Research Article

iMedPub Journals
www.imedpub.com

Global Journal of Research and Review
ISSN 2393-8854

2021
Vol.8 No.5:5940

# Landscape Architecture and Environmental Challenges

**Parichehr Goodarzi[1*], Niloofar hashemi[2]**

[1]Faculty of Art and Architecture, Tarbiat Modares University

[2]Ph.D. Student in Sociology, Allameh Tabatabai University

[*]**Corresponding author:** Parichehr Goodarzi, Ph.D. Student in Landscape Architecture, Faculty of Art and Architecture, Tarbiat Modares University; E-mail: p.goodarzi@modares.ac.ir

**Received date:** August 25, 2020; **Accepted date:** August 18, 2021; **Published date:** August 30, 2021

**Citation:** Goodarzi P (2021) Landscape Architecture and Environmental Challenges. Glob J Res Rev Vol.8 No.5.

## Abstract

Nowadays, citizens, city managers, and civic decision-makers face environmental and urban infrastructure challenges as a serious issue. Environmental challenges are one of the topics that have been studied for a long time in various scientific fields, including landscape architecture. This is a review article aimed at informing about the latest research developments and an in-depth and structured review of studies conducted since 2005. In this regard, this study extracted the most important environmental challenges, approaches, solutions, and analytical tools presented in the studies by referring to and searching for valid scientific databases, and then categorizing and analyzing them based on the content and importance of the subject. The results indicated that different studies had adopted different approaches while pursuing the same goals. They also complemented or critiqued each other and, at the same time, overlapped. Recent studies have led to holistic approaches, analytical tools, and modern modeling, including artificial intelligence, machine learning, big data, etc., with a more rigorous scientific basis in the field of data mining and analysis. However, internal studies have mainly focused on introducing and identifying some of the proposed approaches. A review of the literature showed the inefficiency of traditional and existing tools in solving environmental crises due to the large volume of data as a result of the increased complexity of effective parameters in urban planning and the common areas of architecture, landscape, and urban planning. It was also found that the use of digital tools and algorithmic processes can help landscape architects to develop holistic models in solving environmental crises and sustainable development.

**Keywords:** Landscape Architecture, Data Mining, Algorithmic Thinking, Digital Landscape, Environmental Crisis

## Problem statement

The rapid growth of urban communities and the uncontrolled increase of urban settlements depend on the destruction, damage, or destruction of environmental potentials and the nature of the bedrock. This challenge can be met wisely through a correct and systematic understanding of both the concept and function of the environment, as a natural and pre-defined natural system, and the city as a man-made, consumer, and bed-dependent system. Urban and environmental problems can be solved, and multiple natural and human systems and processes can be mixed and optimized by understanding the deep relationship between this artificial phenomenon (i.e., the city) and the natural bed (i.e., the environment) (Masnavi, 2011: 60-63). The environment is the natural world and a place for human, animal, and plant life, which in principle satisfies natural needs for the continued survival of all living things. Nevertheless, cities have developed merely as a place for human growth and development and survival. A city is a place where humans take precedence over other beings in terms of satisfying wants and needs.

This leads to numerous environmental changes and challenges in the natural and man-made environment. Wider and deeper problems are expected due to climate change and global warming. Landscape architecture is one of the most important sciences that examines environmental challenges and their consequences.

It is an interdisciplinary science that comprehensively examines all aspects of environmental issues and offers a range of solutions to environmental crises. Accordingly, landscape architecture studies have focused on various issues in recent years in global forums.

These include energy, the phenomenon of heat islands in metropolises, climate change, the environment and natural-human disasters, and the post-disaster landscape, applications of digital sciences, including bigotry and artificial intelligence in optimal landscape-environment design, ecological-industrial-productive urban landscape design with an approach Economics-landscape, food landscapes, urban green infrastructure, etc.

This study first categorizes the research conducted on the role of landscape architecture in the occurrence of environmental crises and how it deals with environmental crises. The future perspective of this research topic was reviewed, and the existing solutions and methods were evaluated and compared.

In this regard, the authors adopted an analytical-critical perspective on the approaches and solutions proposed.

They thus provided a new interpretation to provide a comprehensive solution to urban environmental crises.

© Copyright iMedPub | This article is available from: https://www.imedpub.com/global-journal-of-research-and-review/

## Methodology

This is a review article, and the authors searched the resources of the subject area through a process according to Figure 1 and then categorized them based on internal content.

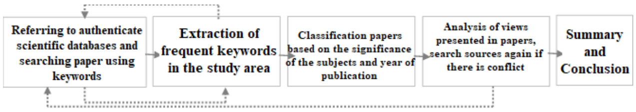


**Figure 1:** Methodology

Due to the rapid production and leap of science in various fields and the existence of extensive Internet and digital networks, such studies can help increase the knowledge and understanding of leading researchers in the field of study, the latest achievements and thematic developments, major gaps in studies, current topics in thematic areas and theories that determine the future direction of research. So, first we went to reputable sites like Science Direct and Scopus. Then, various articles and books published from 2005 to 2020 were thoroughly studied by searching for the term "Landscape architecture and environmental crises". The dissertations of prestigious universities and related conferences were also reviewed. Finally, the most important environmental crises, approaches, and perspectives of landscape architecture studies were extracted using keywords (Table 1).

| Environmental crisis | Approaches | Keywords |
|---|---|---|
| Climate change and landscape impact<br>Energy, heat islands, and urban heating<br>Air pollution and urban structures<br>Loss of non-renewable resources and increased greenhouse gas emissions<br>Reduction of water resources and its impact on urban green spaces<br>Natural disasters (floods, earthquakes, fires, etc.) | Ecosystem-based approaches to adaptation (preventive-evaluative) with climate change<br>Approaches based on sustainable landscape architecture<br>Ecological design approaches (preventive-evaluative) using quantitative approaches (simulation software) artificial intelligence in data analysis<br>Evaluative approaches using models and numerical simulations<br>Approaches based on the role of landscape in the adaptation of cities to climate change (with an emphasis on the role of green infrastructure: enhanced green cover including parks, green alleys, yards, green roofs, green walls, green terraces, and how they are distributed throughout the city)<br>Long-standing coping strategies and mechanisms provide knowledge and experience from communities that have to adapt to specific hazards or climatic conditions to help communities with similar conditions in the future.<br>Landscape urban planning approach<br>Applying Indigenous and Traditional Knowledge and Methods of Adapting to Climate Change - Principles of Landscape Sustainability Extracted from Traditional Cities | Climate change<br>Adaptation<br>Global Warming<br>Green City, Eco-City<br>Renewable Energy<br>Resilience<br>Sustainability<br>Transformative<br>Vulnerability<br>Learning cities<br>Urban Heat Island<br>Heat waves<br>Ecological design<br>landscape urbanism<br>Sustainable nature-based solutions |

**Table 1:** The most important environmental crises studied in landscape architecture, approaches, and keywords in articles and books.

## Study of environmental crises studied in landscape architecture

Planet Earth is experiencing a so-called environmental crisis, characterized by three main themes (Filiz, elik., 2013):

- Rapid population growth and related economic activities
- Non-renewable and renewable resources are lost
- Extensive and severe damage to ecosystems and biodiversity.

This study examines the various solutions and approaches to solving environmental crises based on the above three. Finally, the final summary was made, and the future direction of the research was explained by addressing the gaps in the studies. Figure 2 shows the number of repetitions and the importance of crises in studies. Accordingly, the authors have examined them in research. It should be noted that the proposed approaches to crisis resolution overlap in terms of concepts and tools, which will be emphasized below.

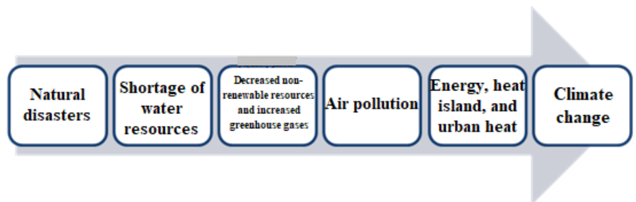


**Figure 2:** Environmental crises, in order of frequency in landscape research

### Architects-Landscapes Approaches to Climate Change

According to studies, most recent studies of landscape architecture in the face of environmental crises have been conducted on climate change and energy. Few studies have been devoted to this subject in different landscape ecological approaches. The most important institutions in the world active in the field of landscape, which have addressed the issue of climate and energy are:

- United Nations: The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change
- International Working Group on Climate Change (IFLA) Working Group on the Publication of the Global Compact for a Changing World and its ratification by IFLA regions, including the Middle East
- United Nations Framework Convention on Climate Change (UNFCCC)
- The United Nations Educational, Scientific and Cultural Organization (UNESCO): Many of the UNESCO-designated sites also play a role in providing mitigation strategies, including the promotion of green economies and the sustainable use of renewable energy sources.
- The American Society of Landscape Architects (ASLA)
- Iranian Association of Green Space and Landscape Specialists under the title of "Climate Change Working Group" (since 2017) in cooperation with the IFLA Climate Change Working Group to promote the field and landscape profession and its training in the country as an effective area to reduce emissions and deal with consequences Climate change and showing the need to develop professional approaches in the field of the landscape to achieve the goals of mitigating the effects of climate change and sustainable and resilient design.

Climate change has many implications in several cities, and approaches have been proposed to address this environmental challenge (Figure 2).

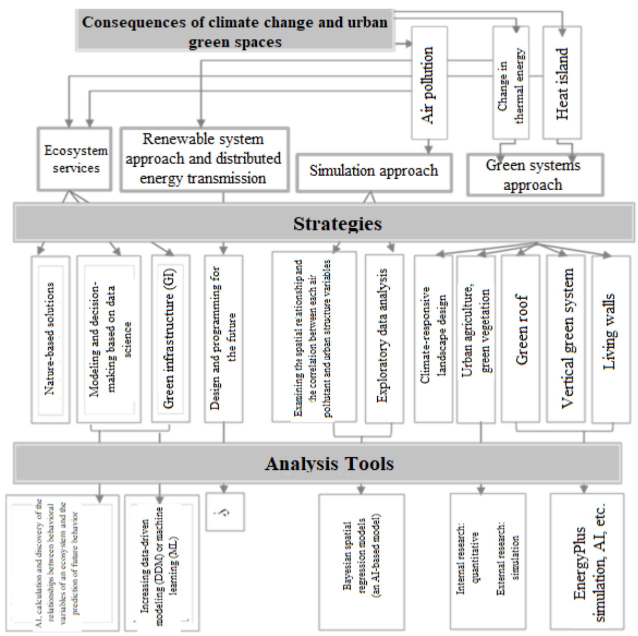


**Figure 3:** Consequences of climate change in cities, Source: Authors

One consequence is the heat island. The proposed landscape-architectural solutions to improve the thermal performance of urban environments have been studied in recent years as an attempt to reduce the effects of the urban heat island. The main strategies are to increase the area under urban cultivation and green cover, increase urban albo and energy efficiency, use the temperature level model (Gill, 2006), living walls, and vertical green system (Castro-Gomes & Manso, 2014). The thermal environment of the building is regulated by the roof and the vertical green space, which covers the building as the outermost layer. To understand the energy-efficient design and thermal performance of rooftop green space, vertical green wall thermal performance studies have been limited to experimental studies and numerical simulations using the Energy Plus simulator program. The role played by the "material" parameter in the simulation of the vertical green system, and the evaluation and simulation of systems developed in green wall technology have been studied to evaluate the thermal performance (Lin Bau, Liu, Li, 2017). In this regard, DeVon Beck and Osmer (2010) addressed the energy distributed in landscape architecture and the environment by taking a critical approach. This study states that many governments and organizations around the world have provided a variety of incentives, including political, social, and economic incentives, for the new distributed renewable energy generation (DREG). Forecasts indicate significant growth in DREG facilities, including wind, biogas, etc., in the coming years. Under the new definition, DREG tools will first be placed in built-in environments close to consumers. Although these tools are typically designed and programmed by landscape architects, no research related to the "new DRE" is currently explicitly published in the Journal of Landscape Architecture. Out of more than 40 journals as major journals of landscape architecture (Erickson, 2009), only one type of energy has been studied for indigenous environments, namely "DREG LARR" (Devine-Wright, 2005; Peel & Loyd, 2007; Peterson, 2006), with an emphasis on the role of landscape architects in future DREG research. In their research, Lenzholzer and Brown (2013) propose a responsive climate landscape design. While emphasizing renewable energy sources, they see it as a way to reduce urban heat, increase thermal comfort, and reduce the effects of greenhouse gases.

In the study of landscape architecture and environment, another consequence of climate change is air pollution in urban spaces. According to studies in South Korea, there is a close link between urban structures and air pollution, with the former being the main source of the latter while facilitating human activities and interaction. Significant challenges may arise for the investigation of underlying mechanisms due to the lack of a generally accepted model. This gap encourages the analysis of the relationships between urban structures and the emissions of four air pollutants, including nitrogen oxides, sulfur oxides, carbon dioxide, and carbon monoxide. This research pioneered the analysis of exploratory data to determine the spatial, global, and local dependence of air pollutants. For this purpose, Bayesian spatial regression models (a model of artificial intelligence) were used to explain and investigate the spatial relationship and correlation between each of the air pollutants and urban structure variables.

The results showed a significant positive relationship between most variables and air pollutants in the range of 0-1, indicating no corresponding negative effect of variables on air pollution due to urbanization. Findings indicate that the government should consider the degree to which urban structures and air pollutants are correlated by

© Copyright iMedPub

region based on achieving sustainable development (Meen, Jaewoo, Sunghwan, 2019).

## The role of ecosystem services in resolving environmental crises

One of the relatively new global approaches to resolving environmental crises caused by climate change is sustainability-focused ecosystem services valuation (ESV). In an article entitled "Urban ESV as a tool for planning more sustainable cities," Masnavi (X) introduced and explained this approach. He has considered it as a new and effective approach in making the best decisions of urban policymakers in the direction of sustainable urban planning (Masnavi and Dabiri, 2017). The term "ecosystem services" has many meanings. The UN Millennium Ecosystem Assessment has defined "ecosystem services" as "the benefits of human ecosystems" (UNEP, 2005: 55). The Economics of Ecosystems and Biodiversity (TEEB) Initiative defines "ecosystem services" as "the direct and indirect participation of ecosystems in human well-being" (TEEB, 2010). Today, a large percentage of the world's population lives in cities and urbanization as a "widespread unplanned experience in landscape change" (Cohen, 2006) is a general trend that is expected to continue around the world at least until the middle of the century (UN Habitat, 2006).

Evaluating ecosystem services can help land-use planners to manage urban areas more comprehensively. Therefore, a more accurate estimate of the current and future effects of urban development on human health requires a better understanding of the relationship between urbanization processes, socio-economic factors, and ecosystem functions, or ecosystem services (Bastian et al., 2012). Ecosystem services, on the other hand, have been almost neglected in the economy, leading to several consequences, including environmental degradation, biodiversity loss, and climate change (Grimm et al., 2008). Researchers discuss the disproportionate environmental and transboundary effects of cities on ecosystems at the local, regional, and transregional scales. These are often assessed using the concept of "ecological footprint" (Folke et al., 1997) or the framework ecology of cities (Jansson, 2013). Such approaches confirm the widespread dependence of cities on inland and transboundary environments. Pollution and disturbance created in these ecosystems have significant direct effects on the health of urban communities (WHO, 2014). In the EU, strategies based on urban ecosystems (with an emphasis on the latest environmental policies) and their processes are often based on the concept of "green infrastructure" (GI, EC, 2013, EU, 2015) and, more recently, "nature-based solutions" (EC, 2015). There is a close relationship between the two, and green infrastructure is a successfully tested tool to provide social, economic, and ecological benefits through the use of nature-based solutions, in line with the EU Green Infrastructure Strategy. Supposedly, green infrastructure is based on the principle that any enjoyment of nature by human society is consciously integrated through spatial planning and urban development (EC, 2013: 2 & Section 1.3.2). Ecosystem service studies have grown significantly since the influential works of de Groot (1992), Daily (1997), and Costanza (1997). The concept was introduced to the areas beyond planning and policy-making through the Millennium Ecosystem Assessment (MA), TEEB, and the Intergovernmental Panel on Biodiversity and Ecosystem Services (See http://www.ipbes.net) IPBES ().

Regarding ecosystem service classification systems, the Common International Classification of Ecosystem Services initiative program can be mentioned (See http://cices.eu) CICES (). Ecosystem services are generally classified into four main groups: provisioning services, regulating services, cultural services, and supporting or habitat services (MEA2005; TEEB, 2010; MEA, 2005). Among them, regulating the services ecosystem plays the biggest role in reducing the effects of climate change.

In recent studies, the Ecosystems Knowledge Network (EKN) has introduced the ARIES (Artificial Intelligence for Ecosystem Services) and introduced it as a common network software technology used to evaluate and value ecosystem services rapidly. Presenting a set of models that support science-based decision-making, a version of which was released in 2018 (2019 Ecosystems Knowledge Network). Moreover, in their paper, Willcock et al. (X) argue that data-driven DDM (modeling) is enhanced by recent developments in machine learning, which allow AI to infer the behavior of an ecosystem by calculating and discovering correlation relationships between variables observed in its behavior. They assist stakeholders in decision-making by analyzing and predicting the flow of these systems. As a result, data modeling plays an important role in modeling ecosystem services and interdisciplinary models in the development of comprehensive solutions for complex socio-environmental issues (Willcock et al., 2018). Studies have shown that different landscape approaches complement each other in solving environmental crises while tending to upgrade their study tools to analyze and evaluate data toward modeling data using new tools such as AI, machine learning, and big data.

The term "big data approach," often used in the discussion of spatial environmental data analysis, etc., was first used academically by Diebold (2000) to facilitate statistical predictions. Recent research has provided a structural approach to integrating big data and machine learning techniques at the specific agent level (Royds, 2016). An example of the use of big data is described in a study by Kavak et al. (X), which simulates urban dynamics tagged by millions of Twitter social media messages. Assessing the appropriateness of data, comparing it with other approaches, standardizing data collection, and providing all of these features in near real-time require further research (Kavak, Padilla, J. Lynch, Diallo.2018). However, more comprehensive and scientific models can be presented in the field of urban landscape design and planning by using this approach due to the use of data science and its systematic view.

## Design-based approaches and environmental crises

Researchers such as Filiz believe that environmental crises are a design crisis in many ways and suggest an ecological landscape design approach. Design as a joint has integrated three components in recent years, namely ecology, sustainability and design, as different fields (Filiz, 2013). Emerging urban environments, as the bedrock of complex economic, political, social, and cultural relationships, require a wide and complex range of approaches, perspectives, and solutions to meet today's conditions and the consequences of continuing the development process. "Landscape-oriented urban planning" and "urban ecology (the product of knowledge-based research)" are among the holistic approaches proposed in this regard. In some sources, the term "landscape urbanization" has been considered as a branch of urban ecology, which deals with abandoned industrial spaces (Shane, 2003 in Donadieu, 2006: 37; Tratsela et al., 2012).

Urban ecology, as a nascent child of ecology, introduces the concept of "urban landscape ecology," for which there is still no single definition, given the future of humankind and the growing urbanization (Masnavi and Dabiri, 2015). Since the mid-1990s, "landscape architecture" and "urban ecology" have emerged as two ideas with concepts and themes of urban design and planning in the 21st century. As a leading researcher in these fields, Wu (2007, 2013, 2014) proposes these two concepts, like the scientific basis for landscape planning, management, conservation, and development. In his view, humanity is highly dependent on cities, and landscape ecology will inevitably have a predominantly urban future. He believed that cities should be built in a sustainable way to meet the great challenge of modernity, namely, sustainability, facilitated by landscape ecology, by providing many solutions. Therefore, urban landscape ecology can be identified as part of landscape ecology. The emerging theory of "landscape-oriented urbanism" confirms the emergence of a pervasive desire to create a crossroads between ecology, planning, and landscape architecture in the context of contemporary urbanism. The basic assumption in landscape design is that "landscape" should be the main pillar and infrastructure in urban design. In traditional urban planning, green spaces were reduced to areas left over from the development process or as a decorative part.

In contrast, natural and cultural processes assist designers in organizing the urban form through landscape-oriented urban planning. "Landscape urbanism" is somehow invented by Charles Waldheim (2006). In the 1980s, Waldheim linked MC Harg's ecological approach to James Corner 's urban design perspective. MC Harg (1969)'s many findings regarding regional planning have been the cornerstone of landscape-oriented urban planning. His approaches have brought people closer to nature (Steiner, 2011). Natural urban and human systems create an active synthesis in this process by interacting with and interacting with each other. Landscape urbanism adds in-depth socio-economic data to this stream and rearranges MC Harg's original approach.

Urban landscape ecology was formed in the early 2000s, linking spatio-temporal patterns with ecological processes. Since the release of MEA in 2005, ecosystem services and their relationship to human health have become the mainstream of ecology. This trend has been accompanied by the rapid development of sustainability knowledge focused on a dynamic relationship between nature and society. As a result, a fledgling but powerful research landscape in the field of urban landscape ecology is now focused on urban sustainability. This emerging approach to urban sustainability integrates the diverse perspectives of urban ecology, whose scientific core develops on the structure, function, and services of the urban landscape. As a result of urban ecological studies, this approach emerged as an area that emphasizes an interdisciplinary approach to identifying drivers, patterns, processes, and outcomes related to urban landscapes. In Advances in Urban Ecology, Alberti introduces the recognition of the process of urban development in a complex interaction between ecological and human processes as one of the most important challenges facing social scientists and natural scientists. Thus, landscape urbanism necessarily goes beyond modern urbanism because it faces problems beyond the urban form and focuses on more complex issues. It is multi-layered urban planning with multiple scales, including socio-cultural, political-economic, infrastructural, and ecological conditions, as tangible and interdependent layers. In the dynamic context of today's metropolis, the landscape is a composite layered phenomenon beyond a two-dimensional plane. If the set of analyzes of the site and the context is beyond the surface of the earth and includes the socio-cultural and political-economic aspects of the landscape, a new typology of infrastructure emerges.

## Post-traumatic landscape approaches

Natural disasters, including floods, earthquakes, etc., are other environmental crises that have received less attention despite their importance in studies. Due to its multidimensional nature, landscape architecture plays a key role in dealing with the consequences of natural disasters, the reconstruction of settlements, and infrastructure, as well as a deep understanding of the causes of any catastrophe (2019 Bowling). Frequent landscape architects, including Mazereeuw (2011), Mitani et al. (2011), the National Research Council and the National Academy of Environmental Design (2010), have examined and presented the potentials of landscape architecture in the face of natural disasters. The Tohoku Geographical Society published tsunami damage assessment and reconstruction planning, including GIS mapping, at Onagawa Harbor (Ikoda, 2011; Mimura et al., 2011; Kyoto University, 2012). The American Society of Civil Engineers (ASCE) (2011) examined rapid team identification in the Minamisanriku region. Due to the possibility of natural disasters in Iran, this issue should be addressed in landscape studies.

In his study entitled "Post-Traumatic Perspective," Bowring (2019) presents various methods in response to earthquakes that occurred in Christchurch, New Zealand. The role of "landscape architecture responsiveness to the post-disaster environment" is presented in ways such as "design and construction of temporary parks" on the demolished site, "development plans," "careful study of cohesive layers of hydrology, geology and built form." These have been done to answer the questions, "Why do disasters occur?" And "prevent the return of such an event" to rebuild the central city.

James et al. (X) introduce the following basic measures for dealing with natural disasters in post-traumatic situations, namely, "characterizing the characteristics of injury patterns, identifying opportunities, and a quick visual review of the site" (James l, Wescoat, JR, Kanda. Shun, 2016). These methods use other equipment instead of survey techniques and follow

© Copyright iMedPub

"emergency shelter planning methods." Copley (X) also addressed the issue of urban flexibility and resiliency in natural disasters, emphasizing people-related infrastructure systems and climate change.

From Chapman's point of view, environmental problems caused by urbanization have their roots in both ecological and urban planning (Chapman, 2007). This has led to the formation of common research areas in these two areas of knowledge. One of these fields of research is the resiliency of the urban system. Resiliency thinking is defined in various ways, with multiple conceptual circles formed from it. However, there is no comprehensive agreement on this issue. Alberti et al. (X) have defined resiliency as the degree to which any system can absorb risks and reorganize itself, which has been widely referred to. Accordingly, resiliency is a combination of "disorder absorption and equilibrium," "reorganization," and "increasing learning capacity and adaptation" (Alberti et al., 2003). In its latest definition presented in recent research, urban resiliency refers to the ability of an urban system and all of its constituent ecological-social and technical-social networks at the temporal and spatial scales, which attempt to maintain desirable functions or return to them promptly when confronted with the disorder. The adaptive system changes rapidly and changes due to the resiliency feature if the system limits its capacity to adapt to current or future changes (Meerow, Newell, & Stults, 2016). In-depth studies should be conducted to achieve this degree of adaptability and design measurable models should be designed for cities and predict their behavior; a point also made in the ecosystem services approach. The important point is how to use environmental data and data mining to provide models responsive to environmental changes and crises, which requires further research.

Due to the breadth of the topic, other notable studies in the field of landscape-environmental architecture are presented with more references in Table 3.

| N | Title | Researcher | Overall focus | Methodology | Results | Year |
|---|---|---|---|---|---|---|
| 1 | Landscape architecture and postmodern reconstruction | Bowring | Prevention or reduction of accidents by specialists | Important intellectual-critical explorations - survey methods | How to deal with natural highs and environmental catastrophes through design and planning studies in landscape architecture | 2019 |
| 2 | Landscape architecture and air pollution | Meen et al | The spatial relationship between urban structures and air pollution in Korea | Bayesian spatial regression models (a type of artificial intelligence) | To achieve sustainable development, the degree of urban structures and air pollutants must be considered by region. | 2019 |
| 3 | Environmental perspectives and policies | Swaffield | Landscape assessment in the environmental policy cycle in New Zealand | Descriptive analysis | Provide models to protect the environment against environmental crises | 2019 |
| 4 | The relationship between renewable energy and ecosystem services for landscape design and planning | Picch | Ecosystem services and the use of the participatory design in landscape design to use renewable energy | Analytical | Knowledge related to sustainable energy transfer proceeds with a special focus on approaches and methods based on ecosystem services | 2019 |
| 5 | Maintaining the stability and resiliency of urban areas | Ndubisi | Provide conservation-based ecological ethics for the balance of human use and environmental concerns, as well as a set of intertwined principles to facilitate meaningful dialogu | Qualitative | Provide principles for creating and maintaining sustainable urban sites: Accept ecological regionalism for context, spatial scale, and intervention infrastructures. Support for | 2017 |

ISSN 2393-8854 Vol.8 No.5:5940

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | e to address these issues. | | resilient thinking and action; Protection and strengthening of ecosystem services; Engage in adaptive and regenerative methods. Implement performance-based thinking and action; Commitment to the construction and development of nested intervention interventions as well as the adoption of social measures --- support, activities, learning and training. As a result, the effectiveness of these principles in growth management in the perspective of cities is due to their ever-increasing | |
| 6 | Holism: A model | Roos | Restorative ecolog | Analytical- | The process of | 2017 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | language for reviving the ecological landscape | | y and the language of the ecological model of revival-systemic thinking | descriptive | self-organization in nature is system-producing, regenerative, and adaptive technology. Environmental revitalization and, more generally, the design are expressed through the rapidly evolving science of model language theory. In the field of living systems, environmental design science has defined "restorative ecology" as "knowledge-making life," where natural processes support the evolution of resiliency and design narrative. This new model is stimulating the discourse of architecture and landscape | |

© Copyright iMedPub

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | architecture to seriously consider new design solutions and features, including a model language-based approach. It includes morphogenetic sequences, urban ecology, self-organization, production codes, biophilia, integrated design and regenerative-adaptation, the beginning of a new era in design | |
| 7 | Resiliency: An exploratory look at post-accident planning and design | Chuxi | Resiliency solutions for crisis-ridden rural settlements caused by floods, fires, earthquakes | Providing a flexible village construction model from four aspects: construction engineering, ecological cycle, safety and social control | Adjust the layout of buildings and materials, ponds, drains, ground water pumps, and other fire protection equipment to combat fires, drain natural rivers, and build networks to reduce the risk of flooding and | 2017 |
| | | | | | landslides; Economic | |
| 8 | Thermal performance of the green wall system and their numerical simulation | Lin et | Investigation of the function of green walls in the thermal performance of urban spaces | Quantitative-simulation | Evaluating the thermal performance of a vertical green system under subtropical climates is the model of the thermal behavior of a vertical green system with PlusEnergy. | 2017 |
| 9 | Landscape architecture and visual analysis of the post-accident site | James et al | Rapid visual analysis of the site for post-disaster landscape planning: expanding the scope of choice in a tsunami-affected city in Japan | Mapping Methods - Predicting Temporary Settlements in Landscape Design - Quick Visual Analysis of the Site | | 2016 |
| 10 | Landscape and environmental design | Zeunert | Landscape architecture and environmental sustainability: creating positive change through design | Analytical-descriptive | Site analysis and visual methods in a pilot study seeking to identify potential sites of new community centers in a devastated city | 2016 |
| 11 | | Waal et al. | Renewable energies and regional | Experimental approach | Proposing new landscape design method | 2015 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | landscape design | | s to deal with environmental harassment such as floods and earthquakes while responding to socio-economic issues | |
| 12 | Combining Renewable Energy Science in Regional Landscape Design: The Results of a Competition in the Netherlands | Festus | Establishing interrelationships between landscape planning and sustainable development | Using descriptive-analytical method | - Provide site analysis methods | 2014 |
| 13 | Key points in landscape planning in the field of environmental sustainability | Filiz | Relationship between ecological landscape design and environmental crises | Descriptive-analytical | Introducing topics that underlie sustainable landscape design thinking and approaches. | 2013 |
| 14 | Ecological landscape design | Devon | Energy and space, sustainable environments | simulation | Demonstrate the potential of landscape architecture for multidimensional sustainability | 2010 |
| 15 | Landscape and energy | Devon | Design of distributed renewable energies in man- | Critical approach | Each section of the book is an index of a key theme | 2010 |
| | | | made environments | | of multidimensional sustainable landscape architecture: ecology, pollution, infrastructure, food, art and aesthetics, social sustainability, cognition of style, and performance. | |
| 16 | | University Ph.D. Thesis (Manchester) | Climate change and urban green spaces (urban green space is a solution to regulate urban temperature) | | Four main strategies have been considered for the transfer of energy from renewable energy science: reducing energy demand, diversifying energy supply, reducing fossil fuel emissions, and paying attention to the components of the energy system. | 2006 |
| 17 | Distributed Renewable Energy and Landscape Architecture: A | Milani Nia | Representation of the Persian garden in vertical gardens and roof | Simulation of optimal models for urban green infrastructure | - There is a significant gap between theory and practice. | 2012 |

© Copyright iMedPub

| | | | | | | |
|---|---|---|---|---|---|---|
| | Critical Look | | garden s | | | |

**Table 3:** The most important environmental-landscape architecture studies with different approaches, Source: Authors.

## Conclusion

A review of numerous studies clarifies two important issues. The first is to prioritize climate change in landscape / architectural approaches to address environmental challenges and create optimal conditions in cities and to use new digital, analytical, computational tools in the proposed solutions to provide patterns of production/distribution of energy resources in cities, sustainable development, and the way models are evaluated. The method of data collection and analysis can be considered in the conducted researches. These studies have taken different approaches, mostly holistic, with close and parallel goals, and have taken steps to complement each other through further research. This is necessary due to the nature of dealing with environmental crises because these crises have different parameters and dimensions, which cannot be solved using local solutions and approaches due to their increasing complexity. Comparison of domestic and foreign studies showed that most of the studies conducted in Iran are often qualitative, and computational models are ignored in urban studies in various areas of environmental crisis with many differences in the nature of research.

On the other hand, although landscape architecture is interdisciplinary, other sciences have played a minor role in landscape research studies. Approaches such as landscape urbanism can be considered as thinking and acting of a range of different disciplines, including architecture, urban planning, graphic design, urban geography, urban hydrology, urban forestry, engineering disciplines, including computers, and so on. This represents an interdisciplinary or multidisciplinary approach to problem-solving, as one of the most important features of this approach, which is considered one of the needs of current architectural and landscape studies in solving environmental and urban problems. Recent studies have increasingly focused on the use of new tools and digital technologies in the fields of architecture, urban planning, and landscape studies. The use of big data, artificial intelligence, neural networks, and algorithmic thinking in the analysis of urban structure and data has yielded comprehensive results. By simulating environmental data, more sophisticated solutions can be proposed. Most importantly, it enables designers to predict future urban behaviors. The methodologies presented in this paper suggest that landscape architecture seeks Klinger analytical tools in resolving environmental crises by adopting Klinger approaches, a state-of-the-art tool is emerging.

Notably, as a system, the city needs to take a holistic approach to its design, development, and modification. Based on the experiences of other countries, new digital tools can be considered as effective solutions in this field and the realization of comprehensive urban green management. However, a very important issue in this solution is the process of data collection or, in other words, data mining, which is almost ignored and requires further study. As studies tend to adopt the new approaches proposed in this field and the results obtained from them, perspectives will be produced that will challenge current knowledge and science and redefine the concept of "nature" inherent in collective perception. Since landscape architecture is located in Iran, in its infancy, the issues and theories raised as well as the use of their applications and global experiences require more in-depth studies. Due to the increasing complexity of parameters affecting the planning of cities and common areas of architecture, landscape, and urban planning, traditional tools in developing countries (including Iran) cannot meet the need for large volumes of data in different typologies, which will weaken the database. For integrated urban management. Today, algorithmic tools can create an intelligent platform for managing urban information and planning based on data diversity in a large format as metadata with diverse and targeted strategies. This tool can be used by a set of data with small solutions and overlap in large infrastructure for metropolitan management. On the other hand, the field of study of "landscape architecture and its relationship with environmental crises" is broad. The categorization of approaches and solutions allows researchers to create an appropriate classification to provide scientific and practical steps in solving various environmental crises simultaneously with other parts of the world.

## References

1. Chapman, D (2007) Creation of neighborhoods and places in the man-made environment. Translated by Shahrzad Faryadi and Manouchehr Tabibian. Second edition, Tehran University of Tehran Press.
2. Masnavi, Mohammad Reza (2011) Sustainable urban ecosystem, paradigm or paradox? The necessity of reviewing the relationship between the city and the environment. Manzar Magazine 16: 60-66.
3. Masnavi, Mohammad Reza, Dabiri, Maryam (2015) Linking spatio-temporal patterns with ecological processes, from urban development to landscape ecological urban planning. Manzar Journal 32: 66-73.
4. Masnavi, Mohammad Reza, Dabiri, Maryam (2017) Evaluating Urban Ecosystem Services as a Tool for Planning More Sustainable Cities. Manzar Magazine 41: 24-36.
5. Milani Nia, Kiarash (2012) Representation of the Iranian garden in vertical gardens and roof gardens. Case Study: District 7 of Tehran. Master Thesis, Faculty of Environment, University of Tehran.
6. Copley, Nicki (2014) The role of landscape architecture in designing for urban transformations and adaption after a disaster: a design-directed inquiry within the context of post-earthquake Christchurch, A thesis submitted in partial fulfillment of the requirements for the degree of Master of Landscape Architecture at Lincoln University, New Zealand.
7. Elizabeth Gill, Susannah (2006) Climate Change and Urban Greenspace, A thesis submitted to the University of Manchester for the degree of Ph.D. in the Faculty of Humanities.
8. Science for Environment Policy (2015) Ecosystem Services and the Environment. In-depth Report 11 produced for the European Commission, DG Environment by the Science Communication Unit, UWE, Bristol.

9. Willcocka Simon, Martínez-Lópezc, AP Hooftmand Javier, J Bagstad Kenneth, Balbic Stefano, Marzog Alessia, Pratog Carlo, Sciandrellog Saverio, Signorellog Giovanni, Voigth Brian, Villa Ferdinando, M Bullocke James, N Athanasiadis Ioannis (2018) Machine learning for ecosystem services. Ecosystem Services 33: 165–174.

10. Ahern J, Cilliers S, Niemela J (2014) The concept of ecosystem services in adaptive urban planning and design: A framework for supporting innovation. Landscape and Urban Planning 125: 254–259.

11. Alberti M (2008) Advances in Urban Ecology. New York: Springer Science.

12. Alberti M, Marzluff JM (2004) Ecological resilience in urban ecosystems: linking urban patterns to human and ecological functions. Urban Ecosystems 7(3): 241–265.

13. Andersson E, Barthel S, and Ahrné K (2007) Measuring Social-Ecological Dynamics Behind the Generation of Ecosystem Services. Ecological Applications 17: 1267–1278.

14. Barthel S, Folke C, Colding J (2010) Social-ecological memory in urban gardens—Retaining the capacity for management of ecosystem services. Global Environmental Change 20: 255-265.

15. Bastian O, Haase D, Grunewald K (2012) Ecosystem properties, potentials and services The EPPS conceptual framework and an urban application example. Ecological Indicators 21: 7-16.

16. Chiesura A (2004) The role of urban parks for the sustainable city. Landscape and Urban Planning 68: 129-138.

17. Costanza R, d' Arge R, de Groot R, Farber S, Grasso M, Hannon B, Limburg K, Naeem S, O'Neill RV, Paruelo J, Raskin R Sutton P, Van den Belt M (1997) The value of the world's ecosystem services and natural capital. Nature 387: 253-260.

18. Daily G (1997) Nature's Services: Societal Dependence on Natural Ecosystems. Washington: Island Press.

19. De Groot RS, Alkemade R, Braat L, Hein L, Willemen L (2010) Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. Ecological Complexity 7: 260-272.

20. EC (European Commission) (2013) Green Infrastructure (GI)-Enhancing Europe's Natural Capital.

21. EC (European Commission) (2015) Nature-Based Solutions & Re-Naturing Cities.

22. Folke C, Jansson A, Larsson J, & Costanza R (1997) Ecosystem Appropriation by Cities. Ambio 26: 167-172.

23. Jansson, Å. (2013). Reaching for a sustainable, resilient urban future using the lens of ecosystem services. Ecological Economics, 291–285,86.

24. Jim, C.Y., and Chen, W.Y. (2006). Impacts of urban environmental elements on residential housing prices in Guangzhou (China). Landscape and Urban Planning 434–422,78.

25. McPherson, E.G. (1998). Atmospheric carbon dioxide reduction by Sacramento's urban forest. Journal of Arboriculture, 223–215:24.

26. MEA (Millennium Ecosystem Assessment) (2005). Ecosystems and human well-being: a synthesis. Washington, DC: Island Press.

27. Meerow, S., Newell, J. & Stults, M. (2016). Defining urban resilience: A review. Landscape and Urban Planning, (147): 38-49.

28. Steiner, F. (2011). Landscape ecological urbanism: Origins and trajectories. Landscape and Urban Planning, (100): 333–337

29. TEEB (The Economics of Ecosystems and Biodiversity). (2010). The Economics of Ecosystems and Biodiversity. Ecological and Economic Foundations. Edited by Pushpam Kumar. London and Washington: Earthscan

30. Tyrväinen, L. (1997). The amenity value of the urban forest: an application of the hedonic pricing method. Landscape and Urban Planning –211:37 222.

31. UN-Habitat. (2006). State of the world's cities 07/2006.Available from: https://unhabitat.org/books/state-of-the-worlds-cities20062007-/(accessed 17 February 2020

32. Villarreal, E.L., and Bengtsson, L. (2005). The response of a Sedum green roof to individual rain events. Ecological Engineering, 7–1:25.

33. Waldheim, Ch. (2006). Landscape as Urbanism. in Waldheim, Ch. (ed.). The Landscape Urbanism Reader. (New York: Princeton Architectural Press), 37-53.

34. WHO (World Health Organization). (2014). The burden of disease from Ambient Air Pollution for -2012 Summary of results, the World Health Organization. Available from: http://www.who.int/phe/health_topics/

35. Wu, J. (2013). Landscape sustainability science: ecosystem services and human well-being in changing landscapes. Landscape Ecology, (28): 999–1023.

36. Bowring Jacky. (2019). Post-disaster Landscapes, LA NDSCA P E REVIEW 1 4 (2) PAGES 1 –4

37. Meen Chel Jung, Jaewoo Park and Sunghwan Kim. (2019). Spatial Relationships between Urban Structures and Air Pollution in Korea, Sustainability, 11, 476; doi:10.3390/su11020476

38. Anne Spicer. E. (2017). Assessing the Consequences of the Lake Taupo Nitrogen Trading Programme in New Zealand, using a Landscape Approach, A thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy at Lincoln University

39. Diebold, F. X. (2012). On the Origin (s) and Development of the Term 'Big Data.' The University of Pennsylvania.

40. Festus, I. A. (2014). key Issues on Landscape Planning in The Context of Environmental Sustainability European Scientific Journal January 2014 edition vol.10, No.2 ISSN: 1857 7881 (Print) e - ISSN 1857- 7431

41. Royds, Don. (2016). Landscape Architecture and Big Data: Its crunch time, A dissertation submitted in partial fulfillment of the requirements for the Degree of Master of Landscape Architecture at Lincoln University

42. Filiz, elik. (2013). Ecological Landscape Design, http://dx.doi.org/10.5772/55760 licensee InTech. This is an open-access chapter distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/3.0), which permits unrestricted use, distribution, and reproduction in any medium provided the original work is properly cited

43. Shu-Yang, F., Freedman, B. and Cote, R. (2004). Principles and Practice of Ecological Design. Environmental Review, vol: 12, p. 97–112, doi: 10.1139/A04-005, Canada

44. Zeunert, Joshua. (2016). Landscape Architecture and Environmental Sustainability: Creating Positive Change Through Design, Book, DOI: 10.5040/9781474222211, University of Gloucestershire, UK

45. Ksenia, i. Aleksandrova. (2016). Green, Grey, or Green, Grey? Decoding infrastructure?? integration implementation for

© Copyright iMedPub

residential street retrofits, thesis at LINCOLN UNIVERSITY, New Zealand

46. James l, Wescoat .j r, Kanda. shun. (2016). Rapid Visual Site Analysis for Post-disaster Landscape Planning: Expanding the Range of Choice in a Tsunami-affected Town in Japan, LANDSCAPE REVIEW 14(2) PAGES 5–22

47. Mikami, T, Shibayamay, T and Esteban, M (2012) Field Survey of the 2011 Tohoku Earthquake and Tsunami in Miyagi and Fukushima Prefectures, Coastal Engineering Journal 54(1), pp 1–26.

48. Kavak. H, Padilla. Jose J, J. Lynch. Christopher, Diallo, Saikou Y (. 2018) BIG DATA, AGENTS, AND MACHINE LEARNING: TOWARDS A DATA-DRIVEN AGENT-BASED MODELING APPROACH, SpringSim-ANSS, 2018 April 15-18, Baltimore, MD, USA; ©2018 Society for Modeling and Simulation (SCS) International

49. Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP) (2007) Synthesis Report: Expanded Summary. Joint Evaluation of the International Response to the Indian Ocean Tsunami, London: ALNAP Technical Evaluation Committee.

50. American Society of Civil Engineers (2011) Japan earthquake/tsunami reconnaissance teams, April 2011. Accessed 25 October 2012, www.asce.org/PPLContent.aspx?id=12884906436

51. Ikoda, Y (2011) Moving the Whole Town up Hill: An Algorithmic Search of Developable Land in Tsunami-hit Onagawa Town, The 2011 East Japan Earthquake Bulletin of the Tohoku Geographical Association. Accessed 25 October 2012, http://tohokugeo.jp/disaster/articles/e-contents19.html

52. Noh, T (1966) Sanriku Coast Prepared for Tsunami: A Preliminary Report on Men's Defense against Natural Disaster. Accessed 25 October 2012, http://ir.library.tohoku.ac.jp/re/bitstream/10097/44873/1/AA0045945066165.pdf

53. Ndubisi Forster. (2017). Maintaining Sustainable and Resilient Urban Places: A Future, CELA 2017 Bridging

54. Chuxi, CHEN& Yan. DU.2017. Resilient Village: Exploration of the Post-Disaster Reconstruction Planning of Wenquan Village, Jianhe County, Guizhou Province, CELA 2017

55. Lin. Bau-Show, Liu Ching-Yu, Li Ming-Han (2017). Thermal Performance of a Vertical Greening System and Its Numerical Simulation, CELA 2017

56. Roos. Phillip, Jones. David. (2017). Towards Wholeness: A Pattern Language for Restorative Ecological Design, CELA 2017.

57. Picch ,Paolo .(2019). Advancing the relationship between renewable energy and ecosystem services for landscape planning and design: A literature review, Ecosystem Services, 35(Environ. Manage. 56 2 2015), 241-259, February 2019 http://www.hnsland.nl/en/projects/landscape-energy

58. DeVon Beck, Osmer. (2010). Distributed renewable energy generation and landscape architecture: A critical review, A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF LANDSCAPE ARCHITECTURE, UTAH STATE UNIVERSITY, Logan, Utah.

59. Swaffield, Simon. (2019). Landscape assessment in New Zealand: landscape review, 2019:5(I) pages 3-16

60. Renée M. De Waal & Sven Stremke & Anton Van Hoorn & Ingrid Duchhart & Adri Van den Brink, )2015(. Incorporating Renewable Energy Science in Regional Landscape Design: Results from a Competition in The Netherlands," Sustainability, MDPI, Open Access Journal, vol. 7(5), pages 1-23, April.

61. Elizabeth Gill, Susannah. (2006). Climate Change and Urban Greenspace) A thesis submitted to the University of Manchester for the degree of Ph.D. in the Faculty of Humanities