# Advances in Scientific Research: Engineering and Architecture

Editors

Ilia CHRISTOV
Viliyan KRYSTEV
Recep EFE
Abd Alla GAD

ISBN: 978-954-07-5047-7

ST. KLIMENT OHRIDSKI UNIVERSITY PRESS
SOFIA • 2020

# Advances in Scientific Research: Engineering and Architecture

**Editors**
Ilia CHRISTOV
Viliyan KRYSTEV
Recep EFE
Abd Alla GAD

ISBN 978-954-07-5047-7




ST. KLIMENT OHRIDSKI UNIVERSITY PRESS

SOFIA • 2020

## Editors

Prof. Dr. Ilia CHRISTOV
Poushkarov Institute for Soil Science, Agrotechnology and Plant Protection - Sofia, Bulgaria

Prof. Dr. Recep EFE
Balıkesir University, Faculty of Arts and Sciences, Department of Geography, 10145-Balıkesir-Turkey

Assoc. Prof. Dr. Viliyan KRYSTEV
University of Economics – Varna
Faculty of Management
Varna - Bulgaria

Prof. Dr. Abd Alla GAD
National Authority for Remote Sensing and Space Sciences (NARSS), Cairo, Egypt

St. Kliment Ohridski University Press
ISBN 978-954-07-5047-7

The contents of chapters/papers are the sole responsibility of the authors, and publication shall not imply the concurrence of the Editors or Publisher.

© 2020 Recep Efe
All rights reserved. No part of this book may be reproduced, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission of the editors and authors

## Contents

**Preface** ..... 8

**Section I: LANDSCAPE ARCHITECTURE**

**Chapter 1** ..... 11

*Reactivating an Idle Road: A Greenway Approach for Old Hopa-Borçka Highway*

Banu KARAŞAH and Derya SARI

**Chapter 2** ..... 22

*The Usage Properties of The Garden in Iskenderun Located on The Mediterranean Coast and The Reasons for Choice of Plants in The Garden*

Elif BOZDOĞAN SERT

**Chapter 3** ..... 35

*Innovative Spatial Design Approach: Biophilic University Campus*

Aybüke Özge BOZ and Canan CENGİZ

**Chapter 4** ..... 60

*Landscape Design and Legal Regulations of Children's Playground*

Gülden SANDAL ERZURUMLU and Orhun SOYDAN

**Chapter 5** ..... 72

*Dimensions of the Landscape*

Huriye Simten SÜTÜNÇ

**Chapter 6** ..... 83

*Landscape in LEED-Certified Buildings: What Matters Most, Aesthetic Concerns or Sustainability?*

Alev P. GÜRBEY

**Chapter 7** ..... 101

*Determination of Changes in Precipitation and Temperature Values Between 1989-2019 in Niğde Using GIS*

Orhun SOYDAN and Gülden SANDAL ERZURUMLU

**Chapter 8**..... 119

*Düzce Great Melen Basin Visual Habitat Quality Assessment and Its Importance in Landscape Rehabilitation / Restoration Plans*

Osman UZUN and Elif GÜLERYÜZ

**Chapter** 9…..135

*Use of GIS Technology in Land Use Suitability Analysis, LUCIS Model*

B. Niyami NAYIM

**Chapter 10**..... 149

*Medicinal-Aromatic and Ornamental Properties of Certain Plants Indigenous to Alpine Rocky Habitats: The Hatila Valley National Park Case*

Derya SARI

**Chapter 11**..... 164

*Planning Approaches in Climate-Friendly Cities*

Seyhan SEYHAN and Elif BAYRAMOĞLU

**Chapter 12**..... 179

*Characterization of The Rural Landscapes of a Mediterranean Highland*

Meryem ATİK, Veli ORTAÇEŞME and Emrah YILDIRIM

**Chapter 13**..... 194

*Determining the Impact of Various Surfaces in Open Green Areas of Iskenderun Coastal Band on Thermal Comfort*

Mehmet ÇETIN, Efdal KAYA, Elif BOZDOĞAN SERT, Zehra Tuğba GÜZEL, Fatih ADIGÜZEL and Şenay GÜNGÖR

**Chapter 14** ..... 211

*Raising Awareness of the World Heritage Sites in Turkey: The Current Situation and Their Contributions to Cultural Heritage Tourism*

A. Esra CENGİZ, Demet DEMİROĞLU and Aybike Ayfer KARADAĞ

**Chapter 15**..... 237

*Forest Therapy (Shinrin-Ryoho) and Forest Bathing (Shinrin-Yoku): new function proposals for protected areas*

Alev P. GÜRBEY, Mark Nadir RUNKOVSKI and Irmak IŞIK

## Chapter 15

# Forest Therapy (Shinrin-Ryoho) and Forest Bathing (Shinrin-Yoku): New Function Proposals For Protected Areas

Alev P. GÜRBEY[1], Mark Nadir RUNKOVSKI[2] and Irmak IŞIK[3]

*1Assist. Prof. Dr.; Istanbul University-Cerrahpaşa, Faculty of Forestry, Department of Landscape Planning and Design, Istanbul, Turkey*
*2Dr.; Natura Pacific, Brisbane, Australia*
*3Landscape Architect, Istanbul, Turkey*

### INTRODUCTION

Before the coronavirus outbreak was labelled a pandemic on 11 March 2020, the World Health Organization (WHO) had prioritised stress as one of the greatest health pandemics of the twenty-first century (Li 2019, URL-1 2020). During March 2020 almost every country in the world went into COVID-19 lockdown with unprecedented restrictions on both domestic and international movement (Guterres 2020). How these restrictions have affected people's psychology and stress levels is a matter of serious concern (Guterres 2020).

Stress is the process by which an individual responds psychologically, physiologically, and often with definable behaviours, to a situation that challenges or threatens well-being (Ulrich et al. 1991, Baum et al. 1985). While many scientists understand the severity that these lockdowns may have had on people due to varying income status and living conditions, it is still relatively unpredictable what impacts they will have had on global human stress levels.

Nature matters to people. It would seem that even a few trees, a small garden, a landscaped area outside one's door, makes a difference. However, these small-scale semi-natural or natural fragments of nature that are immediately accessible do not replace the role of larger contiguous natural areas that one encounters less regularly in urban areas. This is especially important in the management of human stress-levels (Kaplan 1983). A

spectrum of natural settings, like in natural ecotones, is important in the provision of ecosystem services, values and experiences to living organisms, including humans (Knopf 1983). At the top of this spectrum, in the cases of contiguous expanses of natural areas such as forests for example, there is evidence that human stress-levels can effectively be reduced (Bowler, et al. 2010).

Given the recent and continuing movement restrictions imposed by COVID-19 lockdowns, it is of concern that large numbers of people are not able to make contact with nature in these more contiguous and natural forms. In highly urbanised, densely-populated areas, the fear of getting sick and the ongoing turmoil of political decisions and media coverage can exacerbate increasing stress-levels caused by a lack of access to nature. The case of COVID-19 therefore gives the scientific community even more precident to explore the true value of people accessing contiguous natural areas to combat stress.

Nature-based tourism is defined as encompassing the activities that visitors take part in during a holiday whereby, they engage with nature in a location away from their home environment (Newsome et al. 2013, Bell et al. 2007). Nature-based recreation is defined as the nature-based activities that people engage in within natural or semi-natural locations as part of their leisure time (Nicholls 2006; Bell et al. 2007). Both of these important sectors get people into natural areas and are directly dependent on natural resources in a relatively undeveloped state (Bushell 2003). As such, it is a requirement that these sectors carefully manage their impacts on the natural areas they so use, meaning that the growing and popular nature-based tourism and recreation industries are often among the few human activities permitted in many contiguous natural areas (Buckley 2010, Newsome et al. 2013). Activities within these sectors often centre on an ethical responsibility to respect nature and create opportunities for the wider community to learn about and enjoy the environment (Bushell 2003).

Today, 12.4% of protected natural areas are covered by forests (Fao 2000) and these forests play an important role for nature-based tourism and recreation. While flora tourism in general has received growing interest as a whole (Sarı 2019, Pickering and Ballantyne, 2012), forest ecosystems have by far received the most interest in terms of their capacity to provide long-term environmental, economic and social benefits to society (Lohiya 2003). Moreover, in light of the COVID-19 pandemic, they play an important role in managing the physical and mental well-being of humans who can access

forests for nature-based tourism and recreation. This includes physical health benefits such as oxygenated air and pollutant amelioration (Karjalainen et al. 2010, Nowak, 2002) and the support of immune system functioning through phytoncide release (Karjalainen et al. 2010, Li et al. 2006) as well as mental health benefits such as blood-adrenaline reduction (Li 2010) and the reduction of prefrontal brain activity signifying stress-relief (Park et al. 2007). The body of research provides evidence supporting the notion that getting people back into larger contigous natural areas such as forests through managed nature-based tourism and recreation, is important for reducing human stress levels.

While the use of forests has changed over time from spiritual and resource extraction sites to the recognition of their value in providing a variety of complex ecosystem and environmental services and social functions, it is increasingly recognised that new and emerging ways of encouraging people to utilise forests sustainably for human health benefits need to be embraced (Elands et al. 2010). While demographic and political pressures, resource extraction and more traditional forms of recreation (e.g. hunting, hiking, horse-riding), challenge the integration of novel forms of nature-based tourism and recreation in forests they are key to advancing the industry and to allowing more people to gain benefits. Recently, new and emerging types of recreation in forests have included technologically-advanced high-energy activities such as kite-wing and geo-caching (Kaae 2010), while others have focused more closely on the mental health benefits of forests such as the relatively new forest therapy (Shinrin-Rhoyo) and forest bathing (Shinrin-Yoku). Such passive forms of nature-based tourism and recreation as Shinrin-Ryoho and Shinrin-Yoku are considered to be among the most accessible ways for people to "get back to nature" and offer practical ways to help people engage with the restorative physiological and mental benefits of forests, especially in times of a global pandemic.

**Forest Therapy (Shinrin-Ryoho) and Forest Bathing (Shinrin-Yoku)**

Forest therapy (Shinrin-Ryoho) and forest bathing (Shinrin-Yoku) are considered to be among the most accessible ways for people to get in touch with the natural world and to lower excessive stress to levels that are commensurate with what our bodies are adapted to cope with (Tsunetsugu et al. 2010).

A forest bathing trip, or Shinrin-Yoku in Japanese, involves a visit to a forest area for relaxation and recreation by breathing in volatile substances

derived from trees, such as alpha-pinene and limonene and a range of phytoncides (Li et al. 2008a, Mencagli and Nieri 2019). Park et al. 2007 describes Shinrin-Yoku as a process in which activities in forest environments are used to improve the mental and physical health of people. The term was invented in 1982 by the then Director-General of the Agency of Agriculture, Forestry and Fisheries of Japan (MAFF), Tomohide Akiyama, who stated that the people of Japan needed healing through nature. The idea was to develop a unique brand identity, linking forest visits to health and wellness-oriented ecotourism and forming a campaign to protect the forests (Clifford 2018, Li 2019). Since forests occupy 67% of the land in Japan, forest bathing was easily accessible and has since become a recognised form of nature-based tourism and recreation in Japan that anyone can take part in (Li et. al. 2008a).

In 1999, Prof. Dr Iwao Uehara a professor at the Tokyo University of Agriculture and president of The Society of Forest Amenity & Human Health Promotion in Japan presented and defined another term, forest therapy or Shinrin-Ryoho, at the Japanese Forest Society. He discussed that Shinrin-Ryoho is an ideal therapy for people with a disability, suffering from physical illness, mental health and "lifestyle diseases" (Williams 2020). While Shinrin-Yoku and Shinrin-Rhoyo are often stated as the same thing they have a simple fundamental difference and that is their application. Forest therapy (Shinrin-Ryoho) is always conducted by a certified professional. It involves knowing psychological counselling methods as well as having the ability to handle patients with different types of mental health problems. It is most effective when carried out on a one-to-one basis or in small groups of people with similar issues. Forest bathing (Shinrin-Yoku), on the other hand, can be done by anyone. It is merely a more mindful way of being in nature. You do not need any certification for forest bathing. The two forms are simply delineated in this way and while forest therapy with a guide is a great way to fully experience this practice and gain an understanding of how to go about it, it is important to understand that the underlying principle is that the forest itself is the therapist. Any role of a forest bathing guide is meerly to act as a "forest friend", to open the doors of the senses via professional training and knowledge and help people find their connection with nature (Clifford 2018).

By 2004 Japan's MAFF, understanding the potential for a managed forest therapy and forest bathing industry, released the "Therapeutic Effects of Forests Plan". The aim of this plan was to collect data on the relaxation effects of forest environments from the viewpoint of evidence-based medicine (Park et al. 2009). Based on these effects of nature on human well-being, MAFF then

created a blueprint for the "Forest Therapy Stations" project in 2005. The term "forest therapy" was concreted more firmly in administration during the process of developing this project, and at the time the underlying idea was ear-marked as a branch of aromatherapy (Lee et al. 2012). The main reason why forest therapy seems to have been included as a form of aromatherapy is that its healing effects refer to the plant-produced monoterpenes inhaled by visitors. Innovative research since the set-up of Japan's forest therapy plans and strategies has included studies of the effects of monoterpenes issued by trees on the immune system, and of the presence of negative ions beneficial to human health (Mencagli and Nieri 2019). Japan currently continues to lead this field of research and has accumulated a relatively large amount of scientific data on forests and human health. Substantial research on the practise of both forest therapy and forest bathing has focused on the key aim of protecting and using forests for these important health benefits (Yu et al. 2017).

While the emerging concepts of forest bathing and forest therapy became integrated into forest conservation, tourism and recreation planning in Japan, outside of Japan they have been the focus of limited research. These forest practises had been grouped under the practise of aromatherapy in earlier stages of classification, however researchers outside of Japan began to suggest the fields would be more accurately reflected as a form of "ecotherapy". The main ideology of ecotherapy refers to human healing and growth nurtured by healthy interactions with the earth and acknowledges the vital role nature plays in human survival (Clinebell 1996, Buzzell and Chalquist 2009). The term is also used synonymously with "green therapy" and "earth-centered therapy". Ecotherapy is therefore regarded as an umbrella term for nature-based methods of physical and psychological healing and accurately incorporates forest bathing and forest therapy inclusive of, yet not defined by, their components of aromatherapy.

Forest therapy has now become an emerging therapeutic approach used by psychologists, ecopsychologists, biologists, physicians, and health-care workers globally. They draw on interdisciplinary research from a range of disciplines that describe this form of use for forests and experiences practising it to heighten the understanding, importance and benefits of contiguous natural areas and of engaging in such passive forms of nature-based tourism and recreation.

**The Benefits of Forest Therapy and Forest Bathing**

The practice of forest therapy and forest bathing is passive, allowing the participant to take in the forest environment through the senses without exertion (Payne and Delphinus 2018) unlike many other forms of nature-based tourism and recreation. Forest therapy and forest bathing have various benefits not only based on health (physiological and psychological), but also on the host environment such as providing mandates for forest protection and economical diversification of existing nature-based tourism and recreation sectors. Economically, long-term benefits may potentially include the reduction in costs of supplying medications, clinical appointments and welfare support such as residential care to the community (Iwata et al. 2016) if the health benefits can stem the progression of chronic diseases. If forest therapy and forest bathing are promoted and managed to assist people in mental health counseling and in the combat of physical ailments through absorption of volatile compounds, these emerging forms of tourism and recreation could have untold benefits on a wide array of health issues that would otherwise require expensive, reactive treatments and support, often at the cost of government-administered social welfare systems (Miyazaki 2018). Additionally, if forest therapy and forest bathing grow in popularity, rises in visitor numbers can promote surrounding hospitality and accommodation business associated with local communities (Tseng et al. 2017).

For forest therapy and forest bathing however, the benefits subject to most research have been those associated with health (Figure 1). Positive physiological effects of forest therapy have been reported on the cardiovascular system (such as reducing heart rate and blood pressure) (Ohtsuka et al. 1998, Hartig et al. 2003, Tsunetsegu et al. 2007, Park et al. 2008, Lee et al. 2009, Park et al. 2009, Park et al. 2010, Kjellgren and Buhrkall 2010, Li et al.2011, Lee et al. 2011, Mao et al. 2012, Tsunetsugu et al. 2013, Song et al. 2015, Hansen et al. 2017, Ideno et al. 2017, Yu et al. 2017), immune and endocrine systems (such as increase in natural killer cells/anti-cancer protein production and reducing blood-sugar levels) (Ohtsuka et al. 1998, Li et al. 2006, Li et al. 2007, Li et al. 2008b, Li et al. 2008c, Li 2010, Li et al. 2011, Lee et al. 2009, Park et al. 2010, Nakau et al. 2013), gastrointestinal tract (such as stomach ulcer recovery and easing digestion) (Li and Kawada 2014, Kim et al. 2019), respiratory system (such as allergies and respiratory diseases) (Seo et al. 2015, Hansen et al. 2017, Edwards and Woods 2018) and nervous system (such as decreasing the level of cortisol and other stress hormones)

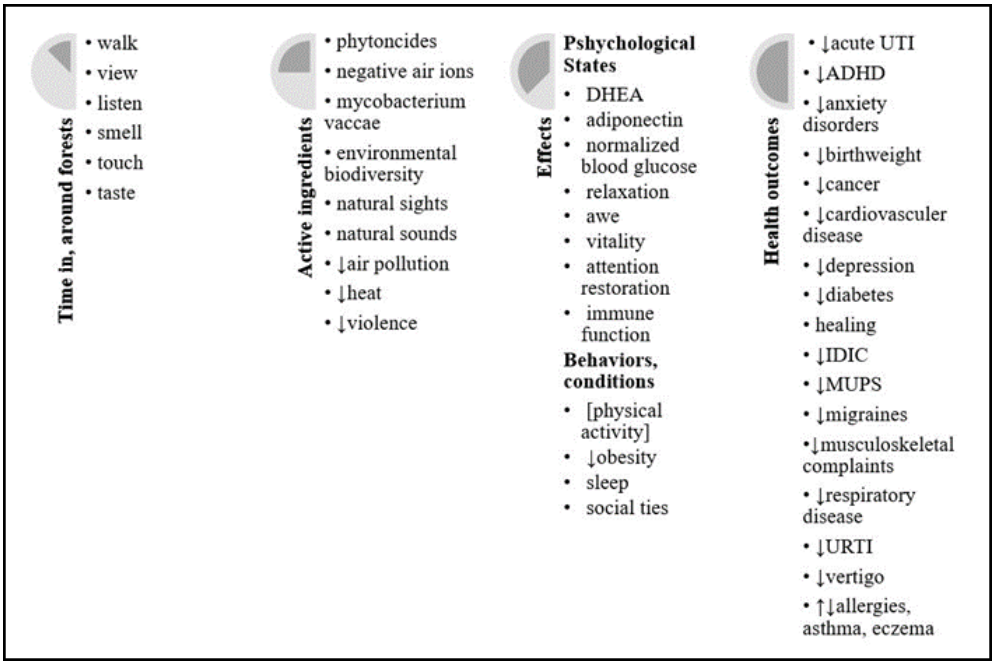


**Figure 1.** Forest therapy and forest bathing health link (adapted from Kuo, 2015)

(Yamaguchi et al. 2006, Lee et al. 2009, Lee et al. 2011, Lee et al. 2014, Tsunetsegu et al. 2007, Tsunetsegu et al. 2010, Park et al. 2007, Park et al. 2008, Park et al. 2009, Park et al. 2010, Jung et al. 2015, Yu et al. 2017). Positive psychological effects can be seen on mental health and emotional well-being by reducing stress, depression, anger, fatigue, confusion, improving mood, concentration and memory, increasing sense of relaxation and helping in the treatment of eating disorders (Yamaguchi et al. 2006, Tsunetsugu et al. 2010, Corazon et al. 2010, Martens et al. 2011, Mao et al. 2012, Song et al. 2013, Craig et al. 2016, Hansen et al. 2017, Yu et al. 2017, Mathias et al. 2018, Clifford 2018, Li 2019).

Both economic and individual health benefits of forest therapy and forest bathing are related to the forested environment being in a relatively contiguous and undeveloped state, and therefore often linked with the requirement for forest protection. The requirement for forests to be in such a natural state is important as healthy and biodiverse forests reminiscent of their relict composition, structure and function can better provide the ecosystem services that catalyse the positive physiological and psychological effects. These ecosystem services, governed by physical parameters such as

moderated cool air temperature, humidity, luminance, low radiant heat, air currents and soundscape therefore function better in larger contiguous natural areas with reduced external human impacts (Forest Therapy Institute 2020).

Such a relatively undeveloped and natural forest atmosphere is highly oxygenated and is largely free of many of the environmental pollutants found in urban environments, as the deposition of pollutants to the canopy and the reduction of air temperature through shading and transpiration can improve air quality (Mathias et al. 2018). The air in forests is also loaded with beneficial natural chemicals including phytoncides (Li 2019). Many studies have been published, and though the results varied, hypotheses from the 1980s have recently been confirmed that phytoncides can catalyse hormonal changes that improve our health (Garcia and Miralles 2020). The concentration of phytoncides in the air depends on many factors, such as season, climate, and forest composition. These chemicals tend to differ from forest to forest and more intensive concentrations can be found at warmer latitudes (Tsunetsugu et al. 2010, Li 2019). The main components of phytoncides are terpenes and the major terpenes are D-limonene, Alpha and Beta-pinene, Eucalyptol, Menthol, Geraniol and Camphene (Li 2019, Mencagli and Nieri 2019). From the numerous studies on European vegetation, especially on that of the Mediterranean basin, information can be obtained on the emission rates of terpenes of different species. For example, the Forest Therapy Institute 2020 describes species such as *Pinus pinea, Pinus halepensis, Pinus sylvestris, Picea abies, Betula pendula, Populus tremula* and *Eucalyptus globulus* as having medium emissive potential, while species such as *Quercus ilex, Quercus suber, Quercus coccifera, Fagus sylvatica* and *Castanea sativa* have high emissive potential (Li, 2019, Forest Therapy Institute 2020).

In combination these physical and chemical parameters reflect the subjective evaluation of forest environments and provide balances between opposing situations that can be beneficial for successful conduct of forest bathing and forest therapy. In a larger, more contiguous natural area, such as in the core of a forest, these physical and chemical parameters support observed positive mental interpretation of the forest environment, e.g. relaxing over stimulating, quiet over noisy, tense over relaxed and colour-rich over plain (Forest Therapy Institute 2020).

In this way, the physical and chemical-based ecosystem services provided by forests of reducing air, noise, heat and light pollution that have been well-researched as beneficial to human health and stress form the

foundations for the phsyiological and pyschological benefits of forest therapy and forest bathing. For years, the capacity for forests to increase human social and health wellbeing has been assessed (Chen 2019) and it is clear now that forest therapy and forest bathing provide a novel form of nature-based tourism and recreation that allows people to truly reap the benefits.

**Forest Therapy and Forest Bathing Trails**

While forest bathing remains unguided and at the mercy of individual interpretation, both forest bathing and forest therapy can benefit from the design and implementation of tailor-made trails. Guiding and supporting safe passage of visitors through a contiguous natural forest area either by a trained professional or individually, trails can be planned to maximise the physiological and pyschological effects of the physical and chemical-based ecosystem services that make forest bathing and forest therapy so beneficial.

A suitable trail needs to incorporate some key features to make full advantage of these benefits such as a certain width, certain length, moderate slopes, well-maintained and well-marked trails, options for universal access, access to restroom facilities and parking at the trail head, safety from hazards and access to a wide variety of eocsystems containing key plant species especially coniferous trees. It is recommended that the trails are divided into 20 minutes of walking time per section so people can electively end their walk where they decide fit (Sato et al. 2017). Additionally, the travel that takes place along the trailed route must be smooth enough to promote enjoyable walking and repetitious testing using a defined methodology muct be conducted to measure the effectiveness of the forest therapy trail in this way.

The trail also needs to be relatively core-located to minimise exposure of visitors to edge effects including infiltration of pollutants, noise and excessive UV. Accompanying guides, therapists or forest managers should be incorporated into this planning to ensure that the experience does not detract from conservation or existing tourism and recreation policies integrated into forest management plans and to make therapy more effective (Li 2019, URL-2 2020).

It is imperative to keep in mind the fundamental importance of accessibility. The inclusion of trails or paths that allow a visitor to spend at least two or three hours in the forest without getting bored or lost, structured in such a way as to allow the experience to carry out in safety without particular physical training, is certainly an important factor to consider (Mencagli and Nieri 2019). In this way more people of varying backgrounds,

abilities and aspirations can take part in forest bathing and forest therapy.

### Forest Therapy and Forest Bathing as New Function Proposals: Potential for Turkey

Being at the center of the landmass adjoining Asia, Europe and Africa, Turkey has a plethora of unique ecosystems hosting remarkable biodiversity. With its unique geographic position, rich topographic features and climatic variation, Turkey has an impressive biodiversity in terms of its ecosystems, fauna and flora, making it home to three of the world's 36 biodiversity hospots (Myers et al. 2000, Terzioğlu et al. 2012, URL-3 2020). Turkey is also the meeting place of three phytogeographical regions, the Euro-Siberian, Mediterranean and Irano-Turanian regions (Çolak et al. 2010). Today, 28.6% of country's total land area (over 221,000km$^2$) is covered with forest ecosystems of varying types and nearly all are assets of public land managed by the Government of the Turkish Republic (99.99%) (Çolak et al. 2010, Terzioğlu et al. 2012, OGM 2015).

Given the large volume of forests present across Turkey that are open for public use through state land access rights, the country is in a prime position to develop and promote sustainable nature-based tourism and recreation opportunities such as forest therapy and forest bathing. Moreover, of Turkey's 450+ native tree and shrub species (Çolak et al. 2010) the dominant tree species that comprise a large majority of Turkey's forests are among those classified as having medium and high terpene emissive potential as described by Li (2019) and Forest Therapy Institute (2020). These species include oaks (*Quercus* spp.) that have among the highest emissive potential, with 13 species, as well as evergreen coniferous species such as the Calabrian Pine (*Pinus brutia*), Scots Pine (*Pinus sylvestris*) and Anatolian Black Pine (*Pinus nigra*). Other species with lower emissive potential but still with great capacity to provide benefit to forest therapy and forest bathing include various beeches (*Fagus orientalis* and *Fagus sylvatica*), and firs (*Abies nordmanniana* and *Abies cilicica*) and these species comprise a considerable share of the country's overall forest resources (Terzioğlu et al. 2012). Forty-two percent (42%) of the country's forest area is comprised of coniferous species alone.

Across the three phytogeographical regions, Turkey's forests are highly suitable for prospective forest therapy and forest bathing tourism and recreation opportunities. The Euro-Siberian region, which extends along most of North Anatolia and a narrow strip along the Black Sea coast of

European Turkey (Istranca Mountains to the Belgrade forest near the Bosphorus), has the largest area covered by forests (Çolak et al. 2012) and also contains a large proportion of the country's human population. The region is characterised by broad-leaf and mixed coniferous forests and is governed by more temperate maritime weather patterns generating higher rainfall and atmospheric moisture than the other phytogeographic regions of the country. Key areas that contain large contiguous natural forests dominated by medium and high emissive potential tree species in the comparatively densely-populated Euro-Siberian region include the Samanlı Mountains, Uludağ, Istranca Mountains, the Bolu Mountains and further east, the Kaçkar (Doğaner 2019). These areas should be the focus of any future prospects to scope out forest therapy and forest bathing ventures in the country.

Despite both the ecological and demographic factors of Turkey's Euro-Siberian region lending itself to forest therapy and forest bathing, to date there is only one forest therapy trail registered in the country, that in Balçova near İzmir. This forest therapy trail is not certified and is located within the characteristically drier and more sparsely forested Mediterranean phytogeographical region where the composition of the dominant strata of forest ecosystems is often more uniform.

Following the commission and release of Turkey's draft TBMM Medical and Aromatic Plants Research Commission in 2019, there was a call for improved mapping of Turkey's ecosystems and plant communities, as well the start of a broadscale capacity study for the establishment of medicinal, mental health and recreation benefits within these ecosystems (URL-4, 2020). It seems that the biggest problem in Turkey preventing the investigation of it's forests for novel and emerging forms of nature-based tourism and recreation like forest therapy and forest bathing is the rapid change of the status of the forest areas designated as urban forests, nature parks and national parks. These rapid legal changes lead to planning and design works in these areas that prioritise examining of natural resource values for extractive and consumptive uses rather than experiential uses and industries such as the tourism and recreation sector.

While Turkey has lagged in kick-starting the studies and planning required to establish forest therapy and forest bathing, other countries have begun to adopt the Japanese-born practises. In Japan itself since the set-up of it's forest therapy plans and strategies, the industries have grown and as of February 2016, 60 forests in Japan had received their credential as forest therapy bases and have actively participated in offering forest therapy

activities. Japan now has 65 certified forest trail over the country (URL-5, 2020). Across these forests, local governments have reported to MAFF a unanimous increase in hospitality demand by the visitors to forest, thus supporting economic incentives to preserve forest ecosystems and further promote forest therapy tourism and recreation. Millions of Japanese people affected by stress, hypertension and anxiety from modern urban life have turned to Shinrin-Ryoho and Shinrin-Yoku at one of these official forests or trails designated by MAFF. These beneficial forms of nature-based tourism and recreation seem to be successful and within everyone's reach (Garcia and Miralles, 2020).

In Germany, the government has already legalized forest therapy as a medical practice and has begun investing in planning and mapping forest therapy trails and forest bathing experiences in the nation's forests, for example those provided by Das Kranzbach (URL-6 2020). In Canada, the Global Institute of Forest Therapy (GIFT) was established as an organisation that focuses on intitiating and supporting scientific research into the social, economic and health benefits of forest therapy and forest bathing. The organisation also supports healthcare practitioners and other trainees to become certified guides in forest therapy ventures. The establishment of GIFT led to the country's first designated Forest Therapy/Shinrin Yoku Trail at the relatively small 11ha forest reserve at Springdale Park recently. This trail is managed and within easy reach of the city's residential areas and therefore open with easy access to it's citizens.

Thanks to the advances made by other countries in embracing forest therapy and forest bathing, Turkey is in a good position to open its doors to further investigation into planning for these forms of passive and beneficial nature-based tourism and recreation. Utilising the structures and certification criteria used to highlight ideal existing forests for trail designation in other countries such as Japan, Germany and Canada, Turkey's Ministry of Forestry is encouraged to communicate with other nations to pioneer and establish forest therapy and forest bathing bases, especially in the highly suitable Euro-Siberian region.

**Conclusions**

The current COVID-19 global health pandemic gives the scientific community greater incentive to present research to national and international governments on the health benefits of forests and other contiguous natural areas. While COVID-19's effects on global human stress levels are yet

unknown, engaging in prescriptive and well-managed forms of nature-based tourism and recreation that provide multiple health benefits that have been proven to ameliorate stress is important. Add to this the tandem economic and environmental benefit of designating nature-based tourism and recreation industries through well-managed and sustainable planning, and there is considerable weight in this subject.

Forests are enormously valuable resources for human health functioning as a source of physical and chemical parameters that benefit both physiological and psychological wellbeing. Evidence based on research from various countries into the health benefits of forests and passive forms of forest-based tourism and recreation like forest therapy and forest bathing, presents growing recognition for the embrace of such novel forms of passive and experiential forest uses (Pillmayer et al. 2019).

Forest therapy and forest bathing constitute more than just a walk in the woods. Unlike hiking, there is no particular destination and no physical exertion required, it is an exercise for the mind, not the body (Li, 2019). These emerging industries deserve more detailed investigation into their potential benefits in holistically managing the fallout of COVID-19 and other global health concerns. Research is needed into the sustainable planning of suitably-designed trail routes for forest therapy and forest bathing, especially in countries currently downgrading the importance of tourism and recreation planning such as Turkey. While Turkey contains abundant and highly amenable forest ecosystems close to dense human populations affected by COVID-19, the prescriptive incorporation of such health-centred forest therapy and forest bathing industries has yet been avoided.

While the world's focus currently lies on reacting to the spread of COVID-19, it could be beneficial to partition some resourcing to the funding of opportunities to allow people to restore mental and physical wellbeing through nature and ameliorate the indirect impacts such a pandemic may have on human stress. This in turn may help to mitigate the double-edged sword of two global health pandemics.

## REFERENCES

Baum A., Fleming R. and Singer J. E. (1985). Understanding Environmental Stress: Strategies for Conceptual and Methodological Integration, Advances in Environmental Psychology. Hillsdale, N J: Lawrence Erlbaum Associates, Vol. 5, Methods and Environmental Psychology, 185-

205.
Bell S., Tyrväinen L., Sievänen T., Pröbstl U. and Simpson M., (2007) Outdoor Recreation and Nature Tourism: A European perspective. Living Reviews in Landscape Research 1, 1-46.
Bowler D.E., Buyung-Ali L.M., Knight T.M. and Pullin A.S., (2010) A Systematic Review of Evidence for The Added Benefits to Health of Exposure to Natural Environments. BMC Public Health 10, 456.
Bushell R. (2003). Balancing Conservation and Visitation in Protected Areas, Nature-based Tourism, Environment and Land Management, CABI Publishing, p. 197-209.
Buzzell L., & Chalquist C. (2009). Ecotherapy: Healing with Nature in mind. San Francisco: [Berkeley, Calif.]: Sierra Club Books.
Chen C. (2019). Nature's pathways on human health, International Handbook of Forest Therapy, Cambridge Scholars Publishing, p.12-31
Clifford M. A. (2018). Your Guide to Forest Bathing, Experience the Healing Power of Nature, Conari Press, Canada
Corazon S., Stigsdotter U., Jensen A. G. C. and Nilsson, K.S. B. (2010). Development of The Nature-Based Therapy Concept for Patients with Stress-Related Illness at The Danish Healing Forest Garden Nacadia. Journal of Therapeutic Horticulture, 20, 33–51.
Craig J.M., Logan A.C., Prescott S.L. (2016). Natural environments, nature relatedness and the ecological theater: Connecting satellites and sequencing to shinrin-yoku, Journal of Physiological Anthropology, **35** (1) p. 1
Çolak, A. H. , Kırca, S., Rotherham, I. D. , & İnce, A., (2010). Restoration and Rehabilitation of Deforested and Degraded Forest Landscapes in Turkey, İstanbul: Ministry of Environment and Forestry-General Directorate of Afforestation and Erosion Control.
Doğaner S. (2019). Flora Turizmi: Orman, Çiçek ve İnsan, Beşeri ve İktisadi Coğrafya Araştırmaları, Babil Yayınları.
Edwards A, Woods V. (2018). Forest-based Therapy: Research Letter of a Novel Regime for Improved Respiratory Health. Integr Med (Encinitas). **17**(1):58-60.
Elands B. et al. (2010). Atlantic Region, Management of Recreation and Nature Based Tourism in European Forests, Springer.
FAO (2000), Forests in protected areas, The Global Forest Resources Assessment 2000. http://www.fao.org/3/y1997e/y1997e0c.htm#bm12
Forest Therapy Institute (2020). The Art of Forest Bathing, Handbook for the

Certified Forest Bathing Guide, 5th Edition.
Garcia H. and Miralles F. (2020). Forest Bathing: The Rejuvenating Practice of Shinrin Yoku, Tuttle Publishing, p.160
Guterres A., (2020) The COVID-19 crisis is an opportunity to reimagine human mobility. United Nations COVID-19 response. https://www.un.org/en/coronavirus/covid-19-crisis-opportunity-reimagine-human-mobility, (Accessed: 04 June 2020).
Hansen M.M, Jones R, Tocchini K. (2017). Shinrin-Yoku (forest bathing) and nature therapy: a state-of-the-art review. Int J Environ Res Public Health.;**14**(8)
Ideno Y., Hayashi K., Abe Y., Ueda K., Iso H., Noda M., Lee J.S. and Suzuki, S. (2017). Blood pressure-lowering effect of Shinrin-yoku (Forest bathing): a systematic review and meta-analysis. BMC Complement Altern Med **17**, 409.
Iwata, Y, Dhubháin, Á, Brophy, J, Roddy D., Burke C., and Murphy B. (2016). Benefits of group walking in forests for people with significant mental ill-health. Ecopsychology **8(**1): 16–26.
Jung W.H.,Woo J. M., Ryu J.S. (2015). Effect of a forest therapy program and the forest environment on female workers' stress. Urban. For. Urban. Green. **14**, 274–281.
Kaae B.C. (2010) Good Practice in European Recreation Planning and Management, Management of Recreation and Nature Based Tourism in European Forests, Springer.
Kaplan, R. (1983). The Role of Nature in the Urban Context, Behavior and the Natural Environment, Plenum Press, p. 127-159, ISBN-13 978-1-4613-3541-2, New York
Karjalainen, E., Sarjala, T., and Raitio, H., (2010) Promoting human health through forests: overview and major challenges. Environmental Health and Preventive Medicine 15, 465.
Kim H. Lee Y.W., Ju H.J., Jang B.J. and Kim Y.I. (2019). An Exploratory Study on the Effects of Forest Therapy on Sleep Quality in Patients with Gastrointestinal Tract Cancers, International Journal of Environmental Research and Public Health, **16**(14), p. 2449.
Kjellgren A., Buhrkall H. (2010). A comparison of the restorative effect of a natural environment with that of a simulated natural environment. J. Environ. Psychol. **30**:464–472.
Knopf R. C. (1983). Recreational Needs and Behavior in Natural Settings, Behavior and the Natural Environment, Plenum Press, p. 205-232, ISBN-

13 978-1-4613-3541-2, New York.
Kuo M. (2015) How might contact with nature promote human health? Promising mechanisms and a possible central pathway, Front. Psychol., **6**, p. 1093.
Lee J., Li Q., Tyrväinen L., Tsunetsugu Y., Park B.-J., Kagawa T., et al. (2012). Nature therapy and preventive medicine, J. Maddock (Ed.), Public health – Social and behavioural health, InTechOpen, pp. 325-350
Lee J., Park B.J., Tsunetsugu Y., Kagawa T., Miyazaki Y. (2009). Restorative effects of viewing real forest landscapes, based on a comparison with urban landscapes. Scand. J. Forest Res. **24**:227–234.
Lee J., Park B.J., Tsunetsugu Y., Ohira T., Kagawa T., Miyazaki Y. (2011). Effect of forest bathing on physiological and psychological responses in young Japanese male subjects. Public Health.**125**:93–100.
Lee J., Tsunetsugu Y., Takayama N., Park B.-J., Li, Q., Song C., Komatsu M., Ikei, H., Tyrväinen L. and Kagawa T.(2014) Influence of forest therapy on cardiovascular relaxation in young adults. Evid. Based Complement. Altern. Med. **2014**, 834360, 7 p.
Li Q, Morimoto K., Kobayashi M., Inagaki H., Katsumata M., Hirata Y., Hirata K., Suzuki H., Li Y.J., Wakayama Y., Kawada T., Park B.J., Ohira T., Matsui N., Kagawa T., Miyazaki Y., Krensky A.M. (2008c). Visiting a forest, but not a city, increases human natural killer activity and expression of anti-cancer proteins. Int J Immunopathol Pharmacol. **21**(1):117–27.
Li Q. (2019). Into the Forest, How Trees Can Help You Find Health and Happiness, Penguin Life, ISBN: 9780241377598, 320 pg.
Li Q. and Kawada T. (2014). The possibility of clinical applications of forest medicine, Nihon Eiseigaku Zasshi, 69, 117-21.
Li Q., Kobayashi M. and Kawada T. (2008a). Relationships Between Percentage of Forest Coverage and Standardised Mortality Ratios (SMR) of Cancers in all Prefectures in Japan, The Open Public Health Journal **1**, 1-7, Bentham Science Publishers Ltd.
Li Q., Morimoto K., Kobayashi M., Inagaki H., Katsumata M., Hirata Y., Hirata K., Shimizu T., Li Y.J., Wakayama Y., Kawada T., Ohira T., Takayama N., Kagawa T., Miyazaki Y. (2008b). A forest bathing trip increases human natural killer activity and expression of anti-cancer proteins in female subjects. J. Biol. Regulat. Homeost. Agent. **22**:45–55.
Li Q., Otsuka T., Kobayashi M., Wakayama Y., Inagaki H., Katsumata M., Hirata Y., Li Y.J., Hirata K., Shimizu T., Suzuki H., Kawada T., Kagawa T. (2011). Acute effects of walking in forest environments on cardiovascular

and metabolic parameters. Eur. J. Appl. Physiol. **111**:2845–2853
Li, Q., (2010) Effect of forest bathing trips on human immune function. Environmental Health and Preventive Medicine 15, 9-17.
Li, Q., Morimoto, K., Nakadai, A., Inagaki, H., Katsumata, M., Shimizu, T., Hirata, Y., Hirata, K., Suzuki, H., Miyazaki, Y. (2007). Forest bathing enhances human natural killer activity and expression of anti-cancer proteins. Int. J. Immunopathol. Pharmacol. **20**, 3–8.
Li, Q., Nakadai, A., Matsushima, H., Miyazaki, Y., Krensky, A. M., Kawada, T. and Morimoto, K. (2006). Phytoncides (wood essential oils) induce human natural killer cell activity. Immunopharmacol Immunotoxicol 28, 319-333.
Lohiya A.H. (2003). Forests For People: Role And Responsibilities, XII World Forestry Congress, 21-28 September, Quebec, Canada http://www.fao.org/3/XII/0224-A1.htm#P13_73
Lovallo, W.R., (2015) Stress and health: biological and psychological interactions - third edition. Sage Publications, London, UK.
Mao G.X, Cao Y.B, Lan X.G, He Z.H., Chen Z.M., Wang Y.Z., Hu X.L., Lv Y.D., Wang G.F. Yan J. (2012). Therapeutic effect of forest bathing on human hypertension in the elderly. J Cardiol. **60**(6):495–502.
Martens D., Gutscher H., Bauer N. (2011). Walking in "wild" and "tended" urban forests: The impact on psychological well-being. J. Environ. Psychol.**31**:36–44.
Mathias S., Daigle P., Needham-Dancause K. & Gadais, T. (2018). Forest bathing: a narrative review of the effects on health for outdoor and environmental education use in Canada. SportRxiv
Mencagli M. and Nieri M. (2019). The Secret Therapy of Trees: Harness the Healing Energy of Forest Bathing and Natural Landscapes, Rodale, 212 p., ISBN 9781984824141, New York.
Miyazaki, Y. (2018) Shinrin-yoku: the Japanese Way of Forest Bathing for Health and Relaxation, Octopus Books, p. 192.
Myers N., Mittermeier R.A., Mittermeier C.G., Da Fonseca G.A.B and Kent J.(2000) Biodiversity hotspots for conservation priorities. Nature 403, 853-838.
Nakau M, Imanishi J, Imanishi J,. Watanabe S., Imanishi A., Baba T., Hirai K., Ito T., Chiba W., Morimoto Y. (2013) Spiritual care of cancer patients by integrated medicine in urban green space: a pilot study. EXPLORE: The Journal of Science and Healing. **9**(2):87–90.
Newsome D., Moore S.A. and Dowling R.K. (2013) Natural area tourism:

ecology, impacts and management - second edition. Channel View Publications, Bristol, UK. 480 p.
Nicholls, S. (2006) Climate change, tourism and outdoor recreation in Europe. Managing Leisure 11, 151-163.
Nowak, D.J. (2002) The effects of urban trees on air quality. Northern Research Station. https://www.nrs.fs.fed.us/units/urban/local-528 resources/downloads/Tree_Air_Qual.pdf, (Accessed: 12 June 2020)
OGM (2015). Türkiye Orman Varlığı 2015, T.C. Orman ve Su İşleri Bakanlığı Orman Genel Müdürlüğü.
Ohtsuka Y., Yabunaka N., Takayama S. (1998) Shinrin-Yoku (Forest-air bathing and walking) effectively decreases blood glucose levels in diabetic patients. Int. J. Biometeorol. **41**:125–127.
Park B.J., Tsunetsugu Y., Ishii H., Furuhashi S., Hirano H., Kagawa T., Miyazaki Y. (2008). Physiological effects of Shinrin-Yoku (taking in the atmosphere of the forest) in a mixed forest in Shinano town, Japan. Scand. J. Forest Res. **23**:278–283.
Park B.J., Tsunetsugu Y., Kasetani T., Kagawa T., Miyazaki Y. (2010). The physiological effects of Shinrin- Yoku (taking in the forest atmosphere or Forest Bathing): Evidence from field experiments in 24 forests across Japan. Environ. Health Prev. Med.; **15:18**–26.
Park B. J., Tsunetsugu Y., Kasetani T., Hirano H., Kagawa T., Sato M., and Miyazaki Y., (2007). Physiological effects of Shinrin-Yoku (taking in the atmosphere of the forest) using salivary cortisol and cerebral activity as indicators. Journal of Physiological Anthropology 26, 123-128.
Park B.J., Tsunetsugu Y., Kasetani T., Morikawa T., Kagawa T. & Miyazaki Y. (2009). Physiological effects of forest recreation in a young conifer forest in Hinokage Town, Japan. Silva Fennica 43(2): 291–301.
Payne M. and Delphinus E. (2018). A Review of the Current Evidence for the Health Benefits Derived from Forest Bathing, The International Journal of Health, Wellness, and Society 9(1), USA
Pickering C.M. and Ballantyne M., (2012) Orchids: an example of charismatic megaflora tourism? In: A. Holden and D. Fennell (eds.) Handbook of Tourism and the Environment. Routledge Publishing, London, UK. pp. 192-199.
Pillmayer M., Markov S., Steckenbauer G.C. and Herntrei M. (2019) Austria: The forest as a touristic landscape, International Approaches in Forest Therapy, International Handbook of Forest Therapy, Cambridge Scholars Publishing, p.337-356.

Sarı D., (2019) A method to determine the potential for flora tourism in mountainous regions: a case study of the Kackar Mountains National Park, Turkey. Eco.Mont 11, 27-35.

Sato N.,Tseng Y.L., Yeh S.S and Huan T.C. (2017) Forest as a Venue for Recreational Therapy in Japan, Nature Tourism (pp. 196-207). Taylor and Francis. https://doi.org/10.4324/9781315659640

Seo S.C., Park S.J., Park C.W., Yoon W.S., Choung J.T. and Yoo Y. (2015). Clinical and immunological effects of a forest trip in children with asthma and atopic dermatitis. Iran J. Allergy Asthma Immunol., **14**, 28–36.

Song C., Ikei H., Miyazaki Y. (2015). Elucidation of a physiological adjustment effect in a forest environment: A pilot study. Int. J. Environ. Res. Public Health **12,** 4247–4255

Terzioğlu S., Bilgili E. and Karaköse M. (2012). Forests of Turkey, Republic of Turkey Ministry of Forestry and Water Affairs, General Directorate of Forestry, 978-605-393-044-0, Ankara.

Tseng Y. L., Sato N., Yeh S. S. and Huan T. C. (2017). Tourism in preserved nature areas in Taiwan. Nature Tourism, pp. 184-195, Taylor and Francis. https://doi.org/10.4324/9781315659640

Tsunetsugu Y., Park B.J. and Miyazaki Y. (2010). Trends in research related to "Shinrin-yoku" (taking in the forest atmosphere or forest bathing) in Japan, Environ Health Prev Med **15** :27–37.

Tsunetsugu Y., Park B.J., Ishii H., Hirano H., Kagawa T., Miyazaki Y. (2007). Physiological effects of Shinrin-Yoku (taking in the atmosphere of the forest) in an old-growth broadleaf forest in Yamagata prefecture, Japan. J. Physiol. Anthropol. **26**:135–142.

Tsunetsugu Y., Lee J., Park B.-J., Tyrväinen L., Kagawa T., Miyazaki Y. (2013). Physiological and psychological effects of viewing urban forest landscapes assessed by multiple measurements. Landsc. Urban. Plan. **113**, 90–93.

Ulrich R.S., et al. (1991). Stress recovery during exposure to natural and urban environments, Environ. Psychol., 11, pp. 201-230

Williams R. (2020), How To Walk Yourself Healthy & Happy, Quickly Discover the many Proven Benefits of Walking for a healthy Body & mind, M-Y Books ltd, 115 pages

Yamaguchi M, Deguchi M, Miyazaki Y (2006) The effects of exercise in forest and urban environments on sympathetic nervous activity of normal young adults. J Int Med Res., **34**: 152-159

Yu, C.P.; Lin, C.M.; Tsai, M.J.; Tsai, Y.C.; Chen, C.Y. (2017) Effects of short

forest bathing program on autonomic nervous system activity and mood states in middle-aged and elderly individuals. Int. J. Environ. Res. Public Health, **14**, 897

URL-1: BBC (2020). https://www.bbc.com/news/world-51839944 (Accessed: 7 April 2020).

URL-2: GIFT (2020), Trail Designation, https://www.giftoftheforest.com/trail-designation (Accessed: 10 June 2020).

URL-3: Conservation International (2020). Why do biodiversity hotspots matter? https://www.conservation.org/priorities/biodiversity-hotspots (Accessed: 5 June 2020).

URL-4: Milliyet (2019) Terapi ormanı oluşturulsun. https://www.milliyet.com.tr/ gundem/terapi-ormani-olusturulsun-6077180 (Accessed: 13 June 2020).

URL-5: Fo Society (2020) Index of certified forest therapy and forest bathing bases in Japan. https://www.fo-society.jp/quarter/index.html#Kyusyu (Accessed: 14 June 2020).

URL-6: Das Kranzbach (2020) Forest therapy in Kranzbach - using the forest for your own well-being. https://www.daskranzbach.de/en/forest-therapy-in-kranzbach.html (Accessed: 15 June 2020).