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Review article

Human Needs as an Approach to Designed Landscapes

Dalia Aly [a]*, Doaa K. Hassan [a], Shaimaa Mohamed Kamel [a] and Johannes Hamhaber [b]

[a] Faculty of Engineering, Ain Shams University, 11517 Cairo, Egypt
[b] Institute for Technology and Resources Management in the Tropics and Subtropics (ITT), Cologne University of Applied Sciences, 50679 Köln Germany

* Corresponding author: daliaali@eng.asu.edu.eg

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Abstract

The traditional approach of landscape architecture has always focused on the aesthetic and visual aspects of landscapes while giving less attention to other aspects. This view has limited the benefits that can be derived from designed landscapes, despite the wide-ranging potential they carry for humans; socially, environmentally and economically. As a result, many researchers and practitioners are currently challenging this view to develop a more holistic and multidimensional approach. The present research therefore aims at proposing a new perspective for public designed landscapes based on fundamental human needs. The study methodology was comprised of critical content analysis for three main domains: sustainable development, human needs in specific relation to public landscapes, and significant approaches to fundamental human needs. Reconciliation among these domains was achieved based on a modified version of Max-Neef's matrix of fundamental human needs. Human needs in public landscapes were merged into the matrix to reach a comprehensive yet specific perspective. The study concluded with a conceptual framework that can provide a wider perspective to human needs in designed landscapes. It proposes a new tool for the analysis of the benefits of public landscapes and their value for humans, which can be further used in various applications.

1. Introduction

The typical view of designed landscapes has often been tied to their visual qualities. Landscape design in this context is viewed as a tool for adding aesthetic value to different open spaces. This produces spaces with typical features that can meet a prior image of how a designed landscape should look without further consideration of other equally important aspects **[1]**–**[3]**. In addition, the dominance of aesthetics as a goal for a designed landscape limits the functionality of its elements. With the pressure of urbanization, being unaware of the full potential of a landscape prioritizes economic and services development at the expense of open spaces. Investments will accordingly be directed to purposes that have direct and short-term economic benefits. As a result, several cities are currently suffering from the loss of their open and green spaces due to the pressure of human activities **[4]**. Achieving greater potential from

designed landscapes requires a more holistic and multidimensional approach. Consequently, they can serve humans in various aspects; socially, environmentally and economically. This research aims at proposing a new perspective for public designed landscapes based on fundamental human needs. It investigates and analyses their potential in meeting human needs to create a better understanding of what they can offer for humans and contribute to their well-being.

2. Methodology

To develop the conceptual framework, the study methodology depended mainly on critical content analysis for three main domains (**Figure 1**). First, the concepts of sustainable development concerning multifunctionality and ecosystem services were analyzed. The aim of this domain was to investigate different landscape elements, functions and services. Secondly, human needs, specifically in relation to public landscapes, were studied through two main concepts, landscape preference and the concept of place. For the second domain, a comparative analysis was used to establish a list of qualities of successful public places. Finally, a comparative analysis of significant approaches to fundamental human needs was also conducted. Accordingly, a modified version of Max Neef's matrix of human needs was selected because of its appropriateness to the research aim. Reconciliation among the three domains was then achieved by incorporating human needs in public landscapes into the FHN matrix to reach a comprehensive yet specific perspective.

3. Designed Landscapes and Human Needs

The following three sections include an analysis of the literature related to the three main domains of the research: sustainable landscape development, human experience in landscapes and fundamental human needs. The aim is to establish a correlation between the holistic approach of designed landscapes and fundamental human needs.

3.1 Sustainable Landscape Development

Sustainability and sustainable development are widely discussed topics in different areas of the literature. In the context of landscape, the European landscape convention argued that well-preserved landscapes can be part of the three pillars of sustainable development and can contribute to enhancing human well-being **[5]**. As mentioned above, traditionally landscape has been linked to its visual and aesthetic aspects. However, the concept of sustainability can widen this view to include more environmental, sociocultural and economic potential. Sustainability can provide a holistic view of natural and human aspects of landscapes and the interrelations between them **[3]**, **[6]**. Discussions related to sustainable landscapes always include two important concepts, multifunctionality and ecosystem services. These two concepts can add important perspective to the analysis related to this research. They discuss functions related to different landscape elements and the services they offer for humans towards the satisfaction of their needs.

3.1.1 Multifunctionality

Sustainable landscapes are multifunctional landscapes, they have multiple environmental, sociocultural and economic functions. The concept of multifunctionality gives a more holistic view of landscape functions. Different landscape functions can be balanced within the same design **[7]**–**[9]**. Not only can a landscape as a whole system be multifunctional, but also each single element within the system can have more than one function. A function is defined as "the capacity (of a driver) to maintain an entity in a certain state or change it in a given direction **[10]**". It includes the description of the "interactive behavior" within a definite system **[11]**. It also describes the "purpose" or "ability to work" of an entity **[10]**. Landscape functions can be discussed within the aspects of sustainability; environmental, sociocultural and economic functions.

First of all, the natural elements, vegetation and water, are the main elements that perform environmental functions. Vegetation and water surfaces are found to have an effect on microclimate regulations and can contribute to pollution reduction **[12]**–**[14]**. Not only does vegetation have a positive effect on air, but also on soil and water. The types of vegetation, their variety and maturity are important in the effectiveness of vegetation cover in decreasing erosion, flood protection and increasing water quality **[7]**, **[15]**. Moreover, vegetation provides essential shelter and food for the survival of living organisms, which in return enriches biodiversity. Biodiversity is important for natural balance and healthy life cycles **[13]**, **[16]**.

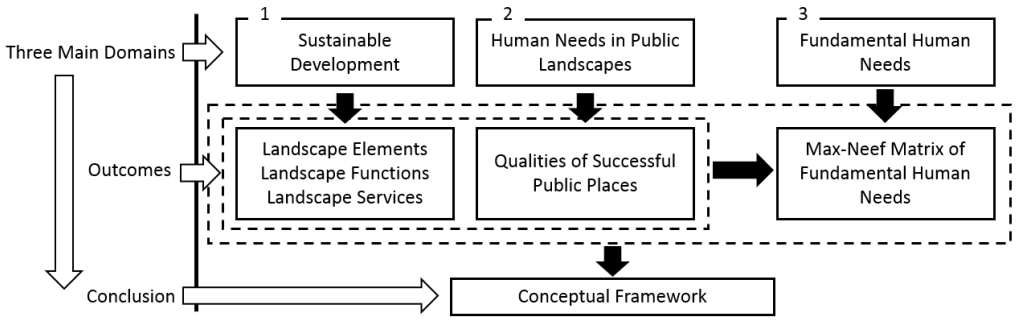

Figure 1: Methodology.

Enhancement of the environment can also have economic value; temperature reduction and shading can save some of the energy needed for mechanical cooling. The cost of mechanical purification of water can also be reduced by the effect of vegetation **[7]**.

Secondly, public landscapes provide cities with contact with nature, in addition to areas for active social and cultural life for all ages, i.e. sociocultural functions. Common public life, involving sharing and celebration, is found in public spaces. In playgrounds, parents meet and socialize while their children are playing, experience their first social life and build their social skills. Elderly groups also enjoy the social interactions within public spaces. Public art can form points of interest that encourage interaction. In public spaces, you may find people imitating a statue for pictures, climbing it, or wondering about its story and what it symbolizes. Street performers can also encourage people to interact with each other, not only passively watching them **[13]**, **[17]**–**[19]**. Moreover, distinct elements within the design of a space can add visual character. Vegetation, flooring, street furniture and distinctive architecture can be part of a space's character and identity. These elements may have symbolic value or just have unique features either as a single element or in their arrangements.

Finally, the economic aspect of landscapes has two sides; direct economic functions and economic value resulting from other functions, such as economic value related to environmental functions. The economic value of environmental functions includes preserving biodiversity, energy saving and lowering health care costs **[7]**, **[20]**. The economic functions of landscapes include opportunities of productivity **[7]**, positive effects on increasing property value **[13]**, **[21]**, **[22]**, providing attractive touristic destinations and attracting economic activities **[8]**. Office buildings, restaurants, retail and spaces for markets and events can be found within development projects of public landscapes **[13]**. Economic functions can generate revenue and provide job opportunities.

Through the concept of multifunctionality, three important landscape functions have been discussed: environmental, sociocultural and economic functions. In order to provide a more integrative view of landscape multifunctionality, two more functions will be added; configuration functions, and maintenance and operation function. The first three aspects relate to sustainability and can be found in both natural and designed landscapes. The two added functions are more related to designed landscapes. Configuration functions are fundamental functions for the creation of a space, while maintenance and operation functions are important for sustaining and protecting it from deterioration. The two functions are regulatory functions that are essential for the performance of the other three functions and their ability to provide services for humans (**Figure 2**).

The category of configuration functions in this classification is related to the spatial arrangement and organization of a space using its elements. Space definition, creation of subspace (spaces within a space), indicating directionality, emphasizing different forms and defining focuses or centers, can be designed using different elements such as floor patterns, vegetation or public art **[23]**–**[25]**. Design

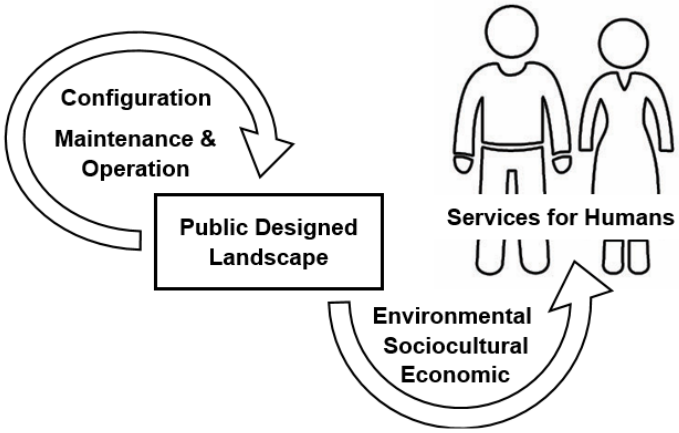

Figure 2: Functions in a Public Designed Landscape.

elements can also be used to allow openness and visual access **[18]**. Moreover, the efficient operation and maintenance of any space after its implementation is important for its success. Continuous feedback and evaluation of the performance of the space allows managers to make decisions on suitable modifications or alterations needed to improve performance **[26]**. Cleanliness and continuous maintenance of the elements of the space; collecting trash, fixing of damaged items, keeping lighting systems functioning **[27]**, efficient irrigation methods for the sustainable use of water **[28]** and securing spaces **[17]**–**[19]** are all important operation and maintenance functions.

It is important to mention that the goal of the discussion related to functions is not to provide an exhaustive list of all potential functions of a landscape or to explain the dynamics of each of them. It is more about providing most evident examples and having a general view of landscape potential in serving human purposes. The complex system of a landscape can then be viewed within a simpler form of analyzed functions.

3.1.2 Ecosystem Services

Since the Millennium Ecosystem Assessment (MEA), the concept of ecosystem services has started to gain more interest in different research studies. The MEA aimed to assess the benefits that both natural and human-modified ecosystems carry for humans and linked them to their well-being **[29]**. In the context of landscape research, ecosystem services were adopted by several researchers as an approach to landscape analysis. This approach includes identification of the connections between landscapes, their functions, and services. Functions and services can then be quantified and valued using different methods. This can inform the importance that landscapes carry and support management and decision-making **[30]**. Several researchers have agreed upon a correlation between ecosystem services and human well-being according to a certain sequence. This sequence starts with a structure or a process which perform functions, and that functions can provide a number of services to humans, which in turn have benefits and value for them reflected in their well-being **[11]**, **[30]**, **[31]**.

Although there is broad agreement about the previous sequence, differentiating between functions and services is still a debated issue **[31]**, **[32]**. Rudolf de Groot defined landscape functions as "the capacity of natural processes and components to provide goods and services that satisfy human needs, directly or indirectly **[32]**". On the other hand, the Economics of Ecosystems and Biodiversity (TEEB) project defined ecosystem services as, "direct and indirect contributions of ecosystems to human well-being **[31]**". The difference between functions and services then, is that functions are more about an action performed by the element, i.e. a substantial act; while services are what the functionality offers humans, the value added to a function **[33]**. The study of functions is processes and systems dynamics-related, while services are more human oriented **[11]**. For example, a landscape element, like a tree, absorbs carbon dioxide within its natural functioning systems. This function contributes to enhancing air quality, which is the service for humans; it is the effect of the function performed. The service carries value for humans and helps in meeting their needs. In the case of pollution mitigation, better environments for living mean better heath. Highlighting the difference provides a better understanding of the underlying system, not only stating the apparent services.

The MEA classified ecosystem services into 4 categories: "provisioning services", "regulating services", "cultural services" and "supporting services" **[29]**. De Groot followed the same classification with the category of "cultural services" termed "cultural and amenity services", and the "supporting services" termed "habitat or supporting services" **[32]**. Provisioning services are related to productivity, for example, food, water, raw materials. Regulating services are related to providing better environmental conditions, for example, air quality regulation, climate regulation and water regulation. Services like water and nutrient cycling, photosynthesis and soil formation, which are an important requirement for the performance of other services, are the supporting services. Finally, cultural and amenity services are related more to intangible human values like aesthetics, spirituality, recreation and identity **[32]**.

3.2 Human Experience in Landscape

Through experiencing surrounding environments, humans always react and create judgments. Accordingly, these environments become either likable or unlikable. In this respect two principal theories have been discussed in several studies to explain this phenomenon, 'preference' and 'space and place'. The concept of 'preference' explains the reasons for favoring certain environments in relation to the mental process of 'perception'. While the concept of 'place' explains further characteristics of meaningful 'spaces'.

3.2.1 Preference

In his book, "Topophilia: A Study of Environmental Perceptions, Attitudes, and Values", Yi-Fu Tuan states that humans prefer environments that are familiar to them. He claimed that visual preference and attachment to certain environments are tied to their expression of a person's past experience **[34]**. In addition, Rachel and Stephen Kaplan developed a significant landscape preference model based on two commonpurposes among humans; 'understanding' and 'exploration' **[35]**, **[36]**. Aspects related to understanding and exploration were categorized by Kaplan and Kaplan into two main levels of analysis. The first level is a two-dimensional level, where environments are perceived as a flat picture. It is referred to as the 'surface level of analysis'; the immediate appreciation of an environment when first contacted. The second level is a three-dimensional level, where humans start to look into the depth of a certain scene; a promise of future information and further opportunity for exploration. The components of these two levels of analysis are, at the two-dimensional level, coherence, the factor that facilitates understanding, and complexity, the factor related to exploration. At the three-dimensional level, legibility is the understanding factor, while mystery is the exploration factor **[35]**, **[37]** (**Figure 3**).

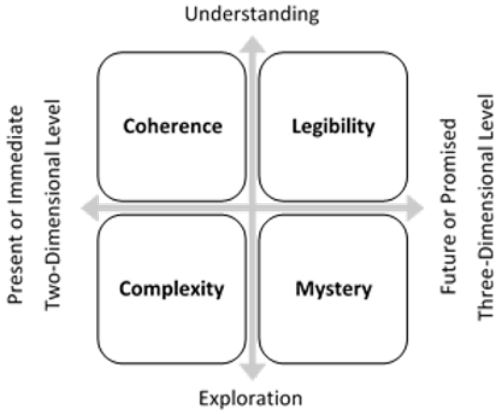

Figure 3: Information Matrix, from **[37]**.

3.2.2 Space and Place

The concepts of space and place have been discussed widely in the literature. Although "public spaces and public places are used interchangeably in the literature **[38]**", Tuan explains specific concepts that differentiate them. Space is more abstract than a place, it implies freedom and openness. Place, on the other hand, as objects constructing a space, can define more closeness and constraints. The openness of a space can indicate threats, the role of place in that perspective is allowing for more stability and security. Being open, space allows movement, place can then be seen as points of pauses through the movement. Place provides the space with points of interests that we pause at and create memories. When people experience space, the value and meaning added by their experience is what makes a space into a place. Tuan claims that concepts of space and place are both important to humans **[39]**, **[40]**. Accordingly, experience is the key; a space becoming a place to people means that they have experienced it, it holds meaning and memories to them and they have a common history as a result **[39]**, **[40]**.

Further characteristics related to places have been discussed in the literature under the term, 'sense of place'. It originates from the Latin term 'genius loci' **[41]**. Genius loci "refers to the unique spiritual force inherent in a place **[42]**". It is about experiencing something beyond

the physical qualities of an environment **[37]**, **[41]**. Sense of place is now used to refer to a place's "spirit", "personality", "atmosphere" and "quality" **[40]**, **[41]**. The importance of a sense of place is that it can make people more consistent with their surroundings. This consistency allows for better usage and behavior in a space, increases the feeling of safety and consequently affects satisfaction **[43]**.

In relation to qualities that enhance humans' sense of place, Stephan Carr *et al*. **[18]**, Mark Francis **[26]**, Jan Gehl **[44]**, John Montgomery **[45]**, and Project for Public Spaces discussed further characteristics of successful public places **[19]**. **Table 1**, shows a comparison between different thoughts concerning qualities of successful public places with obvious overlaps between them. Therefore, these relations could be represented in a way that serves the scope of the present research as follow:

Three qualities, as defined by PPS, are used to integrate equivalent qualities in the comparison above:

- "Comfort and Image": including environmental comfort, physical comfort, and social and psychological comfort **[17]**–**[19]** in addition to place identity, spirit and memory related to creating space image **[45]**.
- "Access and Linkage": regarding spaces being truly and equally open to everyone; inclusive, offering diversity of activities, being well connected by different means of transportation, being visually and physically linked to their surroundings **[19]**, **[26]** and having continuity within the space itself **[19]**, **[35]**.
- "Uses and Activities": "Relaxation", "Passive Engagement" and "Active Engagement" defined by Carr *et al*., are included under this category **[17]**–**[19]**, **[21]**.

Qualities, as defined by Francis, with no equivalent qualities in the comparison above:

- "Participation, Control, Modification" is discussed under the title 'Participation and Flexibility'. Participation includes people's involvement throughout any project's life cycle. It can increase the sense of community attachment where people get to define their own needs and ensure the consideration of their culture and identity **[21]**, **[26]**. Flexibility, on the other hand, is about allowing a degree of choice that enhances the use of space through flexible, movable elements and multiuse spaces **[25]**, **[26]**.
- "Conflict and Resolution" is under the category of participation and flexibility.
- "Management and Evaluation" is discussed within the discussion of functions under the title 'Maintenance and Operation Functions'.
- "Ecological Quality" is included without modifications to the term used. Natural elements, such as vegetation and water, are found to be one of the preferred elements by people in landscapes. They encourage outdoor activities and enrich the space's natural experience. In the natural context of a public landscape, people can overcome the hostility of some urban environments and have more peaceful experiences **[18]**, **[21]**, **[22]**, **[26]**.

3.3. Fundamental Human Needs

Coming from diverse backgrounds, several researchers have defined different models of fundamental human needs, from different perspectives and for a variety of purposes. The human motivation theory by Abraham Maslow **[46]**, **[47]**, non-violent communication by Marshall Rosenberg **[48]**, **[49]**, conflict resolution by John Burton **[50]**, human scale development by Manfred Max-Neef **[51]** and quality of life by Robert Costanza **[20]** are all significant studies that establish models of fundamental human needs as a core base for their development. Each approach defines a list of human needs with some common needs and others that are expressed in different terminologies with the same underlying meaning.

Based on the previous perspectives, important characteristics related to human needs were concluded as follows: needs are the same among all humans, and it is their right to have opportunities for the satisfaction of their needs. No need is less important than the other,

Table 1: Qualities of Successful Public Places.

Montgomery, 1998	Francis, 1988	Gehl, 2004	Carr et al., 2007	Projects for Public Spaces
Meaning and Image	Comfort	Comfort Protection	Comfort	Comfort and Image
Physical Setting	Accessibility / Publicness			Access and Linkage
Activities	Use and User diversity Discovery, Delight and Challenge Environmental Learning and Meaning	Enjoyment	Relaxation Passive Engagement Active Engagement	Uses and Activities Sociability
	Participation, Control, Modification			
	Conflict and Resolution			
	Management and Evaluation			
	Ecological Quality	Enjoyment		

none of them can be considered as a luxury, and mutual relationships can be found between them. Moreover, all needs are simply 'basic', the sum of all of them and their interactions are what define the quality of life achieved for humans. Satisfiers of human needs vary through time and between cultures **[20]**, **[46]**, **[48]**, **[50]**, **[51]**. Comparing the approaches to fundamental human needs, it can be seen that the differences between the lists are due to the variety of backgrounds of the researchers and these differences are not at the core of their interpretation. A modified Max Neef's matrix of fundamental human needs was found to be the most appropriate approach for the present research aim, since it:

- Has the most comprehensive detailed list of defined needs.
- Uses clear, simple and direct terminologies.
- Comprises all needs defined by other researchers except for spirituality.
- Can be adjusted to serve the research purpose in terms of its matrix axes of basic human needs, the 'axiological level', and needs satisfiers, the 'existential level', detailed in terms of 'being', 'having', 'doing' and 'interacting' **[51]**, **[52]**.

To ensure a more comprehensive and clear list of needs, some of the changes that were added by Costanza will be adopted. The term 'leisure' used by Costanza will be used instead of 'idleness'. One of the meanings of idleness is "the quality or state of being lazy" **[53]**, which is not the intended meaning for this need. Leisure refers more accurately to the meaning required. The 'spirituality' need added by Costanza will also be used. Moreover, the terms safety, protection and security are often used as synonyms in most contexts. However, Charles Oakes defined clear differences between security and safety, which he used in a study related to safety and security of different built environments. He defined safety as being a "steady state", "stability over time, continuity of function and reliability of structure", while security is the set of means that work towards maintaining that "steady state" **[54]**. The dictionary definition of the word protection is found to be more related to Oakes's definition of the word security, "a person or thing that protects someone or something **[55]**". Therefore, in the context of this research, the term safety used by Maslow is more consistent with what is defined in the column of human needs as it describes an abstract quality. While security and protection belong more to the other columns of the matrix as they refer to the means and tools towards achieving safety. Accordingly, the modified list of needs includes subsistence, safety, affection, identity, participation, understanding, creation, leisure, freedom and spirituality.

4. Reconciliation: Max Neef's Matrix of Fundamental Human Needs vs Human Needs in Public Designed Landscape

The literature review made it clear through a number of studies how landscapes can serve many human purposes and significantly contribute to providing a better life for people. For more clarification of the aspects of public landscapes, a conclusion of the literature review is presented in the form of a conceptual framework. The conceptual framework is developed based on the integration between Max Neef's matrix of fundamental human needs and needs in public landscapes, landscape functions and services.

Satisfiers of 'being' and 'having' are detailed into two themes: The first theme relates to the long-term fundamental needs that a public landscape can contribute to satisfying. The second theme relates more specifically to the aspects of a space, which indicates short-term needs related to the immediate use of a space. For example: people 'need' to feel 'safe' in designed landscapes. At the same time, the site may contribute to flood protection, which goes back to a basic 'safety need'; protection from natural hazards.

In Max-Neef's Matrix of Human Needs, all the aspects in this research are integrated (**Figure 4**). First, 'Being' is a description of the abstract value of a need. Accordingly, satisfiers specifically related to landscapes defined by Max-Neef and Constanza, in addition to place qualities defined in human experiences in landscapes are mainly included in the column 'Being'.

Secondly, specific points from human experience in landscapes, in addition to ecosystem services represent the 'having' column of the classification, as this includes 'physical and non-physical' entities required for need satisfaction. Satisfiers defined under the 'having' category are consistent with the notion of ecosystem services. For example, having food or work are part of provisioning services, having vital ecological processes is equivalent to regulating services and access to nature, community and social life can be related to cultural and amenity services. The classification of ecosystem services defined by De Groot, "provisioning services", "regulating services", "cultural and amenity services" and "supporting services", is used under the title "landscape services". The category of supporting services is used with the same underlying concept, but with different entities than the ones outlined by the MEA or by de Groot. This category includes all services required for the efficient performance of a public landscape.

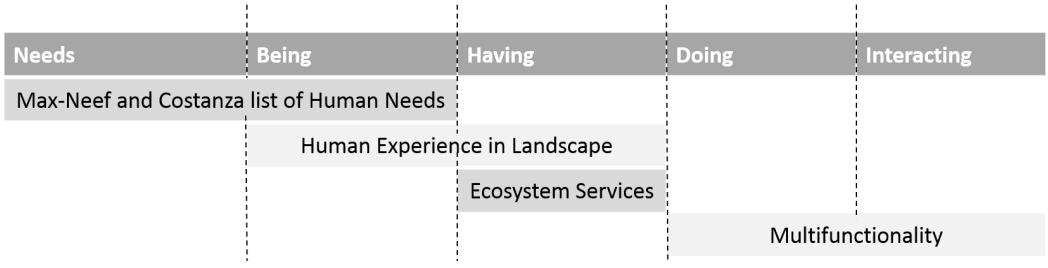

Figure 4: Structure of the Conceptual Framework: Human Needs and Landscape Satisfiers.

Finally, the concept of multifunctionality provides an outline that can be used in the 'Doing' and 'Interacting' columns in the matrix. 'Doing' includes functions that are required for the satisfaction of needs, while 'Interacting' includes different elements that perform those functions. The functions included are environmental, sociocultural, economic, configuration, and maintenance and operation functions. The differentiation between services and functions provides a better insight into the properties of each. This will help to emphasize each entity in the classification and highlight its importance. The integration between structures (elements), functions and services helps to achieve value for human life. The following table (**Table 2**) illustrates the correlation between each fundamental need and its landscape satisfiers in Max-Neef's Matrix.

Table 2 Conceptual Framework: Fundamental Human Needs and Landscape Satisfiers.

Need	Landscape Satisfiers					
	Being		Having (Service)		Doing (Function)	Interacting (Setting-Element)
	Need Attributes	Space Attributes	Need Related	Space Related		
Subsistence		Physical Comfort		**Supporting Services**	**Maintenance and Operation Functions**	
				Cleanliness	· Collecting trash · Fixing damaged items	Management and Maintenance
				Image	· Providing water needed for irrigation with the consideration of sustainable use · Keeping vegetation healthy	Management and Maintenance Irrigation sources and systems Processes of tending to vegetation
				Supporting Services	**Configuration Functions**	
				Utilities	· Providing adequate surfaces for different activities	Flooring
					· Providing comfortable sitting places	Street Furniture (Benches)
					· Providing different options for having food and drinks	Buildings and Light structures (Restaurants and Cafes, Restrooms) Street Furniture (Drinking Fountains)
	Physical Health Mental Health Emotional Health		**Cultural and Amenity Services**		**Configuration Functions**	Dedicated and Multiuse Spaces (Walking, jogging and cycling paths – Playgrounds)
			Contact with Nature	Ecological Quality	· Providing friendly spaces that encourage outdoor activities	Vegetation and Water
					· Enriching space natural experience	Vegetation
					· Adding visual barriers from undesired elements	
			Regulating Services		**Environmental Functions**	
			Climate Regulation (Microclimate)		***Reduction of heat Island effect***	
					· Decreasing heat absorption by using light-colored surfaces	Flooring Materials Selection
					· Decreasing temperature by evaporation and transpiration	Vegetation and Water
					· Providing shade · Decreasing heat energy absorption by different surfaces · Decreasing amount of heat energy transferred from the surfaces to buildings and the atmosphere	Vegetation
			Air Quality Regulation		· Filtering air from dust, smoke and harmful gases	
			Noise Regulation		· Creating noise barriers	
			Erosion Protection Water Regulation		· Increasing water quality by natural purification through vegetation · Decreasing erosion and stabilizing the soil · Slowing water flow · Reducing runoff and increasing infiltration	
			Provisioning Services		**Economic Functions**	
			Food Financial Resources Work		· Providing products (Vegetables-Fruits-Ornamental Species-Herbs-Medicinal Resources) · Providing recycled products from plant waste	Vegetation
Safety	Future Subsistence				· Increasing property values	***Quality Public Landscapes*** Vegetation and Water
					· Providing attractive touristic destinations · Attracting economic activity · Creating job opportunities	***Quality Public Landscapes*** Buildings (Office Buildings – Restaurants) Dedicated and multi-use Spaces (Events-Concerts-Markets)

Need	Landscape Satisfiers					
	Being		Having (Service)		Doing (Function)	Interacting (Setting-Element)
	Need Attributes	Space Attributes	Need Related	Space Related		
	Protection from Natural Hazard		**Regulating Services**		**Environmental Functions**	
			Natural Hazard Mitigation (Flood Protection)		· Decreasing erosion and stabilizing the soil · Slowing water flow · Reducing runoff and increasing infiltration	Vegetation
	Future Subsistence		Biodiversity		· Providing shelter and food that support the creation of habitats for different living organisms	
					Economic Value	*Effects of Environmental Functions*
					· Decreasing costs and energy needed for mechanical cooling resulting from temperature reduction and shading · Increasing productivity and work performance due to improved environment and health · Decreasing costs needed for water purification · Maintaining healthy natural cycles that can preserve resources	
		Environmental Comfort		**Supporting Services**	**Configuration Functions**	
				Shelter from weather (rain-sun exposure-sun protection)	· Providing canopies either for shade or protection from rain - wind barriers	Vegetation (Trees) Light Structures
		Psychological Comfort		Visual Access - Openness	· Providing safety through allowing vision	Design arrangement
				Utilities	· Providing adequate lighting for night use	Street Furniture (Lighting Fixtures)
				Supporting Services	**Maintenance and Operation Functions**	
				Utilities	· Providing a secure space	Surveillance Cameras, personnel,
					· Keeping lighting systems functioning	Management and Maintenance
Affection	Respect Receptiveness Passion	Active Engagement	**Cultural and Amenity Services**		**Sociocultural Functions**	
			Attachments to things and people outside oneself	Shared Experiences	*Facilitation of interactions*	
					· Providing areas for active social and cultural life	***Quality Public Landscapes***
			Social Interactions		· Providing spaces for shared events and public celebrations	Dedicated and multi-use Spaces
					· Adding interest or focus features that encourage interaction	Street Furniture (Public Art) Street Performers
					· Providing comfortable places for people to sit and socialize	Street Furniture (Benches)
			Cultural and Amenity Services		**Configuration Functions**	
			Contact with Nature		· Adding contrast to urban context	Vegetation and water
Identity	Sense of Belonging			**Cultural and Amenity Services**	**Sociocultural Functions**	
	Consistency			Image	· Can be part of a space visual character	Special single element or arrangement
	Sense of Place			Participation	· Allowing public participation in design, planning and management	Design and Planning
Participation	Accessibility		**Cultural and Amenity Services**		**Sociocultural Functions**	
					· Ensuring equal rights for all people to use public spaces	
	Respect Receptiveness Passion		Rights		· Allowing for public participation in design, planning and management · Allowing people to express their ideas and thoughts about the design and planning of public spaces	Design and planning
			Responsibilities			Management
		Active Engagement	Community and Social Life		*Facilitation of interactions*	
					· Providing areas for active social and cultural life	***Quality Public Landscapes***
			Social Interactions		· Providing spaces for shared events and public celebrations	Dedicated and multi-use Spaces
					· Adding interest or focus features that encourage interaction	Street Furniture (Public Art) Street Performers
					· Providing comfortable places for people to sit and socialize	Street Furniture (Benches)

Need	Landscape Satisfiers					
	Being		**Having (Service)**		**Doing (Function)**	**Interacting (Setting-Element)**
	Need Attributes	**Space Attributes**	**Need Related**	**Space Related**		
Understanding	Curiosity Astonishment Rationality Making Sense	Coherence Legibility		**Supporting Services**	**Configuration Functions**	
				Logical connections between elements	· Defining a space · Defining directionality · Defining a focus or center · Creating Subspaces	Vegetation Public Art Floor Patterns
					· Adding variety within coherent elements · Facilitating moving, orientation and way-finding	Any unique element that can be a 'Landmark' Visual Design (Repeated Elements-Smooth textures
			Cultural and Amenity Services		· Providing places for cultural, educational and awareness opportunities	Buildings (Museums-Exhibition) Dedicated and multi-use Space
			Access to Information Education		**Environmental Functions**	
Creation	Imagination Curiosity Artistic Expression		**Cultural and Amenity Services**		· Providing shelter and food that support creation of habitats for different living organisms	Vegetation and Water
			Inspiration for culture, art and design			
	Exploration	Complexity Mystery		**Supporting Services**	**Configuration Functions**	
				Rich and diverse environment	· Adding interest, preventing monotony	Any unique Elements
				Continuity	· Creating a promise of further information	Visual Design (Bent/curved paths-Partial hidden views-Levelling)
Leisure		Physical Comfort		**Supporting Services**	**Configuration Functions**	
				Walkability	· Providing suitable surfaces for walking and other activities	Flooring
				Sittability	· Providing sitting places for both individuals and groups	Street Furniture (Benches) Lawn Areas
				Proper location for seating	· Studying through design and planning the proper locations for seats based on users' preference, activities and the location of utilities	Design and Planning
	Passive Engagement				· Selecting locations near activities for people's enjoyment in watching other people's activities and passers-by	
					· Adding points of focus or interest	Public Art Fountains Street Performers
	Aesthetic Enjoyment		**Cultural and Amenity Services**		**Configuration Functions**	Floor Patterns
			Contact with Nature	Aesthetics	· Defining a space · Defining directionality	Vegetation
					· Defining a focus or center	Public Art
	Relaxation Tranquility				· Enriching space natural experience	Vegetation and water
	Active Engagement		Interactions		· Providing focus, interest and interaction points	Public Art Street Performers
	Active Engagement - Recreation				· Providing spaces for different recreational activities · Providing adequate spaces for organized events (concerts-public ceremonies etc.)	Dedicated and multi-use Spaces
Freedom	Accessibility		**Cultural and Amenity Services**		**Sociocultural Functions**	
			Rights		· Ensuring equal rights for all people to use public spaces	Design and planning strategies
				Participation and Flexibility	· Allowing public participation in design, planning and management	Management
					Configuration Functions	
					· Permitting choice within the daily use of the space	Multi-use Spaces Movable Elements (Chairs-Table)

Need	Landscape Satisfiers					
	Being		Having (Service)		Doing (Function)	Interacting (Setting-Element)
	Need Attributes	Space Attributes	Need Related	Space Related		
Freedom		Legibility	Mobility	Supporting Services Logical connections between elements	Configuration Functions · Defining a space · Defining directionality · Defining a focus or center · Creating Subspaces · Adding variety within coherent elements · Facilitating moving, orientation and way-finding	Vegetation Public Art Floor Patterns Any unique element that can be a 'Landmark' Visual Design (Repeated Elements-Smooth textures)
Spirituality			Cultural and Amenity Services Contact with Nature Aesthetics	Ecological Quality Panoramic and open views	Configuration Functions · Enriching space natural experience · Adding contrast to the urban context	Vegetation and water

The discussion above shows multiple aspects of landscape potential in achieving the satisfaction of human needs. Landscape elements perform specific functions, functions provide services for humans, which in turn contribute to human need satisfaction. The correlation between elements, functions, services and needs is not a simple linear relationship. Elements and their functions complement each other for the delivery of services. It can be noted in the framework that a single service contributes to more than one need satisfaction and the same interrelated relationship can be found in functions (**Figure 5**). For example, satisfying subsistence, spirituality, affection, identity, participation, creation, understanding and leisure all require diverse cultural and amenity services. Different configuration, sociocultural and environmental functions are required for cultural and amenity services.

On the other hand, each need may have one or more service and function contribute to its satisfaction, depending on the need's attributes, i.e. 'being'. A basic need could also become a satisfier for another need; for example, participation can be a satisfier for identity. Weighing the degree of importance of each item in this classification, or arranging them according to their relative importance, is not in the scope of this research. However, it is essential to mention how the absence of one quality from the space can be very effective, even if all other qualities are present. For example, a designed public landscape with a very good visual design and a variety of activities will not be used if there is any reason that it threatens people's feeling of safety. It may also not be used if it is not well connected to public transportation. Absence of safety can ruin the experience of a space and the absence of good accessibility prevents people from reaching it. It is important to realize the significant potential a public landscape carries for humans. It is important also to remember the complexity of introducing a designed landscape and that it requires careful examination of the mutual effects of its multiple aspects.

Moreover, the scope of the effect of a landscape's functions and their degree of contribution to service provision have diverse levels. An effect could range from a direct effect on a definite site to a wider effect on the surrounding area or even to a whole city or region **[31]**. For example, vegetation in a park can contribute to enhancing

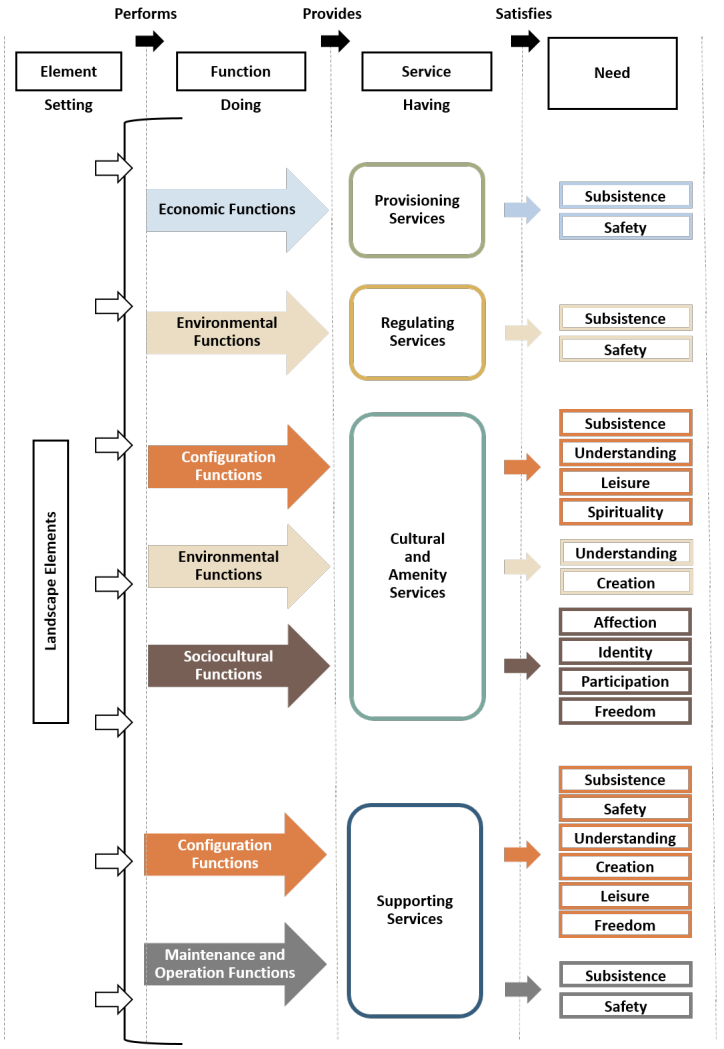

Figure 5: Fundamental Human Needs and Public Landscapes.

the microclimate within the park and nearby buildings. The same park in a larger system of connected landscapes within a city or a region

can make a larger contribution to biodiversity or climate mitigation on a larger scale. Another example, a public landscape may change the image of a neighborhood where it exists. It can also be a part of a city image and one of its touristic attractions.

5. Conclusion

This research created a conceptual framework that integrated different landscape elements, functions and services in relation to fundamental human needs. The development of the framework depended on a modified Max-Neef matrix of fundamental human needs. The arrangement logic of the matrix was adapted from the point of view of public designed landscapes. It consisted of a vertical list of human needs, while satisfiers of each of these needs can be found horizontally in landscape related aspects. These aspects were interpreted in terms of 'Being', 'Having', 'Doing' and 'Interacting'. 'Being' describes the qualities of the needs from the perspective of landscape, 'Having' includes different landscape services, 'Doing' includes the landscape functions that provide the services, and 'Interacting' includes landscape elements that perform the functions.

This framework can constitute a new tool for the analysis of public landscape benefits and their value for humans; it can be used in various applications. Its current generic form provides a starting point for further applied research in diverse contexts. It can help in providing a new viewpoint for designers and planners in which their end-users are again included in the focus of their approaches. Public landscapes can be created through a wider perspective that includes multiple landscape functions and provides a variety of services towards the satisfaction of human needs. In addition, the framework can be used in assessing different public landscapes to help in decision-making related to enhancing the functionality of the landscapes in question or to provide a strong argument for their protection.

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