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# SPAD'21 International Spatial Planning and Design Symposium

*Metamorphosis in Environment, Planning and Design*

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**ABSTRACT BOOK**



IZMİR DEMOCRACY UNIVERSITY  
NOVEMBER, 26-28, 2021 | IZMİR, TURKEY

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*SPAD'21 International Spatial Planning and Design Symposium  
Metamorphosis in Environment, Planning and Design  
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**IZMIR DEMOCRACY UNIVERSITY**

**IDU SPAD'21**

**International Spatial Planning and Design Symposium  
Abstract Book**

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## **Investigating the Influence of Neighbourhoods' Physical Changes on Place Attachment (Case study: Daryan No and Eastern Marzadaran in Tehran, Iran)**

**Hossein Kashi – Maryam Mohammadi**

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### **ABSTRACT**

The main issue of this study is how physical changes reduce the sense of relation between residents and their living environment. In fact, the speed and amount of urban changes in various dimensions (physical, functional, social, etc.) and the incompatibility of these changes with human perceptual processes is considered as the initial idea of this research paper. Urban change causes many challenges, and it has various desired or unintended consequences. Research indicate that the impact of these consequences has often been studied and planned with quantitative approaches, but their impact on human social processes and interactions with the urban environment, especially place attachment has been less investigated and studied. The main purpose of this study is to identify the dimensions of urban change, especially physical changes and place attachment, as well as their relationship. This study is carried out using "grounded theory" as the method and its purpose is to discover the concepts, categories, their relationship and finally to identify a paradigm model by examining the neighbourhoods of Daryan No and Eastern Marzadaran located in District 2 of Tehran in Iran.

Based on the interactions with the residents of selected neighbourhoods, causal/ conditional categories include "Pressure from population growth on the physical and functional structure of the living environment", "Pattern of cultural context", "Conserving old life patterns or moving towards new lifestyle" and "Inefficiency of urban management due to one-dimensional and commodity-oriented view". Ten interactive categories, including "Satisfaction of open and wide spatial proportions", "Need for familiarity with the living environment", "Conflict of residents' intentions", "Need for sense of peace and security", "Need for territory and sense of belonging", "Inconsistency of existing capacities with current events", "Visual disorders and distortions", "Responsibility of living environment to the needs of residents", "Tendency to low density" and "Welcoming liveable activities" are identified. Consequential categories include "Sustainable housing", "Disconnection from the living environment" and "Intention for immigration", and the concept of "Inconsistency of citizens expectations and demands with their living environment" is identified as the core phenomenon of the paradigm model.

**Keywords:** physical changes, place attachment, paradigm model, neighbourhoods, Tehran.

## **The Effect of Climate on the Design of Resilient Settlements, Learning from the Case of Alaçatı**

**Belgin Terim Çavka**

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### **ABSTRACT**

For a sustainable future, it is observed that the built environment in harmony with nature won't be enough to compensate the damage given to the world. In order to create a sustainable built environment, as a way to reduce or even transform the damage caused by human beings to the environment, it is necessary to take regenerative steps. After pandemic occurred, all our lives started to be reconstructed and the planning of our environment believed to follow this change in time. The challenges caused by pandemic seems to mark significant life changes and environmental changes for human beings. This seems to be a good opportunity to question the built environment and start planning for a more sustainable version, adaptable to future pandemic/disaster conditions. Living environment habits in Turkey seem to shift from dense urban to sub-urban and the request for low rise residential units, mainly single-family houses started to increase vastly with the disasters occurred in the last 3 years. This study aims to investigate the sustainable ventilation and urban planning options from the tradition of the quartier style-built environment in our heritage through a case study area and adapt it to future planning options resilient to new conditions of the changing world. Researcher observed and analysed the architectural and urban characteristics in harmony with climate conditions in vernacular architecture of specific windy climate of Alaçatı, Çeşme Peninsula. Then these observations are tested by analytical methods, which gives us the opportunity to understand the similarities in spatial organization within the traditional towns and convey it to future planning of new residential areas. According to on-site observations, urban pattern with attached two storey houses and plan configurations welcoming natural ventilation is one of the key features that continued in design of sustainable environments. This fact is tested through CFD (Computational Fluid Dynamics) modelling from urban site level to interiors level with two different housing typologies of Aegean houses as test modelled interiors. Calibration made possible by on-site thermal and meteorological data collection. Interior and exterior wind velocity, temperature and relative humidity data gathered for two different housing typologies in the case area. Cross ventilation and single side ventilated main living areas' (halls) and outdoor weather data collected simultaneously with an outdoor portable weather station, 36 sensors (temperature and relative humidity), 6 Anemometers (indoor air velocity). Further sofa/stair designs alternatives suggested in order understand how airflow changes according to the design of linear sofas. The airflow predictions are isothermal, expressing steady state conditions, where only airflow is simulated. Suggestions for better sub-urban climate resilient environments/settlements generated with the tested hypothesis.

**Keywords:** climate resilient, sustainable urban settlement, vernacular, CFD modelling, calibration.

## **Examination of Additional Space Designs Based on Form, Material and Function Parameters**

**Burcu Ayaz- Sema Balçık- Gizem Karaoğlu**

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### **ABSTRACT**

The buildings, which were built in line with the needs of the period in which they were built, lose their function over time due to various reasons. Some of these structures are protected today as an architectural heritage, as they are of historical nature. Structures that are only intended to be preserved and cannot continue their life activities in line with the needs of the users cannot go beyond the quality of sculpture. For buildings that have lost their function or have insufficient functions, usage suggestions have been produced according to the needs of the day, and modern solutions have been developed for traditional buildings. In this study, the additional space designs needed in the buildings that are planned to be re-functioned or to maintain their current function are emphasized. Additional designs can cause functional changes in buildings in line with the needs, as well as helping them to continue to perform their current function. The designs added to the existing building in different ways create new space that will contribute to the use of the building. There are different design approaches applied on the condition of respecting the buildings to be added. When the annex created belongs to different periods with the previous building, the differences such as material, form, and function of the new one makes it easier to separate the buildings from each other. In this way, the existing structure gains a new identity with the annex. In this study, additional spaces needed in buildings for reuse were examined according to the way they were added to the existing structure, their materials, forms and functions they brought to the structure. According to the way of adding annex structure, in the outer mass of the building, in a way that completes the deficiencies of the building and in the immediate vicinity of the building. Lightweight construction elements such as glass and steel were mostly used as materials. It has been observed that the buildings are functionally old, new and reused in three different ways that contain both functions. Finally, additional structures are designed in varied forms such as neutral, similar and contradictory. The examples examined in the study aim to bring a clearer understanding on additional space designs by evaluating them in terms of the way they are added, material, form and function parameters in order to distinguish the space added to the structures from the existing building. Reintroducing buildings to the present day with additional designs sets an example for the sustainability of buildings. It is important for the continuity of architectural culture to convey the buildings to future generations with new annexes.

**Keywords:** architectural design, architectural heritage, additional space, reuse of buildings.



## **Rethinking Spatial Metamorphosis: The 'Palet Restaurant' in Izmir's Collective Memory**

**Pınar Ergül Taşkiran-İpek Akpınar**

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### **ABSTRACT**

In the 21st century, memory has once more begun a lively debate and research domain in humanities. Where remembering and forgetting are intertwined, spaces may be seen as a tool in the creation of collective memory in architecture. In this regard, how does metamorphosis of space have a dialogue with collective memory? How can photography work as a way of remembering in collective memory? In the light of the above-mentioned questions, this study focuses on the 'Palet Restaurant' in the Egean sea-front Izmir and aims to unveil the relationship between spatial metamorphosis and collective memory. Following the land reclamation of the sea front Kordonboyu, the 'Palet Restaurant' was destroyed and the emptiness was converted to a recreation area. The restaurant has been rebuilt with its iconic roof at Bayraklı sea-front, the other side of the coast. Its execution and the rebuilding process signify the change of form and function of public space, in other words, the spatial morphosis. With in-depth interviews with former users who had experienced or been informed about İzmir's coastal interrupted memory in the 1980s and the 1990s by proposed highway project and land reclamation in 1997 on Kordonboyu, the absence of 'Palet Restaurant' has unveiled links with collective urban memory. It discusses why and how the term of space is important throughout the photographic remembrance where social process of remembering goes parallel with forgetting in the spatial metamorphosis. In this regard, the study collects data by six online in-depth interviews by former users while showing a photograph of 'Palet Restaurant', a special landmark in Kordonboyu-Izmir. In this framework, the research process provides empirical insights into how collective memory changed during the time, how memory and space socially are constructed and shaped, and in which way photography represents a space of representation to recreate the collective memory by the method of several interviews through the metamorphosis of 'Palet Restaurant'. The essay first of all introduces a brief theoretical framework, secondly, it unveils the Palet restaurant by in-depth interviews. The concluding remarks give a critical link between the spatial metamorphosis and collective memory. This study may contribute to the research on the links between collective memory and spatial metamorphosis in Izmir, and in Turkey in general.

**Keywords:** collective memory, space, photography, metamorphosis.

## **Does a Wall Always Just a Wall? Following the Traces of a Conceptual Metamorphosis Under the Influence of Migration Debates**

**Şeyma Ersoy- Pınar Kılıç Özkan**

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### **ABSTRACT**

Can a wall, which is a structural element of architecture, carry any other meanings, definitions, functions, or relations beyond being just a wall? Are there any conceptual metamorphosis that can be attached to a wall apart from being just a building element? These questions, which led to the emergence of this study and create its base, evolved from the current and potential migration debates in our country and in the world's agenda. This paper stems from this question, does a wall always just a wall. Starting with this question this paper presents a conceptual review by following Michel De Certeau's ideas. In this regard, this study is not only tracing vertical planes but also it is searching for power strategies and social tactics, in a wide geographical context from China to Berlin, and from West Bank to America-Mexico border.

**Keywords:** borders, migration, strategies and tactics, conceptual metamorphosis, Michel De Certeau.

## **The relationship between Agricultural Change and Industrial Development in Bursa**

**Anıl Akın- Süha Berberoğlu- Hatice Oya Eşbah**

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### **ABSTRACT**

Agricultural areas have an important value on economic and social structure as well as ecological and environment quality. They are one of the most important components of the ecological networks situated in the city and the near environment. Creating a buffer zone including agricultural lands around the city, forests and green structure is very common approach all over the world in order to protect productive agricultural areas and restrict urban sprawl. Agricultural landscape is quite effective on cultural achievements and must be analysed for every settlement. Because they are degraded by anthropogenic effects on the first place. Bursa has very important position in agricultural production in Turkey. After the seventies, the city was come forward with the Industrial identity which was ended up with the agricultural lost due to infrastructure investments for the industry. Despite the spatial planning decisions and Plain Protection Protocol in 1977, one third of the agricultural land was lost around the city. In this regard, the project aims to i. analyses the agricultural landscape change in the Bursa; Osmangazi, Yıldırım and Nilüfer districts which are represent the %67 of the total population and detecting the quality and quantity of change and ii. identify the negative effects of industrial development. High spatial resolution remote sensing images including CORONA air photo and Sentinel satellite data acquired between the years of 1979-1921 was used. Hierarchical classification with the object-based approach was performed. By correction of the classification mistakes manually, high accuracy of land use/land cover map was acquired. Post classification technique was used for detecting the quantity and the quality of change and industrial areas was digitized from remotely sensed data in geographical information systems environment. Past and present industrial structure was evaluated in terms of agricultural change. This research will provide a scientific foundation to understand and assess agricultural landscape change by considering past and present implications and consequences using spatial information technologies. Inappropriate land use policies of the time were unable to cope with the rapid development which has resulted to land degradation and this is especially true for agricultural areas.

**Keywords:** agricultural change, industry, Bursa city

## **The metamorphosis of Bursa Yıldırım district urban dynamics**

**Gül Sayan Atanur- Merve Ersoy Miirci- Nazlı Deniz Ersöz**

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### **ABSTRACT**

The green area destroyed is the main resource the environmental problems come across of urbans and this is incontrovertible fact. Contemporary concern of environment-city-human-oriented disciplines is to minimize the destructive effects of humans on nature and continue a healthy city environment. Determining the processes of change / metamorphosis from the past to the present for the permanent development of healthy spaces is of great importance in terms of future projections . In this study, the urban development dynamics of Bursa Yıldırım district and the metamorphosis of the green pattern within these dynamics were analyzed for the period between 1985 and 2020. With the help of object-based classification using Landsat satellite images, the changing dynamics in the land cover were revealed in five-year periods. In addition, it is aimed to determine the metamorphosis in the land and social identity of Yıldırım district from past to present by considering the changes in the social identity of the district with literature research.

**Keywords:** Bursa, Yıldırım District, Land Cover Dynamics, Metamorphosis, Social identity.

## **Green Infrastructure Suitability Analysis in Izmir**

**Birsen Kesgin Atak- Ebru Ersoy Tonyaloğlu**

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### **ABSTRACT**

The concept of green infrastructure (GI) refers to the multifunctional ecological systems in which natural, semi-natural and artificial networks in and around the city have an important role in terms of the functioning of the whole urban ecosystem. As a system GI can be implemented at varying different scales and spatial contexts to achieve certain targets and functions, including the control of flooding and erosion as well as improving the quality of water, air, community life etc. However, the benefits of GI can only be achieved through its strategic identification and planning. In this respect, GISs and GIS based analytical approaches provide a unique platform for capturing, storing, recalling, analysing and displaying complex spatial and non-spatial data related to GI. In particular, GIS based suitability analysis has given researchers / planners the opportunity for diagnosing and assessing the current situation and identifying opportunity areas for the implementation of GI. Within the context of Izmir / Turkey, where the population increase, urbanisation, and lack of planning for the open public spaces drives a dense land development and the urban landscape, the absence of explicitly identified and planned GI is evident. This study aims to identify the opportunity areas where suitable GI components can be incorporated, and to propose important implications and recommendations as well as guidelines at the municipal scale in order to mainstream GI as a municipal initiative. The study employs the GIS based Green Infrastructure Suitability Model (GSIM) which uses a multi-criteria decision analysis approach and allows the consideration of a series of alternatives and criteria as well as conflicting preferences. Initially, we identified a number of criteria which can affect the GI, those include the soil type, slope, elevation, distance to the water sources, land surface temperature (LST), proximity to buildings and current land use types. Then, all of those criteria were weighted to reflect their significance to the overall determination of the suitable areas for the GI. The resulting maps, demonstrating the suitable locations for GI implementation on a certain level, were used to depict the areas of low, medium, and high spatial opportunity for the implementation of GI. Our study is concluded with reflections and recommendations on specific municipal guidelines to facilitate the implementation of GIS.

**Keywords:** GIS, Green infrastructure, multi-criteria, Izmir municipality.

## **Epidemics in the Historical Process and Their Effects on the Spatial Change**

**Büşra Kavcar- Feral Geçer Sargın**

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### **ABSTRACT**

Epidemics have affected the world throughout history. Changes such as agricultural activities, overseas trade, the invention of the steam engine, the industrial and information revolutions, which occurred as people transitioned to settle life, played a role in the growth of the cities. As a result, with the technological developments, the movement area of people has also expanded. As the developments took place, the learning process of people have started to be more experience-based. These changes in individuals have revealed hygiene and sanitation problems such as accumulation of individuals, residences, factories, etc. in cities. With these problems, epidemic diseases began to appear. Some of the epidemics experienced during the process were also called as pandemics. Epidemics and pandemics, including the Covid-19 pandemic, which we experience today, have caused spatial changes in settlement patterns. In this research, epidemic diseases from past to present and their effects on spatial changes were examined.

**Keywords:** epidemic, pandemic, Covid-19, spatial change.

## **Land use / land cover change detection in Lapseki / Çanakkale**

**İpek Melisa Özmekik- Ebru Ersoy Tonyaloğlu- Tendü Hilal Göktuğ**

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### **ABSTRACT**

Increasing anthropogenic activity and pressures on landscapes all around the world are causing important changes and many adverse effects on the structure and functioning of global ecosystems. Many researchers claim that the most important changes among those are land use and land cover (LULC) changes that can be experienced at local, regional and global scales in terrestrial ecosystems and affect landscapes to a large extent. In this context, this study aims to identify and analyze the spatiotemporal changes in Lapseki district of Çanakkale province where human activities create a large amount of pressure on the landscape. The study used a set of GIS based analytical approaches to determine changes and transformations in LULC from 2000 to 2020 in the study area. LULC maps are obtained by manual digitization method in ArcGIS 10.5 software using Landsat 7 ETM+ and Landsat 8 OLI satellite images (dated 28 July 2000 and 28 July 2020). The study area is categorized into 7 major LULC classes; agricultural areas, industrial commercial and transport units, forests, urban fabric, open spaces with little or no vegetation, water bodies and mine dump and construction sites. The LULC change detection is based on 7 landscape metrics (class area, number of patches, percentage of landscape, landscape shape index, mean patch size, and connectance Index) at the class level of the FRAGSTATS v4.2 software. The transformations that occurred in the LULC were calculated in ArcGIS 10.5. Our results showed that the components of natural and semi-natural LULC types (forests and open spaces with little or no vegetation) had a decrease in their total area with a fragmented pattern as a result of the increase in human dominated LULC types. Our study is concluded with some reflections and recommendations on the importance of positive LULC changes to facilitate the sustainability of whole landscape.

**Keywords:** GIS, LULC change, spatio-temporal, satellite images.

## **Neuromarketing For Sustainable Construction Materials: As A Tool for Sustainability Metamorphosis In The Construction Material Industry**

**Buket Topcu- Begüm Sertyeşilışık**

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### **ABSTRACT**

Construction material industry is well-known with its outputs' and production processes' environmental footprints affecting embodied environmental footprint of the built environment. Even if green/sustainable material certificates and green/sustainable building certificates have contributed to the reduction of environmental footprint of the construction material industry, there is need for more effective and innovative approaches to reduce environmental footprint of the construction material industry as the state-of-the-art of the climate change and crisis reveal. For this reason, based on an in depth literature review, this research aims to investigate neuromarketing's role in the sustainable construction materials for achieving sustainability metamorphosis in the construction material industry. This research emphasises neuromarketing as a tool for enhancing sustainability performance of the construction material industry.

**Keywords:** neuromarketing; construction material; construction material industry; sustainability; marketing.



## **Environmental Impact of Laws and Policy**

**Ekin Erbaş**

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### **ABSTRACT**

Urbanization, industrialization and population growth, which have taken place in the world from the past to the present and continue to increase rapidly, have started to cause natural pollution and disasters. Undoubtedly, the areas most affected by this situation are forests and seas. In the research, it is seen that the human factor is at the root of the damage to the natural environment. It has become important to create sustainable cities, manage them effectively, establish regional partnerships and produce strategies based on the protection of natural resources. The main actor is not the earnings of individuals, but cities where planning and architectural disciplines are applied will be liveable cities. Urban and environmental problems should be approached holistically and the approach to the global climate crisis should be scientific. A solution should be produced by using public resources without breaking with the planning discipline. A dynamic cooperation network should be established between cities and regions. Control mechanisms should be operated effectively. As the other actor, people living in this world must also act actively and consciously with the awareness of global responsibility. Designs should be made that contribute to the development of the society that supports the social interaction network that improves the policy and cultural activities that increase liveability.

**Keywords:** environment, pollution, ecosystem, urbanization, industrialization.

## **Quantifying Land use/Land cover Change in Aydın with Time Series using Landscape Metrics**

**Eren Kolcu- Birsen Kesgin Atak- Nurdan Erdoğan**

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### **ABSTRACT**

Landscape structure includes land use/land cover elements such as agricultural areas, settlements, forests, deserts and consists of different compositions and configurations of these elements. Changes in spatial structure of land uses/land cover are of great importance in understanding landscape dynamics and ecological processes. The aim of this study is to analyze land uses/land cover change between 1990 and 2019 in Aydın and to evaluate the effects of this change on the landscape structure using landscape metrics. In this study, pixel-based supervised classification method applied to Landsat 5 satellite images of 28.05.1990 and to Landsat 8 satellite images of 28.05.2019 to obtain land use/land cover maps of Aydın. Eight landscape metrics including CA, PLAND, NP, AREA\_MN, AREA\_AM, MESH, ENN\_AM, PROX\_AM were calculated to evaluate the change in landscape structure between 1990 and 2019. As a result of this study, remarkable increase observed in artificial surfaces. All landscape metric parameters are evaluated together, it shows that settlement and mine surfaces expand and grow in the landscape and patches are located closer. Which means that landscape was become dominated by urbanization patterns in this period. Depending on this, there has been a decrease in agricultural areas, natural, semi-natural areas and open spaces and landscape become more fragmented. As a conclusion, the increase in artificial surfaces causes the destruction of natural areas and the deterioration of the structure and functioning of the landscape. These destructions affect the ecosystem and cause problems such as the extinction of living things and generations.

**Keywords:** landscape metrics, Landsat, land use/land cover.

## **Evaluation of Meles Stream in the Context of İzmir urban memory**

**Ilgaz Ekşi- Hakan Doygun**

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### **ABSTRACT**

While planning the city, it is a necessity to carefully examine the socio-cultural characteristics, the profile of people and tourists living in the region, and especially the identity of the city. Cities are remembered, symbolized by people, in short, identity formation is directly proportional to the robustness of urban memory. It is very important to preserve the historical elements in order to make the cities unique and to make the people living in the city feel a sense of belonging. Cities can continue to exist as long as they can preserve their past traces. In this study; Meles Stream, which is an important value for the city of İzmir in terms of its historical and ecological characteristics and has a strong identity feature for the city, has been evaluated. The location of the Meles Stream in the city memory from past to present has been examined and solutions have been presented for the preservation of its existence.

**Keywords:** Meles, urban memory, identity, İzmir

## **The Importance of Maintenance and Repair Implementations For Disabled and Disadvantaged People Friendly Public Open Spaces**

**Aslı Güneş Gölbey- Emine Aslan- Çiğdem Sezer- Zehra Yıldız**

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### **ABSTRACT**

Urban outdoor spaces are public spaces that serve different user profiles with equal capabilities and functions. Therefore, the design and the accessibility of public spaces should include all disadvantaged groups, within the framework of universal design principles. All disadvantaged citizens such as children, the elderly, persons with physical disabilities, pregnant women, people carrying loads, strollers, and temporary disabled people must continuously access all social facilities without any difficulties at every stage of city life. Because of this, the continuous accessibility of public spaces on the design and using levels should be provided. Public spaces are also worn out over time by the influence of the user, and these places and units cannot fulfil their functions, and they can be even a threat to the users. At this moment, the importance of the proper maintenance and repair applications can be seen for accessibility of disadvantaged people after public space's implementations. Therefore, in public spaces designed with universal design principles and by considering all disadvantaged groups, the maintenance and repair applications should be carried out regularly as well as the design of the units. In this study, the importance of maintenance and repair implementations on urban public spaces and their units, which are specially designed for disadvantaged people, are examined and discussed for İzmir, Göztepe - Güzelyalı district. The examples of maintenance and repair problems of these places and units; possible threats and dangers are examined, and necessary solutions were suggested.

**Keywords:** public spaces, disadvantaged people, universal design, maintenance and repair applications.

## **Urban heat island analysis using the Landsat 8 satellite data: A case study in Karşıyaka, İzmir**

**Besna Aydemir- Dilan Ağgöl- Nurdan Erdoğan**

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### **ABSTRACT**

A large number of studies have shown that urban areas create their own climates and modify the local meteorological fields. The urban heat island (UHI) is one of these climatic characteristics of urban areas. Mainly the term refers higher atmospheric and surface temperatures occurring in urban area or metropolitan area than in the surrounding rural areas due to urbanization. The elevated air and surface temperatures during UHI events can cause to reduce the urban well-being, increase heat and pollution related mortality, change microclimatic conditions, and elevate energy demand for cooling. In this study, it was aimed at analysing by using Landsat 8 data in the case of Karşıyaka, İzmir. Also, the correlation between land surface temperature and the normalized difference vegetation index (NDVI) and the normalized difference build-up index (NDBI) were examined to explore the impacts of the green areas and the build-up land on the urban heat island. Results shows negative correlation between LST and NDVI indicates that the green area can weaken the effect on the urban heat island, while the positive correlation between LST and NDBI means that the built-up land can strengthen the effect of the urban heat island in the study area.

**Keywords:** Urban Heat Island (UHI), Land Surface Temperature (LST), Landsat 8, Normalized Difference Vegetation Index (NDVI), The Normalized Difference Build-Up Index (NDBI)

## **Nature-based Solutions to Develop Cities Resilient to Climate Change**

**Esra Melis Yüksel- Hakan Doygun**

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### **ABSTRACT**

The aim of this study is to reveal the role of Nature-based Solutions in increasing the resistance potential of cities against the effects of climate change. Cities worldwide are facing resilience challenges as climate risks interact with urbanization, loss of biodiversity and ecosystem services. And NbS are defined by IUCN as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”. Nbs are approaches that use nature and natural processes for delivering infrastructure, services, and integrative solutions to meet the rising challenge of urban resilience, and they can be applied across spatial scales and settings in and around cities. Within the scope of the study, NbS foreseen to make cities resilient to climate change have been examined, and evaluations of this approach's potential to improve urban ecosystem services and urban living conditions in general have been put forward.

**Keywords:** climate change, nature-based solutions, urbanization

## **How the Design Characteristics of Courtyards Affect Thermal Comfort?**

**Müge Ünal Çilek**

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### **ABSTRACT**

The technological development in the climatic study helps to create climatically comfortable settlements in dense urban spaces. In this direction, courtyards, an important architectural structure in many geographies from the past to the present, have importance for climatic and social life. The courtyard is an effective and widely applied typology by adapting it in all climatic zones. This study aimed to determine the most suitable design criteria for structures with courtyards with different studies carried out in hot climate regions. Study results show that the North-South orientation is the most appropriate direction in terms of sunbathing. It has also been determined that rectangular courtyards, whose north-south distance is less than the east-west distance, are ideal for sunbathing and thermal comfort in the summer period. Orientation is the other important factor affecting outdoor and indoor thermal comfort for sun exposure and air velocity. Courtyards, located parallel to the prevailing wind, make optimum use of the summer wind. In addition, it was concluded that the use of plants with high shadow effects and the presence of large water surfaces positively affect the courtyard climate.

**Keywords:** Thermal comfort, courtyards, design criteria, microclimate, ENVI-met.

