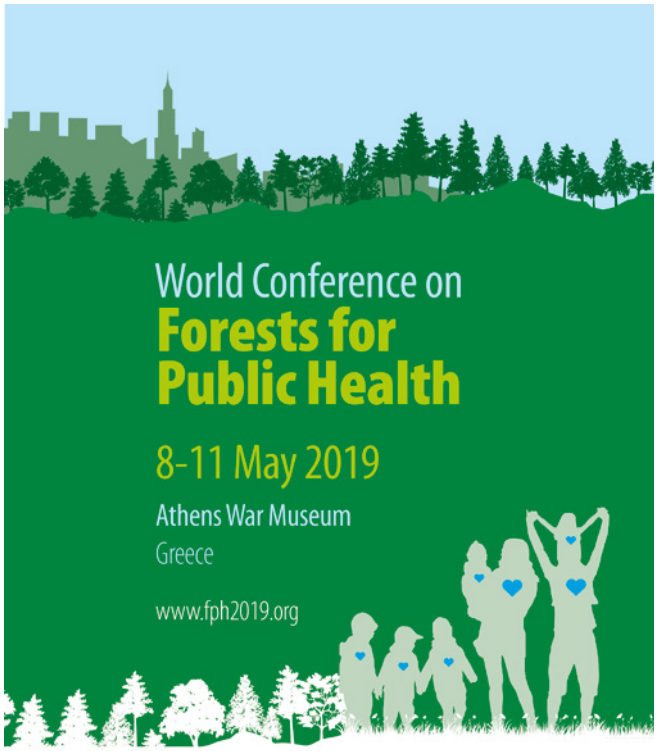
INTRODUCTION: With urbanization increasing there is a common presumption that people in the urban areas spend the least time on physical and mental restoration, believing that an urban environment hinders the recovery process and does not have adequate capacities to support the rehabilitation process. At the same time, the public space and green infrastructure in the surrounding context enhance the important role as a resource for the prevention and improvement of the quality of mental well-being, especially when it comes to treating different groups. The aim of this study is to draw closer with more evidence the values of the Belgrade Botanical Garden and horticulture therapy as a nature-based solution for people with mental health problems in the Western Balkans region.

METHOD: The methodology implies a mix-method and analyses using Clinical Global Impression (CGI) scale as a clinical tool for measuring the symptoms of severity, treatment response and the efficacy of treatments in studies of patients with mental disorders and observations as a designing tool to record the patterns and site activities and duration of use in order to better understand how people actually move through and engage with a designed space.

RESULTS: The results of the clinical assessment provided the solid and positive findings showing the more progressive psychological improvement of the participants involved in the horticulture therapy programme. The several patterns emerged from the observation. One whole area which supported the rehabilitation process was identified in the Belgrade Botanical Garden merging six green resting points that were defined by the average number of visitors, time spent at those points and species recorded on site.

CONCLUSIONS: An interdisciplinary approach to research is important for topics related to mental health problems and the rehabilitation of vulnerable groups. The horticultural therapy programme as a form of supportive therapy represents an adequate and efficient mechanism for improving the quality of mental health in urban areas focusing on people suffering from anxiety and stress. The Belgrade Botanical Garden has been recognized as an environment suitable for the implementation of horticulture therapy and development of evidence-based rehabilitation practice.

KEY WORDS: nature-based solution; horticulture therapy; clinical assessment; observations; the Belgrade Botanical Garden



ORAL
PRESENTATIONS

Planning physical activities in Forest/Natural environment for Public health

FORESTS AND OTHER NATURE AREAS AS AN ENVIRONMENT FOR PHYSICAL ACTITIVITY: CASE STUDY FROM HELSINKI

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INTRODUCTION: Inadequate physical activity (PA) is acknowledged as a key health risk factor in modern societies and therefore, potential ways to increase PA at population level is of high public health priority. Forests and nature areas are suggested to be an attractive, low threshold and cost-effective environment for PA when compared to built-up environments and thus offer an economically sustainable approach for physical activity policies. In Finland, most green areas in cities are forested offering an important resource for residents to participate in different outdoor activities. Many residents also prefer green exercise over using the indoor sport facilities as forests are most popular outdoor environments for Finns. In Helsinki area it is also found that a short distance to at least middle-sized, often forested green areas, is of great importance for green exercise (Pyky et al. forthcoming).

From a residents' perspective, a relevant issue is not only the accessibility of nature, but also the quality of green areas including the opportunities for activities and nature experiences in their everyday living environments. The aim of the study is to identify the indicators of attractive everyday green areas that have therefore higher potential to encourage physical activity. This study examines the role of green area accessibility and quality among the Helsinki residents.

METHOD: A Public participatory GIS survey was conducted to Helsinki residents in three study areas: compactly built-up urban core area in Helsinki and two suburban areas. The survey was targeted to random sample of 18-80 yrs. old Helsinki residents. Altogether 1106 residents responded to the survey, indicating 2902 places for the green exercise on the map. PPGIS-tool also enables to link the quality aspects (reasons for visiting) for the specific location. The PPGIS-data was analyzed with the ESRI ArcGIS software package.

RESULTS: The preliminary results of this study showed that the majority of the residents (over 80%) highly appreciated the possibilities for green exercise in their living environment. The favorite places for green exercise were indicated within larger green areas, typically forests, which offer great variety of recreation and sport facilities as well as the beautiful scenery and possibilities to nature experience. The results confirm previous research findings that personal satisfaction with the quality of green areas nearby is associated with the increased use of areas. Moreover, good accessibility to green areas by route or by public transport was appreciated in generally, but especially by people with disabilities.

CONCLUSION: This study contribute to getting new knowledge about the role of nature in increasing the physical activity among the urban residents and for creating knowledge-base of the elements in green environments that are enhancing PA. This study brings new information for the planning the green infrastructures, arguments to prevail the existing ones and developing them to better provide the health benefits for the residents.

MAINSTREAMING A FOREST BASED PHYSICAL ACTIVITY PILOT PROGRAMME: RESULTS AND LESSONS FROM THE ACTIVE FOREST PROGRAMME IN ENGLAND

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INTRODUCTION: The United Kingdom is facing unprecedented public health challenges as a result of physical inactivity, sedentary behaviour and obesity. Part of the solution to these challenges is to create easily accessible opportunities that enable people to sustain or increase their physical activity. The Active Forest programme was set up to encourage physical activity for life. The programme is a partnership between Forestry Commission England and Sport England. A pilot ran for 3 years at 5 forest sites in England from 2014-2017. The programme is now being mainstreamed and in 2018, 14 sites across England were participating. Research is being undertaken to explore the types of activities being undertaken, who participates, and what their experiences of getting involved have been.

METHODS: Monitoring and evaluation of the Active Forest programme includes gathering operational data on how many events and activities are run and numbers attending; a short survey of participants (n=2,206); a follow on survey (n=274) sent to participants 3 months after completing the first survey; in-situ participant observation, interview and focus groups (n=61).

RESULTS: There were a total of 700,097 visits to the 5 sites in the 3 year pilot programme. Less active individuals significantly increased their sporting activity. The main motivations to participate were to be physically active in nature, for enjoyment, to get fit and, improve health. Over 80% of participants identified the four key benefits of getting involved as: physical wellbeing, fun and enjoyment, mental wellbeing, a feeling of escape and freedom. The qualitative research found that the beauty, scenery, wildlife, sensory and seasonal experiences, sense of freedom and atmosphere of the forest sites were key drivers for participants and greatly enhance their experiences of being active in nature.

CONCLUSIONS: The pilot programme was viewed as a success by the two partners and the Active Forest programme has been mainstreamed. Four urban sites will be included from early 2019 in order to include more deprived populations. This programme provides an example of the scaling up and mainstreaming of a pilot programme in order to embed it in the long term management of key public forests in England.

URBAN FORESTS CONTRIBUTING TO PHYSICAL ACTIVITY OF RESIDENTS IN HELSINKI, FINLAND

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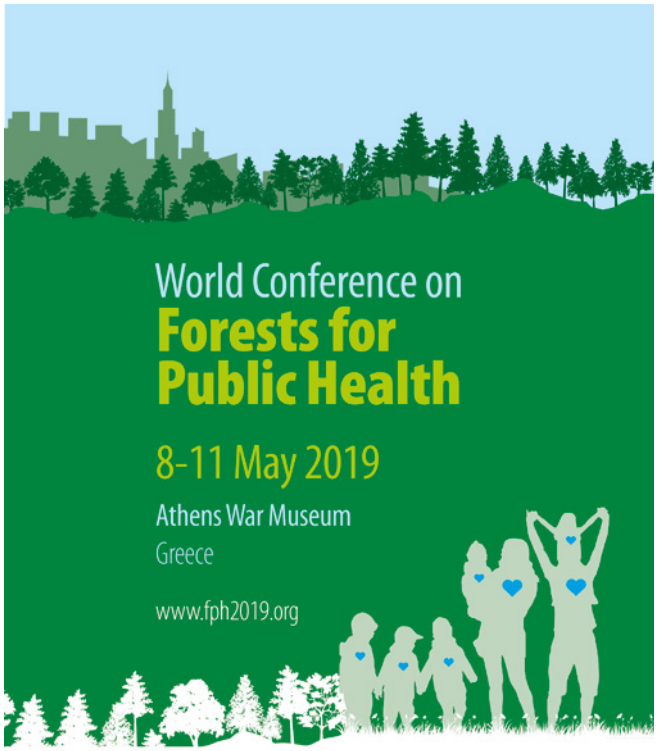
INTRODUCTION: The role of physical activity (PA) in promoting health and preventing diseases is scientifically well documented. Nature areas offer attractive and cost-effective opportunities for PA when compared to built-up sport facilities and thus offer an economically sustainable approach for enhancing physical activity policies. In Finland, urban and peri-urban forests create an important resource for recreational activities that contribute to people's health and well-being. The amount of research exploring green infrastructure's role in PA promotion is still limited, in particular, compared to built-up sport facilities. This study investigated i) to what extent accessibility of close to home recreation areas affects physical activity and ii) how individuals differ in their relationship with and perception of nature that might motivate residents being physical activity outdoors.

MATERIAL AND METHODS: The study data was collected in Helsinki, Finland using both mailed and electronic questionnaires. A random sample of 8,000 Helsinki residents was drawn from the Population Register. Of these, 3,730 (47 %) people participated in the survey. The amount of green exercise and leisure time physical activity were self-reported as well as information regarding of respondents socio-demographic, personal-level variables and health status. Spatial data of green areas was constructed using the green area database of the City, aerial photographs and annually published land-use data. The green areas were classified into small, middle-sized and large areas to reflect their qualities for green exercises (GE). The distances to the green areas from home were calculated using walkways and cycle paths with the GIS tools. Distances to the nearest cluster of built outdoor and indoor sports facilities were also objectively measured. The data analysis methods included multinomial logistic regression, t-, and Chi Square tests.

RESULTS: The results indicate that having a short distance to at least a middle-sized green area and high nature relatedness are important for participation in GE, both in core urban and suburban areas. These areas in Helsinki are typically forested areas. More factors were found to be related to GE in the suburban areas compared to core urban areas and among the low leisure time physical activity group compared to the high activity group. Nature relatedness was directly associated with GE despite the physical activity level or the living environment. In addition, a good level of perceived health and the quality of the green area as well as a high degree of active commuting were associated with GE.

CONCLUSIONS: The results confirm the positive association between the availability and proximity of relatively large green areas and GE. The size and the type of the green area seem to be good indicators for predicting the usability of green areas for PA. The results encourage urban planners to maintain larger nature areas and their accessibility as well as prevent further fragmentation of green areas in Helsinki MPA in spite of heavy land-use pressures. More information, however, is needed what kind of nature environment or services would encourage the inactive groups to increase their physical activity levels.



ORAL
PRESENTATIONS

Urban forestry and Green spaces planning and design for human activity

EFFECTS OF URBAN GREEN SPACE ON HEAT-RELATED VULNERABILITY: A METHODOLOGY BASED ON THE INTEGRATION OF CENSUS AND REMOTE SENSING DATA

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INTRODUCTION: Urban morphology plays an important role in the Urban Heat Island phenomenon. As reported in the literature, the green areas, in particular the trees, and the coating materials with a high albedo contribute to reducing the impact of climate change. Therefore an efficient city planning, an efficient use of public green and coating materials can reduce temperatures in critical areas.

For these reasons the aims of the research are: (1) to provide a replicable methodology useful to analyze the effect of green spaces on the reduction surface temperature; (2) to provide high-resolution urban mapping for adaptation strategies to climate change based on green space projects for reduce heat-related risks for the vulnerable population.

The research was applied in a municipality on the Mediterranean coast. The data used derive from the following remote sensing platforms: high resolution aerial multispectral images, LiDAR, LANDSTA8. Future climatic data from a downscaled Global Climate Model (Worldclim) were also used. Finally, census data on population and health were used to assess the vulnerability to heat.

METHOD: The method used was divided into three steps. The first allowed us to obtain the current land surface and under the tree canopy temperature. The procedure based on the hypothesis that solar energy is a main factor driving local temperature variability. We have used LiDAR data to estimate an high resolution topographic index (1x1m) derived from the incident solar radiation and so to downscaling the map of temperature obtained through Landsat data.

The second assured us to get the future climatic projections through the Worldclim climate data, using a model that has scenarios for four representative concentration pathways (RCPs).

In the third the census spatial data on population and health were used for implementation through a geographic multi-criteria analysis model of a Heat-related Vulnerability Risk Map.

RESULTS: The results of the first step are the current temperature map. In the second step the future projections show that when CO_2 emissions increase occurs a gradual increase of temperature. In the last step it was possible to identify the three main project dimensions on which to base climate adaptation strategies: the design of efficient public green spaces; the use of low-albedo materials, the design of new urban green spaces to mitigate temperatures.

CONCLUSIONS: The research proposes a method that not only analyzes the climate and its change, but also tries to solve the enormous problem that afflicts our cities, the Urban Heat Island.

In the cities should be implemented green areas and trees in all areas affected by urban transformations, green furniture in the redevelopment of public spaces and, finally, introduced rules that limit the use of surfaces with low heat reflection capacity.

In conclusion, the model proposed helps to solve these problems. It is able to validate the efficiency of the design simulations of new green spaces in the mitigation of temperatures. For this reason, it is useful to public and private subjects in the regeneration and planning of new spaces that permit the improvement of people's lives.

GREEN CARE IN FORESTS IN AUSTRIA – HALLERWALD IN UPPER AUSTRIA AS EXAMPLE

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INTRODUCTION: Shinrin-Yoku, which means taking in the atmosphere of the forest, is originated in East Asia. It covers preventive health care and therapy in forests, it is particularly aimed to foster human health and wellbeing. Shinrin-Yoku now reached Austria. Green Care activities in Austrian forests often follow the principles of Shinrin-Yoku. Green Care interventions in Austrian forests however, often are performed at so-called "power places", which are in many cases selected with scientifically unproven approaches, such as radiesthesia or similar.

The community of Adlwang situated in Upper Austria was inspired by Shinrin-Yoku in redesigning an old forest trail. The planned path connects selected places, which should promote relaxation, strength, and vision of visitors after redesign. But, in contrast to others the local working group looked for scientific support for the project. The accompanying research project is aimed at evaluating the effects of the new design of selected places, the connecting path, and, the forest visit as such. By different questionnaires baseline values and values after change will be assessed.

METHOD: Cooperation between the local project group and the researchers started in June 2018. The local project partners defined the goals of the redesign, selected the places for evaluation, and developed options for redesign. The researchers operationalized the intended effects, and developed design and procedure of the questionnaire study. Standardized instruments (e.g. Restoration Outcome Scale, Korpela & Ylenn, 2009; Perceived Restorativeness Scale, Hartig et al. 1997; Positive and Negative Affect Scale, Krohne et al. 1996), and open questions assessed the effects of the places, the effect of the forest-visit, and the effects of the connecting path. The locals recruited 105 participants for the questionnaire study after informed consent. The forest walks, guided by five specially trained local people lasted for 2,5 hours on average. Data collection took place between August and November 2018. Data analysis (t-Test and ANOVA) using SPSS will take place in December 2018 and February 2019.

RESULTS: Taking into account prior research on human restoration in forests we hypothesize (1) walking in the forest for 2,5 hours will result in a high score of the restorative outcome after the visit. Accordingly, (2) positive emotions will increase through visiting the Hallerwald also. (3) The selected places will reach high scores on perceived restorativeness, but different scores for perceived personal strength, and for perceived vision.

CONCLUSIONS: Based on the potential of the forest, these of the selected places, and of the path evidence based interventions for Green Care activities in the Hallerwald will be developed and promoted. With this study we want to deepen the body of scientific evaluations on sites and interventions in the domain of Green Care and Public Health in Austria.

INFLUENCE OF GREEN SPACE ON THE EFFECTS OF AIRBORNE PARTICULATE MATTER ON HOSPITALIZATION IN THE UNITED STATES

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INTRODUCTION: Potential pathways of health effects of green space, mainly trees and other vegetation, include the reduction of air pollution and enhancing physical activities, among other possible mechanism. Although a few studies identified positive association of green space and reduced mortality rate, little is known regarding whether green space modifies the association between air pollution and health outcomes. We examined whether regional levels of green space modify the associations between short-term exposure to airborne particulate matter (PM_{10}, $PM_{2.5}$) and risk of hospitalization across 364 urban U.S. counties for 2000-2013.

METHOD: Green space was measured by normalized difference vegetation index (NDVI) with range 0 to 1 for which a higher number indicates dense vegetation such as forest and a value close of zero means no vegetation. Daily number of hospital admissions (≥65 years) for cardiovascular or respiratory diseases from Medicare enrollees and air quality monitoring data for each county were used to assess risks, as percent change in hospitalization related to 10μg/m3 increase in particulate matter. We computed an absolute change in county-specific relative risks explained by difference in county-level NDVI.

RESULTS: We found that the association between air pollution and health was less in areas with more green space. The range of NDVI for study counties was 0.14 to 0.67. We estimated that an interquartile range increase in NDVI corresponds to a 1.68% (95% confidence interval (CI): 0.43, 2.91) decrease in the association between PM_{10} and cardiovascular hospitalization and 10.40% (95% CI: 7.34, 13.34) decrease in the PM_{10}-hospitalization association of acute myocardial infarction. For hospitalization associated with $PM_{2.5}$, a 0.18% (95% CI: -0.39, 0.73) absolute decrease in relative risk was found for cardiovascular hospitalizations. In results stratified by age, younger age groups (65-74, 75-84 years) showed larger reduction for the PM_{10}-hospitalization association with increase in NDVI than older populations (>85 years) but not for the $PM_{2.5}$-hospitalization association. Higher levels of NDVI were associated with a larger reduction in hospitalization risks associated with PM_{10} compared to $PM_{2.5}$.

CONCLUSIONS: The study results add evidence for health benefits of green space and indicate that proximity to green space can diminishing the adverse health impacts of airborne particulate matters on hospitalizations for older populations in the U.S.

EXPOSURE TO NATURE AND CHILDREN WITH AUTISM SPECTRUM DISORDER

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INTRODUCTION: Across the world, the percentage of children having autism spectrum disorder (ASD) is growing at an alarming rate. For example, CDC estimate that about 1 in 68 children has been identified with ASD by 8 years old. Previous studies have demonstrated that contact with nature may promote positive affect, help children develop social relationships and reduce problematic behavior. As a result, contact with nature might be effective in relieving ASD symptoms. However, children with ASD show limited outdoor activities and a smaller range of activity settings, especially those who live in high-density cities. They also face more challenges in playing safely and comfortably in outdoor public space. Therefore, understanding the benefits and concerns associated with their exposure to nature is an important first step to investigating whether nature can be an effective intervention for children with ASD.

METHOD: We conducted semi-structured interviews with 22 parents of children on the spectrum from two cities in China. Interviews were recorded and transcribed. We performed content analysis with the assistance of MaxQDA software package.

RESULTS: Results showed that exposure to nature provided motor-sensory, emotional and social benefits to children with ASD, although the magnitude of the effects varied. Parents identified a wide range of barriers to taking their children to nature. Among them, inappropriate behavior, safety concern, phobias and issues with the public realm emerged as the critical hurdles.

CONCLUSIONS: We discuss the implications of the findings for practitioners to consider the environment as a part of interventions and for planners and designs to create places that accommodate the need of children with ASD.

EARLY CHILDHOOD ADAPTIVE MICROFORESTS AS A HEALTH PROMOTION STRATEGY: A SYSTEM-CHANGE APPROACH

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INTRODUCTION: Engaging children with nature in the first years of life can be a cost-effective, multifaceted, health-promotion strategy for both people and planet. POD (Preventing Obesity by Design) was launched in 2007 as a community-based health promotion strategy to upgrade typically barren preschool (3-5 years old), outdoor spaces in child development facilities as "microforests" containing a diverse mix of natural and manufactured components. More than 100 POD demonstration sites have been created in North Carolina. Results from multiple POD studies, together with research findings by others, provide compelling evidence to influence system-wide early childhood outdoor policy – to date in four US states.

METHOD: Within a theoretical framework combining behavior setting (unit of analysis) and affordance, pre-post mixed-methods assessments of environment-behavior impacts were conducted, using surveys of directors and parents, teacher daily journals, behavior mapping, and best practice indicator (BPI) measures using COLEQT (Children's Outdoor Learning Environment Quality Tool) and POEMS (Preschool Outdoor Environment Measurement Scale). An additional objective study employed behavior mapping to investigate built environment characteristics in 30 childcare outdoor environments, with 6,083 behavioral observations gathered across 355 behavior settings.

RESULTS: Survey data indicate that children attending naturalized childcare facilities spend more time outdoors across all seasons, rest more easily, see nature as a benevolent companion, adapt more quickly to healthy eating of fresh fruit and vegetables, and transfer enthusiasm to home. Those with respiratory problems appear to have reduced symptoms. Teacher journal posts (N=141) demonstrate how increased biodiversity motivates outdoor time and engages children in active learning, including hands-on gardening, across all developmental domains. Behavior mapping data show that each setting adjacency may increase physical activity 6.4%-7.6% and central location of a setting may increase physical activity 13.8% – 16.1%.

CONCLUSIONS: Restoring biodiversity as a microforest adaptable to early childhood education in urban facilities offers a health promotion strategy that can instill in young children the joy of engaging with nature and active living habits that may track through adulthood. Multiple POD studies suggest that site layout, number and diversity of settings, and natural shade for comfort and sun protection may increase health-enhancing behaviors. Results can influence public policy and regulatory systems to intentionally support health-promoting design and management of outdoor play and learning environments. Objective, detailed knowledge can support new standards of built-environment design practice and related risk management protocols. In summary, barren outdoor spaces are a "modifiable health promotion factor" adaptable, using a microforest approach, to become sustainable, *salutogenic*, early childhood environments. Further *early childhood* research is required to better understand the mechanisms and hierarchies of relationships between variables, including the impact of nature exposure on outcomes such as positive social-emotional relations, immune systems, stress reduction, executive functioning, and development of long-term conservation values. Replication is needed in diverse geographic regions and cultural contexts. Research opportunities across multiple disciplines offer potential for supporting the health of all children and the urban ecosystems they inhabit.

THE IMPACT OF URBAN PRIVATE GREEN SPACE ON HEALTH AND WELL-BEING: A SCOPING REVIEW

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INTRODUCTION: There is substantial research on public green space and human health in cities including literature reviews, while studies on urban private green space (PGS) attract less attention. Along with the global urbanization and densification, the percentage of urban residents owning PGS, especially private gardens, has shown a trend of decline. For example, in the UK, it is estimated that 2.6 million homes will be without a private garden by 2020, compared to 2.16 million in 2010, and 1.6 million in 1995 (Hope, 2009). Currently 85% of residents in Norway have private gardens or plots attached to their house, while the number for the city of Oslo is only 41% (Statistics Norway, 2015). Such numbers are likely to decrease, especially in big cities and towns where populations are increasing. In light of this, there is a need for an understanding if PGS has any unique role for human health and well-being. As a start of researching this field, we are currently performing a scoping review covering both qualitative and quantitative studies to provide an overview of peer reviewed literature on the importance of PGS for human health and well-being.

METHOD: The review takes on a wide definition of PGS as it can be seen as green outdoor space designed for private use (by an individual, a family or another defined group of people) instead of public use. Examples may be private gardens, balconies, terraces and green rooftops in attachment to people's home. It may or may not have a legal private ownership, but only a private usership. Further, we apply a wide inclusion of benefits and perspectives on people's relation to PGS may be related to health and wellbeing. The subject is of interest to several research fields and we therefore use databases covering health (Medline, PubMed), environmental psychology (PsychINFO), horticulture sciences (CAB Abstract), as well as one database covering a wide specter of research fields (Scopus).

RESULTS/CONCLUSION: We will present the outcome of the scoping review on the potential importance of PGS on human health and well-being. In an era when the urban densification is broadly embraced as a sustainable model for urban futures worldwide, the likely importance of PGS may be overlooked. We hope our research will provide input to further reflections on different qualities of nature environments in an urban context and to urban sustainability studies.

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RESTORATION EFFECTS IN DIFFERENTLY MANAGED FORESTS

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INTRODUCTION: There has been increasing amount in study results about the positive effects of nature on human well-being. Even a short visit to a nature environment has been found to have positive effects on psychological well-being, such as increased feelings of restoration and decreased feelings of negative thoughts. As the pressure over the green areas is increasing due to the demands in urbanization and other land use, understanding the potential health benefits of accessing natural areas – such as forest – in or near inhabitants is increasingly important. However, despite the increase in research recognizing the importance of nature for human health, it remains unclear if, the restorative effects are influenced by factors such as forest management and a state of naturalness.

METHOD: We investigated whether peoples´ psychological restoration outcome, vitality and emotions vary in three differently managed forests and forest in its natural state. Four spruce-dominated forests - without any major water elements or height differences - were selected: 1) an urban recreation forest that is managed for recreational use, 2) a mature commercial forest, 3) a young commercial forest, and 4) an old-growth forest in its natural state. A total of sixty-six volunteers - 39 women and 27 men from the Helsinki metropolitan area participated in the study. Each participant made one short-term visit to each forest at the end of their workday. The visits were made during spring, summer and autumn of 2016 and 2017 in small groups, under the direction of the lead researcher. Each visit included 15 minutes of observation, followed by 30 minutes of slow walking inside the forest. Participants' restoration effects were measured before and after each visit using the Restoration Outcome Scale (ROS), the Subjective Vitality Scale (SVS) and Positive and Negative Affect scales (PANAS).

RESULTS: The repeated-measures analysis of variance (ANOVA) was used to calculate the outcomes in four different forests. Preliminary results suggest that all investigated forests increase the restoration outcome, vitality and positive emotions and decrease the negative emotions within time but also, with different intensity. People felt less restored in young forest compared to all other three forests. The most restorative forests were the old-growth forest and the mature commercial forest.

CONCLUSIONS: This study brings new information for forest management from recreational point of view. According to our preliminary results, it seems that forest quality has an influence to the perceived restoration. Especially the age is important factor but also the management and the state of naturalness might affect. The noise may also affect and need to be studied further.

RECREATIONAL USES OF URBAN GREEN INFRASTRUCTURE: THE TOURIST'S PERSPECTIVE

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INTRODUCTION: This study addresses tourist uses and perceptions of Urban Green Infrastructures with the aid of a research survey in various European countries. UGIs respond to and serve both inhabitants and visitors' needs.

METHODS: In order to understand and assess the ways that tourists relate to urban GIs and urban forests in the cities they visit, a cross-cultural comparative study was carried out, in 2015, with the aid of a face-to-face interviews with to tourists of UGIs in the Czech Republic, Greece, Latvia, Lithuania, Portugal, Serbia, Slovakia and the UK. The selection of case studies follows a roughly comparative logic, namely on-site questionnaire surveys administered in large and medium size cities in Nordic, Southern European, Central European and Northern European countries. The study's research questions investigated tourists' perceptions of UGIs, their understanding and uses of UGIs, and the ways that this understanding influences tourists' choice of visiting a certain city.

RESULTS: The results revealed that the majority of the tourists were not very familiar with the term 'Green Infrastructure', nor with UGI features offered in the visited cities. Tourists mostly identified UGI as parks, and less often as green corridors or urban forests. Although the majority of the respondents answered that UGI is very important to a city, when it came to their personal circumstances, they stated that UGIs were not their main preference for sightseeing, when choosing a certain city as their travel destination. In all the surveyed cities, it was observed that most tourists were visiting UGIs and spending time in activities like walking, pick-nicking and taking photographs in UGIs, without the latter being their initial intentions, when deciding to visit this particular city. Those visiting Northern and Central European cities showed more interest in and intention to visit UGIs, than tourists visiting Southern European cities. UGIs seemed to play an important role in their plans to visit the specific city of their destination, irrespective of other activities that they were planning to partake take part in. The intention to use UGIs was highest among tourists traveling with friends, who also, however, declared the lowest intention to pay for UGI services, while traveling families showed high intention to pay for such services, but low intention to use them. Tourists seem to care about UGIs in these cities and the majority planned to visit UGI s for more than an hour; for most of them, however, this was not the main reason of their trip, nor did they actually pay attention to what particular type of UGI they were visiting.

CONCLUSIONS: The uses and evaluation of Green Infrastructure, based on tourists' opinions, may, conclusively, reveal more about societies' linkages with UGIs and highlight suggestions, as to the improvement of UGI management in cities—whether either tourist destinations or not.

HOW ROBUST ARE RELATIONSHIPS BETWEEN STREET GREENERY AND FITNESS MEASURES ACROSS DIVERSE COMMUNITIES?

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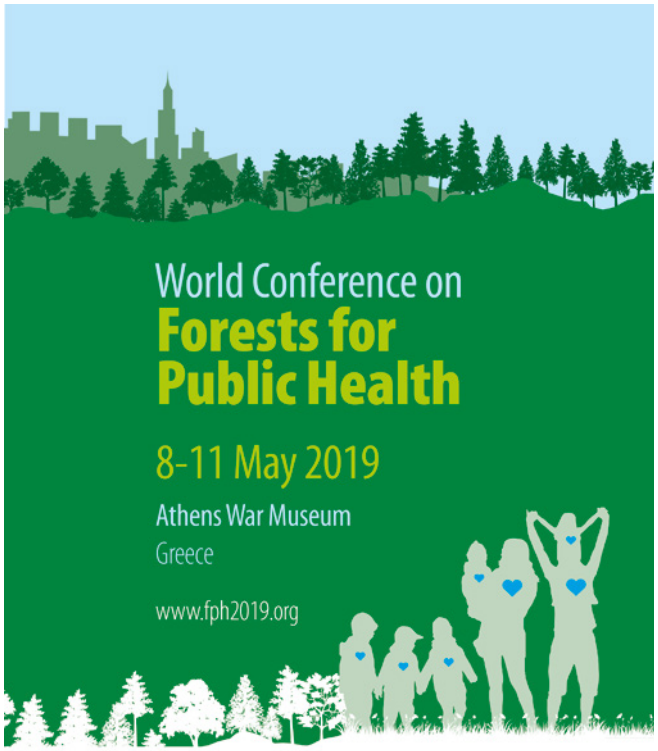
INTRODUCTION: Urban greenery supports human health through ecosystem services including hazard mitigation and provision of venues for healthy behaviors. Evaluating the greenery signal in health outcome data requires the consideration of urban design. This presentation introduces two studies finding effects of street greenery by several neighborhood extents and vegetation types on (1) body mass index (BMI) and (2) participation in active transportation (AT).

METHOD: Individual BMI across greater Phoenix, AZ, and Portland, OR, was calculated using height and weight data from U.S. state motor vehicle departments. Individuals' AT reporting across greater Milwaukee and Green Bay, WI, was collected by the Survey of the Health of Wisconsin. Greenery metrics were developed from one-meter landcover data produced by the U.S. EPA's EnviroAtlas project. Three focal areas (sidewalk, street, and overall) were delineated within 500 – 2000m from study residences. Sidewalk and street focal areas were designed to quantify the pedestrian environment along a gradient of suitability for promoting physical exercise through the provision of shade and aesthetics. An overall focal area was generated for comparison. This circular buffer included lands inaccessible to pedestrians but potentially contributing to large-scale ecosystem services such as ambient air quality and biodiversity support.

RESULTS: Both studies showed positive effects of road-based greenery on indicators of physical fitness in logistic regressions, after controlling for covariates including intersection density and land-use mix. Trees, but not herbaceous cover, were consistently associated with lower odds of being overweight or obese in both Portland and Phoenix, across all residential network buffers. Similar results were observed for odds of participating in AT. Tree cover along sidewalks was more influential in smaller buffers (500m), while tree cover within the broader street viewshed was more important in larger buffers (1000m). Significant associations were not found for circular buffers.

CONCLUSIONS: Street greenery may provide greater physical and visual access to ecosystem services that promote fitness-related health outcomes than does overall greenery. Trees may be more influential than herbaceous cover based on these results from three U.S. climate zones. Findings suggest that it is important to carefully define greenery measures, including extent and type, to better understand the potential pathways for different health outcomes. This abstract has been reviewed and approved for submission by the U.S. Environmental Protection Agency. Its contents do not necessarily reflect the views and policies of the Agency.



ORAL
PRESENTATIONS

Urban Forests and their ecosystem services for Public Health

PERI-URBAN VERSUS NON-URBAN FORESTS: VISITORS' BEHAVIOURS AND PREFERENCES IN CENTRAL ITALY

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INTRODUCTION: In the last decades, forests both peri-urban and non-urban, are the subject of growing society's interest and demand in terms of recreational opportunities, leisure and relaxation. Historically, peri-urban forests in Europe were used by local communities to supply wood products (timber and firewood) and for harvesting edible fruits and mushrooms due to their proximity to urban areas. Lately, people from urban areas are attracted more by forest ecosystem services related to well-being and human health (i.e. recreational activities, air and water quality, landscape contemplation) than by wood products. This change occurred because forests provide several possibilities to improve physical and mental health by reducing stress and increasing an active lifestyle. This trend is evidenced both in urban, peri-urban but also in non-urban forests. In this context, studies aimed at investigating forest visitors' preferences towards features of forests and relation between visitors behaviour and forest features play a key role to support local managers. The present study - carried out under LIFE FoResMit and SelPiBio projects - has the objective of investigating and comparing two case studies in central Italy: Monte Morello peri-urban forest in Florence province and Pratomagno mountain forest in Arezzo province. Through a questionnaire survey forest visitors' preference and behaviours are compared.

METHODS: A semi-structured questionnaire was administered through a face-to-face interview to a sample of 400 visitors in both study areas (200 visitors for each case study) by a single interviewer. The questionnaire formed by 15 open-ended and closed-ended questions was divided in four thematic sections: "Personal information", "Recreational use of forest", "Benefits provided by peri-urban forest", and "Preferences and perceptions towards the peri-urban forest". The sample of visitors was sized considering the main characteristics of the forests such as the surface, points of access to the forest and network of trails. In both case studies three sampling points – in proximity to rest areas and parking – were identified to conduct interviews. The interviews were conducted both in the working days and in the weekend in order to include in the sample different types of visitors. Collected data have been processed to highlight personal preferences related to the man-made and innate forest features and the influence on respondents behaviours.

RESULTS: The results show that the mixed forests with a differentiated stand structure are preferred by visitors in both case studies. Mixed conifers and broad-leaved forests with a high degree of naturalness are those that provide the most positive sensations to visitors. For the visitors of Monte Morello peri-urban forest the three most important ecosystem services are recreational opportunities, CO_2 sequestration, and biodiversity conservation, while for the visitors of Pratomagno mountain forest the priority ecosystem service is protection against natural hazards (e.g., landslides, rockfalls) followed by CO_2 sequestration, and biodiversity conservation. Finally, the respondents highlight their emotions and preferences for three forest landscapes managed through different silvicultural treatments (selective and traditional thinning).

CONCLUSIONS: The results of this study provide quantitative and qualitative information useful for decision makers (forest planners and managers) to define forest management strategies to increase forest recreational attractiveness and to satisfy visitors preferences.

KEYWORDS: social preferences, sustainable forest management, forest recreation, questionnaire survey.

U.S. ENVIROATLAS PROVIDES FINE-SCALE INDICATORS OF ECOSYSTEM SERVICES FOR PUBLIC HEALTH AND WELL-BEING

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INTRODUCTION: Nature's benefits to society, also known as ecosystem services, contribute to many aspects of public health and well-being. Green infrastructure routinely buffers both natural and man-made hazards. Green and blue spaces also promote physical activity, social interaction, and engagement with nature. The U.S. EnviroAtlas produces neighborhood and individual-scale spatial metrics of natural infrastructure to indicate potential for hazard buffering and beneficial exposures. EnviroAtlas also includes the Eco-Health Relationship Browser, which summarizes the global literature in a popular, interactive graphical format.

METHOD: EnviroAtlas metrics for featured communities are based on one-meter scale landcover data, also developed by EPA and partners. Additional inputs include 30-meter resolution population estimates, and existing datasets such as roads, waterways, and outputs from environmental sensors. Consistent methods are used to facilitate comparisons between neighborhoods and across communities. Example metrics include tree cover along busy roadways, window views of water, proximity to parks, and air and water pollutants reduced by tree cover. Based on findings from the scientific literature, metrics are tested and refined with partners in ecology and health science research. Health correlates explored to date pertain to physical fitness, cognitive function, birth weight, and longevity.

RESULTS: A suite of almost 100 fine-scale metrics has been developed and mapped for 27 U.S. urbanized areas to date, encompassing 1,200 cities and towns and fifteen percent of the U.S. population. EnviroAtlas community metrics have informed city planning and health impact assessments. Typically, ecosystem services are disproportionately lacking in neighborhoods with significant amounts of low-income residents and people of color. However, beneficial health links to ecosystem services are often stronger for just such vulnerable populations, as well as for children and the elderly.

CONCLUSIONS: EnviroAtlas maps and supporting information can help screen for neighborhoods most likely to benefit from health interventions such as reducing impervious surfaces in urban heat islands and enhancing walking trails through green spaces. All EnviroAtlas data are available online, and require no more than an internet browser to view or download. Further research and development are ongoing; collaborations on indicator development, eco-health analyses, and applications in additional geographic regions are welcome! This abstract has been reviewed and approved by the U.S. Environmental Protection Agency. However, it does not necessarily reflect the views and policies of the Agency.

DISTINCT ECOSYSTEM SERVICES MAY EXERT PROTECTIVE INFLUENCES ON RATES OF AUTISM VS. SUDDEN UNEXPLAINED DEATH

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INTRODUCTION: Two cross-sectional, ecologic studies explored relationships between the prevalence of natural features in populated areas and two major health issues of unknown etiology: autism and sudden unexpected death (SUD). Trees and other greenery in the built environment can buffer air pollutants and promote physical activity, social interaction, and engagement with nature, all of which reduce stress. Therefore, greenery may be protective for these adverse outcomes yet to date has been unexplored.

METHOD: Child autism prevalence data were obtained for 543 public elementary school districts throughout California, USA. Rates were derived by school district. SUD incidence was retrieved from emergency medical services in Wake County, North Carolina, USA; rates were assessed at the U.S. Census tract level (n=187). Metrics of urban greenery were calculated by study unit from satellite-derived 30-meter resolution landcover data from the U.S. Multi-Resolution Landcover Characteristics Consortium. In addition to overall landcover composition per unit, metrics included tree cover along major roadways and density of greenway trails. Statistical analyses included Poisson and negative binomial (NB) regression, and spatial lag and Bayesian spatial modeling.

RESULTS: Significant protective associations were observed for greenery metrics for both health outcomes, after controlling for covariates. In the autism analysis, greenery metrics were protective only in school districts in the fourth (highest) quartile of major-road density. The strongest predictor was percent tree canopy along major roads (NB adjusted rate ratio [ARR] for a 10% increase = 0.81 [95% CI: 0.73–0.91]). For SUD, the strongest predictor across all study units was density of greenway trails (Poisson ARR for a 1km/km^2 increase = 0.82 [95% CI: 0.69–0.97]). Spatial and non-spatial models returned similar results.

CONCLUSIONS: While cross-sectional analyses cannot determine causation, the contrasting findings from these two studies suggest distinct, highly plausible pathways by which trees and other greenery may affect autism and SUD rates. In the case of autism, the capacity of near-road trees to buffer vehicular air pollutants is strongly suggested by the strength of the near-road metric and its significance only in units with the highest road densities. Previous research has implicated air pollution in autism; however, limitations of this study include lack of documentation of maternal greenery exposures. In the case of SUD, greenery as a venue for physical activity and other healthful behaviors is implied by the strength of the greenway signal (and that of overall tree cover), plus the lack of significance of near-road tree canopy. Experimental designs are recommended to pursue the implications of these suggestive results. This abstract has been reviewed and approved by the U.S. Environmental Protection Agency. However, it does not necessarily reflect the views and policies of the Agency.

SPORTS EVENTS IN THE FORESTS AROUND WARSAW AND GDAŃSK - COMPARATIVE ANALYSIS

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INTRODUCTION: In Poland, active forms of recreation and sport have more and more supporters due to a greater social awareness of the impact of physical activity on the quality of life, health and mental condition of a person, willingness to improve well-being. These objectives are best achieved in the natural environment, therefore forests in Poland are more and more often used not only for recreation but also for sports purposes. The number of sporting events and the number of participants in sporting activities organised in forests, in particular in the agglomerations, is therefore increasing. The article presents the results of comparative analysis concerning the number and attendance of participants of sports events organised in forests in the vicinity to Warsaw and within the Tricity agglomeration.

METHOD: Data necessary to achieve the objective of the work were obtained from all Forest Districts within the range of RDSF Warsaw and Gdansk. The comparative analysis included data concerning sports events organised in forests in the period from 2010 to 2016. Information obtained from individual forest districts through both regional directorates included: the number of events organised in subsequent years, divided into running, cycling and hiking events. Data on this subject, provided by all forest districts, were generally of an estimated nature. The results of the analysis are presented in the form of tabular and maps made in the QGiS 2.14.21 Essen program.

RESULTS: The obtained results indicate that in the years 2010-2016 in RDSF Warsaw there were 537 sport events, in which 127 579 people took part. The total number of events, as well as the number of participants in 2016, increased more than three times in this area compared to 2010. At the same time, 603 events were organized in the forests of RDSF Gdansk, which attracted a total of 124 410 participants. The number of events in the forests of RDSF Gdansk in 2010-2016 increased tenfold, while the number of participants - more than fourteen. The research carried out shows that among all sports events organised in forests, running events dominate. The most popular form of running events in the forests were cross-country competitions. In the RDSF forests in Warsaw, cross-country competitions were more popular than orienteering. In the forests near Gdansk the situation was the opposite, the number of orienteering events exceeded the number of cross-country running. The most frequent form of cycling events in the forests of RDSF in Warsaw were bicycle rallies, followed by cycling competitions and marathons and MTB races. In the RDSF forests in Gdansk the most popular form of cycling events were MTB races. The share of cycling rallies and marathons was comparable here. The smallest group of sports events in the forests of both directorates were walking rallies.

CONCLUSION: The research carried out indicates a significant increase in the importance of non-productive functions of forests located in the vicinity of urban agglomerations and the need for continuous monitoring of actions taken by foresters to promote active lifestyles.

KEY WORDS: sport, forest recreation, forest ecosystem services, running

GO GREENER GO SAFER? THE IMPACT OF URBAN TREE COVER ON PERCEIVED SAFETY

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INTRODUCTION: This paper investigates the impact of urban tree canopy cover on perceived safety. The paper extends previous research by examining this relationship in diverse neighborhoods within a city region and by accounting for neighborhood deprivation, urban form, and individual sociodemographic attributes.

METHOD: Based on GIS data, survey data, and municipal data, the study examines the link between tree cover and perceived safety in 45 neighborhoods of Oslo metropolitan area.

RESULTS: Results indicate that higher urban tree cover is associated with higher perceived safety, even after controlling for neighborhood deprivation, urban form attributes, and sociodemographic variables. This study also finds that, when accounting for tree cover and neighborhood deprivation, denser areas are viewed as similarly safe as low-density areas.

CONCLUSIONS: These findings suggest that increasing tree cover in urban areas may result in increased sense of safety and in turn in health and well-being benefits. Such an intervention could prove especially helpful in increasing the feelings of safety in denser and in poorer neighborhoods. Attention should be paid however to housing policies so that physical improvements in such neighborhoods are combined with measures preventing potential displacement of vulnerable social groups.

DOES GREENSPACE MITIGATE AIR POLLUTION AND MOTIVATE PHYSICAL ACTIVITY? A CASE STUDY OF FOUR EUROPEAN CITIES

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INTRODUCTION: Exposure to urban greenspace may affect health via a complex set of pathways, including lessened exposures to air pollution and enhanced opportunity for physical activity. The HEALS study included a personal monitoring component to pilot and collect environmental exposure data from individuals in four European cities (Edinburgh, UK; Utrecht, Netherlands; Athens and Thessaloniki, Greece) using novel monitors and mobile devices. The data collected over ~1-week periods thus present an opportunity to assess if these two important pathways have the potential to benefit health.

METHOD: We include three metrics of greenspace (Normalised Difference Vegetation Index [NDVI], tree canopy density, and proximity to green land use) and track objective usage of such spaces through GPS data. NDVI values, as an indicator of greenness, were generated from Sentinel-2 satellite data to align with the timing of monitoring periods. We use personal GPS data collected from the MOVES mobile phone application to assign the total duration and distance travelled engaging in active, e.g., walking, and passive, e.g., driving, transport. Fitbit units worn by study participants recorded steps per minute, which are linked to the MOVES data. Indoor $PM_{2.5}$ and noise levels were collected from participants' homes, and we are exploring the use of the Data Integration Model for Air Quality (DIMAQ) to estimate outdoor concentrations during the study monitoring campaign. The analysis aims to determine how the presence of different types of greenspace affect exposure to air pollution and engagement in physical activity.

RESULTS: Based on the Edinburgh participants (n=29), preliminary results suggest no associations between mean values of any of the three residential greenspace metrics with indoor concentrations of $PM_{2.5}$, noise levels, or indicators of physical activity during the monitoring period. However, using the personal GPS data, overall NDVI values demonstrated significant positive correlations with the overall distance of walking or running (adjusted for monitoring period duration) ($r=0.46$; $p=0.02$) and also overall average hourly steps ($r=0.41$; $p=0.04$). No such associations were identified with tree canopy densities.

CONCLUSIONS: Our analysis show significant positive associations between select elements of greenspace and objective indicators of physical activity. We will expand the analysis to incorporate other contextual and socio-demographic covariates of individual participants and also pool data from the other cities to refine these early study results.

POTENTIALS FOR PROMOTING HEALTH EQUITY THROUGH URBAN FORESTRY: A NATIONAL STUDY OF HISTORICAL INFLUENCES ON TREE CANOPY AND AIR QUALITY IN US CITIES

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INTRODUCTION: As access to clean air becomes more scarce in urban neighborhoods (Véron, 2006), increasing tree canopy by promoting urban forestry has become a recognized strategy to combat air pollution (Irga, Burchett, & Torpy, 2015; Nowak, Hirabayashi, Doyle, McGovern, & Pasher, 2018; Selmi et al., 2016). However, empirical studies have shown that the spatial distribution of urban tree canopy in varies significantly in the United States, with lower access among African-American and low-income communities (Berland et al., 2015; Flocks et al., 2011; Heynen et al., 2006; Schwarz et al., 2015; Wolch et al., 2014).

In this paper we aim to examine the long-lasting effects of the early 20th century racially discriminatory housing policies on the current distributions of environmental quality by asking the following question: are there systematic disparities in contemporary spatial distributions of tree canopy, tree canopy change over time and exposure to airborne carcinogens that correspond with Home Owners' Loan Corporation (HOLC) categories for neighborhood appraisals across US cities?

METHODS: We utilize the HOLC maps for a total of 115 areas (https://dsl.richmond.edu), National Land Cover Data (NLCD) 30m2 resolution raster data for tree canopy for 2001 and 2011, and the National Air Toxics Assessment (NATA) estimates (2011) for the concentration of airborne carcinogens. We use 2010 US population data at block level to estimate the population density of each HOLC grade (including A "best," B "still desirable," C "definitely declining," and D "hazardous").

The zonal statistics tool in Esri ArcMap version 10.5 was used to estimate each value for each HOLC boundary. Linear regression analyses examined the association between HOLC grade and two outcomes, tree canopy and airborne carcinogens, while controlling for population density. Analyses were repeated for regions and municipal areas to examine geographic variation in these relationships.

RESULTS: Overall, for the entire study area, grade D areas had, on average, 17% less tree canopy than grade A areas. Mirroring the expected gradient, grade C areas had the next lowest percentage (14% less) and grade B areas had 9% less canopy. The results for different sub-regions indicate that the gradient persists across most regions, though the magnitude and statistical significance varies. As for exposure to airborne carcinogens, for grade D the level of exposure is three times more than grade A.

CONCLUSIONS: Tree canopy is not distributed equally throughout US urban areas. The distribution of tree canopy is closely linked with early 20th century discriminatory housing policies that are thought to have influenced economic investment since that time. These findings add to the evidence suggesting that to combat current day disparities and to ensure environmental justice and reduce health disparities, it is essential to examine and understand historical influences, and craft policies and interventions to reverse these influences.

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RELATIONSHIP WITH NATURE, VISITS TO GREEN AREAS AND WELL-BEING

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INTRODUCTION: There is increasing evidence that green areas support peoples' health and wellbeing through different pathways. The proximity of green areas encourages physical activity and raises the mental health benefits such as restoration and stress relief. In addition, feeling of belongingness is an important part of wellbeing as humans are social animals. The studies show that not only belongingness to social group, but also with nature can raise happiness and general wellbeing. This means that not only visits to green areas, and the accessibility of green areas, but also subjective relationship with nature has a positive linkage with wellbeing. Still, little is known about the pathways from nature relatedness to wellbeing and not all people feel the same amount of relatedness to the natural environment. In this presentation we elaborate the theoretical model about the links form nature relatedness to wellbeing. We hypothesize that the higher the nature relatedness, the more people visit green areas, and as a consequence they have less stress and better general health. We present a structural equation model that shows pathways from nature relatedness to subjective wellbeing through physical activity and recent stress experiences.

METHOD: The analysis was based on the randomly assigned survey data. The sample consisted over 25-years old Finnish speaking respondents living in Helsinki, the capital of Finland. The mean age of the respondents was 55 years (SD=17), and 59% of the respondents were women. The data was gathered together with the National Institute for Health and Welfare (THL). The response rate was 46.9 per cent (n=3751). We used structural equation model (SPSS AMOS 25) to analyse the data.

RESULTS: The nature relatedness had a small but positive, and feelings of anxiety and stress had direct negative connection to subjective health. Interestingly, the higher the nature relatedness, the more people had experienced recent stress. However, higher nature relatedness was also related to more visits to green areas that in turn was related to lower recent stress and higher subjective health. The preliminary model explained 35 per cent of variance of the subjective health.

CONCLUSION: The relationship with nature seems to be an important link to subjective health, partly promoting the amount of visits to green areas. Little is known about the development of nature relatedness and its change over time. Probably the influence is circular, high nature relatedness leads to more visits to green areas, and the gained benefits from these green areas. In turn, these benefits strengthen nature relatedness. The proximity of green areas, suitable for physical activity and recreation, is therefore a public health concern. The accessibility to green areas should be made easy to city inhabitants. The importance of relationship with nature and recreational visits in relation to mental and physical health should be studied further.

AN INNOVATIVE NATURE INTEGRATION PROGRAMME FOCUSED ON INDIGENOUS SWEDES AND MIGRANTS: IMPACTS ON HEALTH AND WELLBEING

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INTRODUCTION: The influx of refugees, migrants and asylum seekers into Europe from the Middle East and Africa has meant that the integration of migrants into different societies has become an important topic in recent years. A partnership between the Swedish Public Employment Service (Arbetsförmedlingen), Swedish Forestry Agency (Skogsstyrelsen in Skåne) and the Swedish Nature Conservation Unit (Länsstyrelsen) is using a nature based integration programme to bring together refuges and migrants as well as long term Swedish unemployed to participate in a year (for migrants) and two-year long (for Swedish unemployed) vocational training programme. The programme provides training in nature conservation skills for all the participants and lessons in the Swedish language for the migrants. An evaluation of the programme is exploring whether it has brought about changes in general health, physical activity, self-efficacy and nature connectedness.

METHODS: A mixed methodological approach is being used through the use of survey instruments at baseline and two follow up points in the programme. We used the Connectedness to Nature Scale, the EQ-5D to measure health related quality of life, the General Self-efficacy scale, a sleep questionnaire and the International Physical Activity questionnaire to research whether any changes take place for individuals over time from participating in the programme. In-depth case study interviews are also exploring the impacts of the programme on wellbeing, social connection, changes in behaviour, participant's attachment to place, and to what extent there has been integration between the Swedes and migrants via their nature conservation activities. The questionnaires have been translated into six languages and interpreters are used for all types data gathering.

RESULTS: Final results from the evaluation will be presented at the conference Preliminary results show that there has been a statistically significant change in sleep and self-efficacy for the migrants between the baseline and follow up at the end of the programme. However, there has been no change in physical activity or connectedness to nature over the 3 survey waves for migrants. The qualitative results highlight that the trainees feel the conservation activities are physically demanding and are perceived as meaningful work. Many of the trainees talked about inviting friends and family to the sites where they worked and proudly showing them what they have been doing. This has meant the migrant families have been introduced to nature sites they would not have visited otherwise. Many migrants talked about starting to feel more rooted in Swedish society.

CONCLUSIONS: There have been challenges with the data gathering and the different timescales of the programme for Swedes and migrants. The researcher have adapted the work and incorporated more qualitative data gathering to gather data that might be able to provide insights into the quantitative data. The governance of the programme is interesting, the Swedish Forestry Agency is the key driving force within the programme partnership. The programme is being adapted due to the reflexive learning approach adopted by the organisations as part of programme development and there are lessons that other countries could learn from this programme.

A STUDY FOR MANAGING KOREAN URBAN FORESTS TO ENHANCE URBAN RESIDENTS' HEALTH AND MEET THEIR ACTIVITY DEMAND

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INTRODUCTION: South Korea, with its high urbanization rate and its high population density, is vulnerable to natural disasters including PM10 and heat islands. Seoul's annual average concentration of PM10 is 48μg/m^3 as of 2016, much higher compared to major developed countries, and its air pollution level is the worst among the capitals of 15 countries. Also, with urban residents' rapidly increasing living inconvenience and concerns over health and economic losses due to disasters including urban heat islands caused by the 2018 heat wave, national countermeasures are urgently needed. Urban forests, with various merits such as PM10 reductions and air purification, have emerged as a countermeasure to natural disasters. However, Seoul's urban forest area per capita in the living zone is 5.35m^3, less than the WHO-recommended standard, 9m^2, and much lower compared to major developed countries. Also, Korean urban forests are not functioning fully due to insufficient consideration of their ecological health and stability, inadequate strategies for creating and managing them by type, and the lack of their systematic management.

METHOD: To identify urban residents' demands for urban forests for health and diverse activities, we analyzed big data based on the major media and SNS, surveyed the citizens of five largest cities, and had interviews with administrative officials in charge of urban forests.

RESULTS: The results of big data analysis and the survey show that urban residents hope that urban forests will expand near their living zone and actively reflect their opinions. According to the officials in charge of urban forests, urban forest models with purposes and forest welfare services using urban forests are insufficient, and cooperation among relevant ministries and local governments' role should be strengthened.

CONCLUSIONS: We presented the following strategies to create and manage urban forests reflecting demands of urban residents and related officials.

First, it is needed to expand garden infrastructure in the living zone linked with urban regeneration projects, and to expand urban forests by utilizing idle sites in cities.

Second, it is necessary to decrease natural damage by developing and disseminating urban forest models with purposes, including wind path forests and forests for reducing PM10, and to increase forest welfare services reflecting the purposes such as forest education and healing from the planning stage of urban forests.

Third, it is required to build a system for maintaining the ecological function of urban forests and for managing total green space by introducing a system for no net loss of urban forests, and to improve forest health by creating peri-urban mixed forests.

Fourth, it is needed to create citizen-led urban forests and their management system by establishing private-public governance, and to prepare the legal basis to actively support the governance.

Last, the creation of urban forests should be complete by establishing regional urban forest management plans and master plans to strengthen cooperation among related ministries and local governments' role.

EXPLORING THE IMPACT OF THE RELATIVE ABUNDANCE OF ALLERGENIC TREES IN FORESTS ON HEALTH-RELATED ECOSYSTEM SERVICES AND DISSERVICES

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INTRODUCTION: Forests are important sources of atmospheric pollen. A number of tree species, including trees from the genera *Betula*, *Alnus* and *Corylus*, produce allegenic pollen and these may trigger allergic symptoms in the sensitized population. The relative importance of allergenic tree species in forests therefore has a potential impact on the ecosystem services delivered by the forest. Forests with a dominance of allergenic species may generate important disservices to the public in the form of aeroallergen emissions. We used the Belgian forest inventory to calculate the relative contribution of allergenic trees to the total basal area of the Belgian forests and investigated associations between residential exposure to allergenic tree species and respiratory health effects in a prospective cohort of allergy sufferers.

METHOD: We tracked 49 allergy-sufferers with a smartphone during the pollen season of Hazel, Alder and Birch (January – May 2018). The cohort reported allergy symptoms through a diary implemented in a smartphone application. We hypothesized that participants residing in the vicinity of forests with a higher relative importance of allergenic trees would report more allergic symptoms.

Allergenic tree fraction in forests were calculated as the sum of the basal area of the three allergenic tree species (Hazel, Alder and Birch) compared to the total basal area of the plot. Residential exposure was calculated as the average fraction of allergenic tree species for the forest plots within 2, 5 and 10 km distance from the residence. Participants' self-reported respiratory health was calculated as the seasonal average of the sum of the daily symptom severity scores reported for 11 common allergy symptoms after a full day of exposure on a five point Likert scale.

RESULTS: Allergenic tree fraction varied between 0% and 32% at the local scale (2 km). At mesoscale (10 km) the maximal allergenic tree fraction was 19%. For 19 of the participants no forest plots were available within a 2 km distance from the residence. The average health response was 3.1±2.6. At all scales the participants exposed to the lowest fraction of allergenic trees reported fewer symptoms compared to the people exposed to the highest fractions, yet the differences were not significant at the 0.05 significance level.

CONCLUSIONS: In our cohort, residential exposure to allergenic trees in forests alone was not significantly associated to the health responses of allergy-sufferers. Urban parks, trees outside forests and other vegetation types not included in the Belgian forest inventory are very likely to contribute significantly to the distribution and species composition of atmospheric pollen. Our results suggest that studies on public health effects of nature must not only consider forests, and that measures of residential exposure must be complemented by measures of dynamic exposure to determine accurate dose-response relationships.

RESIDENT´S ATTITUDES TOWARDS POTENTIAL GREEN AREAS INFLUENCE ON THEIR HEALTH – CASE OF THE CITY OF BELGRADE

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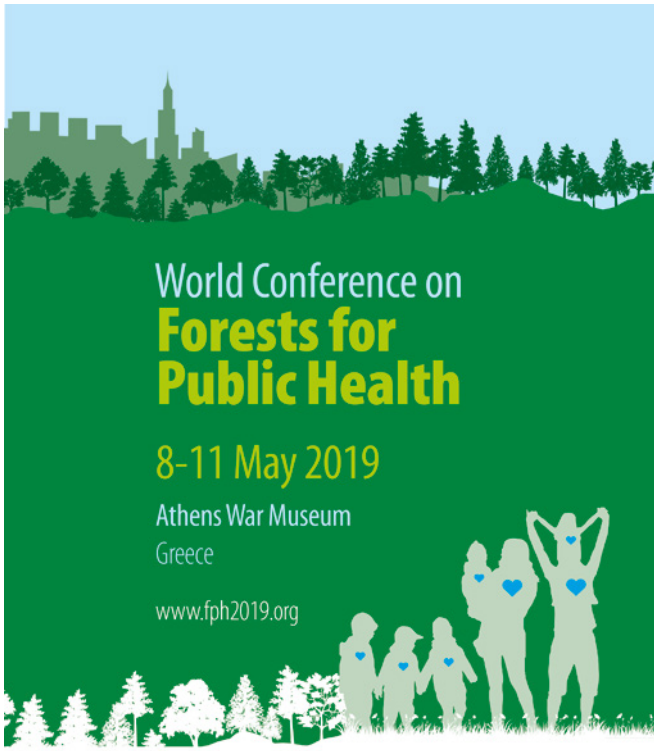
In the last decade many scholars showed that people who live in greener environments have been found to be healthier. By now exist very strong scientific and practical evidence that nature has many positive impacts on our health and wellbeing. Still, Serbia lacks such evidences and this kind of research. Therefore, in this paper we examine resident's attitudes of the city of Belgrade towards green areas influence on their health.

The aim of the research was to examine the relationship between the socioeconomic and health characteristics of the Belgrade´s inhabitants, with the quality of the green infrastructure of the city of Belgrade. The hypothesis is that residents of central city municipalities, who are under a higher degree of urbanization and therefore exposed to higher pollution, have major health problems compared to residents living in municipalities with higher amounts of green areas. For this study four city municipalities were selected, two with low level of green areas (Savski venac and Stari grad) and two with more green areas (Zvezdara and Vozdovac). In those municipalities 405 users of those green areas were surveyed with random sample method. The survey included three aspects: socio-demographic, health and recreational aspect.

The obtained results showed that users of green areas are persons belonging to the middle age group, with high or higher education, family-oriented or single, visit the doctor two to three times a year and stay on the green surface up to three times a week. The respondents prefer to use green spaces for walking and recreation. The hypothesis that people living in city municipalities with more green areas have lower levels of stress and better quality of life compared to people living in less-greener city municipalities has not been fully confirmed. However the importance of green infrastructure proved to be very relevant, since study respondents, also from the most endangered and most polluted municipalities of the city of Belgrade, express believe that green areas in the city has a great influence on all segments of their health and are therefore ready to visit other green areas in the city on a weekly basis.

KEY WORDS: green areas, green infrastructure, human health, quality of green areas, Serbia



E-POSTERS
PRESENTATIONS

Forest Medicine, Forest therapy, Health Policies, practices, economics and culture of Forests for Public Health

THE THERAPEUTIC CONTRIBUTION OF FORESTS TO REHABILITATION CLINICS IN BAVARIA

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INTRODUCTION: Rehabilitation clinics are often associated with a rather rural location and a green environment. The patients usually stay a few weeks and one could assume, that rehabilitation clinics use these opportunities to implement the surrounding nature and forests in their therapy program. But what is the actual spatial relationship between Bavarian rehabilitation clinics and forests? Do they already use the forests and how might this status quo develop after the health benefits of forests become more known? What would this mean for Bavarian forest owners and the potential of future cooperations with health institutions?

METHOD: The locations of all rehabilitation clinics in Bavaria were analyzed with GIS Software regarding there natural environment. With the software package ATKIS 25 the walking distance to the nearest forests were examined.

Three Clinics in Southern Germany were identified, who are currently working on the implementation of a therapy forest. These locations were studied qualitatively through expert interviews with the involved stakeholders on site. In the last step 29 rehabilitation clinics of psychosomatic, psychic and addictive diseases with walking distances of less than 500 m to forests were surveyed with the help of telephone interviews

RESULTS: Roughly 170 of the 337 rehabilitation clinics in Bavaria have less than 500 m walking distance to the nearest forest. Clinics with conditions, which are assumed to be facilitating for the therapeutic usage of nearby forests mostly do so. Most use forests mainly nonspecifically as part of the natural environment outdoors for different kinds of therapies. Three locations were identified, where stakeholders are working on projects to specifically use the health benefits of forests in southern Germany.

The carriers of these projects were two hospitals and rahabilitation clinics for psychological deseases and one health resorts. The forest people are perceived as main actors. They are concerned by potential additional costs and work, but also see it as the obligation to contribute to public welfare. A trustful relationship between these two mainactors was important for the success of the projects. The sizes of the forest areas was smaller than 10 ha in all cases.

CONCLUSIONS: The prevailing proximity between rehabilitation clinics and forests in Bavaria indicate a high potential for the usage of those forests in therapies. It is likely that more and more health care facilities will specifically implement forests in their therapy program. Since the areas of the planned therapeutic forests are rather small, it is assumed, that the therapeutic usage has a small area significance in Bavaria. However, the communicative effect of these treatment forests should not be underestimated. The actors involved in the case studies (including forest stakeholders) hope for a clear image gain for their institutions.

FOREST BATHING COMBINED WITH TRADITIONAL KNEIPP THERAPY AS A NEW PUBLIC HEALTH APPROACH IN GERMANY

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INTRODUCTION: Shinrin-yoku or forest bathing as well as forest therapy are gaining popularity in Germany. The health benefits indicate positive outcomes for psychological, cognitive and physiological effects. The German definition of forest bathing is a preventive, health promotion intervention, whereas forest therapy is recognized as a secondary preventive approach to improve people's health. Kneipp therapy -a proven and well-accepted complementary and alternative medicine approach- is a traditional inexpensive holistic concept for health promotion as well as therapy for chronic diseases, where the therapeutic usage will be covered by the health insurance. This paper seeks for shared common factors of Kneipp therapy and forest bathing as a cheap and effective strategy to foster people's health.

METHOD: The Japanese forest bathing concept of "shinrin-yoku" will be compared with the core elements of the traditional German Kneipp therapy. Each core element have been identified by literature as well as curricula reviews.

RESULTS: A strong theme of both concepts is the usage of nature to strengthen people's health and well-being. Kneipp philosophy contains five natural elements: water, herbs, exercise, nutrition, and lifestyle management. Forest bathing as an ecotherapy approach uses a 2-3 hour guided mindfulness and nature connection experience.

Nearly all Kneipp elements fit perfectly to the forest bathing approach: Kneipp hydrotherapy, e.g. cold-water immersion, is an important strategy to improve people's hardening. During a forest bathing experience, walking in a stream refers to Kneipp hydrotherapy. Cold-water immersion stimulates the thermoregulatory system, which leads to hardening and better health. Kneipp recommended daily exercises in nature, which will be addressed during a slow-paced forest bathing walk of 2-3 hours to counteract the sedentary daily behaviour. Another pillar of Kneipp therapy is the application of herbs (phytotherapy) in different forms as tea or medication. Some forest bathing guides are using leaves of trees/bushes for a tea infusion at the end of forest bathing walk. The forth Kneipp pillar describes the important aspect of a balanced lifestyle. Forest bathing acts as an opposite pole to urban indoor living to foster well-being through a guided outdoor experience. Only the fifth Kneipp pillar (nutrition) in the form of a specific diet would not be addressed in this combined practice of Kneipp therapy and forest bathing. In contrast, the forest bathing concept initiates a more directed sensory experience. During forest bathing, people will be guided on deeper sensory experiences to reach an increased awareness of their body, mind and nature to restore their health. Finally, both concepts benefit from the healthy forest climate to unburden people from their daily urban stresses and strains (pollution, noise etc.). It is important to consider specific contraindications when using Kneipp therapy during a forest bathing experience.

CONCLUSION: The unique combination of forest bathing as an ecotherapy approach to Kneipp therapy, as a naturopathic practice for less money leads to a new public health approach. Both practices complement one another successfully as a health preventive strategy to increase the general health as well as adapting a healthy lifestyle for everyday living.

KEYWORDS: Forest bathing/shinrin-yoku, Kneipp therapy, CAM, ecotherapy

SHINRIN YOKU – A QUALITATIVE DECRIPTIVE DEFINITION OF TERMS BASED ON A SEMANTIC CONTENT ANALYSIS

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INTRODUCTION: The term "Shinrin Yoku" was adopted in 1982 by Tomohide Akiyama, head of the responsible forestry administration in Japan. His aim was to convince the population of the health benefits of national forests and thus increase the demand for forests as recreational areas. The Japanese ideograph for "Shinrin Yoku" consists of the three words "forest", "wood" and "bathing". However, the literal translation "forst bathing" remains diverse in its linguistic interpretations. Due to the fact, that the current literature on "Shinrin Yoku" mainly focuses on evidence-based physiological and psychological effects of forest landscapes, science uses a concept without first having a consensus about its uniform use. The very base for a joined research, namely a unified definition, remains open. A missing, intersubjective accepted scientific definition of "Shinrin Yoku", results in the danger of hyped expectations which the term may not fulfil. Furthermore, a "most fundamental confusion" can arise that Wittgenstein warned of in Tractatus 3.324. For this reasons, a clear definition of the term is vitally important, because only the conceptual clarity allows statements about reality and forms the basis of any serious basic research. Thus, the aim of this study is to suggest a convention on the uniform use of the linguistic expression "Shinrin Yoku". To achieve this goal, the study follows three research questions: What is meant by the term "Shinrin Yoku" in scientific research? How is the term "Shinrin Yoku" defined by Japanese practitioners? Is there a joined understanding of "Shinrin Yoku"?

METHOD: The semiotic and linguistic model of the semiotic triangle forms the methodological basis for the definition. For this purpose, and as a part of a systematic literature search, 23 scientific publications were chosen by inclusion and exclusion criteria. Based on this literature search, a qualitative descriptive, semantic content analysis was carried out within the scope of a semantic field analysis. Afterwards, the syntax (the order of the individual terms) was analysed for the semantic content. In addition, the analysis method Text2Onto was used to create an ontology, which was compared with the statements of 13 practitioners in Japan in a further step.

RESULTS: According to the semiotic model, the term "Shinrin Yoku" was shaped. By understanding the semantic content, the definition closes the gap between the term "Shinrin Yoku" and its real-world phenomenon.

CONCLUSIONS: A missing scientific definition of "Shinrin Yoku" can lead to the "most fundamental confusion" in science and practice. Since conceptual clarity forms the basis of any further research a clear definition of the term in empirical research design is vitally important. The semiotic triangle proves to be a suitable way for suggesting an intersubjective accepted scientific definition for the term „Shinrin Yoku" by describing its meaning with certain essential characteristics. Thus, the present study allows a broad consensus on the term "Shinrin Yoku" and provides an essential contribution for further action in science and practice.

EFFECTS OF FOREST AND NATURE ON OLDER PEOPLE: A SYSTEMATIC REVIEW

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This study systematically reviewed the comprehensive health benefit of exposure to nature and green space on older people and methodological rigor to guide future studies. This systematic review was conducted in accordance with the Preferred Reporting Item for Systematic Reviews and Meta-Analyses guidelines. The review was conducted to identify full-text articles published from 2007 to 2017. Electronic databases (Scopus, Pubmed, MEDLINE, EBSCO(ASP) were used to cull article that evaluated the effect of nature and forest for older people. In the final sample, 31 articles were included in the systematic review. We concluded that nature and forest is effective intervention for older people. However, it is necessary to improve the design and quality of the development and effectiveness of forest healing in the elderly due to the lack of forestry programs and methodological rigor. Future research should be conducted to develop a systematic program aimed at enhancing the health and welfare of the elderly and the causal relationship between various healing environments based on nature and the elderly.

FOREST THERAPY PROGRAM ASSOCIATED WITH TKM TO PREVENT COGNITIVE DECLINE FOR THE ELDERLY

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INTRODUCTION: With the rapid aging of the population, the number of patients with cognitive impairment is rapidly increasing as over 46 million people were reported with dementia worldwide in 2015 and is estimated to be 132 million by 2050. Activities in the forest for the elderly over age 65 are limited due to degradation of physical and mental abilities. In this work, we aimed to develop (1) forest therapy programs that can run on rural forest area for the elderly to prevent cognitive decline and (2) a portable tool to evaluate the efficacy of the therapeutic programs.

METHOD: We developed two forest therapy programs of 1.5 hours long on average per daily session and running a total of 10 sessions with one session per week. To improve the effectiveness of our program, we adopted some therapies from traditional Korean Medicine such as breathing therapy and acupuncture therapy. The first program is specialized with meditation with breathing (breathing program) to induce relaxation and improved mental wakefulness for the elderly with exercise dysfunction. The second program is specialized with walking with acupressure stimulus on Yongquan (K11) during walking session (walking program) for the elderly with no problems in walking. Both programs adopt a short sessions of stimuli on several acupuncture points known for dementia prevention such as Bauhui (GV20), Shenting (GV24), Fengchi (GB20) and Taixi (KI3). We performed the Mini-Mental State Examination (MMSE) test and measured Electroencephalogram (EEG) for the assessment of global cognitive decline, and performed the Gariatric Depression Scale test and measured bio-impedance and heart rate variability (HRV) for the assistant health information.

RESULTS: After approved by IRB of Chungbuk National University, we recruited 30 participants for the breathing program, 31 for the walking program and 30 for the control group. The age and MMSE scores were 78.27± 6.89 and 24.03 ± 3.51 for the participants of the breathing program and were 72.60 ± 6.30 and 25.97 ± 3.20 for the participants of the walking program. After the screening test, the programs initiated on September 29 and are expected to end on November 9, 2018.

CONCLUSION: We expect score differences in MMSE and EEG and HRV markers between the program participants and the control group. Therefore, it will be possible to suggest forest therapy programs that are effective in preventing the cognitive decline for the elderly and the effectiveness can be estimated by affordable EEG and HRV markers based on portable and low cost EEG and HRV devices.

KEYWORDS: Forest therapy, Cognitive decline, EEG; Mini-mental state examination; Dementia; Cognitive decline

ACKNOWLEDGEMENTS: This research was supported by the Korea Forestry Promotion Institute (grant no. AP0000453) funded by the Korea Forest Service.

PRELIMINARY ANALYSIS OF PSYCHOLOGICAL AND PHYSIOLOGICAL BENEFITS FOR FOREST THERAPY IN TAIWAN

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The objective of this research was to understand the effects of forest therapy on the psychological and physiological benefits based on the field research at three private forest sites in Taiwan. This research was conducted in northern Taiwan. For each site, 12 adults participated in this field experiment. For psychological analysis, the Profile of Mood State (POMS) questionnaire was applied to assess different aspects of mood before and after the forest therapy activities. Besides, the indicators of blood pressure, heart rate, and saliva amylase were measured for physiological analysis. Results showed that the scores of negative feelings such as tension, depression, anger, fatigue, and confusion were significantly decreased. However, the score of vigor was significantly increased after the forest therapy activities. In addition, for physiological analysis, the blood pressure was significantly decreased; while the heart rate was significantly increased after the forest therapy activities. However, the saliva amylase value had not significant change. This research revealed that forest therapy has obvious benefits for human's mood and physiological health.

KEY WORDS: Private Forest Therapy, psychological effects, physiological benefits

THE ROLE OF CERTIFIED PHYSICIAN IN FOREST MEDICINE OF INFOM IN JAPAN

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INTRODUCTION: INFOM (International Society of Nature and Forest Medicine) started in Japan in 2010 to advance Forest Medicine as well as contributing to health, welfare, and integrated medical care. In order to spread the medical effect of the forest bathing, a certifying doctor system has been established and there are 57 members of Certified Physician in Forest Medicine so far in Japan. They actually take part in activities in Japan, so we will show the contents of activities.

METHOD: In INFOM, we have two main activities. One is A: "Walking Forest Therapy Roads ® with a doctor" since 2013. The event will allow subjects to efficiently experience the medically proven healing effects of forests through forest-based activities such as bathing, walking, sit- and-seeing, and simply laying proven healing effects of forests. And the other is B: "ESD (Education for Sustainable Development) and LH (Life of Health) for children" since 2014. Children can learn that they get relaxed and become healthy by walking in the forest, the relations with the environmental problem of multiple functions of the forest and how to use woods and how woods are used in local communities. These activities are subsidized by the 'National Fund for Forest Greenery and Waters' which is under the auspices of the 'National Land Afforestation Promotion Organization'.

RESULTS: The activities of one year, from July 2017 to June 2018 are reported. In activity A, forest bathing was carried out in ten places in Japan, and the participants were 187 adults. In B, the event was carried out in ten places in Japan, and the participants were 52 children and 75 adults. One doctor joined every one place by all means. Blood pressure measurement, the saliva amylase measurement and questionnaire were carried out before and after forest bathing at all places. The Forest Medicine Certified Doctors analyzed the results of measurements of participants, and doctors explained how the forest bathing influence on the body of participants. Doctors also advised how to spend time in the forest and appropriate momentum to the individuals according to their results. In B, 59.6% of children, 88% of adults replied it with "satisfaction" about the correspondence of the doctor.

CONCLUSIONS: Forest bathing is not a mere healing but an activity with a medical effect. Furthermore, if doctors joined the forest bathing, the participants can enjoy safety and effective forest bathing and were able to get high satisfaction. We believe that these activities are the unique style of INFOM in Japan and help every people enjoy and practice the forest bathing.

THE INFLUENCE OF A FOREST EDUCATION PROGRAM ON FAMILY STRENGTH

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INTRODUCTION: Weakened family functions and family dismantling are increasing due to rapid technology development and various social changes in contemporary society. Therefore, it is crucial to make efforts to recover family strength and build better relationships among the members. Today, there is an increasing tendency of family visiting forests. The study aims to investigate the effects of family participation in forest education programs for family strength.

METHOD: From May to July 2017, we conducted a family-based forest education program at the National Center for Forest Activities in Hoengseong for 1 night and 2 days. Forest education program consist of forest interpretation, forest experience, craft class using natural materials, snack making, and meditation session. 103 parents and 62 children participated in the program and they were surveyed before and after the program to verify its effectiveness.

RESULTS: Parents and children who participated in the forest education program improved their forest attitude, communication skills and family strength. Through forest interpretation and forest experience in forest education program, the awareness of interest and necessity in forest increased. Improvement in communication of family, enhancement of bond and value sharing was shown through the craft class and snack making with family session. In addition, parental efficacy increased through the experience of five senses of forest and meditation and also, children's self-efficacy improved through task solving and accomplishment through participation in forest experience activities.

CONCLUSIONS: Positive family relationship formation and children's education were high as motivation for participation of forest education program with family. The forest education program brought a positive effect on family strength and self-efficacy as well as built a better attitude towards forest. This was consistent with participation motivation. However, this study is limited to short-term forest education programs. Thus, it is necessary to analyze the program's effects for longer period of time in the future. We hope that this research will be the basis of the development of a program that will help building a healthy family relationship using forests.

COMMUNITY AS KNOWLEDGE BUILDING AND SHARING SPACE IN FOREST THERAPY METHOD DEVELOPMENT AND PRACTICAL USE

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INTRODUCTION: "Shinrin-yoku" was introduced in 1982 by the Japanese Forest Service to promote the effects of forests on physical and mental health and to facilitate their targeted use. During the last few years Shinrin-yoku has become popular worldwide. It is an important inspiration for forest social and therapeutic interventions aiming to reduce stress and to connect people with nature. The practice transforms into different forest bathing methods depending on cultural, social and geo-political contexts. Gradually Shinrin-yoku is also beeing developed into methods, which use clinical therapeutic interventions adapted to the client's needs, while at the same time assessing the health effects and efficacy of those interventions.

METHOD: International Forest Therapy Days (IFTDays) is an initiative of "bridge builders", which aims to first and foremost connect people with nature for the overall wellbeing of mankind and the natural world. The IFTDays brings together practitioners, scientists and policy makers working in forest therapy and related fields. It aims to exchange experiences of professionals using forest therapy in their daily work with a variety of client groups, to analyse and contribute to existing scientific knowledge and on-going research on health outcomes from forest, which could lead to certain policy developments especially in disease prevention and health promotion. It also aims to evaluate methodologically the efficacy of forest bathing and forest therapy practices using questionnaires, surveys or semi-structured interviews.

RESULTS: The first meeting of IFTDays took place on 6-12 August 2018 in Karjalohja, Finland. This event consisted of a one-day seminar of presentations with some practical demonstrations, followed by four days of practical training programme where forest bathing and therapy methods used at the moment in various geographical regions were introduced and explained to the participants.

The IFTDays initiated the creation of a community of motivated and highly committed professionals with different backgrounds who would like to continue to collaborate and contribute to forest therapy knowledge with their own expertise and experience. The main mission of the IFTDays community is to create a collaborative transdisciplinary space for open dialogues and discussions with the main goal of connecting people with nature in order to promote sustainable and pro-environmental behaviour, to address climate change and biodiversity loss issues. Secondly, by creating a transdisciplinary sustainable and durable knowledge sharing space, we hope to contribute in a collaborative way at the global scale to the development and validation of forest therapy methods. On their grassroots level, the community members are also working on raising awareness of the general public, individuals and companies, on forest therapy health outcomes, not the least of which is connecting people with nature. In the short term, through dialogues and inputs to the environmental, social and economic projects of local, regional, national or international organisations, IFTDays focuses on achieving the UN's 2030 sustainable development goals.

Besides health promotion and disease prevention, social and environmental contributions, the IFTDays community also works on development of ecopreneurship models which would help members of the community to set up sustainable business models based on collaboration, and not competition.

VISITORS' PERCEPTIONS AND RECREATIONAL VALUE OF PERI-URBAN FORESTS: AN EXPERIENCE FROM CENTRAL ITALY

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INTRODUCTION: In the last decades, the role of urban and peri-urban forests has changed, in particular for the increasing importance of the recreational and environmental services attributed to forests. This fact is due to the urbanization and globalization phenomena that occurred in many parts of the world. In this context, great part of the population of the post-modern society considers more important the environmental, social and cultural values of forests (e.g., recreational activities, landscape aesthetic, habitat conversation, and natural hazards protection) than the economic values of forests (e.g., timber, biomass for energy, food and fodder).

Concerning peri-urban forests, these forests are characterized by multiple-use and various kinds of recreation activities and planners and managers have to take into account ecological, economic and social issues to provide a sustainable management. In this framework understanding visitors' perceptions of peri-urban forests is a key element to support decision-makers and ensure proper forests management.

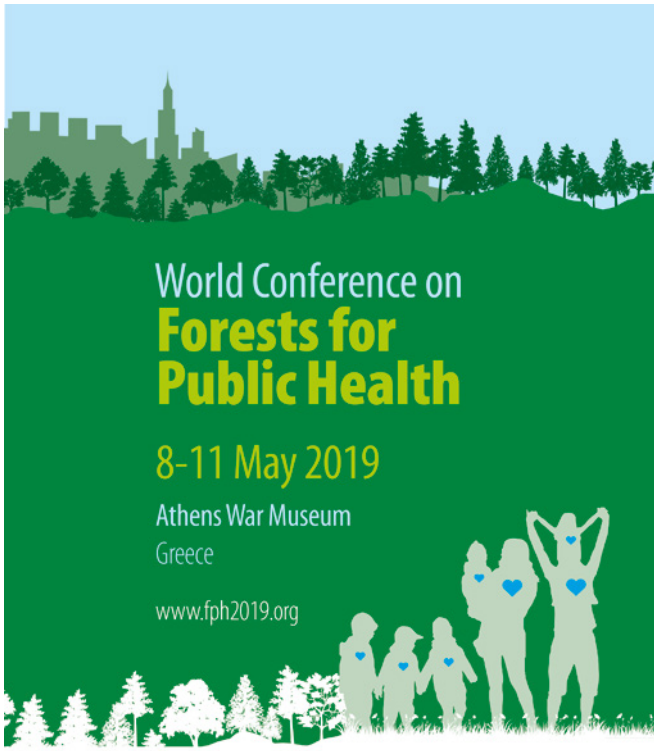
The present study - carried out under SelPiBio Life Project - has the objective of investigating visitors' perceptions towards different forest scenario in a case study in central Italy: Pratomagno mountain forest in Arezzo province, Tuscany. Moreover recreational value of forest has been investigated through visitors' opinions.

METHODS: Between June and September 2017, the views and perception of 200 visitors were gathered through a questionnaire submitted by a face to face interview. The questionnaire formed by 15 open-ended and closed-ended questions was divided in four thematic sections: "Personal information", "Recreational use of forest", "Benefits provided by peri-urban forest", and "Preferences and perceptions towards the peri-urban forest". The sample of visitors was sized considering the main characteristics of the forests such as the surface, points of access to the forest and network of trails. In particular the interview aimed to investigate the recreational value of the forest and the perception of the landscape, regarding different forest scenario. Scenario are the results of two different kind of silvicultural interventions (selective and traditional thinning). The collected data allowed to estimate the recreational value of the forest through the Travel Cost Method. Furthermore, through the Visual Assessment Method, the preferred forest management scenario was investigated.

RESULTS: The results of the Visual Assessment Method show that the forest under selective thinning is the preferred scenario for visitors (priority score 0.4014) followed by the forest scenario after the traditional thinning (priority score 0.3358). With regard to the recreational value of the forest, data from Travel Cost Method showed a value of 1268,08 euro per year.

CONCLUSIONS: The results of the present research, obtained from peri-urban forest visitors, are an important support for decision makers in order to provide forest plans and to pay attention to visitors' priority when defining forest management strategies.

KEYWORDS: peri-urban forest, recreational value, Travel Cost method, visitors' perception, Visual Assessment method.



E-POSTERS
PRESENTATIONS

Mental Health benefits of exposure to Nature

LEARNING BY PLANTING: EDUCATION FOR FUTURE CITIZENS

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INTRODUCTION: When we talk about forests, it sounds like something distant, that we cannot contribute in anything. However, when we put a handful of seeds in a child's hand and explain that it can turn into a forest, as each seed can germinate, generating a bunch of trees and producing thousands of other trees, it will be easy to see oneself as a transforming agent. In Brazil, there are many youngsters that can be considered functional illiterate, who have diplomas, but know little about writing and interpretation, and about forests. In this way, knowledge becomes unattainable, generating disinterest in the learning process. That is why creative initiatives are needed to get young people out of their class and allow them to be co-authors of their own teaching, by seeing that a forest can begin in their own yard, school or degraded areas in their neighborhood. Using the benefits provided by plants, the objective of this work was to present the experience of the use of the knowledge on plants and its cultivation as an interdisciplinary tool for the promotion of landscape transformation and improvement of public health.

METHOD: The work was carried out at the Unified Educational Center "Três Pontes" of the Municipal Department of Education of São Paulo, located in the city of São Paulo, Brazil. Practical and dynamic workshops were held in the external areas of the school, with groups of students from 9 to 15 years of age, teachers and gardeners. The activities were constructed according to the students' knowledge and interest and using gardening techniques, allowing the group to plant, harvest, produce seedlings and seeded balls so that they could germinate in areas where it is necessary to increase vegetation and promote a better health for all.

RESULTS: The potential of plant cultivation as a transformative educational tool to improve the quality of life was observed in many ways, as in the various forms of expression stimulation of the students, a process that required reflection on the theme, making them form their own opinion. The interaction between the participants, was an exercise of listening to each other's opinions, respecting diverse individual knowledge and building a new landscape for the common good. The perception that they were able to intervene in the environment, transforming it and generating benefits to the community was one of the outcomes. The use of external space, made classes more interesting and provided more pedagogical resources to teachers. The opportunity to plan a planting project, putting it into practice and enjoying its benefits stimulated the critical analysis of the participants, which, for the students, is fundamental for their development as citizens. Practicing what you helped to plan is a practical exercise of citizenship, since it demonstrates the ability of each one in transforming the environment they live, benefitting local community as a whole.

CONCLUSIONS: Practical work with nature has proved to be a rich topic for working on educational issues about citizenship, self-esteem and community empowerment to promote social and environmental transformation.

ECOPSYCHOLOGY AS A NEW GROWING FIELD IN PSYCHOLOGICAL COMMUNITY WORLDWIDE. BALANCING THE INTERRELATION OF HUMAN PSYCHE AND PLANETARY WELL-BEING

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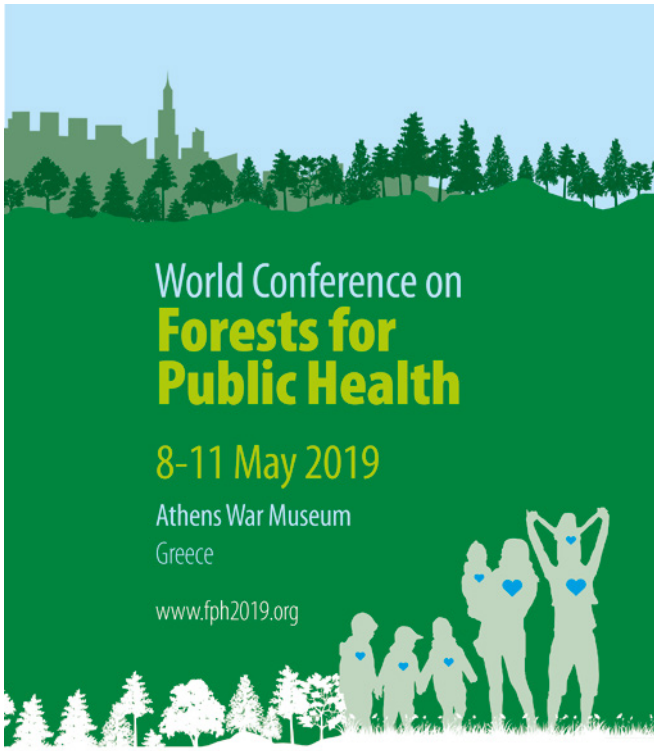
INTRODUCTION: The anthropocentric nature of Psychology has misled the role of natural environment, leading psychoanalysts in their later writings, such as Jung, to emphasise the role of nature in their writings and the negative consequences of the loss of connection of human with nature in human psyche (Sabini, 2008). This "mismatch" has been used as a term that picked up by a number of researchers and authors to describe the detachment of humans from their natural and evolutionary history and second, the consequences of that dissonance on our physical and psychological well-being (Ornstein and Ehrlich, 1989; Bateson, 1980). In the meanwhile, the theory of Biophilia (Wilson, 1980) as the "innately emotional affiliation of human beings to other living organisms" has been presented as a theory and Ecopsychology has been introduced, as a growing direction of Psychology worldwide in order to include Nature as a cooperator and counsellor to individual and planetary well-being (Roszak, 1993).

METHOD: In this presentation, an increasing body of research will be reviewed, especially from the area of environmental psychology but also from the practice of exposure to Nature from multiple disciplines. These demonstrate how contact with natural environments can enhance positive affect; reduce stress (Ulrich and Simons, 1986), improve parasympathetic nervous system functioning (Ulrich et al.1991), enhance self-concept, self-esteem and self-confidence (Wright, 1983) and benefit the treatment of mentally ill (Levitt, 1991). The role of Nature in Mental Health will be explored and how the techniques of psychotherapy and counselling from different perspectives can be used in order to restore the reciprocal connection with Nature, such as the therapeutic relationship (Stolorow and Atwood, 1992), transference and counter transference (Freud, 1912), attachment theory (Bowlby,1969), transitional object theory (Klein, 1952 and Winnicott, 1958) attention restoration and stress reduction (Kaplan and Kaplan, 1989) and Mindfullness (Williams et al.2007) as important therapeutic tools.

RESULTS: A numerous of positive outcomes of the reviewed researches lead us to conclude how the "greenish" of Psychology is important to fill the gap of the nature deficiency in the Science of Psychology and the need of Ecopsychology can be central in supporting ideas within counselling and psychotherapy which position nature as fundamental to revitalising and reconnecting humans within a reciprocal healing relationship to nature (Jordan, 2015).

CONCLUSIONS: Even though there is a numerous research on the field of natural approaches in human well-being and therapy, the field of Ecopsychology it is characterized by a transdisciplinary approach that makes it suitable to stimulate and consolidate the creation of a peculiar methodology, to be applied in many different operating areas not only therapeutic, but also educational, organizational and recreational, to promote environmental awareness starting from a psychological - individual and in group - work. Although National Health System of UK has recently introduced ecotherapy in official therapy techniques (NHS forest project 2018) and Ecopsychology is already having a place in Universities (Naropa University, in Colorado; John F. Kennedy University, in California; Aosta Valley University, in Italy), further research is important-but as Nature proposes itself, needs more time, focus and dedication to grow.



E-POSTERS
PRESENTATIONS

Planning physical activities in Forest/Natural environment for Public health

GREEN CARE WALD AND FOREST PEDAGOGICS - A VIVID SYMBIOSIS

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INTRODUCTION: Modern lifestyle increasingly causes diseases of civilization such as stress, burnout, cardiovascular diseases, obesity or mental illness. In the search for relief, the interest of medical research has more and more turned to prevention and, in this context, the health-promoting effects of the forest environment. Nowadays, numerous research papers emphasize the importance which is attached to the forest as a recreation, experience and learning space. Forest and trees enjoy a high priority in our society. People are happy in this natural space, which is regarded as the epitome of the natural. Some of the most interesting evidence of the health benefits of nature is coming out of Japan, and revolves around the popular practice of "Shinrinyoku" or "forest bathing".

METHOD: Forests in context of human health have been addressed by the IUFRO-Task Force "Forest and Human Health" as well as by the COST Action E39 "Forests, Trees and Human Health and Wellbeing". In addition, the first large-scale research projects have been launched, particularly in Japan, Korea, Finland and Switzerland, in cooperation with forest research institutes, health experts from medical universities and health authorities. In Austria, too, such is under development. Until the 1980ies almost unknown, forest pedagogics has gained increasingly importance within the last two decades. Forest pedagogics in the modern sense means to experience nature, to perceive forest and nature with all your senses. Forest pedagogics plays with rest and movement, invites to undertake voyages of discovery and raises awareness related to the multiple services deriving from forests. As within the last years new scientific findings are dealing with the health effects of the forest environment, Forest pedagogues have extended their offers as well as the target groups. Studies indicate that the forest unfolds its diverse health effects, particularly if people are perfectly accompanied. Forest guides can cover this need due to their educational training. Thus, interesting interfaces arise to the activities and programs that currently are grouped together under the term Green Care WALD.

RESULTS: The study introduces the diverse natural and forest-pedagogical projects and initiatives which have to do with trees and forests offered so far in Austria that contribute to health and well-being in a broad sense. The offers are on the one hand guided tours, forest schools, forest nurseries and play groups. Beyond, forest educational projects have today sometimes more ambitious goals such as the promotion of self - and social skills or violence and drug prevention. Offers adapted to specific age- and target-groups are a way to contribute sustainably to the health and well-being of the entire population. The presentation of best practises intends to inspire the wide field of possible cooperation between forest pedagogues and therapists (speech therapy, physiotherapy, etc.).

CONCLUSION: Many forest-pedagogical activities stimulate the senses and can provide suggestions and assistance for the implementation of the forest as a therapeutic space. The forest has a special power, because the logic of therapeutic action in the forest is obvious and immediate.

INFLUENCE OF FOREST CHARACTERISTICS AND SILVICULTURAL TREATMENT ON STRESS LEVEL: A NEUROSCIENTIFIC APPROACH

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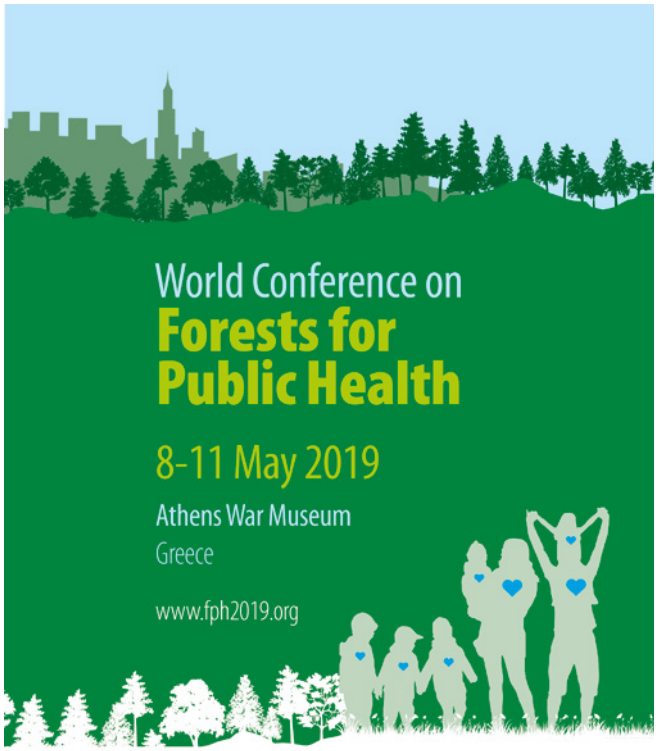
INTRODUCTION: The importance of green and natural spaces for stress recovery and people wellness has been demonstrated in several studies throughout the world. Among vegetation typologies, forests have a positive effect on physiological and psychological parameters of people in terms of anxiety reduction. Even though the increased scientific literature about the topic, a few studies focus on correlation between forest characteristic (e.g., dendrometric parameters and silvicultural treatment) and level of stress. The aim of the present work is to fill the above gap to suggest alternative or complementary forest planning strategies for people wellness and territorial marketing.

METHOD: The work is based on the application of a smart electroencephalographic (EEG) technique to statistically correlate interviewed responses to different stimuli. Stimuli are recorded through a spherical video camera in a reasoned sampling in order to capture control condition (artificial area) and different characteristics of forest (density, forest species, soundscape as well as regeneration system). The immersion of interviewed in each sample area is guaranteed by the application of virtual reality headset. Physiological status of subject is monitored by means of Muse Brain EEG device to highlight alpha and beta waves, the most suitable for stress analysis. Physiological trend is validated with the application of the Profile of Mood Statesshort form (POMS-SF) able to assess the mood states of an individual and to capture both transient and enduring affects. The case study is depicted in forest of Municipality Union Valdarno and Valdisieve in the province of Florence (central Italy).

RESULTS: Preliminary results seem to confirm existing literature in terms of distinction between artificial and forested area for stress reduction. Differences among internal forest variables (i.e. landscape and dendrometric parameters and presence/absence of soundscape) for stress level assessment are also highlighted.

CONCLUSIONS: The applied method represents an easy and updatable technique to evaluate stress level and to compare the influence of different forest characteristics on stress reduction. In-depth analysis should increase the number of sample area to discriminate additional forest parameters and their influence on people perception. Permanent sample area should be considered to assess dynamic trend of forest and stress recovery in different seasons or years. With suggested integrations, results can be useful to recommend planning strategies to forest managers in order to improve recreational and touristic services. In fact - according to findings - ad hoc tracks can be implemented/classified with the objective to develop innovative "sensorial" or "wellness" paths allowing for territorial marketing strategies.



E-POSTERS
PRESENTATIONS

Urban forestry and Green spaces planning and design for human activity

QUANTITATIVE ASSESSMENT OF LANDSCAPE QUALITY IN FOREST THERAPY GARDENS – A CASE STUDY IN BEIJING SUBURB

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INTRODUCTION: Forest therapy is a new type forest resource of health-oriented forest landscape. It is very urgent that the quantitative assessment of landscape quality in forest therapy gardens need to be studied.

METHOD: Based on the forest therapy studies in Germany, Japan and Korea, this study summarized the effects of urban forests on physical and mental health of residents in a rapidly urbanized metropolis, analyzed the functions and types of forest therapy, and concluded the methods of quantitative landscape assessment. Combined with scene photographs and the street view pictures from Baidu company, this study used a deep learning method to quantify forest scenes in therapy gardens and newly brought the Scene Amenity Scores (SAS) to measure landscape quality, and verify the accuracy by building regression model between the SAS and the public rating scores.

RESULTS: The results showed that the regression R^2 reached 0.86, which indicated the assessment indicator is accurate. This study used a deep learning method to provide quantification tools for forest therapy gardens in Beijing suburb, and gave theoretical basis of automatic computation.

CONCLUSIONS: This study has a certain promotion effect on improving the multi-functional utilization of urban forest resources, developing regional economy, improving residents' health and raising people's awareness of environmental protection.

VOLATILE ORGANIC COMPOUNDS AND MICROMETEOROLOGY FACTORS IN URBAN FOREST

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INTRODUCTION: In order to improve the quality of life of the people, it has been highly required to utilize the urban forest as a forest welfare space, and various basic researches related to the urban forest are required as well. This research investigates the occurrence characteristics of phytoncide which is forest healing factor and volatile organic compounds (VOCs) and analyzed the correlation with the meteorological factors in order to examine the health possibility according to the type of urban forest.

METHOD: Monitoring spots were selected as forest, national parks, fenced parks and traffic island according to the urban forest classification of «Creation and management of forest resources act» and the act of use district in Seoul, Korea. We selected additional large forest at the outside of the city centre for reference. The monitoring was carried out five times a day (from 9 to 18 o'clock) in June of 2017, taking into consideration the life patterns of the citizens. In the case of volatile organic compounds, Tenax TA tube was connected to the suction pump, and 9L was collected at a flow rate of 0.15 L/min. In the case of the micrometeorology, 5 minutes interval recording was performed, and then ANOVA and correlation was performed between VOCs and micrometeorology data.

RESULTS: Various phytoncide factors were detected within the urban forest as well as large forest at the outside of the city, and monoterpenes accounted for a high percentage although the composition of phytoncide was different according to tree species. The composition ratio of BTEXS showed no significant difference according to type of urban forest, and overall contribution of toluene was high. The ratio of T:B, which can identify the emission source of VOC, is the highest near the traffic island, and greatly influenced by emission amount and emission intensity from vehicles combustion. In the case of phytoncide (e.g. monoterpenes) shows a strong positive correlation with humidity and a negative correlation with temperature and wind speed, and benzaldehyde, which is a non-terpene among the phytoncide, has an opposite tendency. BTEXS showed a negative correlation with humidity, positive correlation with temperature, wind velocity.

CONCLUSIONS: The concentration of volatile organic compounds in the atmosphere differs depending on the type and scale of urban forests, phytoncide which is forest healing factor has been confirmed at high level in urban forest. It is expected that the results will be provided as basic data to expand the urban forest as a forest welfare space for human health.

INTEGRATION OF MEDICINAL PLANTS KNOWLEDGE AND USE IN FOREST THERAPY

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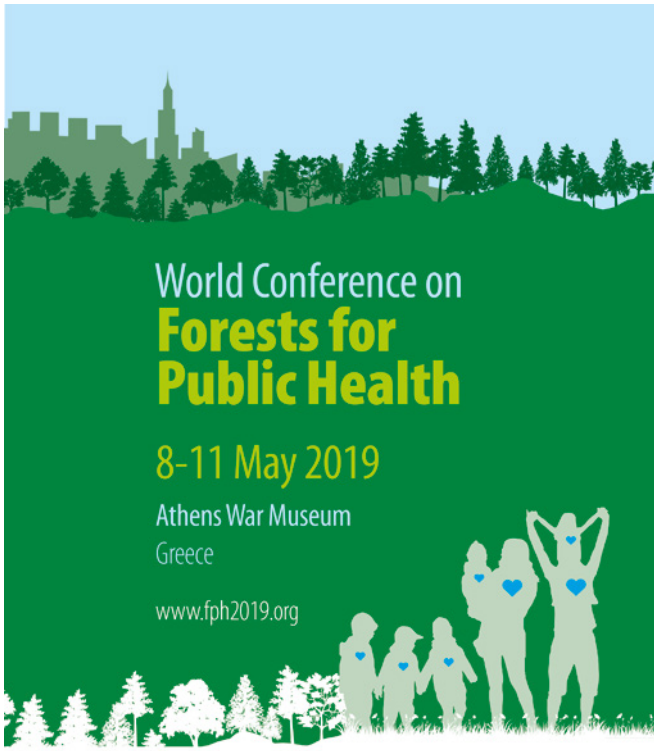
INTRODUCTION: In our days, when the society's afflictions have shifted from infectious to chronic diseases such as chronic stress, burn-out, diabetes, cancer or cardiovascular diseases, health is understood in a broader way: not simply the absence of disease, but as a total state of physical, mental and social well-being. The interest in connecting nature and human health is not new, nor is viewing the environment as a determinant of the well-being of the population. However when public health moves towards place-based and health promoting salutogenic practices, the nature and exposure to it is more often seen as a very important determinant of health. Woodland provides various ecosystem services and contributes strongly to people's quality of life. Forests filter drinking water, purifies air, provides habitats for animals and plants including medicinal and edible species. Medicinal plants have been used by humans since ancient times and have been foraged in woodlands and open landscapes. Even in our days medicinal plants play a very important role in disease prevention, health promotion and new forms of medical care including forest therapy.

METHOD: Our research was carried out using observational methods such as visits to the forest sites where forest therapy is being practised, attending meetings, conferences and seminars related to nature based or assisted interventions, interviewing professionals involved in forest therapy field, following the activities of nature organisations, taking part in forest bathing and forest therapy walks offered by forest therapy guides who are trained by different schools and use different forest therapy methodologies. Our study analysed interlinkages between medicinal plants growing in the forests, ecosystem services they provide and use of medicinal plants in forest therapy methods.

RESULTS: Our study showed that wild medicinal and edible plants including medicinal trees are common in forest environments, both in rural and urban settings. The essential oils released mainly by medicinal trees (phytoncides) are proven to possess antimicrobial properties, enhance natural killer cells activity and are considered important contributors to forest therapy health outcomes. Medicinal flora play an important role in forest therapy. Medicinal plants in the forests provide various ecosystem services (e.g. provisioning, supporting or cultural). People attending forest bathing and forest therapy walks often forage medicinal and food plants. Besides stimulation of all senses that participants experience during forests therapy walks, people are also specifically exploring medicinal plants by smelling, touching or testing them. Medicinal plants are being used in tea ceremonies to conclude forest therapy walks (in methodology proposed by Association of Nature and Forest Therapy) or brought home as provisions for nature based medicines. Medicinal properties of observed, found or collected plants are often being discussed during forest therapy walks. Forest therapy guides and walks participants would like to gain more knowledge on medicinal and edible plants during certification process or in long term professional training. Medicinal plants knowledge and use are considered both by forest therapy guides and participants to be important contributors to forest therapy health outcomes. Medicinal plants are seen to be part of forest intangible cultural heritage and precious local knowledge to be safeguarded for future generations. Study participants repeatedly highlighted that forest medicinal plants should be used sustainably benefiting their contributions to people's health and quality of life and preserving genetic resources at the same time.



E-POSTERS
PRESENTATIONS

Urban Forests and their ecosystem services for Public Health

THE EFFECT OF THERMAL ENVIRONMENT OF THE FOREST ON HUMAN AUTONOMIC NERVOUS SYSTEM

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INTRODUCTION: A forest is one of the best places for people who are tired of busy lifestyles to refresh their mind and body. The healing power of the forest is the result of stimulating the five senses with a combination of various environmental factors (thermal environment, scents, scenery, etc.) which determine the comfort of the forest. Uncomfortable thermal environments cause stress in humans. Therefore, the thermal environment of the forest is a key factor which determines the comfort that people who participate in a forest therapy program feel. Currently, however, there are few studies that examined the effect of the thermal environment of the forest on the human body. This study was carried out to understand the effect of the thermal environment of the forest on the human autonomic nervous system.

METHOD: The experiment in this study was conducted at Minjujisan Mountain, located in Yeongdong-gun, Chungcheongbuk-do, South Korea. Study subjects were 180 healthy university students (including 81 men and 99 women, average age was 25.03±2.60). This study was approved by the Institutional Research Board (IRB) of Chungnam National University (IRB No. 201802-SB-028-01). In order to examine the effect of thermal environment on the autonomic nervous system, predicted percentage of dissatisfied (PPD) was used. PPD is an index that quantitatively predicts the percentage of thermally dissatisfied people. Heart rate, one of the representative indicators of activity of the autonomic nervous system. The subjects were exposed to the forest for five minutes, and during the exposure, both the PPD and the heart rate were measured. In order to investigate the correlation between PPD and autonomic nervous system, a Pearson Correlation Analysis was carried out. Statistical analyses were performed using SPSS 24.0 and the statistical significance was set at $p < 0.05$.

RESULTS: PPD in the forest environment in which the subjects were exposed was 61.33±34.40%, and the heart rate of the subjects which indicates an index of autonomic nervous system activity was 84.81±14.70bpm. The correlation between PPD and heart rate was analyzed to evaluate the effect of the thermal environment of the forest on the activity of the human autonomic nervous system. According to the results, a positive linear correlation was demonstrated between PPD and heart rate which was statistically significant ($p<0.05$). This indicated that the sympathetic nervous system of the autonomic nervous system is activated as the dissatisfaction about the thermal environment of the forest increases.

CONCLUSIONS: This study confirmed that the thermal environment of the forest has an effect on the autonomic nervous system, and in order to enhance the healing power of the forest, it is necessary to create a comfortable thermal environment. The study also confirmed the applicable potential of the PPD as a measuring indicator of the thermal environment of the forest. This study will suggest the importance of reflecting thermal environment in the design of green spaces for human activity and provide a foundation for the research of green space design in consideration of thermal comfort in the future.

THE ROLE OF FORESTS IN THE CONTEXT OF ENVIRONMENTAL CITIZENSHIP: INSIGHTS FROM AUSTRIA

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INTRODUCTION: Environmental Citizenship (EC) is defined by ENEC (2018) as the responsible pro-environmental behaviour of citizens who participate in solving environmental problems and preventing the creation of new problems aiming to achieve sustainability as well as to develop a healthy relationship with nature. We recognize interdependencies between ecological sustainability and public health. An intact environment is a prerequisite for wellbeing and can contribute to recreation as well as mental, physical and social health. EC includes the identification of the underlying causes of environmental degradation and environmental problems. The ENEC - European Network for Environmental Citizenship through Formal and Non-Formal Education Action (COST CA 16229) aims to enable scientific development leading to new conceptualizations and products while contributing to strengthening research and innovation capacities. In this study we aim to analyse the current and future role of forests with regard to EC in Austria. In particular we want to give possible examples of (1) what is "the adequate body of knowledge" and (2) what are the potential characteristics of "an agent of change in the private and public sphere" for forests, using a case study on forest pedagogy.

METHOD: The analysis is based on a literature review identifying the relevant stakeholders and defining the current and future functions in forests of major relevance for citizens and how they contribute to public health. Further a SWOT analysis is applied to discuss major challenges and changes for the key elements of the EC concept: active engagement, civic participation as well as individual and collective actions.

RESULTS: The strength of the EC concept is an increased understanding of environmental and social consequences of the own actions, empowerment and the development of social and sustainable responsibilities. Currently in Austria the concept is not established or known in the public, in contrary to other European countries. Nevertheless, our analysis shows that elements of EC can be found well established, e.g. in forest pedagogy, forest and nature conservation acts or policies and in sustainable forest management concepts. Forests play a major role in achieving the Sustainable Development Goals (SDGs), for example SDG 13 "Climate Action" and SDG 15 "Life on Land". Besides the utility, protective and welfare functions of forests, demands for recreation as well as nature conservation (e.g. biodiversity) and environmental protection (e.g. carbon stock) are increasing. Non-formal education, such as established in the context of forest pedagogy, can contribute to building an adequate body of knowledge. Further efforts are needed to ensure knowledge transfer from the interdisciplinary field of forest science to the public, in order to equip citizens with relevant skills to act as an agent of change and effectively participate in decision-making processes concerning environments and society.

CONCLUSIONS: Environmental Citizenship provides an important opportunity for reaching the SDGs. In addition EC can substantially contribute in green space planning and achieving sustainability on local, national and global scale. Forest pedagogy can be highlighted as best practice example focusing on the dialogue between humans and nature. It creates a participative learning environment and fosters awareness and understanding of forest functions, sustainability and private property. Understanding the need for sustainability is very important since in future further resource conflicts and intersections are expected, including the link to health impacts.

KEY WORDS: Environmental Citizenship, forest pedagogy, forest functions, public health

MICROCLIMATE DEPENDENCE OF ATMOSPHERIC PYHTONCIDE CONCENTRATION ABOVE THE MAIN EAST ASIAN FOREST TYPES

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OBJECTIVE: This study aims to clarify the atmospheric phytoncide concentrations above different major forest types in East Asia. Phytoncides are antimicrobial allelochemic natural volatile organic compounds (NVOCs) derived from trees.

METHOD: The standard substances for the study conducted herein were selected by investigating the effects of phytoncides on the human body in medically verified cases. The research subjects were the following forest types in East Asia: a *Pinus densiflora* forest in a northern temperate region, a *Pinus koraiensis* forest in a middle temperate region, a *Chamaecyparis obtusa* forest in a warm temperate region, an *Abies holophylla* forest in a northern temperate region, a *Larix kaempferi* forest in a northern temperate region, and a mixed-stand forest in a southern temperate region. The phytoncide concentrations were measured in 30-min periods before and after sunrise, culmination, and sunset. Measurements were conducted over 10 days.

RESULTS: The total phytoncide concentration was highest in summer. Although some differences were found among the forest types, the ratio of "Pinene"-type substances was consistently high. In intra-day measurements, the phytoncide concentrations were maximized after sunset, particularly on dull days or when intra-day temperature differences were large. We then correlated the total phytoncide concentrations with meteorological variables and observed that the phytoncide concentration increased with increasing temperature and humidity, and decreased with increasing wind velocity.

CONCLUSIONS: Many studies have reported that phytoncide exposure and decreased stress hormone levels increase the activity of natural killer cells in human body. Therefore, phytoncides are a potentially therapeutic factor in forest environments. The results of this study will assist the design of therapeutic forest environments for improved public welfare.

EFFECTS OF FOREST THERAPY PROGRAM ON THE RECOVERY FROM FIREFIGHTERS' STRESS

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INTRODUCTION: For the past one-year, firefighting officers were exposed to extreme traumatic events by an average of 7.7 times per person, 4.4% of the firefighters experienced the posttraumatic stress order, which was 7 times higher than the prevalence of the general public and one out of ten firefighters thought of suicide (National Fire Agency, 2018), which proved that firefighters experience serious mental stress. This study was conducted on firefighters who were mentally and physically exhausted with the handling of disaster sites, work on shifts, etc. to examine effects of forest therapy programs on the recovery from stress and the prevention of posttraumatic stress disorder.

METHOD: National Center for Forest Therapy, Korea Forest Welfare Institute located in Gyeongsangbuk-do, Korea ran the Forest Therapy Program (5 days) to strengthen the recovery of firefighters from the stress. To examine psychological changes of the firefighters (196 officers), the self-entry questionnaires of PCL-5-K (Korean version of Post-traumatic Stress Disorder checklist for DSM-5) and K-POMS-B (Korean version of Profile of Mood States-Brief) were used for research before and after the participation in the forest therapy program.

RESULTS: The posttraumatic stress analysis result shows that the stress index was lowered by 4.46 points on average after the participation (11.38 points before the participation and 6.91 points after the participation) and the participants mood state disorder was improved by 9.21 points (8.58 points before the participation and -0.63 points after the participation) ($p<.001$).

CONCLUSIONS: The high-risk group for post-traumatic stress decreased from 17 people before the therapy to 8 people after the therapy and the mood state was also proved to be improved. Therefore, it is expected that the forest therapy program utilizing forests will help strengthen the recovery from the stress of firefighters and prevent PTSD.

INTRODUCTION TO KOREA FOREST WELFARE INSTITUTE

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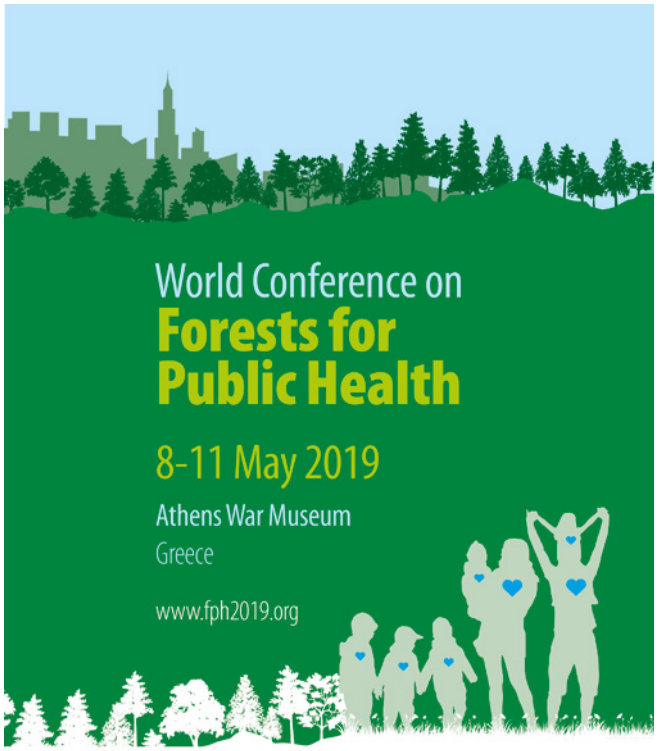
Korea Forest Welfare Institute: The Korea Forest Service established The Korea Forest Welfare Institute(FOWI) to facilitate and perform these Forest Welfare Policies on the basis of Forest Welfare Promotion Act (2016). It has been established with a goal of improving people's health, quality of life and happiness through the promotion of forest welfare. Now, The Korea Forest Welfare Institute is leading forest welfare culture with successful operation of new business such as Forest Welfare Service Voucher and Forest Welfare company registration system, etc.

Introduction to Forest Welfare Policy in Korea: The background on forest welfare policy came from various demands of the people's. New social problems like low birth rate, aging society, environmental disease are occurring with various needs. In response to diversified demands for forest service from the general public, the Korea Forest Service has set up the said comprehensive plan with the aim of provide forest benefits of recreation, culture, health and education to the general public.

Korea Forest Welfare for Life Cycle Service: We tailored forest welfare services by each life cycle with seven stages: 1) birth; 2) early childhood; 3) childhood-adolescence; 4) early adulthood; 5) midlife-mature adulthood; 6) late adulthood; 7) after death. We can call it 'G-7 project' and provide different programs customized from G1 to G7. It starts from birth through childhood and adulthood to death. Even there is a forest service offered after death.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