

## MULTIFUNCTIONAL PUBLIC OPEN SPACES FOR SUSTAINABLE CITIES: CONCEPT AND APPLICATION

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**Abstract.** *The idea that multifunctional open spaces support sustainable urban development has been widely accepted in theory and intensively used in practice of urban planning and design. It is based on the assumption that multifunctional spaces bring a wider spectrum of environmental, social and economic benefits to urban areas. And yet, multifunctionality of space is still a vague and diffuse concept that needs further clarifications. Besides that, different academic disciplines understand and use this concept in different ways. This makes the application of the concept difficult to assess and manage in relation to different aspects of urban sustainability. Through the literature review, this paper analyses and compares how the concept of multifunctionality is used in various spatial disciplines (urban planning and design, landscape architecture) in order to better understand and relate its different dimensions, applications and expected benefits for sustainable development. Based on this, a new, relational and multidimensional conceptualisation of the multifunctionality of public open spaces is proposed for analysis and assessment of urban design solutions. It is further applied and discussed in relation to students projects from “Ecological urban design studio” from the University of Belgrade Faculty of Architecture, as visions for development of multifunctional public open spaces in modernist mass housing area of “Sava Blocks” in New Belgrade, Serbia.*

**Key words:** *multifunctionality, public open space, sustainable urban development, urban planning and design*

### 1. INTRODUCTION

Planning and designing multifunctional spaces is not a new idea, and great vibrant and vital urban spaces all over the world confirm its relevance and significance. Moreover, the concept of multifunctional space is nowadays widely promoted in the context of the sustainable spatial development, assuming that multifunctional spaces may bring a wider

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spectrum of environmental, social and economic benefits to urban areas and thus contribute to urban sustainability.

Although the concept has been intensively used in spatial and strategic plans and projects at different scales, there is an on-going debate of what multifunctionality is, and how it can be best related to development [1] [2] [3] [4] [5] [6] [7]. These debates on urban and rural change, stress the problem of uncritical and weakly theorised use of the notion of 'multifunctionality', and recognise that the concept is still vague, diffused, and prone to different interpretations [8]. In addition, different academic disciplines understand and use the idea of multifunctionality in different ways, which makes its application difficult to assess and manage in relation to different aspects of sustainable urban development [9] [10].

At the same time, the idea of what urban functions are, changed as well. In the contemporary planning and design theory, the new integrated approaches to spatial development recognise new dimensions of functionality, and affirm the wider meaning of this term. For example, in elaborating her theory of integral urbanism, Nan Elin suggests new functionalities of an urban space that supports urban vitality. In this approach, functionality refers not only to classical urban functions - activities and use of space - but also ecological, emotional, symbolic and spiritual functions of space [11]. Moreover, in the field of landscape planning and architecture, the concepts of ecosystem services and green infrastructure are gaining much attention as a new way of perceiving the relation between nature and culture, attributing to Nature different values for spatial development [12].

In that context, this article aims to contribute to the debate on the meaning and use of concept of multifunctionality for sustainable spatial development, by specifically focusing on public open spaces in urban contexts. In a search for *how to conceptualise multifunctionality of public open spaces to best support urban sustainability*, it first provides a conceptual and theoretical analysis of the meaning and scope of the concept of multifunctionality of spaces in different spatial disciplines (urban planning and design, landscape planning and architecture). The aim of the analysis is to derive and determine various dimensions and different interpretations of the notion of *functionality* of spaces (that further influence how the concept is applied in practice), and to relate them to the concept and aspects of sustainable urban development.

Based on the findings, in the second part of the paper, we argue for relational and multidimensional approach to multifunctionality of space, and develop a new analytical framework for reading and evaluating multifunctionality of public open spaces in relation to ecological, socio-cultural and economic aspects of sustainable urban development. In the last section we showcase its application in the context of modernist mass housing area, through visionary students' projects from "Ecological urban design studio" from University of Belgrade Faculty of Architecture.

## 2. UNDERSTANDING THE CONCEPT OF MULTIFUNCTIONALITY IN SPATIAL DISCIPLINES

### 2.1. What is (multi)functionality?

Functionality refers to the *ability* to perform a task or a function. The meaning of functionality is relative and depends on which medium is considered as the carrier of an ability to perform the task/function - space, object, or activity (or even process) and for what purpose. In that sense, multifunctionality is a *feature* of space, artifact or activity

that means having or fulfilling several functions and achieving multiple outputs, purposes or goals at the same time. Multifunctionality can be also understood as a *value* that contributes to the simultaneous solution of multiple problems or the achievement of multiple benefits. But it is not a value per se; it becomes a value only when related to the specific purpose and goals [10].

## **2.2. Multifunctionality in spatial analysis: multifunctionality in SPACE and TIME**

Conceptualized as a characteristic of space, multifunctionality refers to "the possibility of having more than one activity or function in the same SPACE and / or at the same TIME" [1]. In that sense, it is seen as a *characteristic* of the space that enables a synchronic or diachronic realization of various economic, social and environmental benefits.

Multifunctionality of space is a relative concept that depends on the spatial coverage that is the subject of the analysis (SCALE), or the spatial situation in which multifunctionality is considered. For example, in the size of the whole city it is always possible to identify multifunctionality, but it can be a set of fragments of mono-functional areas [5]. In addition, whether a site has one or more purposes or activities, also depends on its capacity to host activities with specific space requirements [1].

In relation to spatial development, the analysis of multifunctionality is possible on two grounds: on the *supply side* and on the *demand side* [9]. Multifunctionality viewed from the side of the offer, can be seen as a characteristic/feature of space or object (resources) that enables the realisation of the activities that achieve desired effects, as intentionally or consequently realised. Observed from the demand side, multifunctionality can be viewed as a social goal/value. Such a perspective starts from the social expectations in relation to a certain activity (use) and is related to the achievement of desired qualities of the particular territory [13].

The concept of multifunctionality of space and its relation to socio-spatial development is an important topic not only in urban planning and design, but also in other spatial disciplines such as landscape planning and architecture, forestry, agriculture. However, different scientific disciplines have different understandings and interpretations of this concept that we will further consider in more detail.

## **2.3. Multifunctionality in urban planning and design: multifunctional USE of space**

The notion of multifunctionality came into focus of urban planning and design theory and practice due to the problems of spatial fragmentation, social segregation and traffic congestion, perceived as indicators of the decline in the ecological, social and economic quality of modern cities. The Functional-segregation doctrine of modern urbanism has been accused to be a key cause of the aforementioned problems [14].

As opposed to that, the concepts of mixed use of space and multifunctional land use were offered as a way to achieve better land utilization and greater vitality of the city. These concepts may be applied at different spatial scales and to both buildings and open spaces [5]. While mixed use of space is related to enabling residential, commercial, cultural, institutional, or entertainment activities to take place in a certain area, multifunctional land use is understood as a combination of different socio-economic functions in the same area, where the focus is on achieving social and economic benefits from the USE OF SPACE [6]. Several different planning and design approaches to mixed land use were developed, such as "new urbanism",

"smart growth", "compact city", etc. They differ in the purpose of multiplying functions in space, and in spatial scale they applied, but in all these approaches use of urban land stands at the core [15]. Based on literature review [1] [2] [3] [4] [5] [6] [7] the following types of multifunctional land use can be identified in relation to space and time:

- Mixed use of the land – different functions are interconnected in a certain area;
- Multiple use of the land – different functions exist within the site, not necessarily integrated;
- Multifunctional use – includes both horizontal and vertical combining of functions in order to achieve synergies;
- Multifunctional use over time – space can have different functions at different moments.

In urban planning and design, multifunctionality of urban open spaces refers to use of both civic (built) and green spaces. Different types of urban open spaces (parks, gardens, edges, playgrounds, squares, pedestrian zones, wildlife habitats) can have a variety of functions and be used for different activities: recreation, play, movement, education, wildlife habitat setting, landscaping, agriculture, community development [16]. The application of the concept has historically been linked to central locations, but has over time, extended to other parts of the city. Unfortunately, until recently, functionality of land per se (ex. ecological value of undeveloped areas) was not taken fully into account when evaluating qualities of urban areas. Besides that, multiplication and increase of use of some urban green open spaces, caused their degradation and undermined their ecological sustainability.

#### **2.4. Multifunctionality in landscape architecture and planning: landscape and ecosystem SERVICES**

Within the disciplines of landscape planning and architecture, the concept of multifunctionality of space is based on the understanding of ecological relationships and processes in landscape. The landscape is understood as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors" [17], and *landscape functions-services* are the benefits it brings to human well-being and to society [18]. Goods and services that different types of landscapes provide include: production of food and timber, water purification and climate regulation, biodiversity, aesthetics values and opportunities for recreation [19]. The provision of these services is based upon the performance of ecological structures, processes and functions [6].

In that sense, multifunctionality relates to the phenomenon that the landscape can provide multiple tangible and intangible goods and services that meet social needs or respond to social or economic requirements [7]. From this perspective, urban open spaces are perceived as parts of urban landscape, and their functionality is perceived as landscape functions based on natural and cultural ecosystem services. Landscapes themselves have various dimensions of quality that can be linked to various options of socio-spatial development. But, in practice, due to traditionally favouring nature over culture in landscape disciplines, the existing conservative attitude towards natural elements in urban areas neglects social and economic issues of development. There are still tendencies to maximise quantity of green spaces in urban areas without considering its economic sustainability, and to underestimate (or even perceive as negative) the value of built open spaces for urban life and development.

This restricts the full use of the concept of multifunctionality of landscapes and open spaces for sustainable urban development.



**Fig. 1** Potsdamer platz, Berlin – multifunctional use and ecosystem services (A. Kujučev)

### 2.5. Meanings and dimensions of multifunctionality of space

The analysis reveals that conceptualisation of multifunctionality of space is possible on several grounds. It can be understood from spatial and temporal, as well as from the use and service perspective. At the same time, multifunctionality has been differently understood and interpreted in different spatial disciplines. Each of these perspectives stresses one aspect of relation to urban development. Seen individually and disciplinary, they do not fully use the potential of urban spaces for sustainable urban development.

The possibility to understand multifunctionality as a feature of space, but also as a value that contributes to the simultaneous solution of multiple problems or the achievement of multiple benefits, forms the basis for linking multifunctionality and sustainable development. Based on this, multifunctionality can be understood as a tool for urban ecological, social and economic sustainability, as well as a normative concept that evaluates the quality of sustainable development policies.

This is especially important for planning and designing public open spaces, as urban spaces that are generally open and accessible to a variety of people, whose sustainability depends on how they are perceived and valued by people. Therefore, based on results of our literature review and analysis, in the next section we will focus on the relation between public open spaces and sustainable urban development, and draft a basic conceptualisation of multifunctionality of public open spaces for better achievement and harmonisation of different aspects of sustainability.

## 3. CONCEPTUALISING MULTIFUNCTIONALITY OF PUBLIC OPEN SPACES FOR DEVELOPMENT OF SUSTAINABLE CITIES

### 3.1. Concept of sustainable development in urban planning and design

The concept of sustainable development is value-based, resource and goal-oriented concept that tends to *balance and integrate* environmental issues and socio-economic development in order to equitably meet developmental and environmental needs of present and future generations, improve quality of life standards for everyone, and better protect and manage ecosystems. Anthropocentric and focused on the human well-being, this approach involves taking care of the overall living and non-living environment, understanding that

people depend on healthy ecosystems as much as they depend on other people. In that sense, sustainability is a requirement for long-term social, cultural, economic and environmental health and vitality [20].

In urban planning and design, this approach represents a breakthrough in relation to the traditional movements of environmental protection, which were focused primarily on the protection and conservation of nature. It assumes that destructive behaviours can be transformed towards a more productive and healthier environment and "represents a process of social transformation in which all vital functions of the community are maintained indefinitely and without jeopardizing the basis on which they are based" [21]. Understood in this way, the key to sustainable urban development is *harmonisation* of ecological, socio-cultural and economic values and goals.

### 3.2. Why are urban open spaces important for sustainable development?

Urban open spaces are all physically un-built spaces within the city's territory [22]. They are integral parts of the urban structure and through their own values contribute to the quality of life in cities. Open spaces can be planned and designed to perform various urban functions: movement and traffic, recreation, gathering, water management ..., but also "non-urban activities", such as agricultural production, forestry and nature conservation. Their purpose is related to their position in the city structure and to urban activities in surrounding areas [23]. The function of urban open spaces is conditioned by their materiality and physical structure. In this sense, they differ in relation to the presence and character of natural features in space. They exist in a wide range of forms of built (civic) and green open spaces. Taking into account the complexity of urban needs, all the categories of open spaces are equally important for the quality of life in the city [20].

Public open spaces (POS) are social spaces that are open and accessible to people. They are simultaneously a part of the urban open space system and a part of the public sphere. Besides their aesthetic and functional qualities, POS have various social functions and contribute to the urban identity. They operate as the arenas for social interaction and places for cultural exchange [24]. These places are also "containers of collective memory and desire... and places for geographic and social imagination to extend new relationships and sets of possibility" [25]. If well planned and designed, they may serve as an integrative element in urban structure, and contribute to urban sustainability based on their ecological, socio-cultural and economic functions and values [26]:

- THE ECOLOGICAL VALUE of an urban open space is based on its bio-physical characteristics that support natural systems and biodiversity. All components of the urban green infrastructure have ecological value per se, but built open spaces can contribute to ecological sustainability of urban areas too. If located, planned and designed based on ecological principles, they can enhance environmental quality of urban space by effecting urban climate, water and air quality.

- THE SOCIO-CULTURAL VALUE of an urban open space is many-fold. First, they can function as community meeting places for different levels of social interaction and engagement, thus contributing to social sustainability of the area. At the same time they can function as places where strangers encounter and mix up in pleasurable or contesting events, expressing the "right" to the city, contributing to sustainable urban development by nurturing the democratic culture. Public open spaces also have a cultural dimension, since through

symbolic representation and everyday practices they contribute to the formation of local cultures and identities.

- THE ECONOMIC VALUE of an urban open space is based on the capacity to function as a resource for various economic sectors: agriculture, forestry, leisure and tourism...In addition, high quality and convivial public open spaces make cities and urban areas attractive for tourists and new inhabitants, by providing a positive image of a place that is desirable for living and visiting.

Besides contributing to urban sustainability by bringing new values to urban areas, public spaces can also be perceived as indicators of urban sustainability. Negative phenomena in the urban areas, such as ecological degradation, economic weakening of the area, neglect, under-use and devastation of space, are manifestation of unsustainable life patterns and urban development policies.

### **3.3. Multifunctionality of public open spaces for sustainable urban development: developing an analytical model**

In order to fully use the potential of the concept of multifunctionality to support sustainable development, we propose a matrix as an analytical model that relates different dimensions of multifunctionality of public open spaces to the ecological, socio-cultural and economic aspects of sustainability. In this framework multifunctionality of public open space is understood as a feature, characteristics that become value only when related to a certain set of development goals in a specific context. At the same time, multifunctionality of a public open space is perceived as multidimensional in order to better relate to various aspects of sustainable development (ecological, socio-cultural, economics) and thus contribute to their harmonisation. Dimensions of multifunctionality are defined in relation to: space, time, use and services provided by land:

- SPACE dimension refers to how different functions are distributed in space horizontally and vertically, as well as in relation to the scale (location, area,...). Mixed, multiple and multifunctional use may be considered.

- TIME dimension refers to how different functions are distributed in time – synchronic and diachronic multifunctionality is possible. "Diachrony" refers to the disposition(s) of functions across time. "Synchrony" refers to the disposition of different functions at one specific moment in time.

- USE dimension refers to provision of possibilities for people and other living beings to use the space in different ways - based on urban design to enable activities and/or through organisation of special events.

- SERVICE dimension refers to the capacity of land (natural or built) to provide tangible and intangible goods, services and amenities to people and nature

In the new analytical model - different dimensions of multifunctionality are related to different aspects of sustainability in order to reveal possible positive and negative impacts of multifunctional design solutions, as presented in Table 1.

**Table 1** Public open space multifunctionality in relation to aspects of sustainability

		ASPECTS OF SUSTAINABILITY		
		Ecological	Socio-cultural	Economic
<b>DIMENSIONS OF MULTIFUNCTIONALITY</b>	<b>Space</b>	Increase and intensification of activities in space may diminish its ecological value. At the same time ecological value of space can be protected by revealing it to users through various activities.	Diversification and increase of activities in space attracts more people and supports sociability. Level of sociability depends on how activities are distributed -as dispersed or concentrated - and how are they linked and combined.	Diversification and increase of activities in space enhances attractiveness for different user groups and supports local economies, investments and rents in surrounding areas. Harmonisation between size, level of equipment and financing is necessary.
	<b>Time</b>	Increase and intensification of activities in time (synchronic and diachronic) may diminish its ecological value. Natural, vulnerable spaces may be especially endangered. Control of intensity of multifunctional use is a paramount.	Increase and diversification of activities in time attracts more people and supports sociability. Synchronicity enables concentration of people, and diachronic increase and diversification supports continuity of socialisation in space for different user groups.	Synchronic and diachronic increase and diversification of activities in time enhances attractiveness for different user groups and supports local economies, investments and rents in surrounding areas.
	<b>Use</b>	Increase and diversification of different uses of space, but also type and character of activities that are provided or enabled, are important for the increase or reduction of ecological values of the area.	Increase and diversification of different uses of space attracts more people and increase the chances for people to meet and interact. Level of sociability depends on type of activities, and how are they linked and combined.	The diversification of uses, attracts more people, enhance the attractiveness of space and supports local economies, investments and rents in surrounding areas.
	<b>Service</b>	Increase and multiplication of land functions and services for urban life, help revealing different values of Nature and confirm the need to protect natural features in urban environment.	Increase of environmental comfort and aesthetics through land and ecosystem services increases use and sociability of space, and helps construction of positive identity of the area.	Increase of environmental comfort and aesthetics through land and ecosystem services, increases economic value of urban area by enhancing its attractiveness to live, visit and invest.

#### 4. ANALYSING CONTRIBUTION OF MULTIFUNCTIONAL PUBLIC OPEN SPACES TO SUSTAINABLE DEVELOPMENT OF MODERNIST MASS HOUSING

The new model for analyzing the contribution and effects of multifunctional public open spaces on sustainable development is applied to visionary students' urban design projects. The aim is to determine a) how different design solutions of multifunctional public spaces may contribute to the sustainable development of public promenade in modernist mass housing area, and to b) help identify possible shortcomings in order to reveal issues that need harmonization of sustainability goals. Examples were selected to showcase different approaches to multifunctionality of public open spaces, while addressing the same problem of underuse of the green public promenade. All cases are based on the water as natural element in urban space and theme that leads urban design visions.



#### 4.1. Context and purpose of developing multifunctional public open spaces

“Sava Blocks” in New Belgrade, Serbia is a modernist mass housing area that comprises several super blocks (45, 44, 70). They are inter-connected by two parallel green promenades: centrally located "Lazaro Kardenasa Promenade" and “Sava river Promenade”. These promenades form a part of well developed public open space system of super-blocks. They are characterised by high quantity of green public open spaces, but also with the problem of their underuse and neglect, especially in the Lazaro Kardenasa promenade case. Therefore, the purpose was to investigate possibilities for developing multifunctional public open spaces, as places where nature and culture connect, overlap and permeate, in order to contribute to sustainable development of “Sava Blocks”.

#### 4.2. Case 1 – “Water leads to water”

The project explores the relationship of the Block 45 with water, based on the fact that the block is located on the Sava riverfront and that this feature defines the block’s identity. Moreover, the groundwater levels in the block are high and it is often threatened by flooding.



**Fig. 2** Case 1 - “Water leads to water”- Milica Pavić

Key questions that are addressed in the project were: 1) what does water mean to different users, and 2) how to use water in urban design so that it contribute to the adaptation of cities to climate change? It was presumed that through the development of multifunctional public spaces as adaptation measures to climate change (at area, system and local level), it is possible to create an environmentally sustainable system of spaces, which simultaneously protect Block 45 of floods and control drainage, and are attractive, symbolic, useful and comfortable spaces for a variety of users (Figure 2, Table 2).

**Table 2** Assessing sustainability of multifunctional public open space – case 1

		ASPECTS OF SUSTAINABILITY		
		Ecological	Socio-cultural	Economic
<b>DIMENSIONS OF MULTIFUNCTIONALITY</b>	<b>Space</b>	Nature is used as mentor in design at all spatial levels, and thus needs of nature and people are harmonised. Forms and activities that water as element in design brings, reveals values of nature and contribute to its appreciation and protection	Different functions of water are dispersed space, increase use by different user groups, support interaction and create positive identity .	Increase in number of activities, at system, area and location level, enhances attractiveness of space for people and may contribute to investments and rent. <i>Critical issue:</i> need for harmonisation between size, level of equipment and financing
	<b>Time</b>	Multifunctionality in time refers to changes in use of water basins in relation to seasons or flooding levels. Intensity of different uses is well planned in relation to location and size of natural elements in area, thus protecting their ecological value.	Seasonal and flood-related changes of water-plazas contribute to variety of uses and to identity. Increase and diversification of use of space at synchronic or diachronic levels, contribute to sociability of area <i>Critical issue:</i> level of sociability depends on season.	Increase of number of different activities that may simultaneously take place increase attractiveness and economic value of space. <i>Critical issue:</i> maintenance.
	<b>Use</b>	Introduction of water features, that support water related activities, increase use of space and enhance ecological value by providing contact with nature.	Increase of possible uses of space by different user groups contribute to greater sociability of area. Water based design brings positive local identity.	Increase of use enhance attractiveness and supports investments and rent increase in area.
	<b>Service</b>	Introduction of ecosystem - water services is the leading idea of the project and helps revealing different values of Nature.	Introduction of natural features - water and its services (retention, microclimate regulation...) into design, brings positive identity and attracts people.	Natural services are provided in space that may decrease the costs of flooding. Good balance of natural and special management areas is achieved.

### 4.3. Case 2 – “Vital space – water path”

The goal of the project was to activate the promenade Lazaro Kardenasa to become a vital and vibrant place. The spatial concept is based on the idea to develop the promenade as a complex system by designing multifunctional spaces for different purposes, related both to culture and nature.

**Fig. 3** Case 2 - “Vital space- water path”- Tamara Radić and Bogdan Popović

Focal social and economic activity points are located on the central position in the promenade, providing different necessary and thematic uses of space. They are combined with natural areas in order to support biodiversity and contact with nature. By their interconnection, public open spaces and buildings are defined as community meeting places. These natural and cultural sites located on the promenade are supported with a variety of activities provided in surrounding areas (Figure 3, Table 3).

**Table 3** Assessing sustainability of multifunctional public open space – case 2

		ASPECTS OF SUSTAINABILITY		
		Ecological	Socio-cultural	Economic
DIMENSIONS OF MULTIFUNCTIONALITY	Space	Natural features of space were recognised as value to protect and support by revealing its importance to people through planning of different activities on various locations.	Increase and diversification of activities through well connected and authentically designed space, contribute to creation of positive identity and increase the use by different user groups. Both concentration and dispersion spatial strategies are applied.	Increase in number of activities at system, area and location level, enhances attractiveness of space for people and contribute to investments and rent. Harmonisation between size, level of equipment and financing is achieved through balancing private and public management.
	Time	Intensity of different uses in time is well planned in relation to type, location and size of natural elements in area, thus protecting their ecological value.	Increase and diversification of activities attracts different people and supports sociability in the area. Social vitality of space through time is supported by different forms of management and creation of spaces that differ in size, level of equipment and character.	Provision of variety of different types of spaces and increase of number of different activities that may simultaneously take place, increase attractiveness and economic value of space. <i>Critical issue:</i> maintenance of high quality spaces through time.
	Use	Introduction of water features supports both use of space and contributes to overall ecological value by providing contact with nature.	Increase of possible uses of space by different user groups was a main goal of the project in order to contribute to greater sociability of area. High level of sociability is achieved through provision of different types of activities and their connections.	The increase and diversification activities in space, attracts more people, enhance the attractiveness of area and supports local economies.
	Service	Although mostly built-up, this open space improves ecological value of area through integration of water retention and purification measures. <i>Critical issue:</i> increase in built-up surfaces lowers porosity and size of natural self-sustained areas.	Increase of activities, environmental comfort and aesthetics that attracts and connects people is achieved through water-spaces that provide variety of services (retention, regulation of microclimate).	Commercial, as well as natural services are provided in space that increase its economic value. New water-bodies provide environmental comfort and aesthetics and enhance attractiveness of area to live, visit and invest.

#### 4.4. Case 3 – “Promenade as a river flow”

In order to overcome problems of under-use and neglect of the “Lazaro Kardenasa promenade, “learning from nature” was selected to be the guiding principle of the project. Water was perceived as a mentor that guides development. The starting point for the project was the analysis of main users groups of the promenade (children, old people, recreationalists and people with dogs), their needs and the dynamic of their movement in public spaces. Development of a multifunctional promenade was conceptualised as a system of river-flows that connect and orchestrate flows of different user groups. A variety of ambiances was developed on different segments of this “flows”, with a purpose to help people interact among themselves and with nature. The presence of water was integrated in this system in different forms and with different purposes: as a moderator of climate and place for water management; as a symbol and a spiritual and emotional connector with Nature; or as a place to relax or play. Basic commercial activities that support the public life and needs were also proposed in nodal locations (Figure 3, Table 3).



**Fig. 4** Case 3 - “Promenade as a river flow”- Tamara Bošković

**Table 4** Assessing sustainability of multifunctional public open space – case 3

		ASPECTS OF SUSTAINABILITY		
		Ecological	Socio-cultural	Economic
DIMENSIONS OF MULTIFUNCTIONALITY	Space	Ecological value of space is revealed and protected by connecting natural elements to various activities on the promenade. The idea of promenade as a river-flow connects different spatial scales.	Diversification and increase of activities on promenade attract more people and supports sociability. Both dispersion and concentration spatial strategies are implemented. <i>Critical issue:</i> organisation of events	Spatial interventions and increase of enhance attractiveness for different user groups and supports local economies, investments and rents in surrounding areas. <i>Critical issue:</i> management
	Time	Increase and intensification of activities on the promenade are related to built-up spaces and can't diminish ecological value.	Increase and diversification of activities in time, that support sociability of place are enabled in both synchronic (nodes and centres) and diachronic form (different user groups).	Synchronic and diachronic increase and diversification of social and economic activities in time enhances attractiveness for different user groups and supports local economies.
	Use	Increase and diversification of different uses of space, is harmonised with the natural characteristics and qualities of specific locations on promenade and thus contribute to ecological value.	Diversification of activities and possible uses of space is related to needs of different user groups. It attracts more people, and through overlapping of “flow-paths” increases the chances for people to meet and interact.	The diversification of uses, attracts more people and enhance the attractiveness of space. As such it supports local economies, investments and rents in surrounding areas. <i>Critical issue:</i> management
	Service	Land functions and services are provided through development of water basins and flows, and help reveal different values of Nature to people	Increase of environmental comfort and aesthetics is provided and contribute to increases use and sociability of space, and construction of positive identity of the area.	Integrated natural elements (green and blue spaces) enhance environmental comfort and aesthetics and contribute to attractiveness of area to live, visit and invest.

#### 4.5. Discussion

Presented design projects had different primary purposes and that was reflected in the design at both area and detailed levels, as well as in their expected performance. Anyway they all provided systemic view and manage to contribute to all aspects of urban sustainability.

The new analytical model *enabled broad understanding* of the conditions for sustainability of each project, by revealing space, time, service and use dimensions of multifunctionality. It also *enabled critical review* of different design approaches by *simultaneously* relating different dimensions of their functionality to various aspects of sustainable development. As such it helped identifying benefits but also shortcomings and critical issues of implementation of certain urban design solutions from ecological, social or economic aspects. The opportunity to simultaneously analyse the effects of design solutions on different aspects of sustainability is important for their harmonization in order to achieve sustainable cities. Based on this, it is possible to conclude that a new approach can help evaluation of design alternatives, but can also serve as a platform for discussion on alternative futures between different stakeholders in

the planning process, by revealing potential environmental, socio-cultural and economic benefits as well as critical issues of their application.

## 5. CONCLUSIONS

Our analysis revealed that multifunctionality is a complex concept that can be understood and applied based on its *spatial, temporal, use and service* dimensions. It is an important concept for sustainable urban development that has been differently understood and interpreted in different spatial disciplines, which makes its application difficult to assess and manage in relation to different aspects of sustainable urban development.

In order to better balance ecological, socio-cultural and economic development goals and, at the same time, enable creative and context specific approach to design of urban space, the concept of multifunctionality needs to be integrated into the planning and design of public open spaces in a *relational and multidimensional way*. This means that multifunctionality should be understood as a feature that becomes value only when related to certain set of development goals in specific context. At the same time, multifunctionality of public open space should be perceived as multidimensional in order to better relate to various aspects of sustainable development (ecological, socio-cultural, economic) and to contribute to their balance.

A new analytical framework, based on these principles and outlined in this paper, confirmed to be adequate for reading, analysing and assessing the contribution of multifunctional public open spaces to sustainable urban development, and applicable in different situations. Its application was showcased in the context of modernist mass housing, and it should be further tested in other urban development situations. Anyway, we suppose that this new approach has a significant potential for application in the planning and design practice. It can be used for evaluation of urban design alternatives in a rational or collaborative planning process, but also as a basis for the future public open space planning and design projects that aim to *balance* cultural and natural values in urban space. We hope, that understood in this way, planning and design of multifunctional public open spaces can more fully contribute to the quality of life in cities and be a factor of urban sustainability and resilience.

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## REFERENCES

1. M. Batty, E. Besussi, K. Maat and J. Hars, "Representing multifunctional cities: density and diversity in space and time", *Built Environment*, 30(4), pp. 324–337, 2004. <https://doi.org/10.2148/benv.30.4.324.57156>
2. H. Haccou, et al, *MILU Guide: practitioners handbook for multifunctional intensive land use*, MILU net - The Habiforum Foundation, Gouda, 2007.
3. E., Hoppenbrouwer and E. Louw, "Mixed-use development: theory and practice in Amsterdam's eastern docklands", *European Planning Studies* 7 (13) pp. 967-983, 2005. <https://doi.org/10.1080/09654310500242048>
4. I. B. Kajtazi, *Measuring Multifunctionality of Urban Area*, Thesis. International Institute for Geo-Information Science, Enschede, The Netherlands, 2007.

5. S. Majoor, "New Norms for Multiple Intensive Land Use", 39th Iso CaRO Congress, 2003. [www.isocarp.net/Data/case\\_studies/306.pdf](http://www.isocarp.net/Data/case_studies/306.pdf) [Accessed: 2nd July 2012].
6. R. Verkeer, H. De Groot and E.T. Verhoff, "Urban multifunctional land use: theoretical and empirical insights on economies of scale, scope and diversity", *Built Environment* 30 (4), pp. 289–307, 2004. <https://doi.org/10.2148/benv.30.4.289.57157>
7. H. Wiggering, et al., "Indicators for multifunctional land use: Linking socio-economic requirements with landscape potentials", *Ecological Indicators* (6) pp. 238–249, 2006.
8. G.A. Wilson, *Multifunctional Agriculture: A Transition Theory Perspective*, CABI international, Cambridge, MA, 2007.
9. OECD, *Multifunctionality: a framework for policy analysis*, AGR/CA (98) 9, OECD publications, Paris, 1998.
10. OECD, *Multifunctionality: towards an analytical approach*, OECD publications, Paris, 2001.
11. N., Elin, *Integral Urbanism*, Routledge, NY, 2006.
12. R. Fish, A. Church and M. Winter, "Conceptualising cultural ecosystem services: A novel framework for research and critical engagement", *Ecosystem Services* 21, pp.208-217, 2016.
13. G. Huylenbroeck et al., "Multifunctionality of Agriculture: A review of Definitions, Evidence and Instruments", *Living Reviews in Landscape Research* (1),p.3. 2007. <http://dx.doi.org/10.12942/lrlr-2007-3>
14. J. Jacobs, *The Death and Life of Great American Cities*. Vantage, New York. 1961.
15. J. Živković, K. Lalović, and D. Milovanović-Rodić, Multifunkcionalnost otvorenih prostora u kontekstu prilagođavanja gradova klimatskim promenama (Multifunctionality of Open Spaces in Adapting Cities to Climate Change), In: M. Bajić-Brković (Ed.), *Klimatske promene, nacionalne politike i lokalni razvoj* (Climate changes, national policies and local development) pp. 125-155. Faculty of Architecture University of Belgrade, Belgrade, 2016.
16. S. Waters and M. Smith, "The Planning and management of urban open spaces in Scotland", *Scottish Natural Heritage Review* (SNH) No 130, 2002.
17. Council of Europe (2000) *European Landscape Convention*
18. L. Willemen, *Mapping and Modelling Multifunctional Landscapes*, Thesis, Wageningen University, Wageningen, The Netherlands, 2010.
19. R. Hine, J. Peacock and J. Pretty, *Green spaces: Measuring the benefits, drawing on case studies from the East of England*. Report for the National Trust. University of Essex, 2008.
20. J. Živković, *Uticaj ekoloških zahteva na oblikovanje otvorenih rekreativnih prostora u gradu* (The Impact of Ecological Demands on Design of Open Recreational Spaces in Urban Environment), MSC Thesis, University of Belgrade Faculty of Architecture, Belgrade, 2000.
21. M. Bajić Brković, *Ogledi o planiranju i održivom razvoju grada* (Essays on planning and sustainable development), Faculty of Architecture University of Belgrade (internal edition),, Belgrade, 2000.
22. Ž. Vesnić Nederal, *Rekreativna funkcija otvorenih prostora u gradu* (Recreational function of urban open spaces), Faculty of Architecture University of Belgrade, Belgrade, 1990.
23. J. Živković and N. Vasiljević, "Predeo i održivi prostorni razvoj Srbije" (Landscape and Sustainable Spatial Development of Serbia). In: M. Bajić-Brković (Ed.), *Kreativne strategije za održivi razvoj gradova u Srbiji* (Creative strategies for sustainable urban development in Serbia) (pp. 123-157). University of Belgrade Faculty of Architecture, Belgrade, 2010.
24. Z. Đukanović and J. Živković, *Public Art & Public Space program: learning, but doing!* *ANNALES-Anali za istrske in mediteranske studije-Series historia et sociologia*. Vol. 25/1, pp. 49-65. 2015. <http://zjdp.si/annales-series-historia-et-sociologia-25-2015-1/>
25. J. Corner, "Terra Fluxus", in: Waldheim Ch. (ed.) *The Landscape Urbanism Reader*, (pp.21-33), NY: Princeton Architectural Press, 2006.
26. R. Kaufmann-Hayoy, T. Hammer and D. Raemy, "Institutional Steering and Collective Action for Sustainable landscape Development - The Case of the Vineyard Landscape at the Lake of Biel", 2007. <http://www.ikaoc.unibe.ch/forschung/nie-bielersee/index.html> [Accessed: 2nd July 2012].

## MULTIFUNKCIONALNI JAVNI OTVORENI PROSTORI ZA ODRŽIVE GRADOVE: KONCEPT I PRIMENA

*Ideja da je multifunkcionalnost otvorenih prostora važna za urbanu održivost se sve više naglašava u teoriji i sve češće primenjuje u praksi urbanog planiranja i dizajna. Pretpostavlja se da multifunkcionalni prostori mogu da pruže širi spektar ekoloških, društvenih i ekonomskih koristi. Međutim, sam koncept multifunkcionalnosti nije dovoljno teoretski elaboriran. Dodatno, različite akademske discipline konceptualizuju i koriste ovaj koncept na različite načine. Usled toga je otežana procena kako multifunkcionalni otvoreni prostori stvarno doprinose održivom urbanom razvoju i kako ih razvijati sa tim ciljem. Ovim radom se, na osnovu pregleda literature, analiziraju i porede načini konceptualizacije i primene koncepta multifunkcionalnosti prostora u različitim disciplinama prostornog razvoja (urbanističko planiranje i dizajn, pejzažno planiranje i arhitektura) kako bi se razumele i uspostavile veze između različitih dimenzija multifunkcionalnosti i očekivanih koristi od primene koncepta za održivi urbani razvoj. Na tim osnovama se definiše nova relacijska i multidimenzionalna konceptualizacija (multi)funkcionalnosti javnih otvorenih prostora kao analitički okvir za vrednovanje doprinosa projekata urbanog dizajna održivom razvoju. Primena novog analitičkog okvira se demonstrira i diskutuje na primeru studentskih projekata sa studija "Ekološki urbani dizajn" sa Univerziteta u Beogradu - Arhitektonskog fakultet, kao vizija razvoja multifunkcionalnih javnih otvorenih prostora modernističkog kompleksa "Savskih blokova" u Novom Beogradu u Srbiji.*

*Ključne reči: multifunkcionalnost, javni otvoreni prostori, održivi urbani razvoj, urbano planiranje i dizajn*