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HEALTHY LANDSCAPES: A REVIEW OF THE RESEARCH ON URBAN LANDSCAPES ASSOCIATED WITH HEALTH AND WELLBEING

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Abstract: Cities shelter more than two thirds of the world's population, and health security in such environments became a challenge. The outbreak of the SARS-COV-2 pandemic revealed the urgency of assessing urban resilience towards major health crises. Major cities are acknowledged for decreasing the health status of their residents through complex drivers, and researchers from various domains have been addressing these issues for the past three decades. The aim of our study focused on highlighting the main methods and indicators used by scholars to assess the impact of urban landscapes on health, and to cluster urban landscapes based on their conclusions. We scoped the scientific literature published in the past 10 years, addressing the issue of health in relation with urban landscapes. We used statistical approaches, API algorithms, and social network analysis for generating and exposing our results. Most studies focused on perception analyses (mainly self-perceived health), literature reviews or environmental quality impacts on health. Green and blue features were considered therapeutic landscapes, while dense built-up spaces were described as harmful. Urban landscapes are acknowledged as enablers or disablers of health, thus planning strategies and regulations should consider the impacts generated by the design and structure of new urban fabrics.

Keywords:

green spaces;
therapeutic landscapes;
urban sustainability;
well-being

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Introduction

Worldwide, major urban settlements attract population as they are considered environments providing better living standards. These standards are correlated with the coverage and accessibility of public and private services (United Nations 2019). Nevertheless, living in cities inflicts specific habits and routines associated with unhealthy behaviour besides citizens being exposed to pollutants and stress factors (World Health Organization 2012). The high densities of population, specific to major cities proved to be a major vulnerability amid epidemiological breakdowns (Sharifi and Khavarian-Garmsir 2020). These shortcomings are becoming important challenges for planners and policy makers who must concentrate their efforts on keeping the proper balance between the benefits and weaknesses of urban living. Urban living has been acknowledged as unhealthy (Flies et al. 2019), enabling health in such environments being on the agenda of international and regional conventions (United Nations 2021). The pressures on human health in cities has been mostly correlated with the decreased environmental quality and the complexity of stress factors (Snell and Bhullar 2019).

Scholars have approached these issues from various angles, and they endorsed the idea that urban planning embedded with health risk assessments is appropriate for designing healthy cities (Davies and Kelly 2013, Ramaswami et al. 2016). Therefore, planning and health agendas should be aligned at local level, health priorities should be relevant, new tools designed to implement health principals in urban planning should be created, and adequate resources need to be allocated (Carmichael et al. 2019).

The quality of urban landscape influences the way dwellers perceive the urban quality of living (Gavrilidis et al. 2016). The quality of urban living is often correlated with the self-perceived health and the perceived environmental quality (Wolch et al. 2014). Therefore, the main goal of our study is to assess which are the most important features of urban landscapes which are associated in scientific research with health and wellbeing. For achieving this goal, we scope the scientific literature addressing this topic in the past decade to: 1) synthesise the scholars' profile tackling the issue; 2) extract the main methods and indicators used for their assessments; and 3) extract the types of urban landscapes labelled as therapeutic or harmful towards human health.

Health pressures in cities

Environmental quality is an important driver of health issues. Urban areas are acknowledged for dealing with complex environmental challenges (Nita et al. 2022). Mitigating the effects of air degradation in cities is among the common objectives that cities around the world share, as air quality directly impacts the health status of urban dwellers (Ghorani-Azam et al. 2016). Economic activities and heavy traffic, along with the decrease of areas covered with vegetation are the main drivers of air pollution

within cities. Cities are constantly expanding, reinforcing the air quality issues. Particulate matter and nitrogen oxides are the main pollutants of urban air (Taiwo et al. 2014), heavy concentrations exposing urban dwellers to various respiratory and cardiovascular diseases (Shi et al. 2019).

Cities have for long been considered noisy environments, affecting biodiversity as wild species are sensitive to unnatural and intense sounds (Katti and Warren 2004). Humans, however, are sensitive to noise pollution, long exposures causing hearing malfunction, heart related diseases (Hammer et al. 2014), or mental illnesses (Gruebner et al. 2017). Constant noise sources in cities are associated with traffic or construction sites.

Urban vegetation is considered an important asset in the pursuit of cleaner air and better health in cities. Urban green spaces, especially macro-structures like parks and gardens, enhance communities' lifestyles by ensuring better environment, safety and health (Shimamoto 2019). Green urban features proved to be vital barriers against the spread of SARS-COV2 virus (You and Pan 2020). During the imposed restriction due to the pandemics, vegetated areas provided the proper landscapes where urban dwellers could restore their physical and mental conditions (Grima et al. 2020, Venter et al. 2020). However, urban green may be a disabler of health in cities given the fact that some species can provoke allergies or skin irritations (Cariñanos and Casares-Porcel 2011), or they can trigger asthma or respiratory infections (Aerts et al. 2021). Moreover, wild landscapes edging urban areas favours the encounters of wild species with humans, determining a high level of reluctance towards natural landscapes within cities, especially if the media endorses alarming narratives (Neagu et al. 2022). Another argument against urban biodiversity emerged along with the outbreak of the SARS-COV2 pandemics, as, despite the lack of undebatable origins of the virus (Andersen et al. 2020), the first assumptions endorsed the idea of animal origin.

While easier and wider access to healthcare units within cities is an important argument for better quality of life (Paul 2012), the recent health crisis proved that health infrastructures succumb in overcrowded cities (Plagg et al. 2021). The last global pandemics emphasised just another shortcoming enhanced by urban overcrowding. The high density of people in major cities impacts both directly and indirectly human health (Jain and Arokiasamy 2018). Recent global events gave food for thought to scholars and practitioners who now must focus on controlling the urbanisation process considering health hazards as well. Scholars and health specialists considered that built environments, along-side genetics and socio-economic contexts are the main cause for chronic diseases (Sarkar et al. 2014). Therefore, our society has to deal with the paradox that while urbanisation means progress and well-being, these benefits come at the cost of complex health pressure. In order to break this paradox, planning policies and urban management should consider designing cities containing features enabling health, while reducing the ongoing pressure over their healthcare system.

Opportunities for increasing urban health levels

Embedding health aspects in all policies would help to address the planning challenges driven by market forces (Barton and Grant 2013). As the World Health Organization (1986) indicates, "health is created by people within the settings of their everyday life", and to these days and for future years, the main setting in which people will spend their time will be urban or urbanised.

Citizen's access to therapeutic urban landscapes is considered germane considering the modern lifestyles and health risks (Thompson 2011). Lands covered with vegetation are generally accepted as therapeutic landscapes. However, there are differences in providing these benefits based on the type of vegetation or species association. Wide water bodies and a high diversity of tree species, along with greenspace patches that are well interspersed with the built environment are considered to provide more health benefits than any other types of green areas (Mears et al. 2019). Complex topography landscapes and the ones including large water bodies determined positive health effects (Deng et al. 2020). Urban fabrics with blue infrastructures are widely considered as therapeutic landscapes (Volker and Kistemann 2015). Unplanned urbanisation increases the exposure of people to environmental hazards and the heterogeneous nature of human health risk in an urban landscape reveals critical risk hotspots where immediate action should take place (Morandeira et al. 2019). Public health and wellbeing should be integrated into the implementation of nature-based solutions for resilient and liveable urban landscapes (Van den Bosch and Ode Sang 2017).

The planning and design of residential landscapes determines the health level of their inhabitants (Petteway 2019). Most studies are associating mental disorders with socio-economic indicators (poverty, poor education, unemployment, segregation) or major life events, but not much has been dwelled upon the influence of the built environment (Garrido-Cumbrera et al. 2018). Sprawling cities are developing incoherent landscape patterns (Nistor et al. 2021) which determine subliminal stress on the citizens' subconscious (Halpern 2013). The adequate provision of public green space in local neighbourhoods and within walking distance is important for positive mental health (Wood et al. 2017). Urban design enabling access to large green areas is mandatory for planning a green and healthy city (Niță et al. 2018). The distribution of urban green features throughout the cities and their level of accessibility helped scholars to determine which neighbourhoods are more likely to furnish healthier environments for their residents (Cetin 2015).

Both planning and micro-planning in cities must consider how the desired policies would impact the health status (Giles-Corti et al. 2016). However, the healthy city status is reached by implementing policies and planning strategies that enhance and support a healthy lifestyle (Barton and Tsourou 2013). Embracing the smart growth principles may encourage physical activity and lower obesity rates in cities, but at the

same time it would be "naive to think" that by only shifting urban planning codes and regulations would be enough to change behavioural patterns or to alter entrenched development practices (Durand et al. 2011).

Urban landscapes as enablers of health

The complexity of activities and functions occurring in urban environments are clustered in specific landscapes, this conglomerate providing both opportunities and pressures for the dwellers. The design and association among urban landscapes mostly focus on enabling economic efficiency (Hirai 2015). The experiences gathered throughout decades of local and regional health crises, culminating with the global pandemic started in 2020, advocate for considering health protection as another specific pillar of urban planning, along the economic, social, and environmental concerns.

Accessibility and affordability of healthy food within urban areas could influence the eating habits, especially among the vulnerable groups (Hammelman 2018). The edible city approach is considered the right path towards the development of sustainable, liveable, and healthy urban areas as it will encourage residents to adopt healthier eating behaviours (Säumel et al. 2019). Urban blue infrastructures, especially large water bodies, can provide the proper stimulation for outdoor activities, such as paddling or swimming (Volker and Kistemann 2013). Major urban green features, such as parks, gardens or forests are adding up their contribution in stimulating residents to practise outdoor activities (Wolch et al. 2014). Local policy makers and practitioners can create supporting landscapes for a healthy living, designing them to tackle the health burdens of urban society (Root et al. 2017).

Morphological and structural features of urban landscapes influence air quality, especially particulate matter dispersal (Liang and Gong 2020), thus this environmental issue is described within the cityscape through specific chromatics of built-up structures or odours (Quercia et al. 2016). Most urban areas, especially post-communist European countries are still confronted with specific unhealthy landscapes such as brownfields, which are the testimonial of industrial decay from the last 30 years (Kunc et al. 2014). The derelict industrial landscape is mostly reconverted in other types of landscape such as residential, commercial, logistic, or green spaces (Moţcanu-Dumitrescu 2015).

Urban planning can enhance human and environmental health by providing the proper marketability of healthy urban designs, persuading the private sector to invest in it (Carmichael et al. 2019). Health benefits generated through cultural ecosystem services need to be given more attention for being at least considered by practitioners and policy makers in their documents (Chen et al. 2019). Even if there is a considerable amount of knowledge relating the importance of accessibility towards therapeutic landscapes in cities, the need for better evidence and understanding endorsing this desire remains on the table (Thompson 2011).

Methodology

The first step of our analysis was to search and download relevant papers for the study. We have used the scientific databases search engines and the main keywords used during the searching process were: "urban landscape" and "health", complementary using other relevant keywords (Figure 1). The established searching terms were aimed at the title, abstract and keywords. After a preliminary search, we compiled a database of 310 downloaded papers. Going further with an in-depth validation of the downloaded papers (by thoroughly reading the abstracts and the aims of each downloaded paper), the database was downsized to less than 280 papers, most of which were published by Elsevier and MDPI. Therefore, we have decided on keeping for further analysis just papers published between 2010 and 2020 in the two scientific databases. The final analysis database consisted of 262 relevant papers, published in 57 journals (33 in Elsevier and 24 in MDPI).

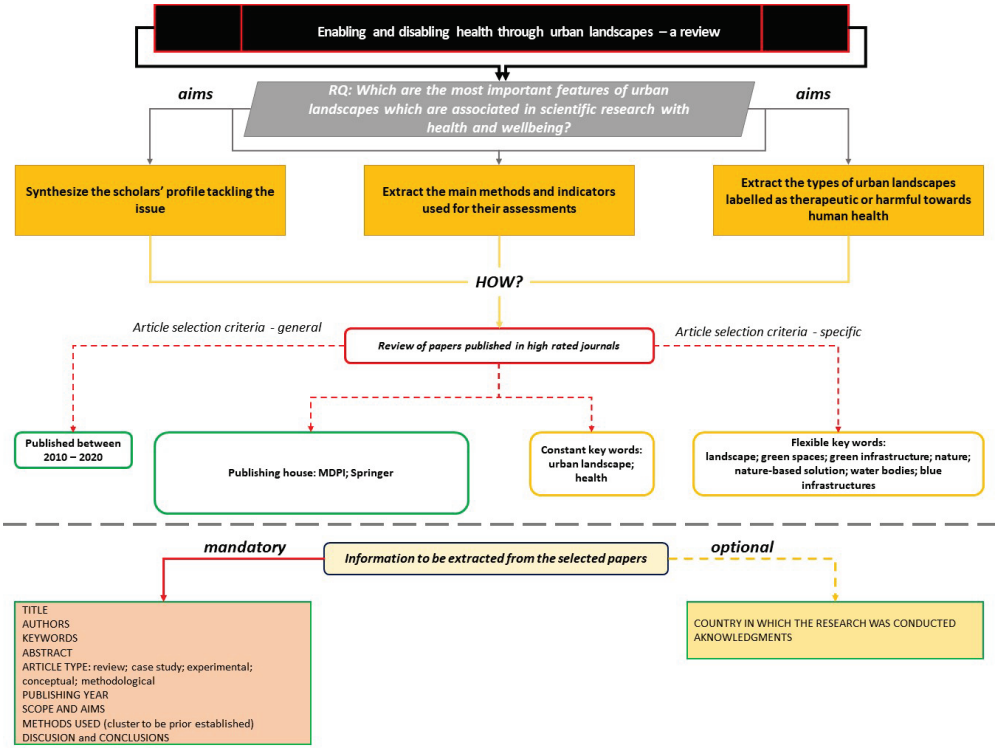

Figure 1. Methodological steps for selecting the proper scientific papers relevant for the assessment

All 262 papers were shared among the research team for an in-depth analysis, which consisted in the reading of the papers and the extraction of their: identification data (ID, doi_wos, title, authors, authors' affiliation, affiliation country, year published and journal's name); general information (abstract, study aims, keywords); approach (scale

of the analysis, location of study area/s and article type); addressed urban landscapes (provided definitions, types of landscape); addressed health issues (provided definitions, types of analysed health, methods and indicators used); perspectives (future directions, study limitations); and outcomes (major findings and conclusions). These data were compiled in an additional database which was used for further processing. After manually extracting the indicated data, we used the Deep Categorization and Text Classification APIs provided by Meaning Cloud (2022a, 2022b) for automatically labelling the abstracts with a specific topic/s. If human validation occurs, using text mining approaches in scientific reviews proved to be efficient in improving the quality of the studies, especially for non-native English speaker authors, as these tools have high accuracy when mining English texts (Dale 2015, Sulova et al. 2017).

Deep categorization is an in-depth rule-based categorization, assigning one or more categories to a text using a very detailed rule-based language that allows you to identify very specific scenarios and patterns using a combination of morphological, semantic and text rules (Meaning Cloud 2022a). The Text Classification API assigns one or more classes to a document according to their content, the classes being determined from a previously established taxonomy (Meaning Cloud 2022b). For this study, we used the IPTC taxonomy (International Press Telecommunications Council), as it comprises more classes which may be applied and may be relevant for scientific publications as well. Using the UCINET software (Borgatti et al. 2002), we provided the network analysis related with the authors' countries of affiliation and with the topics' associations in the reviewed papers. The methods, tools and indicators used in the analysed articles were clustered as indicated in Table 1 and Table 2. The indexes and indicators used in the analysed papers were further clustered by the authors using the DPSIR classification (Smeets and Weterings 1999). For better exposing the outcomes related with the addressed landscape and the health issues analysed in the reviewed papers, we clustered them as indicated in Table 3.

Table 1. Clusters of the methods used by the authors in the reviewed papers

ID	Method cluster	Details
1	Experimental	*Methods involving experiments (e.g.: Usage of VR technologies on human subjects, exposure to urban features while recording various biometrics, biometric analysis among different socio-demographic groups etc.)*
2	Index calculation	*Methods aimed at developing indexes*
3	Literature review	*Papers aiming in reviewing the existing literature on a particular subject*
4	Miscellaneous	*Approaches in which the authors combined methods described in the other clusters*
5	Perception analyses	*Methods based on surveys, interviews, and questionnaires*
6	Remote Sensing	*Methods using satellite imagery to determine urban phenomena*
7	Risk assessment	*Methods assessing the risks of being exposed to various pollutants and pathogens*
8	Spatial analysis	*Methods in which different spatial metrics were computed (e.g., distances, travel time, land uses dynamics)*
9	Statistical processing	*Methods in which raw data were statistically processed*

Table 2. Clusters of the indexes and indicators extracted from the reviewed papers

ID	Index cluster	Abbreviation	Details
1	Ecological	ECO	*Related with species or ecosystem assessments*
2	Physiological	PHI	*Related with human physiology*
3	Psychological	PSY	*Related with psychological assessments*
4	Landscape metrics	LAM	*Usage of indexes attributed to landscape analysis*
5	Demographic	DEM	*Demographic indicators (e.g., age, gender, etc.)*
6	Social	SOC	*Social indicators (e.g., unemployment, homelessness, etc.)*
7	Economic	ECN	*Economic indicators (e.g., investments, budgets, etc.)*
8	Document	DOC	*Indicators extracted through document analysis*
9	Medical Behaviour	BEH_m	*Indicators on human behaviour in relation with health issues*
10	Environmental	ENV	*Data related with environmental components quality*
11	Climate	CLM	*Data related with climate and microclimate*
12	Urban amenities	URA	*Data related with urban amenities (e.g., sewage, water provision, healthcare, etc.)*
13	Environmental behaviour	BEH_env	*Data on human behaviour in relation with environmental components*
14	Perception	PER	*Data extracted through perception analyses*
15	Literature data	LID	*Data extracted through literature review*
16	Spatial metrics	SPM	*Data extracted through spatial analysis*
17	Accessibility	ACC	*Data related with accessibility towards different urban features*

Table 3. Clusters of urban landscape types and health issues addressed in the reviewed papers

Landscape cluster	Details	Health cluster	Details
Foodscape	*Related with food provisioning*	Habits	*Focusing on people's habits and their driving forces*
Social	*Providing social benefits (e.g., shelters)*	Healthy living	*Related with physical activities, good nutrition, or outdoor activities*
Workscape	*Related with people's workspaces*	Mental	*Focusing on the mental wellbeing*
Educational	*Related with the educational buildings*	Physiological	*Focusing on the physiological wellbeing*
Industrial	*Related with the industrial activities and buildings*	Self-reported health	*Related with self-perceived medical data gathered through surveys, interviews, or questionnaires*
Soundscape	*Related with noise stress*	Behaviour	*Related with the human behaviour*
Agriculture	*Related with croplands, allotment gardens or other edible landscapes*	Healthy environment	*Focusing on the health of environmental components*
Cultural	*Related with places providing cultural outcomes*	Overall wellbeing	*Focusing on the general well-being of urban citizens*
Therapeutic	*Mixture of natural and artificial features providing general wellbeing*		

Landscape cluster	Details	Health cluster	Details
Streetscape	*Landscapes perceived from the street level*		
Residential	*Related with housing, private gardens or neighbourhoods*		
Bluescape	*Related with natural or artificial water bodies*		
Leisure	*Related with places where people go for leisure activities*		
Political	*Related with documents, strategies or plans*		
General urban landscape	*Analysis of the overall urban landscape*		
Greenscape	*Focusing on landscapes consisting of natural features*		

Results

Most of the authors addressing the relation between urban landscapes and human health were affiliated in China, USA, UK, and Germany (Figure 2). The authors affiliated in academic or research institutes from these countries represented more than 50% of the total authors inducted in our studies. Authors affiliated with European institutions conducted 40% of the reviewed studies. Most studies were co-authored mainly by researchers affiliated in UK (egnv=0.400), Germany (egnv=0.386), Australia (egnv=0.286), USA (egnv=0.278) and China (egnv=0.263), according to the principal component SNA results (Figure 3). During the analysed period, the interest in the topic has exponentially increased. While from 2010 to 2015 the number of papers failed to exceed 5 articles per year, starting with 2015 the number reached 15 articles per year, with 72 papers in 2019 and 87 in 2020. The emergence of the global health crisis starting from the end of 2019 has spurred the number of articles addressing health in urban landscape. The cumulative impact factor of the journals in which the reviewed articles were published was 202.63 (Elsevier: 155.63; MDPI: 46.69).

Content analysis

After using the Deep Categorization API on the abstracts of the reviewed articles, 74 topics and subtopics were identified. The topic incidence throughout all the analysed abstracts shows that the topic "science" with the subtopic "environment" has a share of 21% of all topics, followed by the topic "medical health" (15%), "Business and Finance>Industries" (7%), and "Medical Health>Diseases and Conditions" (4%). The principal component SNA (Figure 4) shows that most of the topics are correlated with "Science>Geography" (egnv=0.296), "Medical Health" (egnv=0.266), "Business & Finance Industry" (egnv=0.265), or "Healthy Living>Fitness & Exercise" (egnv=0.216).

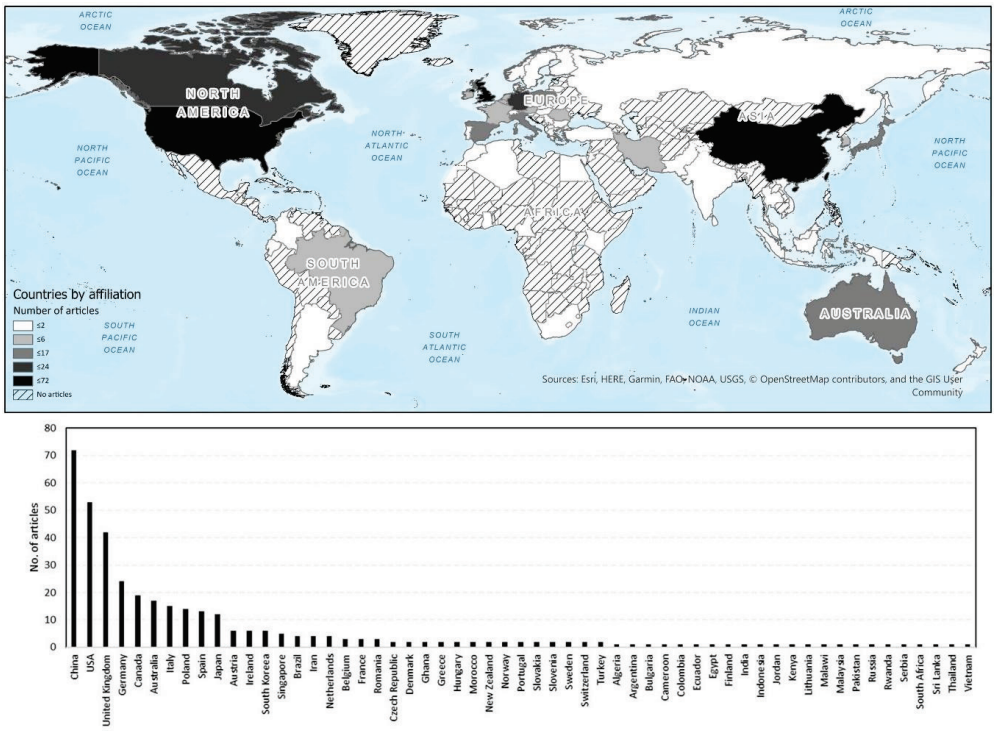

Figure 2. Global representation of the authors' country of affiliation

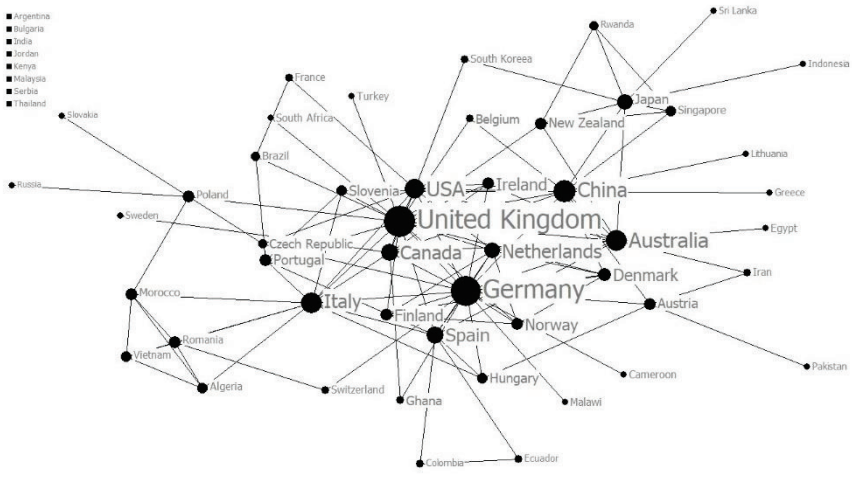

Figure 3. Principal component SNA describing the affiliation countries co-authoring the reviewed articles Label sizes are based on eigenvector values, and node sizes are based on degree

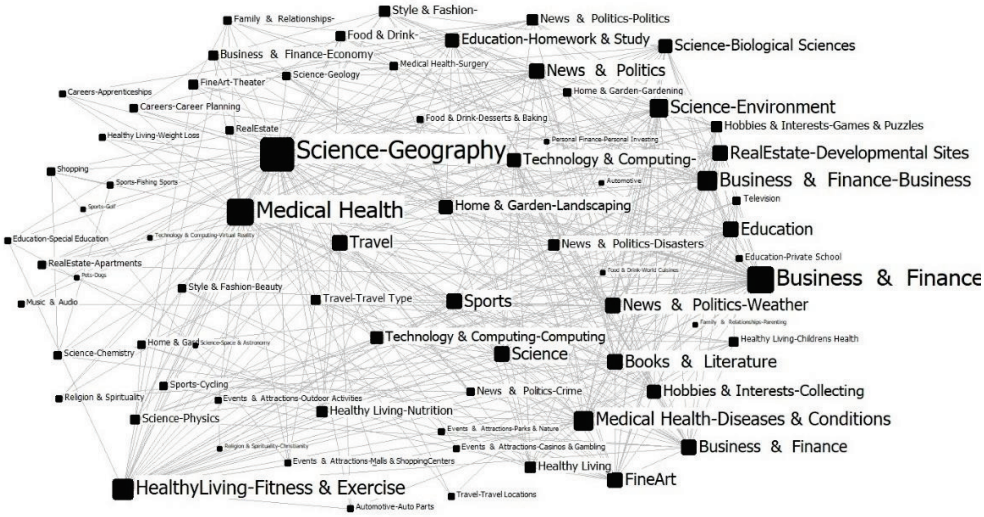

Figure 4. Principal component SNA describing the Deep Categorization topics' association from the abstract of the analysed papers
Label sizes are based on eigenvector values, and node sizes are based on degree

The Text Classification API using the IPTC taxonomy was set to extract the central topics from the analysed abstracts. It extracted 64 topics and subtopics, the most present topics in the analysed abstracts being: 1) politics – interior policy – housing and urban planning (present in 21% of the analysed abstracts); 2) environmental issue – nature, economy (present in 15% of the analysed abstracts); 3) business and finance – construction and property (present in 13% of the analysed abstracts); 4) health (present in 8% of the analysed abstracts); 5) environmental issue – environmental pollution – air pollution (present in 3% of the analysed abstracts).

We have extracted the types of landscapes and health issues that the authors addressed in their studies. Based on the clustering of the landscapes and health issues previously exposed, the most analysed urban features were the greenscapes and the general urban landscapes (Figure 5a), as for the health issues, the most addressed were the overall wellbeing and the health of the environmental components (Figure 4b).

Further, we determined the associations between the analysed landscapes and the health issues within the processed articles. The principal component SNA shows that, besides the "environmental health" (egnv=0.283) issue, the identified landscapes are mainly associated with the overall "wellbeing" (egnv=0.315), "behavioural patterns" (egnv=0.259), and "self-reported health" (egnv=0.220); while the main urban landscapes analysed in relation with different health issues are (Figure 6): "general urban landscape" (egnv=0.328), "greenscapes" (egnv=0.328), "leisure landscape" (egnv=0.320), "streetscapes" (egnv=0.278), and "residential" (egnv=0.255).

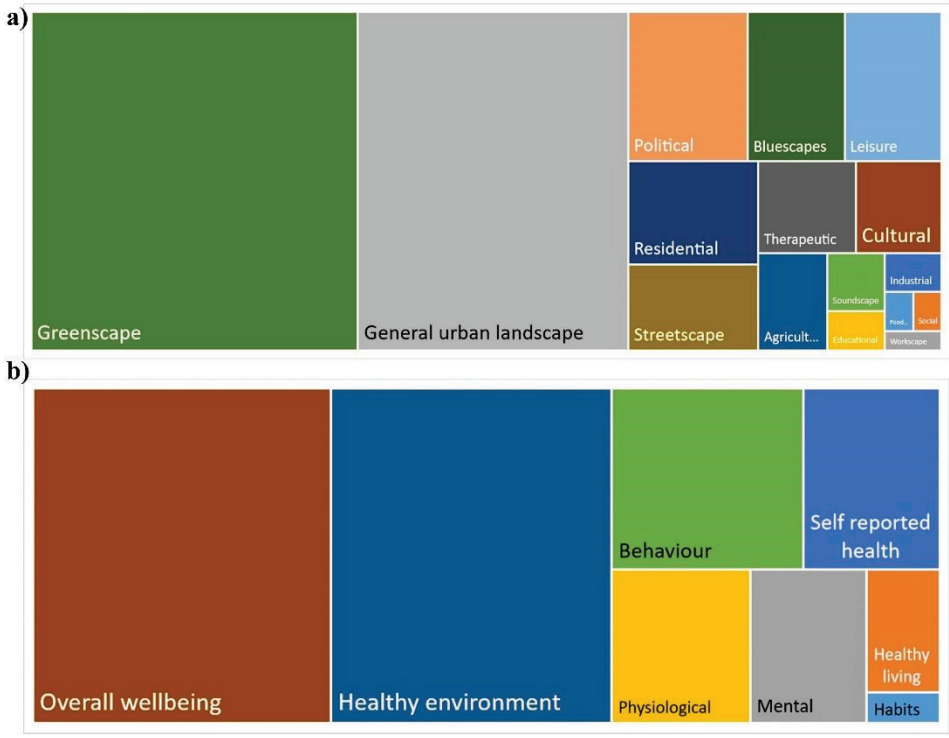

Figure 5. Landscape (a) and Health issues (b) clusters extracted from the aims and objectives of the analysed papers

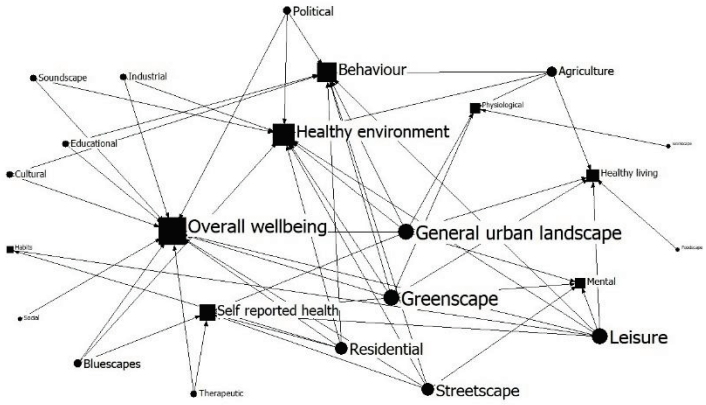

Figure 6. Principal component SNA describing the relations between landscape and health issues clusters within the analysed papers
Label sizes are based on eigenvector values, and node sizes are based on degree

The methods chosen by scholars in their studies were mostly clustered as "miscellaneous" (20%), "perception analyses" (20%), "spatial analyses" (16%), "statistical processing" (15%), and "literature review" (13%). Overlapping the methods used by the researchers with the country of their affiliation, it was expected that

countries generating more articles on the topic to have authors applying various methodological approaches for their assessments. However, we must highlight the European context where even the countries with fewer publications are having authors that apply at least three methodological approaches (Portugal, France, Ireland, and Romania).

The index/indicators clustering using the DPSIR (Drivers, Pressure, State, Impact, Response) classification shows that, in 52% of the cases, the authors used State indicators (Figure 7a), followed by Impact indicators (17%) and Pressure indicators (161%), while Drivers indicators were less used (9%), along with Response indicators (5%). Using the classification developed in this study, the perception data (11%) and the landscape metrics (11%) are the most used parameters in the analysed papers (Figure 7b). However, there are other data which were used in more than 5% of the cases, revealing a wide palette of data types used by the authors in addressing the urban landscapes in relation with human and environmental health.

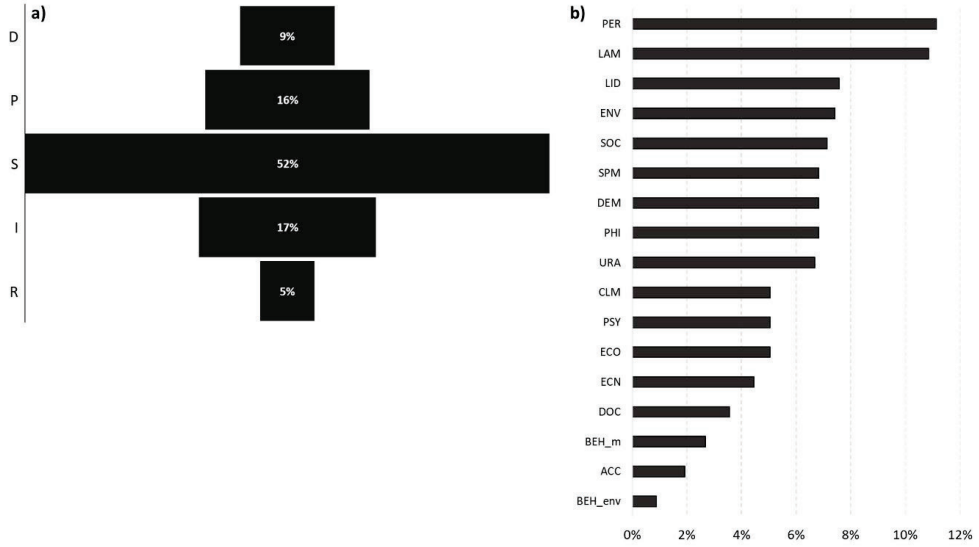

Figure 7. DPSIR classification (a) and Indicators' clusters (b) used in the reviewed articles
The b) section of the image contains the clusters described in Table 2.

Discussion

The review of the literature addressing urban landscapes as drivers of health burdens revealed that, in recent decades, scholars emphasised the health benefits provided by natural features within cities, and they highlighted how high built-up densities weakens human health on medium and long terms. Our study endorses the importance of green landscapes within cities, regardless of their size. Nature and vegetated areas provide serenity for the urban dwellers, but several of the reviewed

studies pinpointed also other urban landscapes as health enablers, such as the bluescapes or foodscapes.

Urban landscapes as health enablers – a transdisciplinary topic

The results revealing the main countries from which the authors of the reviewed articles are affiliated are consistent with the world rankings regarding the scientific production per country (World Bank 2021). The same countries are acknowledged as having the most cities on the path of reaching the health-related UN's SDG (GBD 2015 SDG Collaborators 2016), thus the researchers from these countries have an increased know-how and experience in assessing the health benefits provision of cities. Another argument on why researchers from few countries are addressing this issue is that most Western European, Japanese and Canadian cities are listed in the top 30 in terms of sustainability (Phillis et al. 2017). The fact that mostly British and German authors, along with Asian and North American authors, were involved in joint research projects with scholars from other countries is also consistent with the data provided by the European Research Ranking (2021) and the UNESCO Institute of Statistics (2023), emphasising that research institutes from Western European countries are leading in terms of total research funding expenditure, number of projects being involved in, and number of projects coordinated by, while China, Japan, Republic of Korea or USA are leading in GERD values (percentage of GDP allocated for research and development).

Aspects of urban health could not be addressed either way than transdisciplinary (Grover and Singh 2020), ideas supported also by our results. The topics revealed by the Deep Categorization API revealed a plethora of domains concerned by the urban health subject. While most of the studies were labelled with the "geography" domain, these results are however biased as we focused on urban health issues related with the urban landscape, thus it was expected that this domain or its sub-branches would pop up during the analyses. Nevertheless, three decades ago, scholars have pinpointed how urban health can be addressed from a geographical perspective (Taylor 1993). More recently, geographical approaches were used to emphasise the inequalities of health and wellbeing distribution throughout the cities while highlighting the environmental and planning driving forces for these inequalities (Grover and Singh 2020).

Wealth is also associated with health levels (Qureshi et al. 2017), our results indicating that the reviewed articles were addressing the "business – finance industries" matters. Cities in developing countries which are becoming wealthier are prone to sprawling (Wei and Ewing 2018), and sprawl has been acknowledged to be linked with the health levels, especially the mental wellbeing of the urban population (Garrido-Cumbrera et al. 2018). On the other hand, in developed countries, local authorities are more likely to invest in planning strategies and policies to increase the liveability of their cities, enhancing the health status of their citizens (Shuvo et al. 2020). Environmental quality plays a determining role in the urban health status (Salgado et al. 2020) and all the topics

emerging from it, like climate change, pollution, GHG emission, urban heat island or urban green infrastructures are to become more present in future papers focusing on health within cities. Planning issues are also expected to be frequently associated with urban health analyses as planning policies are the main determinants of urban landscapes in which people are living their daily routine (Carmichael et al. 2019).

The complexity described by the urban environments requires multidisciplinary approaches. Territorial planning requires the proper management space through time, each scientific domain dealing with specific amounts of both (Figure 8). While the expertise of most researchers involved in urban management at a certain level aims at increasing the efficiency only by assessing the socio-economic indicators, health will be under constant and rising pressures. Health should be an intersectoral concern if the future urban world wishes to reach sustainability at all levels (Barton et al. 2003). Through this review, we desire adding more emphasis on the need to consider health impacts in the decision-making process taking place in urban areas. Coherent and proactive urban planning addressing health issues at all levels of expertise could mitigate the negative effects of potential health crises, context that usually determines political turmoil and the rising of populist discourses (Doiciar and Crețan 2021).

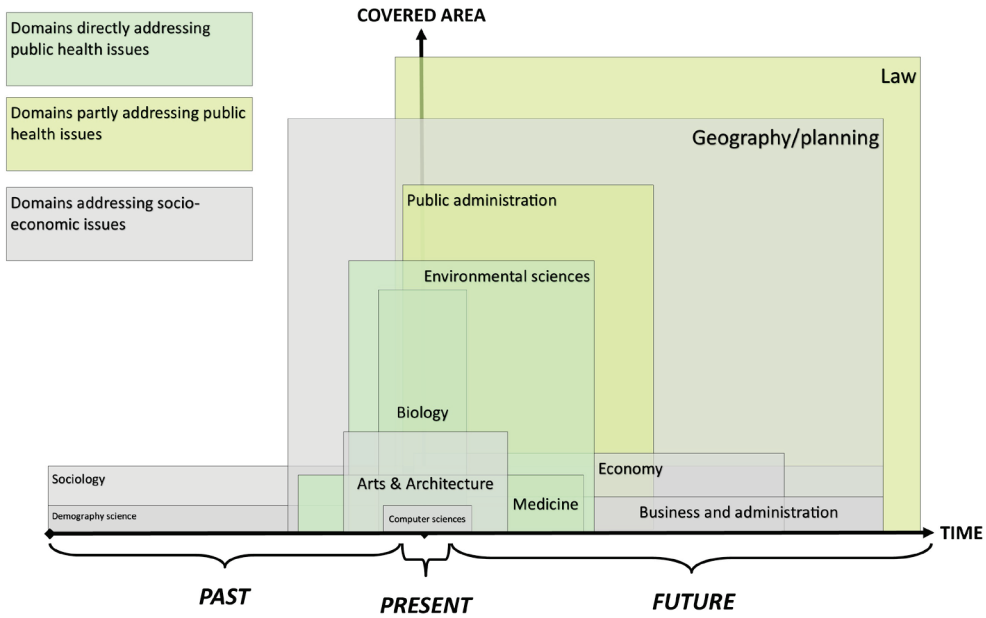

Figure 8. Domains involved in the urban management, by analysed scales and time frames

(Un)healthy urban landscapes

As it was expected, greenscapes were mainly assessed in relation with urban health aspects. This outcome endorses the idea that vegetated areas are improving human

health by mitigating the pressures projected by low environmental quality, especially air pollution, and by providing the proper ground for outdoor activities, enabling people to embrace a healthier way of living (Shanahan et al. 2015). On the other hand, the presence of vegetation within cities has been also viewed as a pressure on human health, mainly to those groups of people with allergies (Cariñanos et al. 2014). The inclu-siveness feature of urban green areas depends on the species composition (Cariñanos et al. 2019) and, more than that, the allergenic potential of some species can be aggravated by the local environmental conditions (Aerts et al. 2021). Therefore, planning and managing the green infrastructure features within urban areas require special attention on the species composition and proper assessment regarding the state of the urban environment. Our results show that greenscapes have been analysed in relation with environmental quality, behaviour patterns, healthy living, mental health, and overall well-being. People manifest positive behaviours when surrounded by nature (Roberts et al. 2019). For enhancing the urban green spaces potential to enable health, planning should focus on their accessibility, quality, equipping, attractiveness, and security (Lee et al. 2015). Similar suggestions are made by the World Health Organization (2017), which encourages planners, practitioners and policy makers to aim their energy in equipping urban green areas with various features that would determine population to adopt a healthier lifestyle.

Besides urban green areas, the authors were engaged in assessing the overall urban landscape in relation with health issues. These holistic approaches are rooted in prior studies addressing the issue in a more niched manner, but, at the same time, they provide the context for further detailed studies for confirming their findings and hypothesis. Urban morphology and the alternance of landscapes within a city have strong effects on the urban functions, healthcare, and traffic conditions (Meng and Xing 2019). The landscapes distribution within cities have been acknowledged to influence the land surface temperature and the occurrence of urban heat island phenomenon (Ramaiah et al. 2020, Yao et al. 2020) which negatively impacts human wellbeing and comfort (Stauber et al. 2018).

The association of the planning and management documents with environmental quality analyses reignites the idea of Kaiser et al. (1974) that environmental quality can be only promoted through suitable planning strategies. This desideratum prevails today as researchers acknowledge that urban planning can enhance human health by considering the quality of environmental components (Carmichael et al. 2019). Leisure landscapes were as well evaluated in relation with all the extracted health issues, excepting physiological health. Engaging in social and cultural activities has a positive impact on the self-reported health status (Cocozza et al. 2020) and the deprivation from leisure activities has negative influences on the general quality of life in cities (Kapuria 2016). Leisure constraints and satisfaction mediate the relationship between socio-economic status and self-reported health (Chick et al. 2015).

Streetscapes consisting of natural features and the traffic limitation generate more benefits over general and mental wellbeing (Wijnands et al. 2019). For improving the environmental quality, sustainability principles should be included in the planning and design of urban streetscapes (Rehan 2013). Visual pollution is often considered a pressure on the mental wellbeing, while shiny ads, or billboards perceived at street level are causing distress to the urban citizens from a psychological perspective (Portella 2014).

Residential landscapes have been highlighted by our results to be associated with environmental degradation, behaviour patterns, self-reported health, and habits. Low-income residential neighbourhoods are considered to cast unhealthy landscapes from a psychological, physiological and environmental perspective (Won and Lee 2020). The amount and complexity of natural features in high density residential districts is scarce, challenging the human and environmental health as well (Wolch et al. 2014), while single dwelling residential fabrics with gardens can project a multitude of benefits (Dennis and James 2017). However, detached houses with gardens are not a viable solution for urban settlements that attract large numbers of inhabitants, but improving the existing multi-dwelling landscapes is something that practitioners and planners are aiming for.

Assessing health at landscape level

The tools and methods used for assessing the relationship between urban landscapes and health are essential for understanding the outcomes of this analysis. Most of the methodologies and tools are borrowed from landscape ecology (Zhou et al. 2018), or remote sensing and GIS (Ramaiah et al. 2020). Perception analyses are also widely used, especially in studies focusing on self-reported health (Garrido-Cumbrera et al. 2018, Won and Lee 2020).

Around 20% of the studies were using perception analyses as methods to evaluate the linkage between different urban landscapes and health. On the one hand, these types of studies require less logistics for gathering data but they entail solid statistical processing knowledge for the results interpretation and meaning. Perception analyses may show specific trends or behaviours, the results being mainly useful if practitioners would like to develop citizen-oriented planning strategies. On the other hand, these types of studies lack quantitative input, being unable to draw straight facts. Studies focusing on perception analyses have emphasised the idea that people feel healthier near areas covered with vegetation (Wood et al. 2017) or near water bodies (Volker and Kistemann 2013). While just the proximity of such features does not guarantee higher health levels for the population living or working nearby, the perceived benefits are undebatable. Self-reported health studies were also conducted within residential areas, objecting that communities from lower socio-economic classes are experiencing negative influences from the built-up areas where they live in (Won and Lee 2020). The perception analysis is a common approach for assessing how the main beneficiaries of urban landscapes are reacting to their planning or management (Zakerhaghighi et al. 2022).

Besides perception analyses, authors have opted for the spatial analyses too. Urban landscapes' dynamics can reveal whether a city is improving its health conditions or not (Carmichael et al. 2019) in relation to accessibility between one landscape to another (Hammelman 2018) or through the shrinkage of the areas covered with natural features (Van den Bosch and Ode Sang 2017). Urban land uses and cover determine the socio-economic profile of a city (Gavrilidis et al. 2015), which ultimately can lead to specific health conditions (Matthews and Gallo 2011). Spatial analyses can derive quantitative data which are able to become fundamental data when designing planning strategies and development scenarios for cities, but, at the same time, they lack the assessment of citizens' needs and requirements. These methods usually ask for more logistics and skills as they require GIS and remote sensing solutions as well as researchers with expertise in using these tools and in interpreting the processed data.

Performing different statistical processes using public data was another approach in the analysed papers. Public data, especially socio-demographic data and health data, are used for highlighting specific health trends in correlation with environmental, economic, or land-use data. Studies consisting of literature reviews represented around 13% of the papers included in this study. They were aimed to condense the knowledge regarding the impact of certain urban landscapes projects over human or environmental health. The data used in the reviewed papers as indicators show that the authors were mainly preoccupied on assessing the state of human and environmental health in relation with urban landscapes and fewer of them focused on the impact or pressure generated by the urban landscapes. Most of the data used in these analyses were extracted from perception assessments, landscape metrics and the literature.

Study limitations and future research directions

The literature synthesis that we have conducted was based on the articles extracted from two scientific databases. To that extent, one may consider that we used a narrow sampling basin for our review analysis. At the same time, the journals from which the reviewed articles were extracted have an important impact within the scientific community and especially within the domain of social sciences. Most researchers that authored the articles included in our analysis have opted for a review analysis as well, thus the works they have addressed are relevant for this study as well. The timeframe from which we extracted our articles may be considered a shortcoming. The outbreak of the SARS COV-2 pandemic fuelled the journals from the entire scientific spectrum with articles; and the scholars with expertise in planning and urban environments addressed the issue in their specific approach. We hypothesise that a future review using the same approach as ours, but after 2020, would generate different outcomes. However, our analysis has captured a time interval in which the interests in the urban landscape and health relation have evolved naturally and they were not influenced by contextual events.

Future studies should investigate clearly and differentiate the healthy from the unhealthy urban landscapes, but they should also describe what processes, policies and concrete measures can decrease or increase the healthiness of urban landscapes. This type of analysis would require a joint effort from scholars of various scientific domains and cultures, and this approach would provide a wider relevance of the potential outcomes.

Conclusions

The outcomes of our review have succeeded in providing an overall picture on which urban landscapes are considered enablers of health by the researchers. We have chosen relevant and prestigious databases from where to extract the papers, meaning that the approaches discovered in these papers are relevant at a wider scale. The overview on the expertise of the scholars concerned with urban landscapes and related health issues showcased that the topic is transdisciplinary, but it is often embraced by researchers with geographic, ecological, or sociological background. This conclusion may be determined by the results regarding the preferred methods of analysis, as most of them are specific tools used in the prior mentioned domains. Emphasising which urban landscapes are enablers or disablers of health completed our proposed set of objectives for this study. Green and blue landscapes are widely considered therapeutic landscapes while other types of urban landscape are considered to contain features posing potential risks for health.

This review offers a perspective on how the research community treated urban landscapes as enablers of human and environmental health for the second decade of the 21st century. The new decade of this century is promising new approaches and more interest in assessing the urban environment and their ability to secure good health levels for their citizens.

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