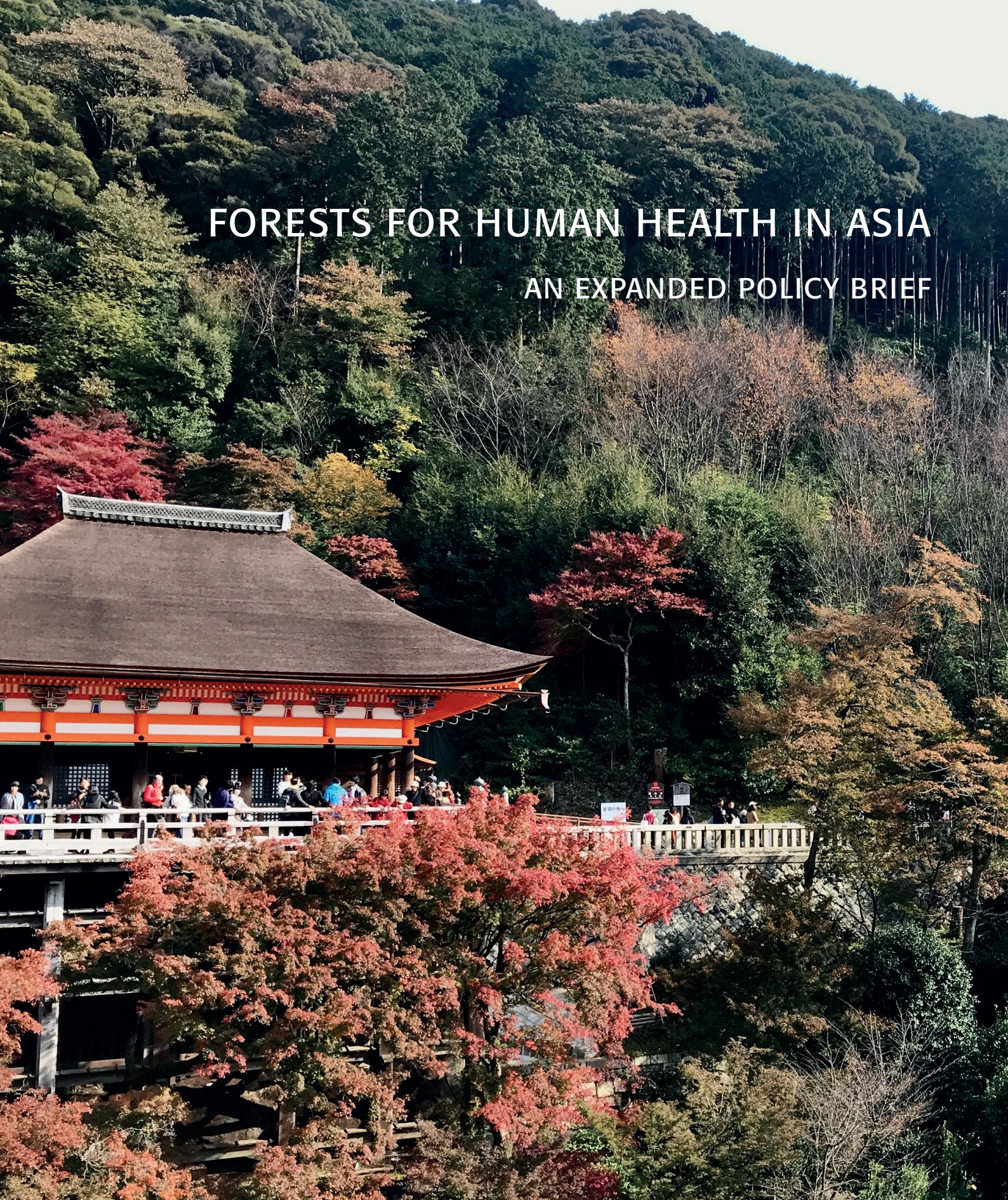

FORESTS FOR HUMAN HEALTH IN ASIA

AN EXPANDED POLICY BRIEF

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People visiting the serene Kiyomizu-dera temple in Kyoto, Japan.
Photo © Sital Uprety

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FOREWORD

In recent years, global public health challenges have taken centre stage. The COVID-19 pandemic has created severe healthcare disruptions and reversed decades of health and economic improvements. In addition to infectious diseases, the surge of non-communicable diseases has also become a major public health threat. Global factors, including urbanisation and climate change, further exacerbate such adverse effects on human health and wellbeing.

Forests have immense potential to contribute to the mental, physical, and social health and wellbeing of humans. Forests, trees and green spaces can provide nutritious food and medicines, support climate change mitigation and adaptation, filter air and water pollutants, and offer areas of recreation and restoration. At the same time, poor practices of conservation and management of forests can result in adverse effects on human health with the emergence of zoonotic diseases, forest fires, and allergic outcomes.

This publication consolidates available scientific evidence on the interlinkages between forests and human health in the Asian region. It aims to serve as a tool for supporting policymakers and stakeholders in their ambition to ensure sustainable development that takes into consideration the health of humans and nature.

It is my sincere hope that those who bear responsibility for implementing the Sustainable Development Goals (SDGs) at all levels will find this report a useful source of information and inspiration.

Alexander Buck
IUFRO Executive Director

ACKNOWLEDGEMENTS

This publication is the result of collaborative work between many scientists and experts who served as authors in different capacities. We express our sincere gratitude to all of them.

The information contained in this publication derives from the detailed analysis of relevant information contained in the global assessment report "Forests and Trees for Human Health: Pathways, Impacts, Challenges and Response Options" (IUFRO World Series Volume 41), which was developed in the framework of the Global Forest Expert Panels (GFEP) joint initiative of the Collaborative Partnership on Forests (CPF). Additional research focusing on Asia was carried out to complement the findings of the global assessment. We sincerely thank all authors of the global assessment.

We are grateful to the institutions and organisations to which the authors are affiliated for enabling them to contribute their expertise to this publication. At the same time, we wish to note that the views expressed in this publication do not necessarily reflect the official policy of these institutions and organisations.

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1. INTRODUCTION

1.1 Global study context and background

Forests, trees and green spaces provide multiple products and services that contribute to human health and wellbeing, including nutritious food, medicines, and non-wood forest products. They also support climate change mitigation and adaptation, moderate micro-climate, filter air pollutants, reduce noise exposure, enrich environmental microbiota, and offer areas for recreation, stress reduction, socialisation, and tourism, all of which can contribute to better physical, mental, and social health and wellbeing.

At the same time, poor forest management practices can result in negative outcomes from the interlinkages between forests, trees, and humans. These are, for example, the emergence of zoonotic and vector-borne diseases such as coronavirus disease 2019 (COVID-19), Severe Acute Respiratory Syndrome (SARS), and malaria, or when forest fires threaten people's health and wellbeing. Forest loss and degradation cause additional negative impacts on human health through the loss of the aforementioned ecosystem services crucial to human wellbeing. Ten million ha of forests were lost each year between 2015 and 2020 globally, including 2.24 million ha in Asia[1]. Global factors such as climate change, biodiversity loss, and poorly planned urbanisation also result in adverse effects on human health through air pollution, noise, and increased extreme weather events such as heatwaves, floods, and droughts, exacerbating existing public health threats.

Policy processes at different levels across the globe and an accumulating body of scientific evidence have recognised the impacts of forests, trees and green spaces on human health and wellbeing. For example, the Kunming-Montreal Biodiversity Framework adopted in December 2022 calls for the implementation of holistic approaches such as the One Health approach, and Target 12 specifically aims to increase the area, quality, connectivity, accessibility, and benefits of urban green spaces in improving human health. Likewise, to "Ensure healthy lives and promote wellbeing at all ages" is the third United Nations Sustainable Development Goal (SDG 3), and linkages between health and forests are evident in several targets of the SDGs.

A holistic understanding of the impacts of forests on human health is rapidly growing but still has several knowledge gaps. This is also the case in Asia, a continent that has seen major changes in terms of urbanisation, demography, lifestyles, and relations with forests, for example. Although policies and initiatives have increasingly acknowledged and integrated the health-environment nexus, these efforts are often fragmented, unsustainable, and do not explicitly focus on the interlinkages between forests and human health.

1.2 Relationship between forests and human health

The relationship between forests and human health is multifaceted and modulated by various interrelated factors such as forest management strategies, urbanisation, and infrastructure development around forested areas, as well as global drivers such as climate change and biodiversity loss. Although the interdependence between forests and health is universal, the extent and outcomes of this relationship

1 FAO, 2020

differ according to local context, for example, socio-economic status, demographic and cultural factors, and individual lifestyles.

This Policy Brief takes a broad view of forests, trees and green spaces in diverse contexts, including those of urban, rural, and forest-dependent communities. A broad perspective is also taken of human health as including all aspects of physical, mental, spiritual, and social health and wellbeing of people, while also considering links to the health of other beings and ecosystems. Key terms used in this Policy Brief are defined in Box 1.1[2].

BOX 1.1

Key terms

EcoHealth
An approach that is committed to fostering the health of humans, animals, and ecosystems and to conducting research which recognises the inextricable linkages between the health of all species and their environments.

Forests
Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10%, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. Forests include both natural forests and planted forests as well as areas that are temporarily unstocked, e.g., after disturbance, but are expected to revert to forest.

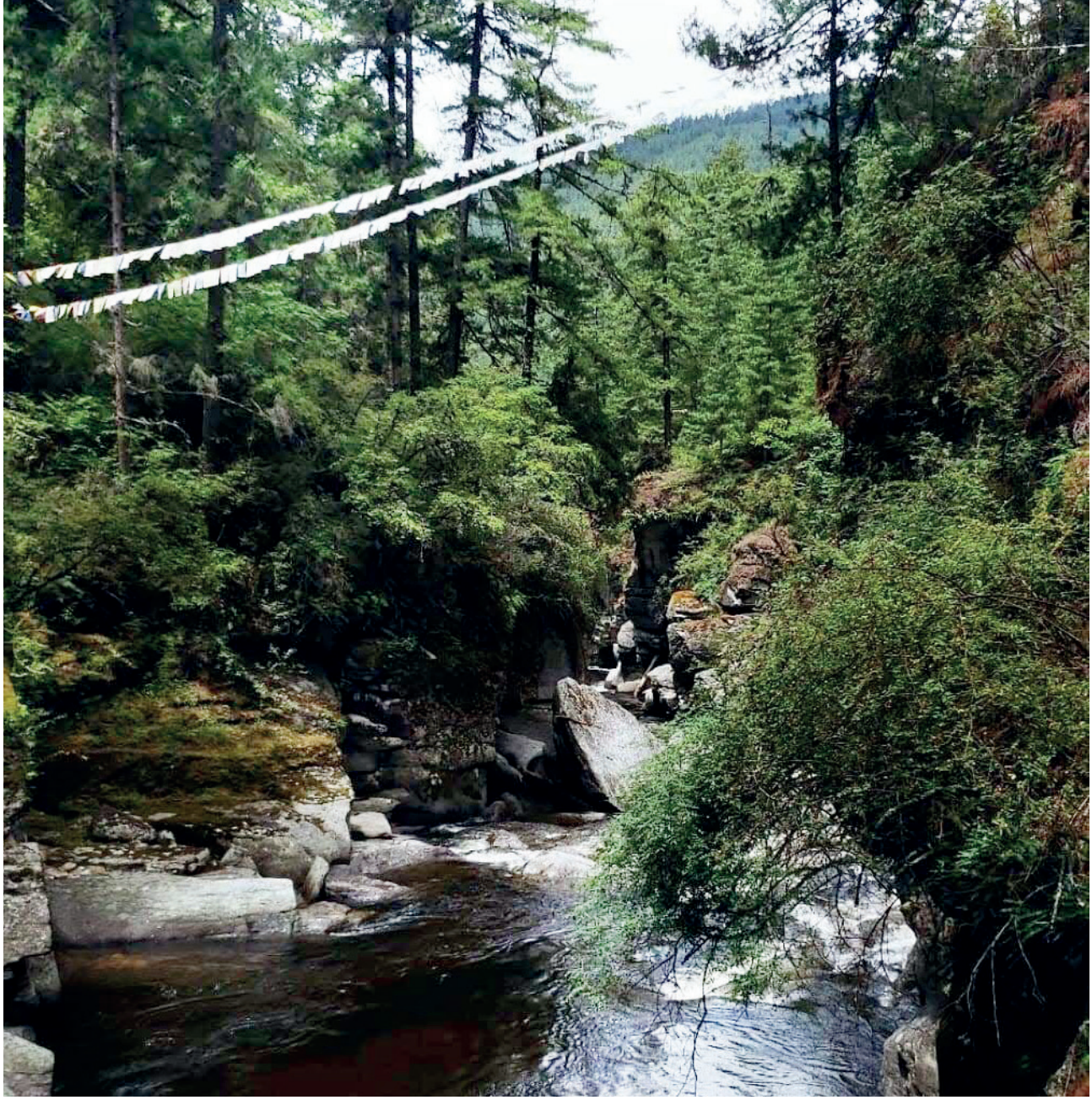
Forests, trees and green spaces
Forests and land, partly or completely covered with trees, shrubs, grass, or other vegetation, including parks, street tree plantings, community gardens, and cemeteries, but also rooftop gardens, vertical gardens, meadows, and woods.

Health
Health is a state of complete physical, mental, and social wellbeing and not merely the absence of disease or infirmity.

One Health
An integrated, unifying approach that aims to sustainably balance and optimise the health of people, animals, and ecosystems.

Planetary Health
The achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems – political, economic, and social – that shape the future of humanity and the Earth's natural systems that define the safe environmental limits within which humanity can flourish.

2 The terminology used in this Policy Brief is based on the global report *"Forests and Trees for Human Health: Pathways, Impacts, Challenges and Response Options"* (Konijnendijk et al., 2023). For all terms and definitions and respective sources we refer to this publication.

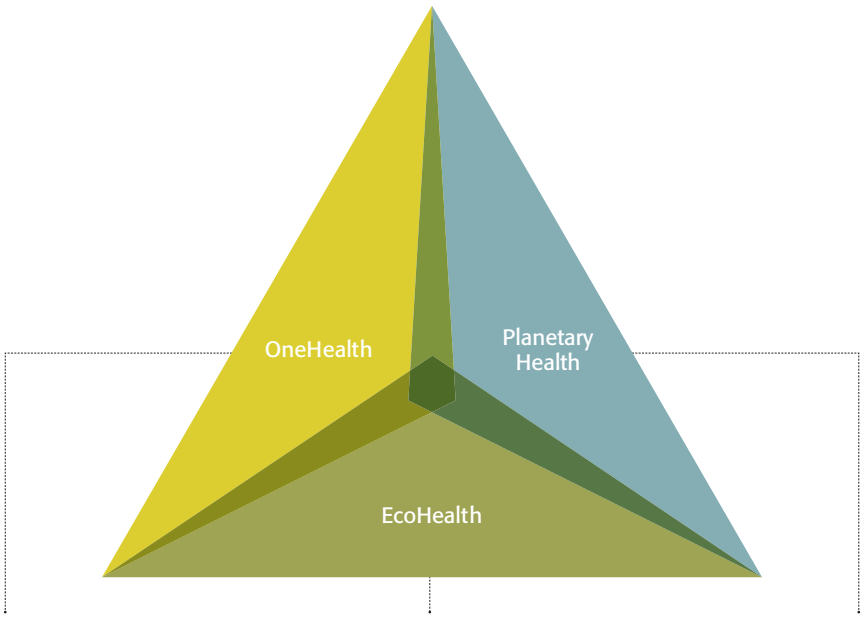


Forests can enhance and maintain water quality, which is crucial for human health
Photo © Dikshya Devkota

The relationship between forests and human health is reciprocal and interlinked. It is, therefore, essential that the interactions between humans and forests are studied and addressed across multiple disciplines, including forestry, public health and medicine, but also involving a wide range of other disciplines, from ecology to sociology and from (health) economics to climate science. This will require a more integrative systems perspective on human health and the health of other species, as well as the health of ecosystems. This Policy Brief builds upon three such integrated concepts: One Health, Planetary Health, and EcoHealth (Figure 1.1).

FIGURE 1.1

Illustration of how this assessment builds upon the convergence of three systems approaches: One Health, Planetary Health and EcoHealth – each with roots in different backgrounds, but with increased convergence in the science-policy-practice space



OneHealth	EcoHealth	Planetary Health
Background roots in animal health – human health studies, centered around how the environment and environmental management impact zoonotic diseases. Pandemics – including COVID-19, ebola, zika and others – have increased urgency to act upon this. OneHealth science & practice have contributed to an increased evidence-base, awareness and policy space about the links between environmental management and zoonotic diseases.	Background roots in biodiversity, ecosystem services and social-ecological systems studies. The increased attention to, and impacts of, biodiversity loss contribute to further connect this field to human health and the urgency to act upon this. EcoHealth science & practice have contributed to an increased evidence-base, awareness and policy space on the linkages between biodiversity and human health.	Background roots in Earth system – human health studies, centered around how human-induced environmental change impacts human health. Climate change impacts including extreme weather events, changing temperatures and droughts, have increased urgency to act upon this. Planetary Health science & practice have contributed to an increased evidence-base, awareness, and policy space about how climate change & environmental degradation affect human health.

1.3 Objectives and scope of the Policy Brief

This Policy Brief synthesises existing evidence on the linkages between forests, trees outside forests, and green spaces on the one hand, and different aspects of human health and wellbeing across all life stages on the other hand, in the context of Asia. It also presents response options and highlights current knowledge gaps. The scope is the continent Asia, as classified according to the United Nations (UN) geographic regions[3]. The evidence presented in this Policy Brief and references largely derives from a global assessment report on the same topic[4], supplemented by additional resources relevant to Asia.

The objective of this Policy Brief is to support decision-makers and stakeholders in better understanding and addressing the interlinkages of forests and trees with human health and wellbeing in Asia to efficiently utilise their synergies while minimising trade-offs. The main target audiences are decision-makers in Asia and beyond, including government officials at various levels and from different sectors across the continent, as well as UN and other global international organisations. This Policy Brief will also be of interest to regional bodies such as the Association of Southeast Asian Nations (ASEAN), Asia-Pacific Economic Cooperation (APEC), Asian Development Bank (ADB), Shanghai Cooperation Organisation (SCO), Sino-Russian Environmental Cooperation, and South Asian Association for Regional Cooperation (SAARC), and to civil society actors, private sector actors, donors, and academia in the health and forestry sectors as well as other relevant sectors across Asia and beyond.

1.4 Regional and policy context

Asia covers approximately 18% of the total global forest area (4.06 billion ha) and hosts around 56% of the world's population (4.5 billion people)[5]. More than 700 million people live within 5 km of forests[6] and depend on forests for food, medicinal plants, and livelihoods, all of which directly or indirectly contribute to health and wellbeing. Although **forest restoration efforts** across Asia have resulted in an overall net gain of 6.4% in forest area between 1990 and 2020, forest loss and degradation continue in several local contexts, largely driven by commodity-driven deforestation, shifting agriculture, and wildfire[7]. These forest losses and degradations negatively impact the provision of ecosystem services vital to enhancing and maintaining human health and wellbeing. Ongoing and future forest restoration efforts across the continent provide a unique opportunity to design and implement approaches that result in positive health outcomes along with sustainable forest management.

The speed and scale of **urbanisation and population growth** in cities across Asia over the last 50-70 years have been unprecedented. For example, the populations of Beijing (China) and Dhaka (Bangladesh) grew from 1.7 million and 0.5 million

3 UN DESA, n.d.
4 Konijnendijk et al., 2023
5 UN DESA, 2022
6 Newton et al., 2020
7 FAO, 2020

in 1950, respectively, to 18 million each by 2015[8]. The Tokyo-Yokohama agglomeration, a megacity with an 11.25 million population in 1950, grew further to become the world's most populous city with 37.26 million inhabitants in 2015. In 2015, sixteen of the 30 largest cities in the world were in Asia. Eighteen of the top 30 most densely populated cities were in Asia in 2015, including four of the top five (Dhaka, Mumbai, Surat, Ahmedabad)[9]. Asia is also expected to be one of the hotbeds of urbanisation in the next decades. It is projected that 90% of the increase in urban population by 2050 will occur in Asia and Africa, with India, China, and Nigeria accounting for over one-third of this increase in the global urban population[10]. This ongoing urban expansion enhances the importance of trees and urban green spaces for climate adaptation, public health, and other benefits, as discussed in the next section.

The proliferation of megacities in Asia has coincided with an **epidemiological transition**, where increase in life expectancy and decline in some communicable infectious diseases and infant mortality have been coinciding with rising levels of non-communicable diseases (NCDs) such as hypertension, diabetes, and cardiovascular diseases. The rise in NCDs in Asia is among the highest in the world and aligns with processes of urbanisation that have fostered car dependency, sedentary and stressful lifestyles, and the adoption of calorific 'Westernised' diets. However, the scale of these transitions varies with respect to sociodemographic, cultural, economic, and development factors between and within populations. For example, one of the largest rural-to-urban migrations in recorded history has taken place in China, where massive urbanisation, air pollution, and NCD-related challenges, including high levels of diabetes and obesity, have been well-documented. In less educated areas of China, more highly educated individuals tend to have a higher body mass index (BMI) in comparison with less educated peers. In contrast, in more educated areas, individuals with lower levels of education tend to have higher BMIs, as is also seen in high-income Western countries[11]. This illustrates how different parts of China – and potentially other countries in Asia – are at different stages of the 'nutrition transition'. Population transitions in Asia also relate to rapid population ageing, with one in four people in Asia (and the Pacific) projected to be 60 years or older by 2050. With an estimated 1.3 billion, this age group will be three times larger than in 2010[12].

Knowledge generation and evidence syntheses at global, regional, and national levels regarding diverse dimensions of the linkages between forests, trees, and human health have also increased in recent years. For example, the most recent report (2019) of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) stresses the important links between biodiversity and pandemics, identifying the overexploitation of forests and wildlife as a contributing factor. While forests and trees provide essential ecosystem services to maintain human health and wellbeing, disturbed forest-people relationships have contributed to ongoing public health challenges, such as malnutrition, as well as

8 UN DESA, 2018
9 UN DESA, 2018
10 UN DESA, 2018
11 Zhou et al., 2017
12 ADB, 2023

Forests contribute directly and indirectly to human health and wellbeing
Photo © Olya Humeniuk

zoonotic and vector-borne diseases. Anthropogenic factors, primarily land use change, encroachment, and wildlife trade, have been linked to the emergence of zoonotic pathogens, including Nipah virus in several parts of Asia as well as SARS, COVID-19, and Middle East Respiratory Syndrome virus (MERS).

While no specific policy instruments – neither in Asia nor globally – explicitly address forests and human health interlinkages, international policy processes and initiatives like the Kunming-Montreal Biodiversity Framework, the Quadripartite Partnership on One Health Joint Plan of Action (2022-2026), the Global Forest Goals, and the 2030 Agenda for Sustainable Development have recognised the contributions of forests and trees to human wellbeing and called for their inclusion. The COVID-19 pandemic has also provided better policy traction towards nature-based solutions besides strengthening healthcare systems and improving forest management and surveillance.

In the context of Asia, several sub-regional policies have factored in the intricate links between forests, biodiversity, and human health or have the potential to do so. The World Health Organization's Southeast Asia Regional Strategic Roadmap for Health Security and Health System Resilience for Emergencies 2023-2027 focuses on efficient risk assessment and surveillance systems following the One Health approach. The Association of Southeast Asian Nations (ASEAN) has issued several relevant regional policies and strategies, including the Strategic Plan 2016-2025 for Food, Agriculture and Forestry, the ASEAN Guidelines on Recognition of Customary Tenure in Forested Landscapes, and the ASEAN Multi-Sectoral Framework on Climate Change focused on Agriculture, Fisheries and Forestry. At the country level, national policies like the Indian Forests Rights Act 2006 can be mentioned as relevant policy frameworks. Although these policies address various aspects of forests, nutritional security, and health, no policies and strategies in Asia explicitly focus on the health outcomes of forests.

2. THE HEALTH AND WELLBEING EFFECTS OF FORESTS, TREES AND GREEN SPACES IN ASIA

2.1. Introduction

A substantial body of evidence has documented the potential of natural environments, including forests, trees and green spaces, to improve mental, physical, and social health and wellbeing. Most studies on these effects of natural environments have focused on nature or green spaces in general. While these studies include forests and trees as part of their assessment of exposure to natural environments, the specific focus on the health outcomes of forests and trees is largely missing. However, the pathways and mechanisms underlying the health effects of natural environments and green spaces in general, and forests and trees in particular, are likely to be largely similar. Therefore, all relevant evidence on the health effects of different types of nature are included in this section. It is also important to note that, apart from a few exceptions (e.g., forest bathing), most existing evidence focuses on Western high-income countries, and the evidence from countries across Asia is relatively limited but emerging. We refer to Konijnendijk et al. (2023) for sources, and additional sources are cited in the text.

2.2. Mechanisms

Trees and our contact with them shape the health of humans through a variety of intersecting mechanisms. These mechanisms can be classified into four domains: (a) reducing harm; (b) causing harm; (c) restoring capacities; and (d) building capacities.

Trees (a) reduce harm in various ways. For example, forests and trees offer shade and evapotranspiration that cool local urban heat islands. They also reduce the detrimental effects of air pollution and noise by regulating air quality via dry deposition and dispersion and psycho-acoustic buffering, respectively. Trees can also (b) cause harm, for example, through falling on people, and production of allergy-inducing pollens. At the same time, (c) seeing trees can relieve stress (Stress Reduction Theory), boost attention (Attention Restoration Theory), and restore capacities for psychological health, potentially aided by the renewal of 'natural immunity' shown to be gained through interactions with forests and trees. Finally, trees support behaviours that (d) build health capacities. Areas with more trees support physical activity, reduce loneliness, and promote better sleep quality. The potency of these mechanisms is dependent on personal and contextual circumstances[13], including connectivity and accessibility of forests, socio-economic and demographic circumstances, and individual lifestyles, among others.

2.3. Physical and mental health effects

2.3.1. Pregnancy complications and birth outcomes

A recent review of 29 studies, including four studies from Asia, found moderate evidence that babies born to mothers in greener neighbourhoods are less likely to be of low birth weight (i.e., birth weight below 2500 g)[14].

13 Astell-Burt et al., 2022

14 Hu et al., 2021

Forests and trees have positive effects on physical and mental health at all stages of life
Photo © De an Sun on Unsplash

Similarly, a study in Iran has reported that more use of green spaces during pregnancy, higher visual access to green spaces, and residential proximity to green spaces are associated with higher birth weight[15].

Evidence on the association between exposure to natural environments and pregnancy complications remains limited, with existing studies mainly focusing on gestational diabetes (high blood sugar that develops in women during pregnancy) and hypertensive (i.e., high blood pressure) disorders of pregnancy. For gestational diabetes, research from China[16] has reported protective effects from neighbourhood green spaces. However, studies conducted in the USA did not find such results for neighbourhood green spaces or proximity to recreational natural environments (including forests). With regards to pregnancy-induced hypertension and preeclampsia (a serious condition during pregnancy that causes high blood pressure, protein in urine, and swelling of legs), evidence from studies outside of Asia indicates a protective association between living in greener neighbourhoods with the risk of these conditions; however, some studies did not find such associations. To summarise, available evidence from Asia and elsewhere suggests a beneficial association of natural environments on birth outcomes. For pregnancy complications, although the evidence is mixed, there is an indication of beneficial impacts.

15 Torres Toda et al., 2020
16 Z. Yu et al., 2023

2.3.2. Mental health and development in children and adolescents

Existing evidence consistently supports a beneficial impact of natural environments on neurodevelopment in children. Earlier studies were mainly small-scale experimental studies reporting the short-term "therapeutic effects" of the brief contact with nature among children with neurodevelopmental problems. For example, a short walk in a park or playing in outdoor natural environments has shown to improve attentional function and reduce symptoms in children with attention deficit-hyperactivity disorder (ADHD) or attentional deficit disorder. More recently, an increasing number of large-scale epidemiological studies have associated long-term exposure to natural environments with positive impacts on different aspects of neurodevelopment, including beneficial anatomical changes in the brain, enhancing cognitive, behavioural, emotional, and motor development, lower risk of neurodevelopmental disorders such as ADHD and perhaps autism spectrum disorder, and better academic achievement[17]. For example, studies on schoolchildren in South Korea and China have demonstrated associations between living or studying in greener neighbourhoods with a lower risk of behavioural problems[18] and a lower risk of ADHD, respectively[19].

Most studies suggest a beneficial impact of natural environments on the mental health and wellbeing of children and adolescents. Although limited, studies analysing health-related quality of life and social functioning in young people have consistently found positive associations with exposure to natural environments. A large population-based study of schoolchildren in Iran found associations between increased use of green spaces with more social contact and self-satisfaction. A synthesis of available evidence from studies in Asia and elsewhere has reported that spending time in forests and forest-based activities could reduce depressive and anxiety symptoms and negative emotions such as aggression and anger, and improve social skills, perceived quality of life, and mental wellbeing.

2.3.3. Physical health and development in children and adolescents

Studies on the benefits of contact with nature for children and adolescents have included a variety of physical health and development outcomes. Available evidence suggests a potential protective association between natural environments and cardiometabolic conditions such as overweight/obesity, hypertension, and diabetes. A large study of over 60,000 children and adolescents in China found that living in greener neighbourhoods was associated with lower blood pressure levels and hypertension. For blood-based biomarkers, studies among children in China reported that the availability and quality of green space around school and/or home was associated with lower lipid levels (e.g., cholesterol). Another study of schoolchildren in Iran reported that longer time spent in green spaces, especially in natural green spaces (e.g., forests), was associated with lower fasting (i.e., without eating or drinking anything) blood glucose (i.e., sugar) levels.

17 Ricciardi et al., 2022

18 Lee et al., 2019

19 Yang et al., 2019d

Forests and other aspects of the natural environment could affect the respiratory health of children in various ways, including through beneficial pathways such as promoting physical activity, reducing stress, enriching the microbiome, and improving air quality. However, forests and trees are also a source of pollen, which can exacerbate symptoms among those sensitised. Thus, the available evidence of such respiratory effects is heterogeneous. While some studies have reported a detrimental effect of trees and green spaces in proximity to home and/or school, others have reported no or protective effects for allergic and respiratory outcomes such as hay fever or asthma. For example, a study of Chinese children reported a higher frequency of clinical visits for hay fever associated with more green space surrounding residential address[20]. On the other hand, another study in China reported a protective association between green space surrounding schools and the risk of asthma[21].

Forests may affect children's risk of contracting infectious diseases (e.g., malaria) mainly through the presence of reservoirs and vectors of infectious diseases such as wildlife and mosquitoes. At the same time, forests could also have a protective effect on the contraction of infectious diseases by enriching the microbiome of children and thereby improving their immune function, by the biological control of infectious diseases, and by providing medicinal plants for the treatment of infectious diseases. The effects of forests on infectious diseases are therefore mixed, depending on the type of human-forest interaction as well as the type of infectious disease, and the behaviour of their reservoirs and vectors. For example, some studies have reported that while deforestation could increase malaria transmission through certain mosquito subtypes in Thailand and India, it can diminish malaria transmission through other mosquito subtypes. Medicinal plants are historically and currently used in various countries across Asia against different diseases and for the general wellbeing of children. Although, in many cases, the benefit of these medicinal plants could justify their use, some medicinal plants have toxicity in humans, especially in children, as reported in China, India, Iran, Malaysia, and Thailand.

Forest foods are of critical importance to the dietary diversity and food security, particularly for forest-dependent populations and communities with poor access to markets. In addition to these 'direct pathways', two additional pathways are identified: the income pathway, through which the sale of forest products contributes to improved food access on markets, and the agroecological pathway, through which forests support diverse crop and livestock production through an array of regulating ecosystem services. Forest foods, particularly sourced through wild animals, are considered potential vectors of rapidly spreading infectious diseases. Epidemics including SARS and the recent COVID-19 pandemic have drawn attention to the "bushmeat crisis" – the unsustainable consumption of wildlife across several countries, including in Asia. As the origins of the pandemic are traced to zoonotic transmission, with bats and pangolins being the primary reservoirs for a wide variety of coronaviruses, unsustainable trade and consumption of wildmeat may pose an untenable risk to global public health.

2.3.4. Mental health and wellbeing in adults

Short- and long-term contacts with forests, trees and

20 Lee et al., 2020

21 Zeng et al., 2020

green spaces have been associated with improved mental and spiritual health and wellbeing. Studies in China and South Korea have reported fewer depressive symptoms and improved mental wellbeing among individuals residing in greener areas[22]. More green space has also been associated with fewer sleep disturbances[23] and improved sleep quality. In Japan, people in urban areas with more trees were found to have a lower risk of depression. Moreover, field experiments have reported mental health benefits of 'forest bathing' ('shinrin yoku') interventions typically involving gentle, deliberate, and mindful activities in forests over extended periods[24]. A small number of randomised trials demonstrated that participation in forest bathing interventions can increase positive feelings and reduce negative feelings in young adult males[25], decrease levels of depression in adults with alcohol use disorder[26], and ameliorate symptoms of anxiety and depression in stroke survivors[27].

2.3.5. Physical health in adults

Cardiovascular diseases (CVD) are the leading cause of death globally. Emerging evidence from several countries including Australia and Brazil, indicates that restoring and protecting trees in cities can reduce risks of CVD onset[28]. In the context of Asia, studies using green space indicators that include, but are not specific to, tree canopy, have reported that more green space in the living environment is associated with lower levels of CVD in China, South Korea, and Thailand[29]. Studies conducted in China have also reported protective associations between green space and diabetes[30], obesity[31], blood pressure[32], and other CVD biomarkers such as blood fats[33]. Other studies from China have reported inverse (i.e., protective) associations between green space and respiratory health conditions, including reduced risk of chronic obstructive pulmonary disease (COPD) and better lung function[34], although evidence is mixed[35]. A few randomised trials have also evaluated the benefits of forest bathing for CVD. For example, a study of women with metabolic syndrome (a combination of obesity, abnormal blood fat and sugar levels, and high blood pressure) in South Korea reported better control of blood sugar levels, pulse rate, and stress hormone levels for participants completing a forest bathing intervention set in a wild forest compared with a tended forest visit[36].

22 Liu et al., 2019; Wang et al., 2021
23 Li et al., 2022
24 Furuyashiki et al., 2019
25 Lee et al., 2011
26 Shin et al., 2012
27 Chun et al., 2017
28 Feng et al., 2023; Moreira et al., 2020
29 for example, Paoin et al., 2023; Seo et al., 2019; Yang et al., 2020; W. Yu et al., 2023
30 Yang et al., 2019c
31 Huang et al., 2020; Xiao et al., 2021
32 Yang et al., 2019a
33 Yang et al., 2019b
34 Xiao et al., 2022
35 Fan et al., 2020; Gou et al., 2023
36 Lee et al., 2018

The shade of trees protects from the intense heat
Photo © Sital Uprety

2.3.6. Healthy ageing

There is growing evidence that natural environments are associated with improved healthy ageing, including better mental health and perceived wellbeing and quality of life, decelerated cognitive and physical ageing, and reduced risk of dementia and mortality in the elderly. Research in Western countries has identified the importance of trees as distinct from other types of green spaces (e.g., open grass) for supporting psychological resilience and functional capacity in

older age[37]. Comparable findings in Asia have focused on green space inclusive of, but not solely composed of, tree canopy. For example, in China, studies examining the effects of green space on the elderly have reported longevity benefits and better cognitive function[38]. This may translate into reduced dementia risk, as shown in high-income countries outside Asia. Likewise, research in South Korea has linked green space with reduced risks of Parkinson's Disease[39]. Emerging research also highlights linkages between increasing exposure to green space and lower risks of frailty, bone mineral density decline, and incident fracture in the elderly, with an indication that physical activity plays a key mediating role[40].

2.4 The state of the evidence

The body of evidence on the health and wellbeing effects of natural environments and green spaces in general, and forests and trees in particular, is accumulating globally as well as in Asia. Existing evidence strongly supports a wide range of beneficial associations, including neurodevelopment in children, mental health and cardiometabolic health in adults, and mental health, cognitive ageing, and longevity in the elderly. Current evidence also suggests a beneficial association for pregnancy outcomes and complications, cardiometabolic health in children, and physical functioning decline in the elderly. Given that many of these outcomes are among the major contributors to the burden of disease in Asia, forests, trees and green spaces have a great potential for improving the health and wellbeing of humans across all life stages. However, most of the studies investigating interlinkages between forests and human health have been conducted in high-income countries outside of Asia and among urban residents, presenting an urgent need for more studies on the topic in the context of Asia, and particularly among its rural and forest-dependent communities.

37 e.g., John et al., 2023

38 Feng et al., 2023; Ji et al., 2020

39 Jung et al., 2022

40 He et al., 2022

3. SYNERGIES AND TRADE-OFFS BETWEEN HEALTH AND OTHER OUTCOMES ASSOCIATED WITH FORESTS AND TREES

3.1 Regional diversity, synergies, and trade-offs

Asia represents high geographic, demographic, socio-economic as well as cultural diversity. This diversity can make it difficult to develop universal policies and guidelines for enhancing the positive health and wellbeing outcomes associated with forests and trees. Rapid urbanisation and economic transition exemplify the potential detrimental effects of precipitous and poorly managed growth on natural systems. Factors such as increasing population, inadequately planned development, unsustainable high-intensity agriculture and energy production, poorly planned rapid land-use changes, and changing production and consumption systems pose substantial challenges to natural systems and human wellbeing. Climate change further exacerbates the impediments in the forests and human health nexus by impacting essential ecosystem services, for example, which in turn affects livelihoods and public health.

Inadequate urban development may compromise the health benefits of forests and trees
Photo © Prikesh Savla on Unsplash

The COVID-19 pandemic has highlighted critical vulnerabilities in the human-ecosystem nexus in Asia. The region has witnessed a number of epidemics of infectious diseases in the last two decades, including SARS and MERS, associated with environmental and climate disruptions. While harmful pathogens may exist in forest ecosystems, zoonotic and vector-borne diseases can be better contained in sustainably managed ecosystems. At the same time, disturbed forest-human relations may bring animals and humans in close contact, heightening the possibility of zoonotic outbreaks. Unregulated wildlife trade and dependency, including wildmeat for nutritional and medicinal needs, may also result in such outbreaks. Appropriate management strategies and planning based on sound risk-benefit studies are vital to prevent such outbreaks in the future.

Around 70 per cent of the global Indigenous People and Local Communities (IPLCs) are based in the Asia-Pacific region, with most of them living in close proximity to forests, including protected areas. Approximately 481-579 million IPLCs in Asia depend directly on nature for food, medicine, and livelihoods[41], all of which affect health and wellbeing. Forest-based pharmacopoeias in the region are rich in medicinal and nutritional plant knowledge, which has been codified over millennia, particularly, in China and South Asia. However, this knowledge needs to be further systematically studied through robust transdisciplinary scientific approaches. Integration of the scientifically tested traditional knowledge into national health strategies and programmes can offer nature-based solutions to improve nutrition, livelihoods, health, and wellbeing of local communities.

Potential or anticipated synergies and trade-offs in the complex relationship between forests and human health need to be thoroughly studied at regional and local levels for tailored context-specific planning and management. A recent survey on COVID-19 and forest-related financing in various sub-regions in Asia-Pacific (South, East, Central, Southeast Asia, and Pacific Islands) showed that during the pandemic there was a significant diversion of the budget allocated to forest management-related activities to sectors such as health and emergency services across countries[42]. Shifts like this are counterproductive as they underplay and even ignore the strong links between forests and human health and wellbeing.

3.2 Sustainable Development Goals, forests, and health

The implementation of the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) impacts the management of forests and trees as well as human health and wellbeing. SDG 15 (Life on land) has direct relevance to forest conservation, sustainable use, and management. In the context of Asia, although most forests are publicly owned (90% in South and Southeast Asia and 88% in Western and Central Asia, for example), a significant population in the region are forest-dependent communities. Therefore, attention must be paid to ensuring equitable access to resources and improving local livelihoods through tenure rights, as increased access to forest resources can have a significant impact on human health, particularly among forest-dependent communities. However, no target of the SDGs has a significant focus on this issue.

41 IPBES, 2018

42 Joshi, 2022

SDG 3 aims to ensure healthy lives and promote wellbeing for all at all ages. Specifically, increasing population and demographic pressure on the natural ecosystems calls for targeted strategies in relation to SDG 3, Target 7, which refers to ensuring universal access to sexual and reproductive healthcare services, including family planning. Likewise, improving the quality of water, land, and air by minimising forest degradation can have significant co-benefits in terms of climate regulation, reducing infectious diseases (SDG 3.3), and protecting medicinal and nutritional flora.

Interlinkages between the sustainable management and conservation of forests and human health and wellbeing can also be found in several other targets of the 17 SDGs, including SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 6 (Clean Water and Sanitation), and SDG 7 (Affordable and Clean Energy). Implementation of the SDG 11 (Sustainable Cities and Communities), Target 7 – universal access to safe, inclusive, and accessible green and public spaces –, will have effects on urban green spaces and the health and wellbeing of communities near these areas.

3.3 Good practice case studies and global implications

Several case studies of natural ecosystem restoration and reconstruction across Asia have demonstrated the potential to strengthen synergies between health and other benefits from forests while minimising trade-offs. Successes and lessons learnt from such cases can inform strategies to promote sustainable economic development while maintaining the sustainability of forests, encouraging forest and tree conservation and effective management, and enhancing the provision of essential ecosystem services that contribute to human health and wellbeing, especially among vulnerable population groups. For example, the Miyawaki Method of planting native species closely together to encourage faster growth has proven to be an effective approach to generating forest cover. Developed in Japan and later in India, this method has been successfully applied across Asia and beyond. It has been especially advantageous in urban areas, where space for new forests is often limited.

In the Middle East, multiple greening projects were launched to mitigate climate change and cool cities and settlements. For example, Dubai has launched the Vertical Forest programme, while in Abu Dhabi, Riyadh, and other cities on the Arabic Peninsula, urban forests are expanding to bring nature closer to the residents and make cities more resilient. There is an increasing focus on native plant species in these efforts. Policies like the 2021 United Arab Emirates General Environmental Policy focus on sustainable environments and resource use, including the preservation of biodiversity.

Densely populated cities like Singapore, Seoul, and Hong Kong have developed innovative approaches to greening that have been globally recognised, often also addressing public health challenges. Singapore has introduced key policies and incentives for promoting the greening of buildings and the city. The Urban Redevelopment Authority of the Singapore Government has set up Landscape Replacement Areas (LRAs) guidelines to replace the greenery lost due to development projects and includes a combination of greenery and communal areas located at ground or sky-rise levels[43]. It aims to enhance access to green urban areas for relief as well as to address the ur-

43 URA, 2009

The Bongeunsa temple and park offer a pleasant and peaceful retreat in the middle of Seoul's busy Gangnam district
Photo © Gerda Wolfrum

ban heat island effect and other challenges of global warming in cities that, in time, affect the health and wellbeing of urban residents.

In countries like Japan, China, and South Korea, forests have been utilised as an instrument to promote mental and physical health since the 1980s. The well-known 'Shinrin-yoku' (forest bathing) approach, widely applied in Japan, has inspired other countries in Asia and globally to follow the practice while using local resources to improve human health and well-being. In Malaysia, the knowledge related to forests possessed by IPLCs and their spiritual bond is displayed in the 'Mandi Embun' practice, which translates to bathing in the forest dew. Both the Shinrin-yoku and Mandi Embun practices entail close contact with nature as a public health strategy, and several studies have suggested their measurable health benefits, including psychophysical wellbeing, and mood and immune function improvements.

Approximately 6500 medicinal plants are used in India, 1178 species of which are in commercial trade and 242 are highly traded. About 72 per cent of such trade is through wild harvest. India has developed a country-wide network (with 115 protected forest areas spread across 15 States) for medicinal plant conservation of endangered flora and revitalisation of associated traditional knowledge on health and nutrition, which has received significant policy attention. Sacred Groves in India and other countries in Asia have also greatly contributed to the protection of forests and trees promoting spiritual wellbeing.

3.4 Response options

3.4.1 Forest and green space planning

There are no simple, one-size-fits-all solutions for the design and planning of forests and green spaces for promoting health, as contexts are very different across Asia. In many cases, it is important to bring forests and trees close to people, also in urban settings, and planning needs to set appropriate standards for providing ample access to green spaces. Both quality and quantity of forests and green spaces should be considered along with the diversity of users in terms of culture, age, gender, socio-economic status, and physical abilities. For example, particular attention should be paid to the selection of species that are less likely to generate allergic reactions in the people living in vicinity of these areas.

The One Health, Planetary Health, and EcoHealth frameworks can guide forest and health planners and decision-makers in efforts to promote more integrative solutions. Examples such as the Beijing Plain Area Afforestation Programme (BPAP) and Singapore's Restoration Action Plan, among others, demonstrate the implementation of such approaches, strengthening socio-ecological systems and their resilience. The potential roles of forests as a supportive setting for mental and physical therapy should also be promoted. Forest and green space planning is also important in rural and forest-dependent communities, where the focus should be on linking forest conservation and management with local livelihoods, food security, biological control of infectious diseases, and health. For a more inclusive impact of forests on human health and wellbeing, efforts are required to ensure access rights to forest-dependent communities while also conserving forest ecosystems, reducing forest loss and degradation, and mitigating the likelihood of infectious diseases.

3.4.2 Communication and education strategies

Communication and education can play a significant role in conserving and optimising the health and wellbeing benefits of forests, as limited public understanding of such benefits can result in missed opportunities to simultaneously improve human health and conserve forests.

Exposure to informal learning through hands-on experience and teaching of practical skills (for example, Green School in Bali and Forest Schools in Azerbaijan, Indonesia, Iran, and Singapore) is essential to promoting sustainable management of forests while deriving its health and wellbeing benefits. The introduction of new programmes on the benefits of forests on health and wellbeing at all levels of education should be considered by decision-makers in forestry, health, and education sectors. Special attention should be paid to children and adolescents because attitudes and behaviours mainly form during these early years of life and increased affinity to nature during childhood could extend into adulthood with positive impacts on health outcomes and ecological behaviours. It is also urgent to tailor training and communication to forest managers and policymak-

ers to manage forests for multiple goals, including health, as currently being done in countries such as the Philippines and South Korea.

3.4.3 Access to forest

Accessibility of forests and green spaces is one of the primary factors affecting their health and wellbeing outcomes. Potential synergies and trade-offs need to be thoroughly considered when developing infrastructure that ensures connectivity and accessibility of forested areas, such as roads. Well-connected roads, trails, and signage can enable people to access these health-promoting spaces more easily, as well as expand trade, consumption, and economic growth. In addition to physical access, visual access to forests and trees could be part of the approach to generate health benefits, especially among urban dwellers. At the same time, the construction of roads and trails may result in forest fragmentation, degradation, and deforestation, which pose risks to vital ecosystem services such as availability of medicinal plants and food or contribute to human-wildlife conflicts. Physical access may also facilitate the incursions of human and animal pathogens and vectors of infectious diseases.

Considering the local context, decision-makers need to regulate different policies and practices related to the proximity and connectivity of forests ranging from fully unrestricted access to restricted access. Planned forest access may also regulate the use of forest products, which is crucial for forest-dependent communities, and prevent conflict between user groups. Other barriers preventing the visit or usage of forests and green spaces, such as lack of public transport, poorly maintained footpaths, and perception of risks and safety, must also be addressed.

3.4.4 Indigenous peoples and forest-dependent communities

While many countries in Asia have rendered customary rights to land and natural resources, in many cases, Indigenous peoples and local communities (IPLCs) still face high marginalisation in terms of their identity, rights, cultural traditions, and exploitation of their access to forest lands and resources. This has resulted in skewed development and disparities in livelihoods, health, and wellbeing[44]. Indigenous peoples and forest-dependent communities possess traditional knowledge and culture that can significantly contribute to forest conservation and sustainability. However, due to issues such as forest gazettement, inequality, and land tenure, these populations have been marginalized. Efforts are needed to efficiently utilize traditional ecological knowledge in forest conservation and management approaches with the benefit of improving health and wellbeing of IPLCs and the wider society. Moreover, clear regulations and guidelines on the sustainable use of forest resources (e.g., seeds, dead wood) should be prioritized.

3.4.5 Mangrove protection and restoration

Mangroves cover 83,500 – 137,000 km^2 globally[45] across the tropics, subtropics, and warm temperate zones, including across Asia. For example, mangroves in Southeast Asia constitute around one third of the global mangrove area. Mangroves act as a barrier against waves and storms, mitigating natural disasters, including Tsunamis. They also harbour healthy fish populations contributing to food and nutritional security. All these functions can have direct and/or indirect impacts on health and wellbeing of coastal communities. Even though international conventions

44 FAO, 2018

45 Hamilton and Casey, 2016

such as the Ramsar Convention, the Charter for Mangroves, and several national policies in Asia (e.g., Philippines, Thailand, and Vietnam) have prioritised the protection of Mangroves, between 1990 and 2020 approximately 8600 km^2 of mangrove coverage was lost globally, with the largest decline in South and Southeast Asia[46]. Protection strategies and approaches that include mangrove planting and ecological restoration models at all levels could be introduced. Common practices such as dependency on paying communities to undertake restoration can be changed by using the metrics of success (e.g., focusing on per cent of survival, as opposed to per cent planted), paying communities for tasks other than planting (e.g., digging creeks for hydrological restoration), or co-funding restoration projects in conjunction with local communities.

3.4.6 Forest fires

The occurrence of forest fires in several countries across Asia, including Indonesia and the broader Equatorial region, has contributed to severe air pollution episodes, also known as haze. Fires impact human health through the loss of human lives and through inducing a wide range of adverse health outcomes such as cardiovascular, respiratory, and obstetric conditions as well as loss of species and important environmental services. Transnational policies such as Singapore's Transboundary Haze Pollution Act of 2014 could serve as a guide for similar cases to address the international impacts of fires and other hazards. The Act presents an extra-territorial attempt to impose criminal and civil liability on agribusiness companies involved in causing forest fires outside Singapore, whether these be Singapore-linked companies or otherwise. Other approaches that can be implemented are composting, mitigating strategy of land clearing, and adoption of new and sustainable methods of forest and land clearing for plantation and agriculture purposes. Such practices can lead to sustainable forest management while promoting better human health and wellbeing.

3.5 Way forward

In most countries across Asia, forest policies continue to place particular emphasis on policy formulation, with limited efforts being put into monitoring and evaluation of their efficacy, especially in terms of health and wellbeing, following its adoption[47]. To guarantee a more responsive policy development process, which fully integrates the health and wellbeing benefits of forests, it is essential to extend the focus beyond policy formulation and emphasise monitoring and evaluating (e.g., through accountability studies) and establish an appropriate feedback mechanism. Genuine reform in the policy process must be associated with a corresponding shift in power. Modifying the processes and mechanisms into a more dynamic, responsive, and integrative policy system requires equitable distribution of power, with a focus on marginalised groups including IPLCs. Efforts need to be made to enhance equitable access to forest health and wellbeing benefits for all urban, rural, and forest-dependent communities across Asia.

46 Bhowmik et al., 2022

47 Pulhin, 2002

4. KEY MESSAGES AND KNOWLEDGE GAPS

4.1 Introduction

This Policy Brief has highlighted the importance of forests, trees and green spaces for human health and wellbeing in diverse settings and communities across Asia.

Several parts of Asia are currently global hotbeds for urbanisation, which can generate both opportunities and challenges. Unsustainable urbanisation could result in the degradation of natural environments, disconnection from nature, higher exposure to environmental hazards (e.g., air pollution, noise, and heat), and stressful and sedentary lifestyles, among others. All these challenges could adversely affect the mental and physical health and wellbeing of humans and, at the same time, contribute to the ongoing global environmental changes.

The global burden of disease has been shifting: non-communicable diseases, including mental health problems, are on the rise, while the same can be said for zoonotic diseases, as illustrated by the recent COVID-19 pandemic[48]. In many instances, health challenges are directly or indirectly related to disturbed relations between people and forests or nature more generally. This is the case in many regions and countries in Asia as well, for example, in tropical rainforest areas. Logging, forest degradation, and forest fragmentation associated with large-scale agriculture can create a launch pad for novel human viruses through altering the habitats of disease reservoirs and vectors and increasing the likelihood of human contact with them. Restoring forests and developing urban forests and green spaces could mitigate the aforementioned adverse effects on humans and the planet.

This Policy Brief has taken a broad view of forest-health relations, defining health in a comprehensive way, and looking at forests, trees outside forests, and other green spaces. Based on the available evidence, forests and trees affect our physical, mental, and social health and wellbeing in multiple ways through a range of direct and indirect pathways. Research has identified proven health benefits of forests for all human life stages, from the prenatal stage to the elderly.

Countries in Asia face a wide range of challenges and transformations, including public health challenges and shifts in the burden of disease. Urban populations are growing, but rural and forest-dependent populations are still very large. While some countries have very young populations (e.g., in the Middle East), others face ageing and declining populations, which puts additional pressure on healthcare systems. Similarly, while some countries in Asia are experiencing the epidemiological transition from communicable diseases to NCDs, others have already passed this transition. These shifts and local contexts need to be accounted for when designing and implementing response options, from governance to planning, and from design and management to education, for promoting positive health and wellbeing effects of forests and reducing negative ones.

48 The Lancet, 2019

4.2 Key messages

Key message 1
Forests, trees and green spaces impact human health and wellbeing across all life stages

Forests, trees and green spaces affect human health at all stages of life, from the prenatal period to the elderly. Existing evidence strongly supports a wide range of health and wellbeing benefits associated with forests, including pregnancy outcomes, neurodevelopment in children, mental health and cardiometabolic health in adults, and mental health, cognitive ageing, and longevity in the elderly. Forests and trees are also crucial in enhancing social interactions and social health during all life stages. In large parts of Asia, medicinal plants derived from forests (and other ecosystems) are vital components of human wellbeing at all life stages, as they provide primary healthcare to more than 70% of the world's population.

Decision-makers from different sectors and at different levels, from the local to the global, and especially those concerned with forests, land use, and human health, need access to the latest knowledge on forest-health links at different life stages to effectively integrate the benefits of forests and trees to human health and wellbeing in their strategies and policies. Although forests and trees impact human health across all life stages, the significant impacts on children (including prenatal and early postnatal life), mainly because of repercussions in later life, need to be noted and addressed in decisions. Childhood is a window of opportunity to prevent diseases, shape behaviour, and promote health with lifelong impacts. The wide variation in the age of populations across Asia calls for context-specific health interventions to promote healthy ageing, also including forests and trees as spaces for providing healthcare. A sound understanding of the complex relationships between forests and human health will allow necessary forest conservation and tailored management practices that optimises health benefits across all life stages.

Key message 2
Positive health and wellbeing effects of forests, trees and green spaces significantly outweigh negative ones

Forests, trees and green spaces have a predominantly positive impact on various health outcomes, ranging from mental health and wellbeing and reduced cardiovascular events to an overall reduction in mortality and morbidity. Evidence of beneficial association is stronger for some outcomes, such as mental health, than others, such as cancers. For some health outcomes the evidence is mixed as forests and trees can also sometimes affect human health negatively through zoonotic and infectious diseases, reduced air quality because of forest fires, respiratory and allergic outcomes due to producing pollens, and human-wildlife conflict. These negative impacts, all of which of high relevance to Asia, primarily result from disturbed forest-people relationships, including poor conservation and management practices and wrong choice of tree species in residential areas.

It is clear, however, that the positive health outcomes from interactions with forests and trees far outweigh the negative impacts. It is crucial that decision-makers in Asia in both forests and health sectors understand the contexts that result in positive health and wellbeing impacts and their extent to ensure that policies and strategies effectively secure and enhance them. Adverse effects prevalent in Asia, such as exposure to zoonotic diseases and forest fires, need to be managed and minimised through policies that sustainably manage forests and promote healthy

forest-people relationships. Vulnerable populations, including forest-dependent communities and the urban poor, who are more significantly affected, need to be carefully considered in forest and health policies.

Key message 3
The health outcomes of forests are the result of several pathways that are dependent on context and individual lifestyles

Forests and trees affect human health and wellbeing through multiple pathways dependent on the specificities of forests and communities. While all population groups may depend on forests for health to a certain extent, the intensity, pathways, and health outcomes depend on context and individual lifestyles. Health outcomes of forests and trees differ between urban, rural, and forest-dependent communities, all important for Asia. The continent has seen large-scale transitions, such as a population shift from rural to urban areas. Differences also exist between different countries and regions across Asia. Health outcomes related to forests differ between Low- and Middle-Income Countries (LMICs) and High-Income Countries (HICs), for example, due to differences in major health issues and the available resources to address them as well as contextual differences in the use of green spaces and forests. The association between forests and human health also varies across age, income, gender, ethnicity, and culture. In Asia, it is important to give due attention to IPLCs (481-579 million people) as well as other marginalised and vulnerable populations. Similarly, the proximity and accessibility of forests, their density and size, diversity in terms of structure and type, and the biodiversity they host all affect the health outcomes of forests.

Policies and initiatives that aim to promote the positive health and wellbeing effects of forests and trees should recognise these differences and adjust to the specific contexts, lifestyles, cultures, and demographics of the target groups while considering promoting health equality. Response options should be based on an understanding of the attributes and characteristics of forests that affect their health impacts. Efforts are needed to promote synergies and minimise trade-offs between different uses of forests for optimal health outcomes. Armed with this information, decision-makers can better tailor policies to different communities and promote opportunities for vulnerable populations and disadvantaged neighbourhoods to benefit from forests and trees.

Key message 4
Forest-health relations offer solutions to global and regional crises

Forest-health relations can provide solutions for tackling global and regional health and other crises, notably pandemics (such as SARS and COVID-19, which all had major impacts on Asia). Global crises such as climate change, land-use change, and biodiversity loss are all strongly present in Asia as well, endangering the critical role that forests and trees provide as 'safety nets' for vulnerable populations. The impacts of climate change on forests are many, including increasing degradation and forest fires, which can reduce ecosystem services and adversely impact human health and wellbeing. At the same time, forests and trees provide measures to not only mitigate climate change but also adapt to its negative health impacts. In Asia's rapidly growing megacities and other urban areas, green spaces and trees can contribute substantially to cooling infrastructure and humans during heat waves. However, in informal urban settlements and other urban areas where vulnerable populations live, the presence of trees and

green spaces is often very low. Similarly, biodiversity loss can gravely affect food security and availability of medicinal plants, particularly for forest-dependent communities.

Sustainable management of forests and trees can not only help in recovering from the COVID-19 pandemic and combatting the biodiversity crisis but can also prevent the next pandemic. This will require recognising the value and crucial role of forests in building inclusive, resilient, equitable, and sustainable economies. While forests are an important component of climate change and biodiversity policies, there is a lack of awareness in Asia and elsewhere of the complex and vital relationship between forests and human health and wellbeing. Decision-makers need to include forests and human health relationships in relevant policies urgently as the various global and regional challenges continue affecting both these sectors. Understanding and addressing the underlying causes of increasing exposure to zoonotic diseases – namely disturbed forest-people relations – can help to prevent the emergence of such pandemics in the future.

Key message 5
Integrative and cross-sectoral approaches need to be adopted to improve the forest-health link

Public health has been historically human-centric. In recent years, new integrative approaches such as the One Health, Planetary Health, and EcoHealth frameworks, which consider the nature-human relation more inclusively, have been developed and have also found some initial application in Asia. These frameworks stress the importance of considering human health and wellbeing along with the health of other beings, ecosystems, and the whole planet, which could also improve the understanding of the human-forest link and help design more integrative solutions. As healthcare shifts its focus to more holistic approaches, including preventing ill health, linking health and environment, universal health coverage, and building resilience, along with curing illness, forest policies also need to recognise their essential interlinkages and consider health outcomes as one of the key aspects of forest and tree management. Asia can be considered a cradle of more integrative and close-to-nature healthcare, which provides a strong foundation for adopting new frameworks. At the same time, forest-health interactions offer an opportunity to broaden the solution space in policy, practice, and stewardship, both for forest and healthcare management.

Decision-makers in both forest and health sectors as well as related domains should adopt more integrated approaches such as the One Health framework, which can lead to better consideration of forests and health relationships and design holistic solutions. Cross-sectoral policies and initiatives that combine the efforts of health, forestry, and climate change domains, as well as other related sectors, can promote positive health and wellbeing impacts of forests and trees while mitigating the negative ones in a meaningful, impactful, efficient, and equitable manner. Better consideration of health impacts can also result in increased preservation and multi-targeted management of forests, trees and green spaces. Raising awareness and collaborative approaches between government, market, and civil society actors are crucial to realise and utilise the health benefits of forests.

4.3 Knowledge gaps

Although the evidence base on forest-human health outcomes has been increasing, major research and knowledge gaps still exist. So far, most research has taken place in urban areas (and major cities in particular) in high-income countries, resulting in a skewed evidence base. While countries like China, South Korea, and Japan are established as regional leaders in this field of research, there are still major knowledge gaps, especially pertaining to LMICs and rural and forest-dependent communities. Evidence and data from LMICs which host a large population of rural and forest-dependent communities, are insufficient. A comprehensive understanding of the interlinkages between forests and human health and wellbeing in varied contexts is crucial to design and tailor integrative solutions that optimise synergies and minimise trade-offs. New cross-sectoral research from understudied areas, populations, and topics may provide solutions to enhance the health of humans, other species, and the whole planet. Researchers working in the context of Asia can make important contributions to addressing global forest-health relations as well. This will require targeted research funding – which is still lacking for most topics at the time.

Key research priorities include developing research infrastructures and conducting cross-disciplinary studies on the health and wellbeing effects of forests and trees in different parts of Asia, so that findings are relevant to regional and local contexts. Stakeholders and researchers working in Asia can contribute to the global body of evidence on forest-human health relations with topics such as forest-based therapy, medicinal plants, rural livelihoods, or prevention of zoonotic diseases, for example. Another key priority is the need to study different populations and contexts to reflect Asia's rich diversity. Although urban contexts are becoming increasingly important, the continent will continue to host large rural and forest-dependent populations. Moreover, there is a need for more studies on the long-term effects of forests and trees on physical health, particularly NCDs that have become the major contributor to the burden of diseases in Asia.

Sound monitoring, valuation, assessment, and sharing of health benefits (and costs) are essential aspects of decision-making and need to be strengthened. In Asia, relatively few assessments on forest-health interlinkages have been conducted to date, although the topics of medicinal plants and other non-wood forest products as well as 'forest bathing' have been given attention. Moreover, the scope of forest-health research needs to be broadened, focusing on cross-sectoral research and policies. Exchange of information and lessons learned among countries with comparable contexts and resources can provide collective inspiration and show the way forward to address the complex forest-human health relations. Finally, the science-policy interface at the national, subnational, regional, and local levels for forests and human health relations must be strengthened to ensure evidence-driven and informed decisions at all levels.

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