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DEVELOPING AN APPROACH FOR ASSESSING URBAN BLUE-GREEN SPACES TOWARDS SUSTAINABLE URBAN GROWTH THROUGH RETROSPECTIVE CYBER METRICS ANALYSIS OF OPERATIONAL ESTIMATIONS APPROACHES

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ABSTRACT

Urban blue-green spaces provide us abundant social, environmental, and economic benefits, but the disparities often exist in their distribution and accessibility. Traditionally urban blue-green spaces are a consolidation of "blue-green infrastructure" within urban areas. Several urban features like parks, forests, gardens, visible water, such as parks, rivers, canals, reservoirs, ponds, lakes, fountains, etc. are categorized or considered under the blue-green spaces and these are very much crucial for various urban ecosystem services. These play a significant role for all stakeholders of the urban community. Thus, everyone must ensure the equitable number of blue-green spaces for all. Recently, several rules and regulations towards the safeguarding of urban blue-green spaces have been outlined. The work presents a methodological framework to develop an approach towards sustainable urban growth with the help of urban blue-green spaces assessments. The current work has attempted to examine the linkage between issues of the urban blue-green spaces for restoring the required infrastructures. It can be utilised for all sustainable urban development for urban planning and design projects to play a pivotal role. The work emphasizes more to develop a methodological framework to analyze the urban blue-green spaces for augmentation with a theoretical framework. It is expected that the advancement of a problem cum objectives-driven approach will help to design an impact-driven approach for planned and concrete action.

Keywords: Assessment, Blue-Green Space, Supervised classification, High Resolutions, Remote Sensing & GIS, Geostatistics.

INTRODUCTION

Environmental sustainability has become one vital component of sustainable urbanization. It creates motivation for developing a versatile methodological approach for assessing urban blue-green for better analysis of any region with the help of advancing remote sensing and GIS methods due to adversities that occurred due to several environmentally sustainable activities, it is essential to evaluate the urban blue-green spaces. It is crucial to design a yardstick or scale to measure the amount of degradation that happened due to any urbanization activity. Also, it is required to assess the amount of degradation to estimate the contribution of influencing factors with the help of multiple sources. Several well-established procedures to improve the analysis are expected for better visualization of urban blue-green spaces. Earlier attempts at the formulation of theoretical concepts were limited to the internal and external factors of sustainable urban growth. These studies attempt to promote sustainable development for sound decisions with an emphasis on assessment, management and monitoring in various scenarios. The current work also tries to propose some methodological framework for addressing the issues to support future development issues. Apart from these, certain standards are expected to be fulfilled to bring out a better framework for constant expansion. These will effectively lead to the environmental quality assessment by integrating various variables obtained from various parameters. These help in improvising the state of any urban area. These may be an effective way of conveying and addressing the issues information for a manageable quantitative or qualitative analysis to encapsulate large or complex sets. Both quantitative and qualitative indicators will express the essential features with precise detail. The measurement, processing, and dissemination of information act as an integral feedback loop within management systems to achieve aims and objectives of reasonable development (Thomas *et al*., 2007). These measurements can provide information on the capacity of the system to deliver improved performance for facilitating intervention on change of key system parameters (Sudhira *et al*., 2004). However, it is the key requirement to identify the gap between approach and a coherent effective management system to addresses the absence of linkages between the increasing literature for urban development concerning theoretical for suggesting a conceptual and practical approach for creating a bridge between them with the management tool (Krajnc & Glavič, 2005). The main aim of this study is to develop a robust method with the help of reviewing the literature to identify the research areas with their methodology with context to urban blue-green space management. Beyond these, it is expected to report the prominent idea in the mentioned research domain to develop the best research techniques. This scientific review will also help to develop a conceptual framework for the research gap. Subsequently, the research questions have been formulated to accomplish the research problem including (a) trends of publications from 1995 to 2021 in the domain, (b) popular journal or research theme by the researchers in the domain, (c) major research organization, countries, research group supporting the research, (d) extent of research accomplishment, and (e) more impactful keywords in line to the research theme.

In addition, the demands of several stakeholders are also addressed with the key objective like (a) supply of information related to urban problems to assist policymakers in prioritizing their major issues, (b) assistance towards policy development for optimal utilization of resources, and (c) effective monitoring of policy responses towards urban resources. Several methods fail in the case of the urban environment, due to the absence of the feedback and/or feedforward system to adjust technological and managerial parameters as part of the process to accommodate continuous improvement (Schowengerdt, 2012). Considering the above-argued instances into consideration, now it is essential to develop or design an approach to address the issues of different urban scenarios. These may be useful to provide an approach for better urban management. The current work focus on evaluation for the retrospective cyber metrics analysis of the research documents keyword analysis and number of citations to evaluate the recent trends urban blue-green spaces estimations to suggest a viable operational method for the domain of urban blue-green spaces estimations

LITERATURE REVIEW

There is a requirement to understand the recent trends of ongoing researches in the domain of urban blue-green spaces. This requires a comprehensive retrospective cyber metrics analysis of the published documents in the Scopus database intended to fill this gap in the research. It requires a wider range of keywords (discussed in depth in the methodology section) for trailing this analysis. The scope of this study includes all academic resources comprising the articles, conference papers, books, book chapters, etc. being published. The study considers both quantitative and qualitative dimensions of the mentioned theme research with the number of publications as well as analysis of productivity of papers. The current study intends for the retrospective cyber metrics analysis to evaluate and identify the recent publishing trends and patterns in the said theme (as reported in table 1) during the year 1995 to 2021.

Prominent research as per Scopus database during 1995-2021

The current research is being accomplished with screened research documents published during 1995-2021 and these are indexed in the Scopus database to recognize significant research contributions or publications in the domain. This study surveyed only the research documents registered in the Scopus database to ascertain better quality research documents and to provide credible information about the research. The exhaustive summary of the literature review has been reported in Table 1, first column summarizes author details with year and the second column reports theme and the title of significant research contribution related to *"Urban Blue-Green Spaces"* while screening the Scopus database. Table 1 reports research contributions from 1995 to 2021 captured from the SCOPUS database. The mentioned table provides an overview of contributions in the field of research related to urban blue-green spaces by various authors over two decades. The majority of the researchers have focussed on an urban green cover area comprising of vegetation cover, urban forest cover, park, shrubs whereas and urban blue cover areas enclose urban water bodies, ponds, reservoirs, rivers. Among these, only a limited number of researchers have performed any specific modelling for urban areas.

Table 1: Summary of significant research contribution with their author details and theme

Authors & Year	Title
(Barber *et al.*, 2021)	Permeability of the city – Physical barriers of and in urban green spaces in the city of Halle, Germany
(Astell-Burt & Feng, 2021)	Time for 'green' during covid-19? Inequities in green and blue space access, visitation and felt benefits
(Tuofu *et al.*, 2021)	Evaluating the Impact of Urban Blue Space Accessibility on Housing Price: A Spatial Quantile Regression Approach Applied in Changsha, China
(Misagh Mottaghi *et al.*, 2021)	Blue-green playscapes: Exploring children's places in stormwater spaces in augustenborg, malmö

(Paciência *et al*., 2021)	Neighbourhood green and blue spaces and allergic sensitization in children: A longitudinal study based on repeated measures from the Generation XXI cohort
(Zhifeng & Yin, 2021)	The influence of greenspace characteristics and building configuration on depression in the elderly
(Hermanski *et al*., 2021)	The effects of blue spaces on mental health and associated biomarkers
(Balbi *et al*., 2021)	Least-cost path analysis for urban greenways planning: A test with moths and birds across two habitats and two cities
(Fisher *et al*., 2021)	Perceived biodiversity, sound, naturalness and safety enhance the restorative quality and wellbeing benefits of green and blue space in a neotropical city
(Lehnert *et al*., 2021)	The role of blue and green infrastructure in thermal sensation in public urban areas: A case study of summer days in four Czech cities
(Suleiman, 2021)	Blue green infrastructure, from niche to mainstream: Challenges and opportunities for planning in Stockholm
(Rosenberger *et al.*, 2021)	Sustainable stormwater management under the impact of climate change and urban densification
(Wright *et al*., 2021)	Addressing the water–energy–food nexus through enhanced green roof performance
(Dushkova *et al*., 2021)	Human dimensions of urban blue and green infrastructure during a pandemic. Case study of Moscow (Russia) and Perth (Australia)
(C. Lin & Wu, 2021)	Green and blue space availability and self-rated health among seniors in China: Evidence from a national survey
(Y.-T. Wu *et al*., 2021)	Perceived and objective availability of green and blue spaces and quality of life in people with dementia: results from the IDEAL programme
(C.-B. Yang *et al*., 2021)	Spatial-temporal Characteristics of the Cooling Island for Blue-Green Space and Its Driving Factors in Suzhou, China
(Xie & Li, 2021)	Detecting the cool island effect of urban parks in Wuhan: A city on rivers
(Ye & Qiu, 2021)	Environmental and social benefits, and their coupling coordination in urban wetland parks
(van Heezik *et al*., 2021)	Relationships between childhood experience of nature and green/blue space use, landscape preferences, connection with nature and pro-environmental behavior
(Baró *et al*., 2021)	School greening: Right or privilege? Examining urban nature within and around primary schools through an equity lens
(Calderón-Argelich *et al*., 2021)	Tracing and building up environmental justice considerations in the urban ecosystem service literature: A systematic review
(C. L. Y. Tan *et al.*, 2021)	The right mix: Residential urban green-blue space combinations are correlated with physical exercise in a tropical city-state
(Autelitano *et al*., 2021)	Colorimetric and photometric characterisation of clear and coloured pavements for urban spaces
(Willems *et al*., 2021)	How actors are (dis)integrating policy agendas for multi-functional blue and green infrastructure projects on the ground
(Huang *et al*., 2021)	Urban green space optimization based on a climate health risk

	appraisal – A case study of Beijing city, China
(Amaral *et al.*, 2021)	Environmental injustices on green and blue infrastructure: Urban nexus in a macrometropolitan territory
(Rigolon & Gibson, 2021)	The role of non-governmental organizations in achieving environmental justice for green and blue spaces
(McDougall *et al*., 2021)	Neighbourhood blue space and mental health: A nationwide ecological study of antidepressant medication prescribed to older adults
(X. Tan *et al*., 2021)	Comparison of cooling effect between green space and water body
(de Macedo *et al*., 2021)	Urban green and blue infrastructure: A critical analysis of research on developing countries
(W. Peng *et al*., 2021)	Assessment of urban cooling effect based on downscaled land surface temperature: A case study for Fukuoka, Japan
(Dai *et al.*, 2021)	Assessing the ecological balance between supply and demand of blue-green infrastructure
(Fletcher *et al*., 2021)	Using demand mapping to assess the benefits of urban green and blue space in cities from four continents
(de Manuel *et al*., 2021)	A new indicator of the effectiveness of urban green infrastructure based on ecosystem services assessment
(Bellezoni *et al*., 2021)	Understanding and conceptualizing how urban green and blue infrastructure affects the food, water, and energy nexus: A synthesis of the literature
(Su *et al*., 2021)	Cooling effect of urban green and blue infrastructure: A systematic review of empirical evidence
(Kajosaari & Pasanen, 2021)	Restorative benefits of everyday green exercise: A spatial approach
(Bedla *et al*., 2021)	Hydromorphological method and gis tools with a web application to assess a semi-natural urbanised river
(Qiu *et al*., 2021)	The effects of urban natural environments on preference and self-reported psychological restoration of the elderly
(Yen *et al*., 2021)	Green and blue physical activity for quality of life: A systematic review and meta-analysis of randomized control trials
(Freeman *et al*., 2021)	Nature exposure and use of open spaces in three generation families: implications for planning
(Jia et al., 2020)	Exploring spatial parameters to evaluate human walking accessibility of urban green space
(Yu et al., 2020)	Critical review on the cooling effect of urban blue-green space: A threshold-size perspective
(Misagh Mottaghi *et al.*, 2020)	Blue-green solutions and everyday ethicalities: Affordances and matters of concern in Augustenborg, Malmö
(Ustaoglu & Aydınoglu, 2020)	Site suitability analysis for green space development of Pendik district (Turkey)
(Heery *et al.*, 2020)	Evaluating seaweed farming as an eco-engineering strategy for ‘blue’ shoreline infrastructure
(Teubner *et al*., 2020)	New Emphasis on Water Transparency as Socio-Ecological Indicator for Urban Water: Bridging Ecosystem Service Supply and Sustainable Ecosystem Health

(Hamann *et al*., 2020)	Valuing the Multiple Benefits of Blue-Green Infrastructure for a Swedish Case Study: Contrasting the Economic Assessment Tools B£ST and TEEB
(Lembi *et al*., 2020)	Urban expansion in the atlantic forest: Applying the nature futures framework to develop a conceptual model and future scenarios [Expansão urbana na mata atlântica: Aplicando o “nature futures framework” para desenvolver um modelo conceitual e cenários futuros]
(Budoni & Ricci, 2020)	Green and blue infrastructures as the structure of a bioregion: The case of the Pontina bioregion
(Xiu *et al.*, 2020)	Applying a socio-ecological green network framework to Xi’an City, China
(Fung & Jim, 2020)	Influence of blue infrastructure on lawn thermal microclimate in a subtropical green space
(B Mu & Li, 2020)	Research on sustainable development of urban green infrastructure based on social ecosystem framework
(Haoying Wang *et al*., 2020)	Distribution of urban blue and green space in beijing and its influence factors
(Mishra *et al*., 2020)	The development of a tool for assessing the environmental qualities of urban blue spaces
(Wan *et al*., 2020)	Research on color space perceptions and restorative effects of blue space based on color psychology: Examination of the yijie district of dujiangyan city as an example
(Y. Lin *et al*., 2020)	Water as an urban heat sink: Blue infrastructure alleviates urban heat island effect in mega-city agglomeration
(Tieges *et al*., 2020)	The impact of regeneration and climate adaptations of urban green–blue assets on all-cause mortality: A 17-year longitudinal study
(Labib *et al*., 2020)	Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review
(Akaraci *et al*., 2020)	A systematic review and meta-analysis of associations between green and blue spaces and birth outcomes
(Hu & Li, 2020)	Greenspace, bluespace, and their interactive influence on urban thermal environments
(Shi *et al*., 2020)	Synergistic cooling effects (SCEs) of urban green-blue spaces on local thermal environment: A case study in Chongqing, China
(Baravikova, 2020)	The uptake of new concepts in urban greening: Insights from Poland
(Kozak *et al*., 2020)	Blue-green infrastructure (BGI) in dense urban watersheds. The case of the Medrano stream basin (MSB) in Buenos Aires
(Jayakody, 2020)	Application of Principle of Network Connectivity in Creation of Sustainable Urban Form: Case of Negombo Water Fronts
(J. Wu *et al*., 2020)	Interaction analysis of urban blue-green space and built-up area based on coupling model-A case study of Wuhan Central City
(Kronenberg *et al*., 2020)	Environmental justice in the context of urban green space availability, accessibility, and attractiveness in postsocialist cities
(Alejandre & Lynch, 2020)	“Kids Get in Shape with Nature”: A Systematic Review Exploring the Impact of Green Spaces on Childhood Obesity
(G. Yang *et al*., 2020)	How can urban blue-green space be planned for climate adaption in

	high-latitude cities? A seasonal perspective
(Avashia & Garg, 2020)	Implications of land use transitions and climate change on local flooding in urban areas: An assessment of 42 Indian cities
(Mulligan *et al*., 2020)	Hybrid infrastructures, hybrid governance: New evidence from Nairobi (Kenya) on green-blue-grey infrastructure in informal settlements: “Urban hydroclimatic risks in the 21st century: Integrating engineering, natural, physical and social sciences to build resilience”
(Denipitiya & Udalamaththa, 2020)	Multifunctional Landscapes for Urban Flood Management – A Study with Reference to the Kotte Wetland
(Cheng & Wu, 2020)	Planning approach of urban blue-green space based on local climate optimization: A review
(Kuhlemann *et al.*, 2020)	Urban water systems under climate stress: An isotopic perspective from Berlin, Germany
(Hefei Wang & Pei, 2020)	Urban green corridors analysis for a rapid urbanization city exemplified in Gaoyou City, Jiangsu
(Kulczyk *et al.*, 2020)	Challenges to Urban gastronomy: Green and blue spaces
(H Nouri *et al*., 2020)	Effect of spatial resolution of satellite images on estimating the greenness and evapotranspiration of urban green spaces
(Alves *et al*., 2020)	Exploring trade-offs among the multiple benefits of green-blue-grey infrastructure for urban flood mitigation
(Wikantiyoso *et al*., 2020)	Green city MIS as a sustainable urban GOS provision control implementation model: Case Study: The GOS provision in the Brantas riverbanks revitalization, Malang City, Indonesia
(Bo Mu *et al*., 2020)	Conceptual planning of urban-rural green space from a multidimensional perspective: A case study of zhengzhou, China
(Monteiro *et al*., 2020)	Green infrastructure planning principles: An integrated literature review
(Augusto *et al*., 2020)	Short and medium- to long-term impacts of nature-based solutions on urban heat
(X. Yang *et al*., 2020)	A visible-band remote sensing index for extracting impervious surfaces
(Dawson *et al*., 2020)	A spatial framework to explore needs and opportunities for interoperable urban flood management
(Côté-Lussier *et al*., 2020)	A novel low-cost method for assessing intra-urban variation in night time light and applications to public health
(Kwak *et al.*, 2020)	Discerning the success of sustainable planning: A comparative analysis of urban heat island dynamics in Korean new towns
(J. Peng *et al*., 2020)	How to effectively mitigate urban heat island effect? A perspective of waterbody patch size threshold
(Subiza-Pérez *et al.*, 2019)	Perceived Environmental Aesthetic Qualities Scale (PEAQS) – A self-report tool for the evaluation of green-blue spaces
(Garau & Annunziata, 2019)	Smart city governance and children's agency: An assessment of the green infrastructure impact on children's activities in Cagliari (Italy) with the tool "Opportunities for Children in Urban Spaces (OCUS)"
(Andreucci *et al*., 2019)	Designing urban green blue infrastructure for mental health and

	elderly wellbeing
(Targino *et al*., 2019)	Green or blue spaces? Assessment of the effectiveness and costs to mitigate the urban heat island in a Latin American city
(Cui *et al*., 2019)	Comprehensive land carrying capacities of the Cities in the Shandong Peninsula blue economic zone and their spatio-temporal variations
(Cronin-de-Chavez *et al*., 2019)	Not a level playing field: A qualitative study exploring structural, community and individual determinants of greenspace use amongst low-income multi-ethnic families
(Du *et al*., 2019)	Urban blue-green space planning based on thermal environment simulation: A case study of Shanghai, China
(Hamideh Nouri *et al*., 2019)	The blue water footprint of urban green spaces: An example for Adelaide, Australia
(Liang *et al*., 2019)	Research on design method for the blue-Green ecological network system to deal with urban flooding: A case study of Charleston peninsula
(Ahmed *et al*., 2019)	Designing a Blue-Green Infrastructure (BGI) network: Toward water-sensitive urban growth planning in Dhaka, Bangladesh
(L. Liu *et al*., 2019)	Blue-green infrastructure for sustainable urban stormwater management-lessons from six municipality-led pilot projects in Beijing and Copenhagen
(Kabisch *et al*., 2019)	Urban natural environments and motor development in early life
(Zari, 2019)	Devising urban biodiversity habitat provision goals: Ecosystem services analysis
(Rall *et al*., 2019)	The added value of public participation GIS (PPGIS)for urban green infrastructure planning
(Alves *et al*., 2019)	Assessing the Co-Benefits of green-blue-grey infrastructure for sustainable urban flood risk management
(Hansen *et al*., 2019)	Planning multifunctional green infrastructure for compact cities: What is the state of practice?
(Childers *et al*., 2019)	Urban ecological infrastructure: An inclusive concept for the non-built urban environment
(Kopp & Preis, 2019)	The potential implementation of stormwater retention ponds into the blue-green infrastructure of the suburban landscape of pilsen, czechia
(Little & Akese, 2019)	Centering the Korle Lagoon: Exploring blue political ecologies of E-Waste in Ghana
(Bolte *et al*., 2019)	Can you see green or blue? on the necessity of visibility analysis of urban open spaces using Remote Sensing techniques and Geographic Information Systems
(Zhang *et al*., 2019)	Effectiveness of aerial and ISERV-ISS RGB photos for real-time urban floodwater mapping: Case of Calgary 2013 flood
(Nieuwenhuijsen *et al*., 2018)	Air pollution, noise, blue space, and green space and premature mortality in Barcelona: A mega cohort
(Dzhambov, 2018)	Residential green and blue space associated with better mental health: A pilot follow-up study in university students
(Singh, 2018)	Urban green space availability in Bathinda City, India

(Russo & Cirella, 2018)	Modern compact cities: How much greenery do we need?
(Boers *et al.*, 2018)	Does residential green and blue space promote recovery in psychotic disorders? A cross-sectional study in the Province of Utrecht, the Netherlands
(Völker *et al.*, 2018)	Do perceived walking distance to and use of urban blue spaces affect self-reported physical and mental health?
(Vaeztavakoli *et al.*, 2018)	Blue and green spaces as therapeutic landscapes: Health effects of urban water canal areas of Isfahan
(D. Wu *et al.*, 2018)	Thermal environment effects and interactions of reservoirs and forests as urban blue-green infrastructures
(Iojă *et al.*, 2018)	Integrating urban blue and green areas based on historical evidence
(Masseroni *et al.*, 2018)	Exploring the performances of a new integrated approach of grey, green and blue infrastructures for combined sewer overflows remediation in high-density Urban areas
(Petrashen *et al.*, 2018)	Destructive landscapes in the context of public urban space: Issues of rehabilitation, adaptation and integration
(Mukherjee & Takara, 2018)	Urban green space as a countermeasure to increasing urban risk and the UGS-3CC resilience framework
(Couper, 2018)	The embodied spatialities of being in nature: Encountering the nature/culture binary in green/blue space
(Thiis *et al.*, 2018)	Classification of urban blue green structures with aerial measurements
(Fenner, 2017)	Spatial evaluation of multiple benefits to encourage multi-functional design of sustainable drainage in Blue-Green cities
(Abelt & McLafferty, 2017)	Green streets: Urban green and birth outcomes
(Rosas-Lusett *et al.*, 2017)	Green spaces, proposal for the improvement of the climate in tropical cities
(Laatikainen *et al.*, 2017)	PPGIS approach for defining multimodal travel thresholds: Accessibility of popular recreation environments by the water
(Kabisch *et al.*, 2017)	The health benefits of nature-based solutions to urbanization challenges for children and the elderly – A systematic review
(Y. Liu *et al.*, 2017)	Diversification of land surface temperature change under urban landscape renewal: A case study in the main city of Shenzhen, China
(Roebeling *et al.*, 2017)	Assessing the socio-economic impacts of green/blue space, urban residential and road infrastructure projects in the Confluence (Lyon): a hedonic pricing simulation approach
(Stepniewska & Sobczak, 2017)	Assessing the synergies and trade-offs between ecosystem services provided by urban floodplains: The case of the Warta River Valley in Poznań, Poland
(Haeffner *et al.*, 2017)	"Blue" space accessibility and interactions: Socio-economic status, race, and urban waterways in Northern Utah
(O'Donnell *et al.*, 2017)	Recognising barriers to implementation of Blue-Green Infrastructure: a Newcastle case study
(Wong & Jim, 2017)	Urban-microclimate effect on vector mosquito abundance of tropical green roofs
(Masullo et al., 2017)	An alternative noise mitigation strategy in urban green park: A

	laboratory experiment
(Chowdhury *et al*., 2017)	Examining the effect of the physical characteristics of the urban green & blue spaces in heat mitigation: A case study of Pune
(Davis *et al*., 2016)	Combined vegetation volume and "greenness" affect urban air temperature
(M Mottaghi *et al*., 2016)	Integrated urban design and open storm drainage in our urban environments: Merging drainage techniques into our city's urban spaces
(Raymond *et al*., 2016)	Integrating multiple elements of environmental justice into urban blue space planning using public participation geographic information systems
(Nutsford *et al.*, 2016)	Residential exposure to visible blue space (but not green space) associated with lower psychological distress in a capital city
(Xiu *et al*., 2016)	The challenges of planning and designing urban green networks in Scandinavian and Chinese cities
(Alshamsi, 2016)	Vegetation extraction from high-resolution satellite imagery using the Normalized Difference Vegetation Index (NDVI)
(Brink *et al*., 2016)	Cascades of green: A review of ecosystem-based adaptation in urban areas
(Wong & Jim, 2016)	Do vegetated rooftops attract more mosquitoes? Monitoring disease vector abundance on urban green roofs
(Zigh *et al*., 2016)	New shadow detection and removal approach to improve neural stereo correspondence of dense urban VHR remote sensing images
(Völker *et al*., 2016)	Determining urban open spaces for health-related appropriations: a qualitative analysis on the significance of blue space
(Ido & Shimrit, 2015)	Blue is the new green - Ecological enhancement of concrete based coastal and marine infrastructure
(Gascon *et al*., 2015)	Mental health benefits of long-term exposure to residential green and blue spaces: A systematic review
(Dreiseit, 2015)	Blue-green social place-making: Infrastructures for sustainable cities
(Sander & Zhao, 2015)	Urban green and blue: Who values what and where?
(Manusset, 2015)	Green space: A new tool of public health policy? [Les espaces verts : Un nouvel outil des politiques de santé publique ?]
(Feng *et al*., 2015)	UAV Remote sensing for urban vegetation mapping using random forest and texture analysis
(Völker & Kistemann, 2015)	Developing the urban blue: Comparative health responses to blue and green urban open spaces in Germany
(Safransky, 2014)	Greening the urban frontier: Race, property, and resettlement in Detroit
(Demuzere *et al*., 2014)	Mitigating and adapting to climate change: multi-functional and multi-scale assessment of green urban infrastructure
(Yakimowich, 2014)	Pipes to parks, integrating green and blue
(Zareba, 2014)	Multifunctional and multiscale aspects of green infrastructure in contemporary research [Multifunkcjonalność zielonej infrastruktury we współczesnych badaniach]
(De Vleeschauwer *et al*., 2014)	Green-blue water in the city: Quantification of impact of source

	control versus end-of-pipe solutions on sewer and river floods
(Völker & Kistemann, 2013)	"I'm always entirely happy when I'm here!" Urban blue enhancing human health and well-being in Cologne and Düsseldorf, Germany
(Völker *et al*., 2013)	Evidence for the temperature-mitigating capacity of urban blue space - A health geographic perspective
(Xu *et al*., 2011)	Green space changes and planning in the capital region of China
(Zhao *et al*., 2011)	Optimization of urban land structure based on ecological green equivalent: A case study in Ningguo City, China
(Zhang *et al*., 2008)	The importance of differentiating urban and rural phenomena in examining the unequal distribution of locally desirable land
(Frischenbruder & Pellegrino, 2006)	Using greenways to reclaim nature in Brazilian cities
(McGuckin & Brown, 1995)	A landscape ecological model for wildlife enhancement of stormwater management practices in urban greenways

Table 1 presents a summary of a total of 165 research papers published in the Scopus indexed databases from 1995 to 2021 within the central theme of urban blue-green space only. Out of the mentioned number of papers, only till now only 42 research papers have been published in the year 2021, 46 papers are published in the year 2020, 21 papers in 2019, 14 papers in 2018, 13 papers in 2017, 10 papers in 2016, 7 papers in 2015, 5 papers in 2014, 2 papers in 2013, 2 papers in 2011, 1 paper in 2008, 1 paper in 2006 and 1 paper published in 1995. This shows an increasing trend in research interest by various research groups in the mentioned research theme. If we go through the recent publications of the year 2021, it is observed that 10 papers are published on an urban green space theme, 5 papers are published on an urban blue space theme, and 23 papers are related to the urban blue-green space theme. Beyond these 4 papers are on another auxiliary theme, out of which one of the researchers has studied urban green and blue space during the COVID period, which reports about the benefit of blue and green. Likewise, In 2020, a total of 17 papers have been published on an urban blue-green theme, where14 papers are on an urban green theme, 12 papers on urban blue theme and 3 papers are published on other keywords. During the years 2006 and 1995, the majority of researches are published only on an urban green theme.

Systematic literature review (SLR) in domain

Method

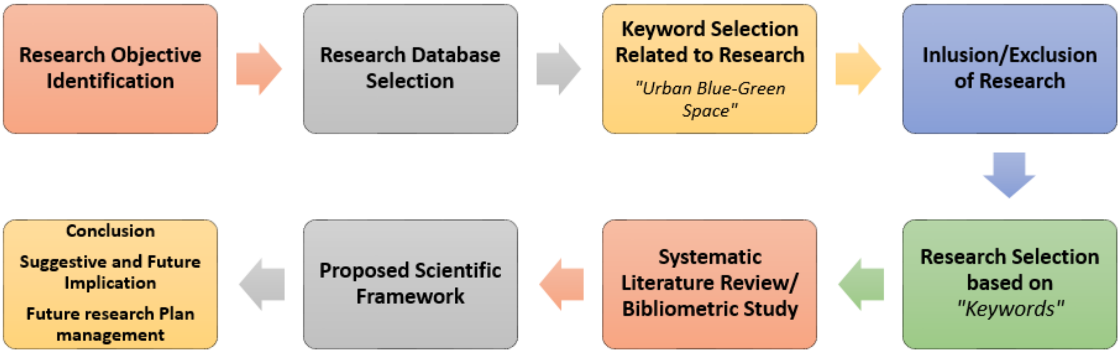
The retrospective cyber metrics analysis method is used to assess and identify the publication inclinations in the mentioned domain. This analysis is a quantitative/statistical technique to evaluate publication trends of research documents including research articles, conference papers, and other scholarly documents.

Database Selection

There are various renowned abstracting/ indexing databases (i.e. like Scopus, WOS) consisting of multidisciplinary research documents, whereas some are subject-specific databases (i.e. MEDLINE, PubMed, AGRICOLA, ERIC). Among these mentioned databases, Scopus and WOS have acknowledged databases across the globe due to the diverse collection of good quality research documents. The current work extracts data from the Scopus database containing quality academic work. The study comprises qualitative and quantitative aspects of the research.

A Systematic Literature Review (SLR) furthermore enhances the capability of reviewing research literature in a more structured manner with the help of keywords, shortlisting criteria, identified subject area, subject type etc. Figure 1 presents the SLR methodology framework being used for performing the study in the mentioned and it can be replicated to various other subject areas.

Fig. 1: Systematic literature review methodology framework



Selection of relevant database for research

Scopus has a wide repository of documents from various disciplines including Environmental Science, Engineering, Earth and Planetary Sciences, Agricultural and Biological Sciences, Computer Science, Social Science and many more areas and it is well-known fact that Scopus to have very broad coverage of database and due to this, it is being utilised for performing the systematic literature review for the present study (Geraldi *et al*., 2011). The Scopus database provides us with the capability to perform the study based on keyword, year, document type and many other features.

Selection of keywords for study with various combinations of "Urban"

Various combinations of keywords are attempted with various combinations of the "Urban" keyword and research documents are being searched with these keywords to track the earlier published documents in the Scopus database. Several combinations of search keywords are used to identify the relevant published research documents in the mentioned research domain. The various combination being used for the search of documents includes: Urban AND "Green Space", Urban AND "Blue Space", Urban AND "Blue-Green Spaces", Urban AND "Blue-Green spaces area", Urban AND "Green space detection", Urban AND "Blue space detection", Urban AND "Blue-Green space detection", Urban AND "Change detection", Urban AND "Blue-Green space assessment", Urban AND "effect on health", and Urban AND "effect on the environment". This mentioned combination of keywords provides a total of 49701 articles from the database. The upcoming section reports the collection of documents being searched with the mentioned keywords.

Collection of articles for Urban Blue-Green Space

Table 2 provide an exhaustive summary of the article collection obtained with the search keywords. Table 2 also provides a summary of different search keyboard combinations along with the corresponding research documents being searched with these combinations selected from the Scopus database. The combination of Urban AND "Green Space" results in 8194 research documents, Urban AND "Blue Space" results in 431 research documents, Urban

AND “Blue-Green Spaces” results in 309 research documents, Urban AND “Blue-Green spaces areas” results in 211 research documents, Urban AND “Green space detection” results in 163 research documents, Urban AND “Blue space detection” results in 18 research documents, Urban AND “Blue-Green space detection” results in 10 research documents, Urban AND “Change detection” results in 3577 research documents, Urban AND “Blue-Green space assessment” results in 9 research documents, Urban AND “effect on health” results in 14584 research documents, and Urban AND “effect on the environment” results in 22195 research documents. There is a total of 49701 research documents being searched with these different keywords phrases. It can be seen that the majority of documents are available with Urban AND “effect on health” with 14584 documents and Urban AND “effect on the environment” with 22195 documents. There are a meagre amount of documents with search keywords consisting of Urban AND “Blue-Green space assessment”, and it results in only 9 research documents, which signifies that there is ample scope for exploring this theme.

Table 2: Search keywords results of significant articles

Search Keywords	Available Articles
Urban AND “Green Space”	8194
Urban AND “Blue Space”	431
Urban AND “Blue-Green Spaces”	309
Urban AND “Blue-Green spaces areas”	211
Urban AND “Green space detection”	163
Urban AND “Blue space detection”	18
Urban AND “Blue-Green space detection”	10
Urban AND “Change detection”	3577
Urban AND “Blue-Green space assessment”	9
Urban AND “effect on health”	14584
Urban AND “effect on environment”	22195
Total	**49701**

Selection of articles and shortlisting (inclusion and exclusion criteria)

The literature reviews performed during the year 1995 to 2021 with the selected keywords are furthermore shorted as per the keyword and their citations. Table 3 narrates the summary of keywords along with the year of published documents and their citations. The table summarises the top 50 research documents as per their citation status. The highest number of citations has been placed at the first position and sequentially others are placed in decreasing order. There are (James, 1992) observed that there are a lot of issues in measuring performance, and converting large amounts of data into useful information for better urban management. As better urban management requires suitable datasets to be analyzed. Usually, problems arise in qualitative (and more subjective) data analysis. Many times, these issues are overlooked. Hence it is a trivial situation to assess the urban blue-green spaces due to the absence of a valid method/approach for assessment. Hence to design robust and scientifically credible methodologies for processing data into indicators may be used as tools for environmental, social and economic management. Several factors and parameters are clubbed together to create a common interest within research, and academia for the improvement of indicators in environmental, social and economic aspects. In this context, prominent work is reported and summarized in Table 1.

Trends of top 50 research citations over years

Table 1 and Table 2 reports the research or studies of research papers being carried out over the past twenty years on urban blue and urban green spaces. According to publication year-wise review includes an exhaustive summary of research citations over the year can be seen in Table 3, which reports the author keyword with their citations as per the SCOPUS database.

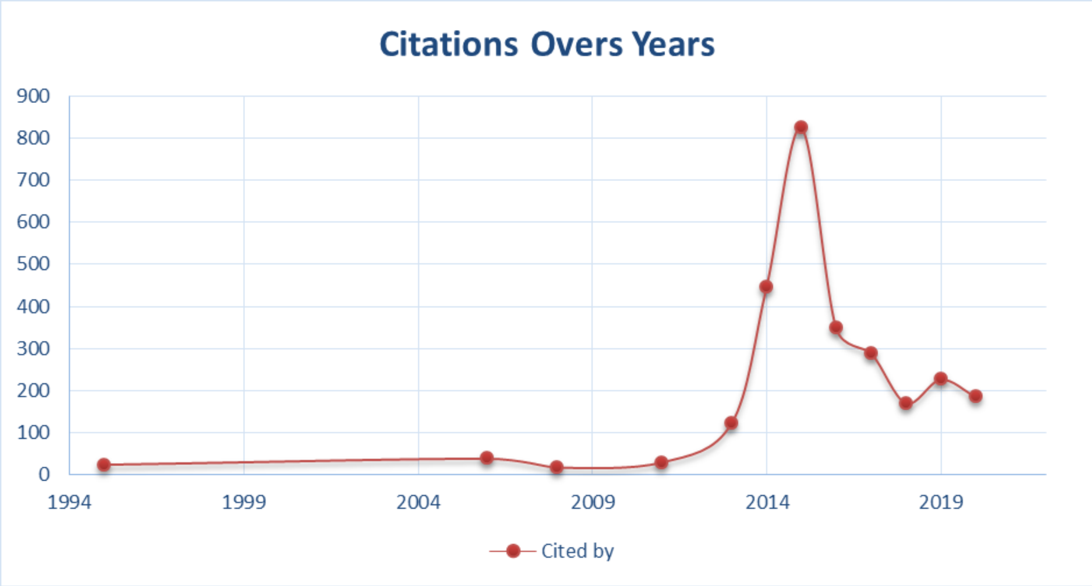
Table 3: Summary of significant Research contribution and their theme

Year	Author Keywords	Source title	Cited by
2015	Blue spaces; Green spaces; Mental health	International Journal of Environmental Research and Public Health	**412**
2014	Biophysical benefit; Climate change; Ecosystem services; Green urban infrastructure; Social benefit; Spatial scale	Journal of Environmental Management	**319**
2015	Random forest; Texture analysis; UAV; Urban landscape; Vegetation mapping	Remote Sensing	**235**
2016	Blue space; Green space; Mental health; Urban planning; Visibility analysis	Health and Place	**122**
2016	Disaster risk reduction; Ecosystem services cascade model; Ecosystem-based management; Green and blue infrastructure; Nature-based solutions; Resilience	Global Environmental Change	**120**
2014	Accumulation by green dispossession; Decolonization; Gentrification; Settler colonialism; Urban greening; Urban political ecology	Geoforum	**109**
2017	Children; Elderly; Health; Nature-based solutions; Urban green space; Urbanization	Environmental Research	**88**
2015	Bio protection; Concrete infrastructure; Ecological enhancement; Ecosystem services; Invasive species	Ecological Engineering	**72**
2017	Flood management; integrated urban water management; SUDS; sustainable urban water management; urban water management; water sensitive urban design	Urban Water Journal	**71**
2013	Cities; Environmental health; Germany; Therapeutic landscape; Urban blue; Urban planning; Water and health; Well-being	Social Science and Medicine	**68**
2019	Densification; Ecological functions; Ecosystem services; Multifunctionality; Urban green space; Urban planning	Ecological Indicators	**63**
2015	Salutogenic health; Therapeutic landscapes; Urban blue space; Urban green space; Well-being	Health and Place	**59**
2019	Co-benefits valuation; Cost-benefits analysis; Decision making; Flood risk management; Green-blue-grey infrastructure; Sustainable urban drainage	Journal of Environmental Management	**57**

2013	Climate change adaption; Environmental health; Heat stress; Temperature mitigation; Urban blue space; Urban heat island; Water bodies	Erdkunde	**54**
2020	Blue space; Epidemiology; Exposure; GIS; Greenspace; Health	Environmental Research	**49**
2018	Biophilic urbanism; Ecosystem services; Edible green infrastructure; Garden cities; Healing Garden design	International Journal of Environmental Research and Public Health	**49**
2015	Economic valuation; Urban environmental amenities; Urban planning; Urban sustainability	Land Use Policy	**46**
2020	Actionable climate planning; Controversy and uncertainty; Threshold size for cooling; Urban blue-green space; Urban cooling effect	Urban Forestry and Urban Greening	**45**
2016	Blue infrastructure; Distributional justice; Green infrastructure; Participatory mapping; Physical accessibility; SoftGIS	Landscape and Urban Planning	**45**
2006	Local authorities; Urban green and blue infrastructure; Urban planning; Urbanization	Landscape and Urban Planning	**38**
2017	Birth outcomes; Blue space; Green space; Greenness; Preterm birth; Small for gestational age; Street trees; Term birthweight; Term low birthweight	International Journal of Environmental Research and Public Health	**33**
2018	Air pollution; Blue space; City; Cohort; Green space; Mortality; Noise	International Journal of Environmental Research and Public Health	**32**
2016	3D; Cook County; LiDAR; NDVI; Nighttime temperature; Urban heat island	Applied Geography	**31**
2019	Citizen involvement; Cultural ecosystem services; Greenspace perceptions; Participatory mapping; Soft GIS; Urban parks	Urban Forestry and Urban Greening	**30**
2017	Benefit intensity; Blue-Green cities; Green infrastructure; Multiple benefits; Sponge cities; Sustainable drainage systems	Water (Switzerland)	**30**
2011	Beijing; Capital circle region; China; Green space; Land changes; Planning	Environmental Management	**29**
2020	Climate adaptation; Seasonal pattern; Threshold value of efficiency; Urban blue-green space; Urban cooling effect; Urban sustainability	Sustainable Cities and Society	**28**
2020	Flood damage reduction; Hybrid drainage infrastructure; Multi-objective optimisation; Multiple benefits; Nature based solutions	Science of the Total Environment	**28**
2018	Blue space; Green space; Health promotion; Salutogenesis; Water bodies	Urban Forestry and Urban Greening	**25**
2018	Bucharest; Green infrastructure; Historical land changes; Large parks; Urban waters	Urban Forestry and Urban Greening	**24**
1995	Landscape ecology; Modelling; Stormwater management	Landscape and Urban Planning	**23**
2020	Central and Eastern Europe; Environmental governance; Environmental planning; Green and blue infrastructure; Neoliberalism; Transition economies	Cities	**22**

2019	Blue water footprint; Evapotranspiration; Smart green city; Urban greenery; Urban water; Water scarcity	Landscape and Urban Planning	**19**
2017	Decision tree; Landscape transformation; Temperature mitigation; Urbanization	Remote Sensing	**19**
2017	ecosystem services; green/blue space; hedonic pricing; scenario simulation; socio-economic impacts; urban planning	Journal of Environmental Planning and Management	**18**
2017	Environmental justice; Network analysis; Spatial access; Urban green space; Utah; Waterways	Landscape and Urban Planning	**17**
2016	Landscape design; Public health; Urban blue; Urban green; Urban open space; Well-being	Environmental Earth Sciences	**17**
2014	Floods; River; Sewer; Source control; Stormwater retention; Urban drainage	Water Science and Technology	**17**
2008	Environmental justice; Green space; Locally desirable land; Public land; Rural; Suburban; Urban	Journal of Environmental Management	**17**
2019	Barriers; Deprivation; Ethnicity; Greenspace; Low-income; Socio-ecological model; Theoretical domains framework; United Kingdom	Health and Place	**15**
2019	Blue and green space; CFD; Thermal environment simulation; Urban cool island	Ecological Indicators	**15**
2019	Ecosystem services; Hybrid infrastructure; Urban Ecological Infrastructure; Urban resilience; Urban sustainability	Elementa	**14**
2018	Blue-green infrastructure; Forest; Reservoir; Temperature inversion; Thermal environment effect	Ecological Indicators	**14**
2020	Blue space; Green space; Synergistic cooling effects (SCEs); Thermal environment; Urban cool island (UCI)	Sustainable Cities and Society	**13**
2019	Age-sensitive landscape design; Alzheimer; Dementia-friendly cities; Elderly people; Evidence-based design; Healing gardens; Healthy public space design	Sustainability (Switzerland)	**13**
2018	Blue space; Environmental factors; Green space; Health data; Psychotic disorders; Schizophrenia	International Journal of Environmental Research and Public Health	**13**
2018	Blue space; Green space; Iran; Isfahan; Public health; Therapeutic landscape; Urban sustainability; Water canal	Sustainability (Switzerland)	**13**
2017	Blue space; Equal access; Public participation GIS; Service area; Travel threshold; Urban planning	Applied Geography	**13**
2016	Disease control; Urban green infrastructure (UGI); Urban green space (UGS); Urban habitat; Urban pest; Vector ecology	Science of the Total Environment	**13**

Fig. 2: Citations of top 50 research documents overs years



It can be observed that the highest citation with 412 is being captured in the year 2015 with the keyword like Blue spaces; Green spaces and it is published in Mental health, International Journal of Environmental Research and Public Health journal. The minimum numbers of citations with 13 in number are being captured with the keywords like Blue space; Greenspace; Synergistic cooling effects (SCEs); Thermal environment; Urban cool island (UCI) for the year 2020, Age-sensitive landscape design; Alzheimer; Dementia-friendly cities; Elderly people; Evidence-based design; Healing gardens; Healthy public space design for the year 2019, Blue space; Environmental factors; Greenspace; Health data; Psychotic disorders; Schizophrenia for the year 2018, Blue space; Greenspace; Iran; Isfahan; Public health; Therapeutic landscape; Urban sustainability; Water canal for the year 2018, Blue space; Equal access; Public participation GIS; Service area; Travel threshold; Urban planning for the year 2017, and Disease control; Urban green infrastructure (UGI); Urban green space (UGS); Urban habitat; Urban pest; Vector ecology for the year 2016. The majority of researchers have performed a study on urban green or urban blue themes only. Only a few researchers from outside India have pursued the research on the theme of urban blue-green space. Figure 2 present the results based on the keywords search of “Urban Blue-Green Space” from the Scopus database. There are a total of 2716 research citations from 1995 to 2020 related to the mentioned keyword. There are 185 research citations in 2020. 226 in 2019, 170 in 2018, 289 in 2017, 348 in 2016, 824 in 2015, 445 in 2014, 122 in 2013, 29 in 2011, 17 in 2008, 38 in 2006 and 23 in 1995 respectively, which shows that majority of the citations are for the year 2015 with 824 citations, and the year 2020 has only 185 citations. This implies that there is a decreasing trend of the citations over the year with a single peak in the year 2015.

META DATA ANALYSIS

Trends of yearly research contribution

The trends of yearly research contributions provide the quantum of research documents published in the mentioned database. It visualises the number of research documents published over the globe at the country-wise level with the specific keyword related to the research theme like urban blue-green space. The curve provides us with the summary of the maximum and the minimum number of research documents published over the years along with the average number of publications. This provides a brief understanding of the research documents publications on yearly basis to showcase the productivity of that particular year including the start of research in that particular theme and their advancements over the years.

Subject wise research contribution

The summary of subjectwise research contribution shows that how many researchers from different domains are having an interest in that particular theme. It tells about the influence of the research theme across the disciplines. More subject involvement will tell about the varied interest on that particular theme and vice versa. It tells that several varied research groups are involved in that particular theme.

Funding support for research

It is well-known fact that to perform good quality research it is required to have a good funding source so that the desired research outcome can be achieved. It will provide an idea about the research interest of the funding agencies across the globe. It summarises the archive of funding support provided by different agencies to each subject domain. It enlists the research theme with more funding opportunities and vice-versa. It also narrates the funding opportunities at each country over a mentioned research theme.

Research outcomes at the country level

The research outcomes at each country level can be assessed through the statistical summary of the research publications/documents. It also tells that which country is more into research and vice-versa over a particular research theme. It tells bout competitive research contributions across the nations. It summarises the number of research documents generated by each country across the domain in form of spatial maps.

Research outcomes in the form document type

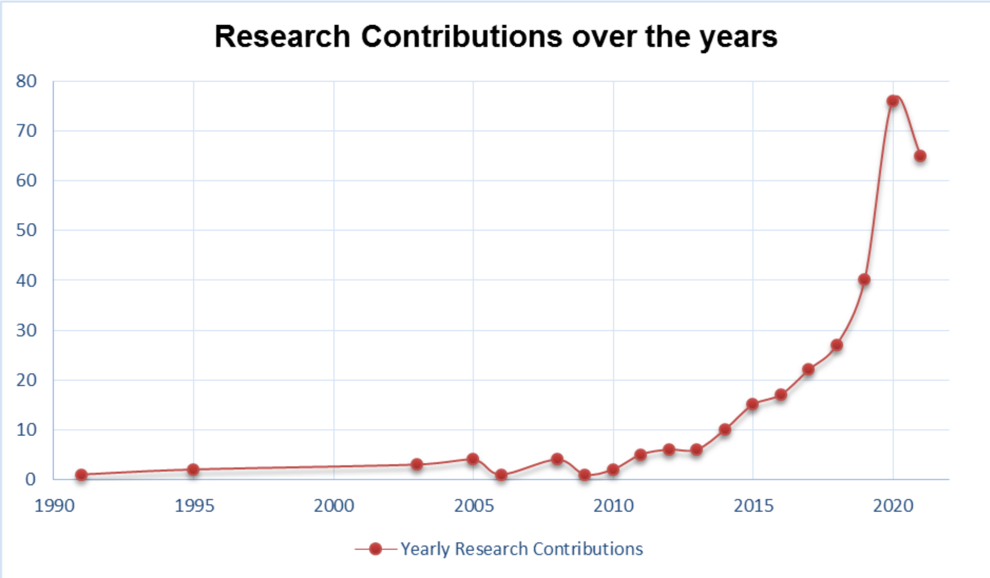
Typically a research document may have several forms like Article, Book Chapter, Proceeding etc. and all these documents have different privileges across the research communities. Therefore it is important to analyse the published research documents in terms of documents. Several research groups have their interest in a particular documents type. Some of the research groups will be interested in research articles, some will be interested in the research book chapter, some will have inclinations towards proceedings and so on. These reports are about the type of documents on a particular research theme. Many research themes have diverse documents type and vice versa. A summary chart will list the summary of several document type involved in the particular research them.

RESULTS, ANALYSIS AND DISCUSSIONS

Trends of yearly research contributions in the domain

Figure 3 presents the trends of yearly research contributions on the selected keywords "Urban Blue-Green Space" from the Scopus database. There are almost 307 research documents published from 1991 to 2021 related to the mentioned keywords. As per the mentioned graph now 65 research papers are published in 2021, 76 are published in the preceding year 2020 (which is highest for the mentioned tenure), 40 are published in the year 2019, with a minimum of 1 paper published in 1991, 2006 and 2009.

Fig. 3: Trends of yearly research contributions with selected keyword

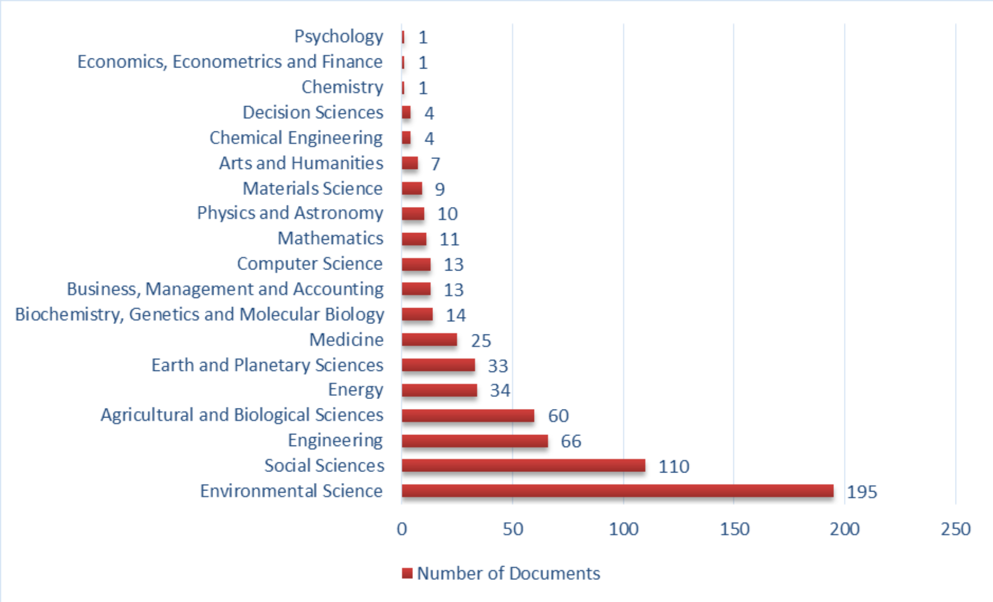


There is an increasing trend of research publications starting from the year 1991 with selected keywords and there is a steep rise in the publications from the year 2010. Before this year, there is a very minimal number of publications.

Subject wise research contributions

Above figure 4 explains the composition of research publications with the selected keyword. It can be observed that there is a single contribution from the field of psychology, economics, econometrics and finance, and chemistry with the selected keyword. The above figure shows that majority of contributions are from the disciplines environmental science with 195 number publications, social science with 110 publications, engineering with 66 research contributions, and agricultural & biological sciences with 60 contributions. There are a moderate number of research contributions with 34 in Energy, 33 in Earth and Planetary Sciences, 25 in Medicine, 14 in Biochemistry, Genetics and Molecular Biology, 13 in Business, Management and Accounting, 13 in Computer Science, 11 in Mathematics, 10 in Physics and Astronomy, 9 in Materials Science, 7 in Arts and Humanities, 4 in Chemical Engineering, 4 in Decision Sciences along with only one document in the field of Chemistry, Economics, Econometrics and Finance and Psychology over the mentioned year. The total number of research documents available during the mentioned time frame is around 611. It signifies that there is good variability of the subject compositions across several disciplines over the mentioned year within the given keyword

Fig. 4: Subject wise research contributions with selected keyword



Funding Support for the research Contributions

Figure 5 provides glimpses of the funding available from the various research agencies across the globe to support the mentioned research theme. It can be seen that the majority of the research work is supported by the European Commission, National Natural Science Foundation of China, Svenska Forskningsrådet Formas, Department of Health, Australian Government, Environment Agency. Apart from the mentioned funding sources, other sources are only supporting a few research in the domain. It can be seen that there are only 159 sponsored researches sponsored by various funding agencies across the globe. The European Commission has sponsored 24 types of research to perform the research, followed by the National Natural Science Foundation of China with 23 types of research, UK Research and Innovation with 17 pieces of research, Horizon 2020 Framework Programme funded 15 research, Engineering and Physical Sciences Research Council has supported 8 research, Natural Environment Research Council has sponsored 7 research. Beyond these agencies like Economic and Social Research Council, European Research Council, Horizon 2020, National Science Foundation, and Svenska Forskningsrådet Formas have also supported 6 research, followed by China Scholarship Council with 5 research, Fundação de Amparo à Pesquisa do Estado de São Paulo, and Seventh Framework Programme with 4 research. It can be furthermore seen that many other agencies have funded only 1 or 2 research. The most popular funding agency to sponsor the research over the globe is the European Commission, the National Natural Science Foundation of China, UK Research and Innovation with a good number of research sponsorship over the mentioned year.

Fig. 5: Funding Support for the research Contributions in the domain

Countrywide research outcomes

There is a requirement to analyse the potential of each nation in terms of research outcomes, as it provides us with a summary of the research potential and their inclination to support science and technology. In this regard figure 6, presents the data in a more visual form along with the corresponding table 4.

Table 4 provides an exhaustive summary of country-wise research contributions over the mentioned time frame. It can be seen that there is a prominent research contribution from only 57 countries in the mentioned theme of urban blue-green space as per the Scopus database. There is a total of 474 research contributions from these 57 countries in the published Scopus database. Out of mentioned research contributions, 63 research contributions are from China, 54 are from the United Kingdom, 46 are from the United States, 29 are from Germany, 21 belongs to the Netherlands, 17 research contributions belongs to Australia and Sweden, 16 belongs to Italy and Poland, 15 are from Canada, 13 are from Spain, 11 are from New Zealand, 9 are from Hong Kong, 8 are from Belgium, Brazil, Denmark, Singapore and Undefined, 7 are from France and India, 6 are from Finland, Indonesia and Japan, 5 are from Taiwan, 4 are from Iran, Israel, Portugal, Russian Federation and South Korea, 3 are from Austria, Czech Republic, Estonia, Greece, Malaysia, Norway, Slovakia and the United Arab Emirates, and in the rest of the countries are having only 1 or 2 research contributions so far in the mentioned domain.

Fig. 6: Countrywide research outcomes in the domain

Table 4: List of country-wise number of research

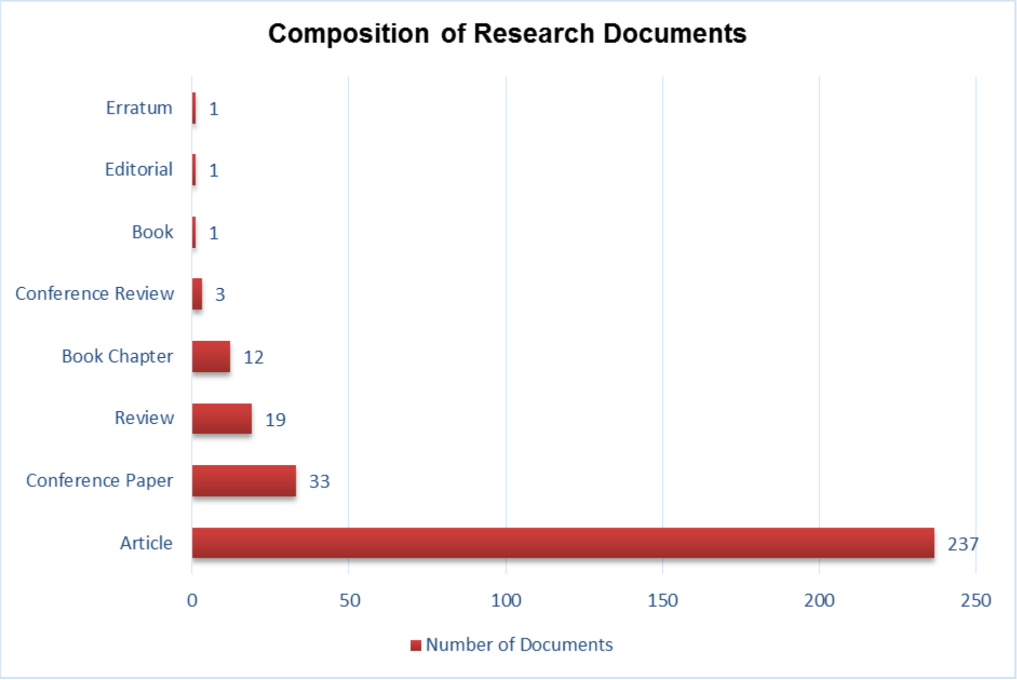
Country	Number of Research	Country	Number of Research	Country	Number of Research
China	63	India	7	Ireland	2
United Kingdom	54	Finland	6	Latvia	2
United States	46	Indonesia	6	Romania	2
Germany	29	Japan	6	Sri Lanka	2
Netherlands	21	Taiwan	5	Switzerland	2
Australia	17	Iran	4	Algeria	1
Sweden	17	Israel	4	Argentina	1
Italy	16	Portugal	4	Bangladesh	1
Poland	16	Russian Federation	4	Colombia	1
Canada	15	South Korea	4	Hungary	1
Spain	13	Austria	3	Kenya	1
New Zealand	11	Czech Republic	3	Lithuania	1
Hong Kong	9	Estonia	3	Luxembourg	1
Belgium	8	Greece	3	Malawi	1
Brazil	8	Malaysia	3	Rwanda	1
Denmark	8	Norway	3	South Africa	1
Singapore	8	Slovakia	3	Thailand	1
Undefined	8	United Arab Emirates	3	Turkey	1
France	7	Guyana	2	Viet Nam	1

It can be summarised very nicely that the majority of research contributions are from China, United Kingdom, United States, Germany, Netherlands, Australia, Sweden, Italy, Poland, Canada, Spain and there are only 7 research contributions from the Indian research community in the mentioned theme. So there is ample opportunity for it to explore further in the Indian context. Figure 6 along with table 4 provides a summary of the research contributions across the globe to visualise a comprehensive idea about the research contributions in the selected domain.

Composition of research outcomes type

Figure 7 provides the composition of research document types published over the given time frame. It can be seen that majority of documents types consists of articles, Conference Papers, Review, and Book Chapter with negligible contributions in terms of conference reviews, book, editorial, erratum. It consists of basically eight types of research document as an outcome namely: articles, conference papers, review, book chapter, conference review, book, editorial and erratum showing in (as shown in Figure 7).

Fig. 7: Type of Research Outcomes in domain



The total number of research documents is 307 consisting of all 8 documents types. The research article type has the highest number of 237 research contributions, followed by 33 research documents as conference papers, and 19 documents as reviews with 12 as book chapters This implies that the majority of documents are published in the form of an Article and very few documents as editorial or book type. This shows that there is an ample opportunity to propose a book with a related theme, there is an absence of a book in the mentioned domain.

THE CONCEPTUALISATION OF THE PROPOSED OPERATIONAL FRAMEWORK

Several well-acknowledged types of research in the field of urban studies have reported that urban analysis has resulted in a limitless emphasis on urban ecological setup caused due to human activities over the resources. These are pushing extra pressure on the current available urban infrastructure and amenities. Various researchers are still working on urban studies to make proficient and intelligent decisions on a real-time basis for each kind of operation, calamity mitigation, and other several unexpected tragedies, especially for urban risks. Usually, the presently available assessment approaches have a lot of complexities & collective vulnerabilities associated with these systems and these typically require a lot of effort with manual operations. The proposed methodological framework is intended for scaled development of precise techniques for advanced evaluation of urban blue-green spaces at micro to macro scale. These types of approaches have been attempted in European and American urban scenarios with a very limited number of trials but researches towards the development or conceptualizing of a robust approach in the developing countries perspective have not been paid very good attention due to the involved risks of arising higher unexpected instances.

Fig. 8: Illustration for the proposed scientific framework

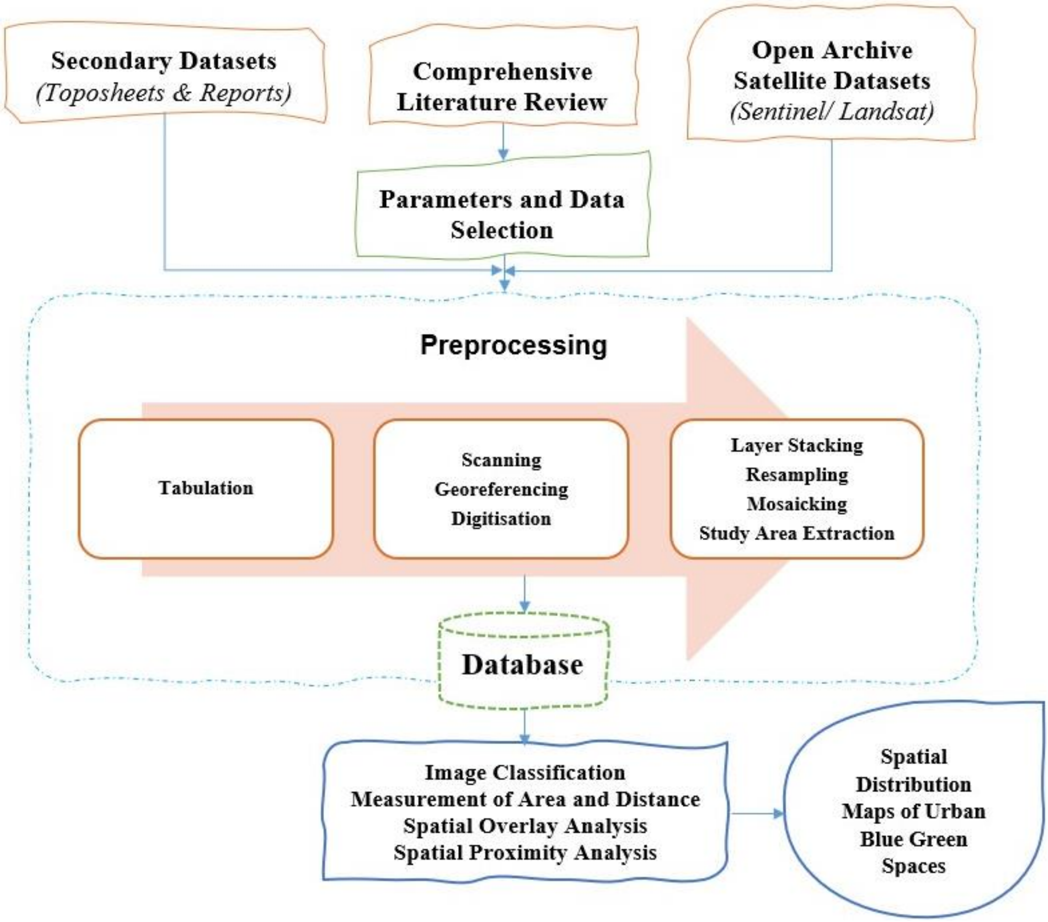


Figure 8 illustrates the proposed methodological framework design towards developing an approach for assessing urban blue-green spaces with certain resource constraints. In Figure 3, the proposed scientific framework explains from data selection to output generation of the approach. It explains that preprocessing is a prerequisite for any approach development and implementation. These techniques combined with advanced remote sensing and GIS technology will work as a significant approach to resolve several issues related to functionality, sustainability and usability of resources. Whilst some of the researchers have begun to investigate the functionality of the proposed approach, but very little attention has been paid. Starting with the prominent type of approaches for evaluating urban blue-green spaces management, the current framework tries to solve the problems considering the following themes:

a) Review and assessment of existing approaches for urban blue-green spaces valuation.
b) Review of advancements in the domain of remote sensing and GIS technology for the required framework.
c) Suggestions for urban blue-green spaces analysis approaches.
d) Abstracting scientific consensus for management, planning and application of advanced decisions cum support system to solve various real-time issues

The approach encapsulates the role of secondary datasets, literature review and then pre-processing of datasets for the creation of the database. After completing the preprocessing segment, the data is ported to the analysis segment to develop and generate the desire outputs. The analysis part includes the processes like image classification, change detection, feature identification and labelling, area and distance assessment, spatial overlay proximity analysis. These are useful for estimating the area under urban blue-green spaces and develop a detailed map for each feature. The approach will help to suggest a future management plan for urban blue-green space. These are proposed methodological frameworks are based on the strong theoretical background mentioned in the earlier segments for better urban resources management framework with the urban blue-green spaces assessment.

CONCLUSIONS

During recent years, due to the application of high-performance microcomputers, improved software's, advanced remote sensing technologies, modern optimization techniques and high-resolution digital elevation model data sets of the earth surface, it has also enabled the possibilities of development for a well-versed technological framework for urban blue-green analysis. In the nearby future, advanced remote sensing, with the help of various geostatistical tools are expected to be employed for the development and management of decision support systems of urban blue-green space management. The suggested methodological framework for assessing urban blue-green spaces can work as an integral part of suitable development and management to optimally manage the environmental condition of resources attached to any urban activity. Thus, it is essential to assess the impact of every single development on urban blue-green space. The assessment of urban blue-green space research is a complex nature of the urban environment. urban blue-green space detection, resource management and assessment of the urban environment monitoring are some of the well-known complex scenarios. A systematic review to suggest along with a brief bibliometric analysis from the SCOPUS database has provided a fair understanding of the image denoising, detection, recognition, restoration, generation, deblurring, quality assessment, classification, and image processing for better understanding and processing of urban blue-green spaces from satellite images. A detailed understanding of key authors, related journals, influential institutions, and impactful keywords are identified using bibliometric analysis from the mentioned research domain. The detailed review of the urban theme has helped in understanding the applications and problems faced by urban imaging techniques. The study will help researchers and engineers in developing practical strategic plans for urban environmental management and analysis operations. These will provide a tool to assess the influence of any urban development activity occurring in the urban area. These will open avenues for advanced spatial analysis to describe classes of exemplary problems to launch some innovative research directions.

Limitations and Future research directions

The main limitation of the study is it limitation of database access for accomplishing the research work. Therefore, the papers not indexed in Scopus are not screened and considered for this research. In the future, other researchers may include other databases like MEDLINE, PubMed, AGRICOLA, ERIC, Web of Science (WoS) and Google Scholar. Furthermore, the upcoming research may explore meta-analysis, systematic literature review, methodologies and application of theories related to the cited research theme. The mentioned review over the mentioned theme has provided the approach for image processing and analysis for the urban sector. The review of bibliometric analysis has identified that countries need to work on image processing techniques for their systematic urban growth and development. Urban blue-green assessment and management have their importance in a scientific study regarding the location and distribution of urban blue-green spaces. The familiarity about these features with their location and distribution over an urban area will advance towards good image classification and recognition techniques. There is a necessity to develop an approach for assessing urban blue-green spaces towards sustainable urban growth with a new approach to play a significant role in transmitting the information content of satellite images into useful information.

AUTHOR CONTRIBUTIONS

Dr Deepak Kumar conceived and designed the study, and Ms Sunita performed the research, analyzed the data, and Dr Sulochana Shekhar contributed to data analysis and editorial input.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

REFERENCES

Abelt, K., & McLafferty, S. (2017). Green streets: Urban green and birth outcomes. *International Journal of Environmental Research and Public Health*, *14*(7). https://doi.org/10.3390/ijerph14070771

Ahmed, S., Meenar, M., & Alam, A. (2019). Designing a Blue-Green Infrastructure (BGI) network: Toward water-sensitive urban growth planning in Dhaka, Bangladesh. *Land*, *8*(9).

https://doi.org/10.3390/land8090138

Akaraci, S., Feng, X., Suesse, T., Jalaludin, B., & Astell-Burt, T. (2020). A systematic review and meta-analysis of associations between green and blue spaces and birth outcomes. *International Journal of Environmental Research and Public Health*, *17*(8). https://doi.org/10.3390/ijerph17082949

Alejandre, J. C., & Lynch, M. (2020). “Kids Get in Shape with Nature”: A Systematic Review Exploring the Impact of Green Spaces on Childhood Obesity. *Journal of Nutritional Science and Vitaminology*, *66*, S129–S133. https://doi.org/10.3177/jnsv.66.S129

Alshamsi, M. R. (2016). Vegetation extraction from high-resolution satellite imagery using the Normalized Difference Vegetation Index (NDVI). *Proceedings of SPIE - The International Society for Optical Engineering*, *10004*. https://doi.org/10.1117/12.2241768

Alves, A., Gersonius, B., Kapelan, Z., Vojinovic, Z., & Sanchez, A. (2019). Assessing the Co-Benefits of green-blue-grey infrastructure for sustainable urban flood risk management. *Journal of Environmental Management*, *239*(December 2018), 244–254. https://doi.org/10.1016/j.jenvman.2019.03.036

Alves, A., Vojinovic, Z., Kapelan, Z., Sanchez, A., & Gersonius, B. (2020). Exploring trade-offs among the multiple benefits of green-blue-grey infrastructure for urban flood mitigation. *Science of the Total Environment, 703,* 134980. https://doi.org/10.1016/j.scitotenv.2019.134980

Amaral, M. H., Benites-Lazaro, L. L., de Almeida Sinisgalli, P., da Fonseca Alves, H., & Giatti, L. L. (2021). Environmental injustices on green and blue infrastructure: Urban nexus in a macrometropolitan territory. *Journal of Cleaner Production*, *289*. https://doi.org/10.1016/j.jclepro.2021.125829

Andreucci, M. B., Russo, A., & Olszewska-Guizzo, A. (2019). Designing urban green blue infrastructure for mental health and elderly wellbeing. *Sustainability (Switzerland)*, *11*(22). https://doi.org/10.3390/su11226425

Astell-Burt, T., & Feng, X. (2021). Time for ‘green’ during covid-19? Inequities in green and blue space access, visitation and felt benefits. *International Journal of Environmental Research and Public Health*, *18*(5), 1–21. https://doi.org/10.3390/ijerph18052757

Augusto, B., Roebeling, P., Rafael, S., Ferreira, J., Ascenso, A., & Bodilis, C. (2020). Short and medium- to long-term impacts of nature-based solutions on urban heat. *Sustainable Cities and Society*, *57*. https://doi.org/10.1016/j.scs.2020.102122

Autelitano, F., Maternini, G., & Giuliani, F. (2021). Colorimetric and photometric characterisation of clear and coloured pavements for urban spaces. *Road Materials and Pavement Design*, *22*(5), 1207–1218. https://doi.org/10.1080/14680629.2019.1662832

Avashia, V., & Garg, A. (2020). Implications of land use transitions and climate change on local flooding in urban areas: An assessment of 42 Indian cities. *Land Use Policy*, *95*. https://doi.org/10.1016/j.landusepol.2020.104571

Balbi, M., Croci, S., Petit, E. J., Butet, A., Georges, R., Madec, L., Caudal, J.-P., & Ernoult, A. (2021). Least-cost path analysis for urban greenways planning: A test with moths and birds across two habitats and two cities. *Journal of Applied Ecology*, *58*(3), 632–643. https://doi.org/10.1111/1365-2664.13800

Baravikova, A. (2020). The uptake of new concepts in urban greening: Insights from Poland. *Urban Forestry and Urban Greening*, *56*. https://doi.org/10.1016/j.ufug.2020.126798

Barber, A., Haase, D., & Wolff, M. (2021). Permeability of the city – Physical barriers of and in urban green spaces in the city of Halle, Germany. *Ecological Indicators*, *125*, 107555. https://doi.org/10.1016/j.ecolind.2021.107555

Baró, F., Camacho, D. A., Pérez Del Pulgar, C., Triguero-Mas, M., & Anguelovski, I. (2021). School greening: Right or privilege? Examining urban nature within and around primary schools through an equity lens. *Landscape and Urban Planning*, *208*. https://doi.org/10.1016/j.landurbplan.2020.104019

Bedla, D., Halecki, W., & Król, K. (2021). Hydromorphological method and gis tools with a web application to assess a semi-natural urbanised river. *Journal of Environmental Engineering and Landscape Management*, *29*(1), 21–32. https://doi.org/10.3846/jeelm.2021.14187

Bellezoni, R. A., Meng, F., He, P., & Seto, K. C. (2021). Understanding and conceptualizing how urban green and blue infrastructure affects the food, water, and energy nexus: A synthesis of the literature. *Journal of Cleaner Production*, *289*. https://doi.org/10.1016/j.jclepro.2021.125825

Boers, S., Hagoort, K., Scheepers, F., & Helbich, M. (2018). Does residential green and blue space promote recovery in psychotic disorders? A cross-sectional study in the Province of Utrecht, the Netherlands. *International Journal of Environmental Research and Public Health*, *15*(10). https://doi.org/10.3390/ijerph15102195

Bolte, A.-M., Kotter, T., & Schuppe, S. (2019). Can you see green or blue? on the necessity of visibility analysis of urban open spaces using Remote Sensing techniques and Geographic Information Systems. *2019 Joint Urban Remote Sensing Event, JURSE 2019*. https://doi.org/10.1109/JURSE.2019.8808936

Brink, E., Aalders, T., Ádám, D., Feller, R., Henselek, Y., Hoffmann, A., Ibe, K., Matthey-Doret, A., Meyer, M., Negrut, N. L., Rau, A.-L., Riewerts, B., von Schuckmann, L., Törnros, S., von Wehrden, H., Abson, D. J., & Wamsler, C. (2016). Cascades of green: A review of ecosystem-based adaptation in urban areas. *Global Environmental Change*, *36*, 111–123. https://doi.org/10.1016/j.gloenvcha.2015.11.003

Budoni, A., & Ricci, L. (2020). Green and blue infrastructures as the structure of a bioregion: The case of the Pontina bioregion. *WIT Transactions on Ecology and the Environment*, *249*, 179–190. https://doi.org/10.2495/SC200151

Calderón-Argelich, A., Benetti, S., Anguelovski, I., Connolly, J. J. T., Langemeyer, J., & Baró, F. (2021). Tracing and building up environmental justice considerations in the urban ecosystem service literature: A systematic review. *Landscape and Urban Planning*, *214*. https://doi.org/10.1016/j.landurbplan.2021.104130

Cheng, Y.-T., & Wu, C.-G. (2020). Planning approach of urban blue-green space based on local climate optimization: A review [**基于局地气候**优化的城市蓝绿空间规划途径研究进展]. *Ying Yong Sheng Tai Xue Bao = The Journal of Applied Ecology*, *31*(11), 3935–3945. https://doi.org/10.13287/j.1001-9332.202011.014

Childers, D. L., Bois, P., Hartnett, H. E., McPhearson, T., Metson, G. S., & Sanchez, C. A. (2019). Urban ecological infrastructure: An inclusive concept for the non-built urban environment. *Elementa*, *7*(1). https://doi.org/10.1525/elementa.385

Chowdhury, A., Vanama, V. S. K., & Valliappan, A. L. (2017). Examining the effect of the physical characteristics of the urban green & blue spaces in heat mitigation: A case study of Pune. *38th Asian Conference on Remote Sensing - Space Applications: Touching Human Lives, ACRS 2017*, *2017-Octob*. https://scopus-amity.refread.com/inward/record.uri?

eid=2-s2.0-85047387679&partnerID=40&md5=8ce2a4b8b592dbb6ae09f9276d72e87d

Côté-Lussier, C., Knudby, A., & Barnett, T. A. (2020). A novel low-cost method for assessing intra-urban variation in night time light and applications to public health. *Social Science and Medicine*, *248*. https://doi.org/10.1016/j.socscimed.2020.112820

Couper, P. R. (2018). The embodied spatialities of being in nature: Encountering the nature/culture binary in green/blue space. *Cultural Geographies*, *25*(2), 285–299. https://doi.org/10.1177/1474474017732978

Cronin-de-Chavez, A., Islam, S., & McEachan, R. R. C. (2019). Not a level playing field: A qualitative study exploring structural, community and individual determinants of greenspace use amongst low-income multi-ethnic families. *Health and Place*, *56*, 118–126. https://doi.org/10.1016/j.healthplace.2019.01.018

Cui, G., Zhang, X., Zhang, Z., Cao, Y., & Liu, X. (2019). Comprehensive land carrying capacities of the Cities in the Shandong Peninsula blue economic zone and their spatio-temporal variations. *Sustainability (Switzerland)*, *11*(2), 1–12. https://doi.org/10.3390/su11020439

Dai, X., Wang, L., Tao, M., Huang, C., Sun, J., & Wang, S. (2021). Assessing the ecological balance between supply and demand of blue-green infrastructure. *Journal of Environmental Management*, *288*. https://doi.org/10.1016/j.jenvman.2021.112454

Davis, A. Y., Jung, J., Pijanowski, B. C., & Minor, E. S. (2016). Combined vegetation volume and "greenness" affect urban air temperature. *Applied Geography*, *71*, 106–114. https://doi.org/10.1016/j.apgeog.2016.04.010

Dawson, D. A., Vercruysse, K., & Wright, N. (2020). A spatial framework to explore needs and opportunities for interoperable urban flood management. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *378*(2168). https://doi.org/10.1098/rsta.2019.0205

de Macedo, L. S., Barda Picavet, M. E., de Oliveira, J. A., & Shih, W.-Y. (2021). Urban green and blue infrastructure: A critical analysis of research on developing countries. *Journal of Cleaner Production*, *313*. https://doi.org/10.1016/j.jclepro.2021.127898

de Manuel, B. F., Méndez-Fernández, L., Peña, L., & Ametzaga-Arregi, I. (2021). A new indicator of the effectiveness of urban green infrastructure based on ecosystem services assessment. *Basic and Applied Ecology*, *53*, 12–25. https://doi.org/10.1016/j.baae.2021.02.012

De Vleeschauwer, K., Weustenraad, J., Nolf, C., Wolfs, V., De Meulder, B., Shannon, K., & Willems, P. (2014). Green-blue water in the city: Quantification of impact of source control versus end-of-pipe solutions on sewer and river floods. *Water Science and Technology*, *70*(11), 1825–1837. https://doi.org/10.2166/wst.2014.306

Demuzere, M., Orru, K., Heidrich, O., Olazabal, E., Geneletti, D., Orru, H., Bhave, A. G., Mittal, N., Feliu, E., & Faehnle, M. (2014). Mitigating and adapting to climate change: Multi-functional and multi-scale assessment of green urban infrastructure. *Journal of Environmental Management*, *146*, 107–115. https://doi.org/10.1016/j.jenvman.2014.07.025

Denipitiya, D. N., & Udalamaththa, S. (2020). Multifunctional Landscapes for Urban Flood Management – A Study with Reference to the Kotte Wetland. *Lecture Notes in Civil Engineering*, *44*, 57–74. https://doi.org/10.1007/978-981-13-9749-3_6

Dreiseit, H. (2015). Blue-green social place-making: Infrastructures for sustainable cities. *Journal of Urban Regeneration and Renewal*, *8*(2), 161–170. https://scopus-amity.

refread.com/inward/record.uri?eid=2-s2.0-84943559008&partnerID=40&md5=0f2add2d10b2880b8bb96f5302009e3f

Du, H., Cai, Y., Zhou, F., Jiang, H., Jiang, W., & Xu, Y. (2019). Urban blue-green space planning based on thermal environment simulation: A case study of Shanghai, China. *Ecological Indicators, 106*(May), 105501. https://doi.org/10.1016/j.ecolind.2019.105501

Dushkova, D., Ignatieva, M., Hughes, M., Konstantinova, A., Vasenev, V., & Dovletyarova, E. (2021). Human dimensions of urban blue and green infrastructure during a pandemic. Case study of Moscow (Russia) and Perth (Australia). *Sustainability (Switzerland), 13*(8). https://doi.org/10.3390/su13084148

Dzhambov, A. M. (2018). Residential green and blue space associated with better mental health: A pilot follow-up study in university students. *Arhiv Za Higijenu Rada i Toksikologiju, 69*(4), 340–349. https://doi.org/10.2478/aiht-2018-69-3166

Feng, Q., Liu, J., & Gong, J. (2015). UAV Remote sensing for urban vegetation mapping using random forest and texture analysis. *Remote Sensing, 7*(1), 1074–1094. https://doi.org/10.3390/rs70101074

Fenner, R. (2017). Spatial evaluation of multiple benefits to encourage multi-functional design of sustainable drainage in Blue-Green cities. *Water (Switzerland), 9*(12). https://doi.org/10.3390/w9120953

Fisher, J. C., Irvine, K. N., Bicknell, J. E., Hayes, W. M., Fernandes, D., Mistry, J., & Davies, Z. G. (2021). Perceived biodiversity, sound, naturalness and safety enhance the restorative quality and wellbeing benefits of green and blue space in a neotropical city. *Science of the Total Environment, 755*. https://doi.org/10.1016/j.scitotenv.2020.143095

Fletcher, D. H., Likongwe, P. J., Chiotha, S. S., Nduwayezu, G., Mallick, D., Uddin Md., N., Rahman, A., Golovátina-Mora, P., Lotero, L., Bricker, S., Tsirizeni, M., Fitch, A., Panagi, M., Ruiz Villena, C., Arnhardt, C., Vande Hey, J., Gornall, R., & Jones, L. (2021). Using demand mapping to assess the benefits of urban green and blue space in cities from four continents. *Science of the Total Environment, 785*. https://doi.org/10.1016/j.scitotenv.2021.147238

Freeman, C., Buttery, Y., & van Heezik, Y. (2021). Nature exposure and use of open spaces in three generation families: implications for planning. *Journal of Environmental Planning and Management*. https://doi.org/10.1080/09640568.2021.1891870

Frischenbruder, M. T. M., & Pellegrino, P. (2006). Using greenways to reclaim nature in Brazilian cities. *Landscape and Urban Planning, 76*(1–4), 67–78. https://doi.org/10.1016/j.landurbplan.2004.09.043

Fung, C. K. W., & Jim, C. Y. (2020). Influence of blue infrastructure on lawn thermal microclimate in a subtropical green space. *Sustainable Cities and Society, 52*. https://doi.org/10.1016/j.scs.2019.101858

Garau, C., & Annunziata, A. (2019). Smart city governance and children's agency: An assessment of the green infrastructure impact on children's activities in Cagliari (Italy) with the tool "Opportunities for Children in Urban Spaces (OCUS)." *Sustainability (Switzerland), 11*(18). https://doi.org/10.3390/su11184848

Gascon, M., Mas, M. T., Martínez, D., Dadvand, P., Forns, J., Plasència, A., & Nieuwenhuijsen, M. J. (2015). Mental health benefits of long-term exposure to residential green and blue spaces: A systematic review. *International Journal of Environmental Research and Public Health, 12*(4), 4354–4379. https://doi.org/10.3390/ijerph120404354

Geraldi, J., Maylor, H., & Williams, T. (2011). Now, let's make it really complex (complicated): A systematic review of the complexities of projects. *International Journal of Operations and Production Management*, *31*(9), 966–990. https://doi.org/10.1108/01443571111165848

Haeffner, M., Jackson-Smith, D., Buchert, M., & Risley, J. (2017). "Blue" space accessibility and interactions: Socio-economic status, race, and urban waterways in Northern Utah. *Landscape and Urban Planning*, *167*(December 2016), 136–146. https://doi.org/10.1016/j.landurbplan.2017.06.008

Hamann, F., Blecken, G.-T., Ashley, R. M., & Viklander, M. (2020). Valuing the Multiple Benefits of Blue-Green Infrastructure for a Swedish Case Study: Contrasting the Economic Assessment Tools B£ST and TEEB. *Journal of Sustainable Water in the Built Environment*, *6*(4). https://doi.org/10.1061/JSWBAY.0000919

Hansen, R., Olafsson, A. S., van der Jagt, A. P. N., Rall, E., & Pauleit, S. (2019). Planning multifunctional green infrastructure for compact cities: What is the state of practice? *Ecological Indicators*, *96*, 99–110. https://doi.org/10.1016/j.ecolind.2017.09.042

Heery, E. C., Lian, K. Y., Loke, L. H. L., Tan, H. T. W., & Todd, P. A. (2020). Evaluating seaweed farming as an eco-engineering strategy for 'blue' shoreline infrastructure. *Ecological Engineering*, *152*. https://doi.org/10.1016/j.ecoleng.2020.105857

Hermanski, A., McClelland, J., Pearce-Walker, J., Ruiz, J., & Verhougstraete, M. (2021). The effects of blue spaces on mental health and associated biomarkers. *International Journal of Mental Health*. https://doi.org/10.1080/00207411.2021.1910173

Hu, L., & Li, Q. (2020). Greenspace, bluespace, and their interactive influence on urban thermal environments. *Environmental Research Letters*, *15*(3). https://doi.org/10.1088/1748-9326/ab6c30

Huang, H., Yang, H., Chen, Y., Chen, T., Bai, L., & Peng, Z.-R. (2021). Urban green space optimization based on a climate health risk appraisal – A case study of Beijing city, China. *Urban Forestry and Urban Greening*, *62*. https://doi.org/10.1016/j.ufug.2021.127154

Ido, S., & Shimrit, P.-F. (2015). Blue is the new green - Ecological enhancement of concrete based coastal and marine infrastructure. *Ecological Engineering*, *84*, 260–272. https://doi.org/10.1016/j.ecoleng.2015.09.016

Iojă, I.-C., Osaci-Costache, G., Breuste, J., Hossu, C. A., Grădinaru, S. R., Onose, D. A., Nită, M. R., & Skokanová, H. (2018). Integrating urban blue and green areas based on historical evidence. *Urban Forestry and Urban Greening*, *34*, 217–225. https://doi.org/10.1016/j.ufug.2018.07.001

James, P. (1992). *Business Strategy and the Environment*. 59–67.

Jayakody, D. S. N. (2020). Application of Principle of Network Connectivity in Creation of Sustainable Urban Form: Case of Negombo Water Fronts. *Lecture Notes in Civil Engineering*, *44*, 378–393. https://doi.org/10.1007/978-981-13-9749-3_34

Jia, J., Zlatanova, S., & Zhang, K. (2020). Exploring spatial parameters to evaluate human walking accessibility of urban green space. In *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives* (Vol. 54, Issue 3/W1, pp. 73–80). https://doi.org/10.5194/isprs-archives-XLIV-3-W1-2020-73-2020

Kabisch, N., Alonso, L., Dadvand, P., & van den Bosch, M. (2019). Urban natural environments and motor development in early life. *Environmental Research*, *179*. https://doi.org/10.1016/j.envres.2019.108774

Kabisch, N., van den Bosch, M., & Lafortezza, R. (2017). The health benefits of nature-based solutions to urbanization challenges for children and the elderly – A systematic review. *Environmental Research*, *159*, 362–373. https://doi.org/10.1016/j.envres.2017.08.004

Kajosaari, A., & Pasanen, T. P. (2021). Restorative benefits of everyday green exercise: A spatial approach. *Landscape and Urban Planning*, *206*. https://doi.org/10.1016/j.landurbplan.2020.103978

Kopp, J., & Preis, J. (2019). The potential implementation of stormwater retention ponds into the blue-green infrastructure of the suburban landscape of pilsen, czechia. *Applied Ecology and Environmental Research*, *17*(6), 15055–15072. https://doi.org/10.15666/aeer/1706_1505515072

Kozak, D., Henderson, H., Mazarro, A. de C., Rotbart, D., & Aradas, R. (2020). Blue-green infrastructure (BGI) in dense urban watersheds. The case of the Medrano stream basin (MSB) in Buenos Aires. *Sustainability (Switzerland)*, *12*(6). https://doi.org/10.3390/su12062163

Krajnc, D., & Glavič, P. (2005). A model for integrated assessment of sustainable development. *Resources, Conservation and Recycling*, *43*(2), 189–208. https://doi.org/10.1016/j.resconrec.2004.06.002

Kronenberg, J., Haase, A., Łaszkiewicz, E., Antal, A., Baravikova, A., Biernacka, M., Dushkova, D., Filčak, R., Haase, D., Ignatieva, M., Khmara, Y., Niţă, M. R., & Onose, D. A. (2020). Environmental justice in the context of urban green space availability, accessibility, and attractiveness in postsocialist cities. *Cities*, *106*(August 2019), 102862. https://doi.org/10.1016/j.cities.2020.102862

Kuhlemann, L.-M., Tetzlaff, D., & Soulsby, C. (2020). Urban water systems under climate stress: An isotopic perspective from Berlin, Germany. *Hydrological Processes*, *34*(18), 3758–3776. https://doi.org/10.1002/hyp.13850

Kulczyk, S., Kordowska, M., & Duda-Gromada, K. (2020). Challenges to Urban gastronomy: Green and blue spaces. *Urban Book Series*, 295–307. https://doi.org/10.1007/978-3-030-34492-4_16

Kwak, Y., Park, C., & Deal, B. (2020). Discerning the success of sustainable planning: A comparative analysis of urban heat island dynamics in Korean new towns. *Sustainable Cities and Society*, *61*. https://doi.org/10.1016/j.scs.2020.102341

Laatikainen, T. E., Piiroinen, R., Lehtinen, E., & Kyttä, M. (2017). PPGIS approach for defining multimodal travel thresholds: Accessibility of popular recreation environments by the water. *Applied Geography*, *79*, 93–102. https://doi.org/10.1016/j.apgeog.2016.12.006

Labib, S. M., Lindley, S., & Huck, J. J. (2020). Spatial dimensions of the influence of urban green-blue spaces on human health: A systematic review. *Environmental Research*, *180*. https://doi.org/10.1016/j.envres.2019.108869

Lehnert, M., Brabec, M., Jurek, M., Tokar, V., & Geletič, J. (2021). The role of blue and green infrastructure in thermal sensation in public urban areas: A case study of summer days in four Czech cities. *Sustainable Cities and Society*, *66*. https://doi.org/10.1016/j.scs.2020.102683

Lembi, R. C., Cronemberger, C., Picharillo, C., Koffler, S., Albuquerque Sena, P. H., Felappi, J. F., de Moraes, A. R., Arshad, A., Dos Santos, J. P., & Mansur, A. V. (2020). Urban expansion in the atlantic forest: Applying the nature futures framework to develop a conceptual model and future scenarios [Expansão urbana na mata atlântica: Aplicando o “nature futures framework” para desenvolver um modelo conceitual e cenários fu. *Biota Neotropica*, *20*, 1–13. https://doi.org/10.1590/1676-0611-bn-2019-0904

Liang, Z., Hewitt, R. R., & Du, Y. (2019). Research on design method for the blue-Green ecological network system to deal with urban flooding: A case study of Charleston peninsula. *International Journal of Design and Nature and Ecodynamics*, *14*(4), 275–286. https://doi.org/10.2495/DNE-V14-N4-275-286

Lin, C., & Wu, L. (2021). Green and blue space availability and self-rated health among seniors in China: Evidence from a national survey. *International Journal of Environmental Research and Public Health*, *18*(2), 1–18. https://doi.org/10.3390/ijerph18020545

Lin, Y., Wang, Z., Jim, C. Y., Li, J., Deng, J., & Liu, J. (2020). Water as an urban heat sink: Blue infrastructure alleviates urban heat island effect in mega-city agglomeration. *Journal of Cleaner Production*, *262*. https://doi.org/10.1016/j.jclepro.2020.121411

Little, P. C., & Akese, G. A. (2019). Centering the Korle Lagoon: Exploring blue political ecologies of E-Waste in Ghana. *Journal of Political Ecology*, *26*(1), 448–465. https://scopus-amity.refread.com/inward/record.uri?eid=2-s2.0-85089397276&partnerID=40&md5=c14bc88b00e86acbb1b26afae8accd28

Liu, L., Fryd, O., & Zhang, S. (2019). Blue-green infrastructure for sustainable urban stormwater management-lessons from six municipality-led pilot projects in Beijing and Copenhagen. *Water (Switzerland)*, *11*(10), 1–16. https://doi.org/10.3390/w11102024

Liu, Y., Peng, J., & Wang, Y. (2017). Diversification of land surface temperature change under urban landscape renewal: A case study in the main city of Shenzhen, China. *Remote Sensing*, *9*(9). https://doi.org/10.3390/rs9090919

Manusset, S. (2015). Green space: A new tool of public health policy? [Les espaces verts : Un nouvel outil des politiques de santé publique ?]. *Environnement, Risques et Sante*, *14*(4), 313–320. https://doi.org/10.1684/ers.2015.0795

Masseroni, D., Ercolani, G., Chiaradia, E. A., Maglionico, M., Toscano, A., Gandolfi, C., & Bischetti, G. B. (2018). Exploring the performances of a new integrated approach of grey, green and blue infrastructures for combined sewer overflows remediation in high-density Urban areas. In *Journal of Agricultural Engineering* (Vol. 49, Issue 4, pp. 233–241). https://doi.org/10.4081/jae.2018.873

Masullo, M., Maffei, L., Pascale, A., & Senese, V. P. (2017). An alternative noise mitigation strategy in urban green park: A laboratory experiment. *INTER-NOISE 2017 - 46th International Congress and Exposition on Noise Control Engineering: Taming Noise and Moving Quiet*, *2017-Janua*. https://scopus-amity.refread.com/inward/record.uri?eid=2-s2.0-85042042988&partnerID=40&md5=7057306305dfb7c1e877e5298cc9a9de

McDougall, C. W., Hanley, N., Quilliam, R. S., Bartie, P. J., Robertson, T., Griffiths, M., & Oliver, D. M. (2021). Neighbourhood blue space and mental health: A nationwide ecological study of antidepressant medication prescribed to older adults. *Landscape and Urban Planning*, *214*. https://doi.org/10.1016/j.landurbplan.2021.104132

McGuckin, C. P., & Brown, R. D. (1995). A landscape ecological model for wildlife enhancement of stormwater management practices in urban greenways. *Landscape and Urban Planning*, *33*(1–3), 227–246. https://doi.org/10.1016/0169-2046(94)02020-G

Mishra, H. S., Bell, S., Vassiljev, P., Kuhlmann, F., Niin, G., & Grellier, J. (2020). The development of a tool for assessing the environmental qualities of urban blue spaces. *Urban Forestry and Urban Greening*, *49*(December 2019), 126575. https://doi.org/10.1016/j.ufug.2019.126575

Monteiro, R., Ferreira, J. C., & Antunes, P. (2020). Green infrastructure planning principles:

An integrated literature review. *Land*, *9*(12), 1–19. https://doi.org/10.3390/land9120525

Mottaghi, M, Aspegren, H., & Jönsson, K. (2016). Integrated urban design and open storm drainage in our urban environments: Merging drainage techniques into our city's urban spaces. *Water Practice and Technology*, *11*(1), 118–126. https://doi.org/10.2166/wpt.2016.016

Mottaghi, Misagh, Kärrholm, M., & Sternudd, C. (2020). Blue-green solutions and everyday ethicalities: Affordances and matters of concern in Augustenborg, Malmö. *Urban Planning*, *5*(4), 132–142. https://doi.org/10.17645/up.v5i4.3286

Mottaghi, Misagh, Kylin, M., Kopljar, S., & Sternudd, C. (2021). Blue-green playscapes: Exploring children's places in stormwater spaces in augustenborg, malmö. *Urban Planning*, *6*(2), 175–188. https://doi.org/10.17645/up.v6i2.3953

Mu, B, & Li, X. (2020). Research on sustainable development of urban green infrastructure based on social ecosystem framework. *International Journal of Environmental Technology and Management*, *23*(2–4), 138–148. https://doi.org/10.1504/IJETM.2020.112965

Mu, Bo, Liu, C., Tian, G., Xu, Y., Zhang, Y., Mayer, A. L., Lv, R., He, R., & Kim, G. (2020). Conceptual planning of urban-rural green space from a multidimensional perspective: A case study of zhengzhou, China. *Sustainability (Switzerland)*, *12*(7), 1–20. https://doi.org/10.3390/su12072863

Mukherjee, M., & Takara, K. (2018). Urban green space as a countermeasure to increasing urban risk and the UGS-3CC resilience framework. *International Journal of Disaster Risk Reduction*, *28*, 854–861. https://doi.org/10.1016/j.ijdrr.2018.01.027

Mulligan, J., Bukachi, V., Clause, J. C., Jewell, R., Kirimi, F., & Odbert, C. (2020). Hybrid infrastructures, hybrid governance: New evidence from Nairobi (Kenya) on green-blue-grey infrastructure in informal settlements: "Urban hydroclimatic risks in the 21st century: Integrating engineering, natural, physical and social sciences to build. *Anthropocene*, *29*. https://doi.org/10.1016/j.ancene.2019.100227

Nieuwenhuijsen, M. J., Gascon, M., Martinez, D., Ponjoan, A., Blanch, J., Garcia-Gil, M. D. M., Ramos, R., Foraster, M., Mueller, N., Espinosa, A., Cirach, M., Khreis, H., Dadvand, P., & Basagaña, X. (2018). Air pollution, noise, blue space, and green space and premature mortality in Barcelona: A mega cohort. *International Journal of Environmental Research and Public Health*, *15*(11), 1–12. https://doi.org/10.3390/ijerph15112405

Nouri, H, Nagler, P., Chavoshi Borujeni, S., Barreto Munez, A., Alaghmand, S., Noori, B., Galindo, A., & Didan, K. (2020). Effect of spatial resolution of satellite images on estimating the greenness and evapotranspiration of urban green spaces. *Hydrological Processes*, *34*(15), 3183–3199. https://doi.org/10.1002/hyp.13790

Nouri, Hamideh, Chavoshi Borujeni, S., & Hoekstra, A. Y. (2019). The blue water footprint of urban green spaces: An example for Adelaide, Australia. *Landscape and Urban Planning*, *190*(July), 103613. https://doi.org/10.1016/j.landurbplan.2019.103613

Nutsford, D., Pearson, A. L., Kingham, S., & Reitsma, F. (2016). Residential exposure to visible blue space (but not green space) associated with lower psychological distress in a capital city. *Health and Place*, *39*, 70–78. https://doi.org/10.1016/j.healthplace.2016.03.002

O'Donnell, E. C., Lamond, J. E., & Thorne, C. R. (2017). Recognising barriers to implementation of Blue-Green Infrastructure: a Newcastle case study. *Urban Water Journal*, *14*(9), 964–971. https://doi.org/10.1080/1573062X.2017.1279190

Paciência, I., Moreira, A., Moreira, C., Cavaleiro Rufo, J., Sokhatska, O., Rama, T., Hoffimann, E., Santos, A. C., Barros, H., & Ribeiro, A. I. (2021). Neighbourhood green and blue spaces and allergic sensitization in children: A longitudinal study based on repeated measures from the Generation XXI cohort. *Science of the Total Environment*, *772*, 145394. https://doi.org/10.1016/j.scitotenv.2021.145394

Peng, J., Liu, Q., Xu, Z., Lyu, D., Du, Y., Qiao, R., & Wu, J. (2020). How to effectively mitigate urban heat island effect? A perspective of waterbody patch size threshold. *Landscape and Urban Planning*, *202*. https://doi.org/10.1016/j.landurbplan.2020.103873

Peng, W., Yuan, X., Gao, W., Wang, R., & Chen, W. (2021). Assessment of urban cooling effect based on downscaled land surface temperature: A case study for Fukuoka, Japan. *Urban Climate*, *36*. https://doi.org/10.1016/j.uclim.2021.100790

Petrashen, E. P., Speranskaya, V. S., & Kuzmina, A. O. (2018). Destructive landscapes in the context of public urban space: Issues of rehabilitation, adaptation and integration [Деструктивные ландшафты в контексте городского общественного пространства. Проблемы реабилитации, адаптации и интеграции]. *Vestnik Sankt-Peterburgskogo Universiteta, Iskusstvovedenie*, *8*(4), 693–714. https://doi.org/10.21638/spbu15.2018.410

Qiu, L., Chen, Q., & Gao, T. (2021). The effects of urban natural environments on preference and self-reported psychological restoration of the elderly. In *International Journal of Environmental Research and Public Health* (Vol. 18, Issue 2, pp. 1–14). https://doi.org/10.3390/ijerph18020509

Rall, E., Hansen, R., & Pauleit, S. (2019). The added value of public participation GIS (PPGIS)for urban green infrastructure planning. *Urban Forestry and Urban Greening*, *40*, 264–274. https://doi.org/10.1016/j.ufug.2018.06.016

Raymond, C. M., Gottwald, S., Kuoppa, J., & Kyttä, M. (2016). Integrating multiple elements of environmental justice into urban blue space planning using public participation geographic information systems. *Landscape and Urban Planning*, *153*, 198–208. https://doi.org/10.1016/j.landurbplan.2016.05.005

Rigolon, A., & Gibson, S. (2021). The role of non-governmental organizations in achieving environmental justice for green and blue spaces. *Landscape and Urban Planning*, *205*(October 2020), 103970. https://doi.org/10.1016/j.landurbplan.2020.103970

Roebeling, P., Saraiva, M., Palla, A., Gnecco, I., Teotónio, C., Fidelis, T., Martins, F., Alves, H., & Rocha, J. (2017). Assessing the socio-economic impacts of green/blue space, urban residential and road infrastructure projects in the Confluence (Lyon): a hedonic pricing simulation approach. *Journal of Environmental Planning and Management*, *60*(3), 482–499. https://doi.org/10.1080/09640568.2016.1162138

Rosas-Lusett, M. A., Bartorila, M. Á., Mújica, J. A. E., & Oropeza, E. C. (2017). Green spaces, proposal for the improvement of the climate in tropical cities. *Proceedings of 33rd PLEA International Conference: Design to Thrive, PLEA 2017*, *2*, 1880–1887. https://scopus-amity.refread.com/inward/record.uri?eid=2-s2.0-85085914643&partnerID=40&md5=1d5868512fb99a88dbba170ca9a85b83

Rosenberger, L., Leandro, J., Pauleit, S., & Erlwein, S. (2021). Sustainable stormwater management under the impact of climate change and urban densification. *Journal of Hydrology*, *596*. https://doi.org/10.1016/j.jhydrol.2021.126137

Russo, A., & Cirella, G. T. (2018). Modern compact cities: How much greenery do we need? *International Journal of Environmental Research and Public Health*, *15*(10). https://doi.org/10.3390/ijerph15102180

Safransky, S. (2014). Greening the urban frontier: Race, property, and resettlement in

Detroit. *Geoforum*, *56*, 237–248. https://doi.org/10.1016/j.geoforum.2014.06.003

Sander, H. A., & Zhao, C. (2015). Urban green and blue: Who values what and where? *Land Use Policy*, *42*, 194–209. https://doi.org/10.1016/j.landusepol.2014.07.021

Schowengerdt, R. A. (2012). Remote sensing: Models and methods for image processing: Second edition. In *Remote Sensing: Models and Methods for Image Processing: Second Edition*. https://doi.org/10.1016/C2009-0-21902-7

Shi, D., Song, J., Huang, J., Zhuang, C., Guo, R., & Gao, Y. (2020). Synergistic cooling effects (SCEs) of urban green-blue spaces on local thermal environment: A case study in Chongqing, China. *Sustainable Cities and Society*, *55*(September 2019), 102065. https://doi.org/10.1016/j.scs.2020.102065

Singh, K. K. (2018). Urban green space availability in Bathinda City, India. *Environmental Monitoring and Assessment*, *190*(11). https://doi.org/10.1007/s10661-018-7053-0

Stepniewska, M., & Sobczak, U. (2017). Assessing the synergies and trade-offs between ecosystem services provided by urban floodplains: The case of the Warta River Valley in Poznań, Poland. *Land Use Policy*, *69*, 238–246. https://doi.org/10.1016/ j.landusepol.2017.09.026

Su, W., Chang, Q., Liu, X., & Zhang, L. (2021). Cooling effect of urban green and blue infrastructure: A systematic review of empirical evidence. *Shengtai Xuebao/ Acta Ecologica Sinica*, *41*(7), 2902–2917. https://doi.org/10.5846/stxb201903290607

Subiza-Pérez, M., Hauru, K., Korpela, K., Haapala, A., & Lehvävirta, S. (2019). Perceived Environmental Aesthetic Qualities Scale (PEAQS) – A self-report tool for the evaluation of green-blue spaces. *Urban Forestry and Urban Greening*, *43*(February), 126383. https://doi.org/10.1016/j.ufug.2019.126383

Sudhira, H. S., Ramachandra, T. V., & Jagadish, K. S. (2004). Urban sprawl: Metrics, dynamics and modelling using GIS. *International Journal of Applied Earth Observation and Geoinformation*, *5*(1), 29–39. https://doi.org/10.1016/j.jag.2003.08.002

Suleiman, L. (2021). Blue green infrastructure, from niche to mainstream: Challenges and opportunities for planning in Stockholm. *Technological Forecasting and Social Change*, *166*. https://doi.org/10.1016/j.techfore.2020.120528

Tan, C. L. Y., Chang, C. C., Nghiem, L. T. P., Zhang, Y., Oh, R. R. Y., Shanahan, D. F., Lin, B. B., Gaston, K. J., Fuller, R. A., & Carrasco, L. R. (2021). The right mix: Residential urban green-blue space combinations are correlated with physical exercise in a tropical city-state. *Urban Forestry and Urban Greening*, *57*(May 2020), 126947. https://doi.org/10.1016 /j.ufug.2020.126947

Tan, X., Sun, X., Huang, C., Yuan, Y., & Hou, D. (2021). Comparison of cooling effect between green space and water body. *Sustainable Cities and Society*, *67*. https://doi.org/10.1016/j.scs.2021.102711

Targino, A. C., Coraiola, G. C., & Krecl, P. (2019). Green or blue spaces? Assessment of the effectiveness and costs to mitigate the urban heat island in a Latin American city. *Theoretical and Applied Climatology*, *136*(3–4), 971–984. https://doi.org/10.1007/s00704-018-2534-1

Teubner, K., Teubner, I., Pall, K., Kabas, W., Tolotti, M., Ofenböck, T., & Dokulil, M. T. (2020). New Emphasis on Water Transparency as Socio-Ecological Indicator for Urban Water: Bridging Ecosystem Service Supply and Sustainable Ecosystem Health. *Frontiers in Environmental Science*, *8*. https://doi.org/10.3389/fenvs.2020.573724

Thiis, T. K., Gaitani, N., Burud, I., & Engan, J. A. (2018). Classification of urban blue green structures with aerial measurements. *International Journal of Sustainable Development and*

Planning, *13*(4), 506–515. https://doi.org/10.2495/SDP-V13-N4-506-515

Thomas, I., Frankhauser, P., & De Keersmaecker, M. L. (2007). Fractal dimension versus density of built-up surfaces in the periphery of Brussels. *Papers in Regional Science*, *86*(2), 287–308. https://doi.org/10.1111/j.1435-5957.2007.00122.x

Tieges, Z., McGregor, D., Georgiou, M., Smith, N., Saunders, J., Millar, R., Morison, G., & Chastin, S. (2020). The impact of regeneration and climate adaptations of urban green–blue assets on all-cause mortality: A 17-year longitudinal study. *International Journal of Environmental Research and Public Health*, *17*(12), 1–12. https://doi.org/10.3390/ijerph17124577

Tuofu, H., Qingyun, H., Dongxiao, Y., & Xiao, O. (2021). Evaluating the Impact of Urban Blue Space Accessibility on Housing Price: A Spatial Quantile Regression Approach Applied in Changsha, China. *Frontiers in Environmental Science*, *9*. https://doi.org/10.3389/fenvs.2021.696626

Ustaoglu, E., & Aydınoglu, A. C. (2020). Site suitability analysis for green space development of Pendik district (Turkey). *Urban Forestry and Urban Greening*, *47*. https://doi.org/10.1016/j.ufug.2019.126542

Vaeztavakoli, A., Lak, A., & Yigitcanlar, T. (2018). Blue and green spaces as therapeutic landscapes: Health effects of urban water canal areas of Isfahan. *Sustainability (Switzerland)*, *10*(11). https://doi.org/10.3390/su10114010

van Heezik, Y., Freeman, C., Falloon, A., Buttery, Y., & Heyzer, A. (2021). Relationships between childhood experience of nature and green/blue space use, landscape preferences, connection with nature and pro-environmental behavior. *Landscape and Urban Planning*, *213*. https://doi.org/10.1016/j.landurbplan.2021.104135

Völker, S., Baumeister, H., Classen, T., Hornberg, C., & Kistemann, T. (2013). Evidence for the temperature-mitigating capacity of urban blue space - A health geographic perspective. *Erdkunde*, *67*(4), 355–371. https://doi.org/10.3112/erdkunde.2013.04.05

Völker, S., Heiler, A., Pollmann, T., Claßen, T., Hornberg, C., & Kistemann, T. (2018). Do perceived walking distance to and use of urban blue spaces affect self-reported physical and mental health? *Urban Forestry and Urban Greening*, *29*, 1–9. https://doi.org/10.1016/j.ufug.2017.10.014

Völker, S., & Kistemann, T. (2013). "I'm always entirely happy when I'm here!" Urban blue enhancing human health and well-being in Cologne and Düsseldorf, Germany. *Social Science and Medicine*, *78*(1), 113–124. https://doi.org/10.1016/j.socscimed.2012.09.047

Völker, S., & Kistemann, T. (2015). Developing the urban blue: Comparative health responses to blue and green urban open spaces in Germany. *Health and Place*, *35*, 196–205. https://doi.org/10.1016/j.healthplace.2014.10.015

Völker, S., Matros, J., & Claßen, T. (2016). Determining urban open spaces for health-related appropriations: a qualitative analysis on the significance of blue space. *Environmental Earth Sciences*, *75*(13). https://doi.org/10.1007/s12665-016-5839-3

Wan, J., Zhou, Y., Li, Y., Su, Y., Cao, Y., Zhang, L., Ying, L., & Deng, W. (2020). Research on color space perceptions and restorative effects of blue space based on color psychology: Examination of the yijie district of dujiangyan city as an example. In *International Journal of Environmental Research and Public Health* (Vol. 17, Issue 9). https://doi.org/10.3390/ijerph17093137

Wang, Haoying, Hu, Y., Tang, L., & Zhuo, Q. (2020). Distribution of urban blue and green space in beijing and its influence factors. *Sustainability (Switzerland)*, *12*(6). https://doi.org/10.3390/su12062252

Wang, Hefei, & Pei, Z. (2020). Urban green corridors analysis for a rapid urbanization city exemplified in Gaoyou City, Jiangsu. *Forests*, *11*(12), 1–12. https://doi.org/ 10.3390/f11121374

Wikantiyoso, R., Tutuko, P., Suhartono, T., Sulaksono, A. G., & Safrilia, A. (2020). Green city MIS as a sustainable urban GOS provision control implementation model: Case Study: The GOS provision in the Brantas riverbanks revitalization, Malang City, Indonesia. *International Review for Spatial Planning and Sustainable Development*, *8*(1), 160–172. https://doi.org/10.14246/irspsda.8.1_160

Willems, J. J., Kenyon, A. V., Sharp, L., & Molenveld, A. (2021). How actors are (dis)integrating policy agendas for multi-functional blue and green infrastructure projects on the ground. *Journal of Environmental Policy and Planning*, *23*(1), 84–96. https://doi.org/10.1080/1523908X.2020.1798750

Wong, G. K. L., & Jim, C. Y. (2016). Do vegetated rooftops attract more mosquitoes? Monitoring disease vector abundance on urban green roofs. *Science of the Total Environment*, *573*, 222–232. https://doi.org/10.1016/j.scitotenv.2016.08.102

Wong, G. K. L., & Jim, C. Y. (2017). Urban-microclimate effect on vector mosquito abundance of tropical green roofs. *Building and Environment*, *112*, 63–76. https://doi.org/10.1016/j.buildenv.2016.11.028

Wright, J., Lytle, J., Santillo, D., Marcos, L., & Mai, K. V. (2021). Addressing the water–energy–food nexus through enhanced green roof performance. *Sustainability (Switzerland)*, *13*(4), 1–13. https://doi.org/10.3390/su13041972

Wu, D., Wang, Y., Fan, C., & Xia, B. (2018). Thermal environment effects and interactions of reservoirs and forests as urban blue-green infrastructures. *Ecological Indicators*, *91*, 657–663. https://doi.org/10.1016/j.ecolind.2018.04.054

Wu, J., Yang, S., & Zhang, X. (2020). Interaction analysis of urban blue-green space and built-up area based on coupling model-A case study of Wuhan Central City. *Water (Switzerland)*, *12*(8). https://doi.org/10.3390/W12082185

Wu, Y.-T., Clare, L., Jones, I. R., Nelis, S. M., Quinn, C., Martyr, A., Victor, C. R., Lamont, R. A., Rippon, I., Matthews, F. E., & the Experience of Dementia, E. A. L. (IDEAL) P. (2021). Perceived and objective availability of green and blue spaces and quality of life in people with dementia: results from the IDEAL programme. *Social Psychiatry and Psychiatric Epidemiology*. https://doi.org/10.1007/s00127-021-02030-y

Xie, Q., & Li, J. (2021). Detecting the cool island effect of urban parks in Wuhan: A city on rivers. *International Journal of Environmental Research and Public Health*, *18*(1), 1–15. https://doi.org/10.3390/ijerph18010132

Xiu, N., Ignatieva, M., & Konijnendijk van den Bosch, C. (2016). The challenges of planning and designing urban green networks in Scandinavian and Chinese cities. *Journal of Architecture and Urbanism*, *40*(3), 163–176. https://doi.org/10.3846/ 20297955.2016.1210047

Xiu, N., Ignatieva, M., van den Bosch, C. K., & Zhang, S. (2020). Applying a socio-ecological green network framework to Xi'an City, China. *Landscape and Ecological Engineering*, *16*(2), 135–150. https://doi.org/10.1007/s11355-020-00412-z

Xu, X., Duan, X., Sun, H., & Sun, Q. (2011). Green space changes and planning in the capital region of China. *Environmental Management*, *47*(3), 456–467. https://doi.org/10.1007/

s00267-011-9626-3

Yakimowich, P. (2014). Pipes to parks, integrating green and blue. *87th Annual Water Environment Federation Technical Exhibition and Conference, WEFTEC 2014*, *8*, 3940–3954. https://doi.org/10.2175/193864714815940217

Yang, C.-B., Zhang, T., Hu, C.-T., Fan, J.-K., Cao, J.-X., & Fu, X.-E. (2021). Spatial-temporal Characteristics of the Cooling Island for Blue-Green Space and Its Driving Factors in Suzhou, China [蓝绿空间冷岛效应时空变化及其影响因素-以苏州市为例]. *Resources and Environment in the Yangtze Basin*, *30*(3), 677–688. https://doi.org/10.11870/cjlyzyyhj202103015

Yang, G., Yu, Z., Jørgensen, G., & Vejre, H. (2020). How can urban blue-green space be planned for climate adaption in high-latitude cities? A seasonal perspective. *Sustainable Cities and Society*, *53*(August 2019), 101932. https://doi.org/10.1016/j.scs.2019.101932

Yang, X., Zhu, D., Yang, R., Fu, Z., & Xie, W. (2020). A visible-band remote sensing index for extracting impervious surfaces [一种提取不透水面的可见光波段遥感指数]. *Nongye Gongcheng Xuebao/Transactions of the Chinese Society of Agricultural Engineering*, *36*(8), 127–134. https://doi.org/10.11975/j.issn.1002-6819.2020.08.016

Ye, Y., & Qiu, H. (2021). Environmental and social benefits, and their coupling coordination in urban wetland parks. *Urban Forestry and Urban Greening*, *60*. https://doi.org/10.1016/j.ufug.2021.127043

Yen, H.-Y., Chiu, H.-L., & Huang, H.-Y. (2021). Green and blue physical activity for quality of life: A systematic review and meta-analysis of randomized control trials. *Landscape and Urban Planning*, *212*. https://doi.org/10.1016/j.landurbplan.2021.104093

Yu, Z., Yang, G., Zuo, S., Jørgensen, G., Koga, M., & Vejre, H. (2020). Critical review on the cooling effect of urban blue-green space: A threshold-size perspective. *Urban Forestry & Urban Greening*, *49*(February), 126630. https://doi.org/10.1016/j.ufug.2020.126630

Zareba, A. (2014). Multifunctional and multiscale aspects of green infrastructure in contemporary research [Multifunkcjonalność zielonej infrastruktury we współczesnych badaniach]. *Problemy Ekorozwoju*, *9*(2), 149–156. https://scopus-amity.refread.com/inward/record.uri?eid=2-s2.0-84903758445&partnerID=40&md5=f0ce20fd188d4e0180dc11cb079e04ea

Zari, M. P. (2019). Devising urban biodiversity habitat provision goals: Ecosystem services analysis. *Forests*, *10*(5). https://doi.org/10.3390/f10050391

Zhang, Y., Canisius, F., Zhen, C., Feng, B., Crawford, P., & Huang, L. (2019). Effectiveness of aerial and ISERV-ISS RGB photos for real-time urban floodwater mapping: Case of Calgary 2013 flood. *Journal of Applied Remote Sensing*, *13*(4). https://doi.org/10.1117/1.JRS.13.044521

Zhang, Y., Tarrant, M. A., & Green, G. T. (2008). The importance of differentiating urban and rural phenomena in examining the unequal distribution of locally desirable land. *Journal of Environmental Management*, *88*(4), 1314–1319. https://doi.org/10.1016/j.jenvman.2007.07.008

Zhao, D., Li, F., & Wang, R. (2011). Optimization of urban land structure based on ecological green equivalent: A case study in Ningguo City, China. *Shengtai Xuebao/ Acta Ecologica Sinica*, *31*(20), 6242–6250. https://scopus-amity.refread.com/inward/record.uri?eid=2-s2.0-80054891965&partnerID=40&md5=7bbb094f7b412f920f434320fe8

aae5f

Zhifeng, W., & Yin, R. (2021). The influence of greenspace characteristics and building configuration on depression in the elderly. *Building and Environment*, *188*, 107477. https://doi.org/10.1016/j.buildenv.2020.107477

Zigh, E., Belbachir, M. F., Kadiri, M., Djebbouri, M., & Kouninef, B. (2016). New shadow detection and removal approach to improve neural stereo correspondence of dense urban VHR remote sensing images. *European Journal of Remote Sensing*, *48*, 447–463. https://doi.org/10.5721/EuJRS20154825