Multifunctional Landscapes as a Basis for Sustainable Landscape Development

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Abstract : In this article it is argued that creating multifunctional landscapes or allowing a landscape to serve multiple purposes is the key to sustainable landscape development. For a landscape to be sustainable, it needs to be well cared for and maintained. It also needs to have a built-in mechanism to absorb changes (disturbances and developments) toward increasing resiliency. Landscape ecological planning such as greenways, ecological networks, and ecological infrastructure is suited to address multifunctional landscapes. The strength of multifunctional landscapes is their ability to afford the needs of diverse users, thus appealing to diverse constituents with various recreational, cultural, and ecological needs/objectives. This leads to a lasting support from these user groups and this support is crucial for landscape sustainability. Multiple uses also facilitate efficient use of time and space, which is an especially attractive feature in urban landscapes where space is limited and a land mosaic is fine and heterogeneous. Time, space, and use conflicts necessarily arise when trying to accommodate multiple competing/conflicting uses. These conflicts can be dealt with strategies such as spatial and temporal separation of uses, stacking, limiting access, and the use of permit to control use.

Keywords: *multifunctional landscapes, sustainable landscape development, landscape ecological planning, greenways, use conflicts*

1. Introduction

Global trends such as the migration of rural populations to cities, the decline of biodiversity, and climate change call for landscape planning that can anticipate and adapt to changes, and that can address these issues in a creative way. Creating multifunctional landscapes may help deal with these challenging issues and play an important role in developing sustainable landscapes. Multifunctional landscapes are those landscapes that can provide multiple functions. If more than one use on a certain location is possible, it is multifunctional land use³³⁾. In the landscape planning context, this means developing a landscape that can serve multiple planning goals/objectives or values. For example, a greenway is planned, designed, and managed to achieve multiple objectives such as recreation, transportation, nature conservation, and aesthetics^{1), 10), 14) ~16)}.

From the land-use perspective, multifunctional land use is the implementation of more functions (uses, activities) in a certain space in a determined period of time^{33), 34)}. According to Legendijk and Wissershof (1999), multifunctional land use is achieved if at least one of the following four conditions is met: (1) increase in the efficiency of land use (intensification of land use); (2) interweaving of land use (which they define as the use of the same area for several functions); (3) use of the third dimension of the land (i.e., vertical space such as the below and/or above ground level along with the surface area); and (4) use of the fourth dimension of the land (i.e., over a certain time frame)^{34), 35)}. Therefore, it is important to consider not only the number of functions (diversity) but also the use of vertical space and time in developing multifunctional landscapes. Rodenburg and Nijkamp³⁵⁾ argue that multi-

functionality is better conceived by the degree (more or less multifunctional) than the binary (mono- vs. multifunctionality). Because the degree of multifunctionality is affected by the spatial scale and the time period considered^{24), 33), 35)}, in this paper, we generally consider multiple land use at a broad spatial scale (e.g., city-regional scale).

We argue that multifunctional landscapes are generally more desirable than monofunctional, or single-purpose, landscapes. This proposition can be supported by the following reasons: (1) natural systems (e.g., wetlands)²⁰⁾ provide various ecological services that are multifunctional; (2) multifunctional land use can save scarce space—especially evident in high population density areas such as cities—and “exploit economies of synergy” (firms can reduce production cost by being close to each other)³⁵⁾; and (3) planning and natural resource management trends have shifted from single-purpose planning/management to multi-purpose planning/management¹¹⁾. For example, multiple land use has been proposed as an alternative to zoning, which enforced the spatial separation of land uses^{24), 33)}.

We further argue that multifunctional landscapes are an important and necessary component of sustainable landscapes. Sustainable landscapes are those that would meet the needs of the present without compromising the ability of future generations to meet their needs^{6), 21)}. Sustainable landscape planning strives to achieve a long-term (i.e., over decades or generations) and productive balance between natural systems and the human use of these systems^{17), 26)}. Creating multifunctional landscapes is important for developing sustainable landscapes because multifunctional landscapes can (1) allow the co-existence of not only compatible uses but also competing

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uses, (2) make an efficient use of limited space and time (this feature is particularly useful in urban areas), (3) “produce advantages of synergy and contribute to both the economic vitality and the environmental quality of modern cities”³⁴⁾, and (4) develop a wide and lasting support from the diverse users of their functions¹⁾ ~3), 18), 35), 41).

The strength and attractiveness of multifunctional landscapes is to be able to afford the needs of diverse users, developing wide constituency with various recreational, cultural, and ecological needs/objectives (explained in more detail below, using greenways as an example). In urban/metropolitan regions, the need for a landscape to provide multiple functions is higher than in rural areas due to the limited space and thus often competing demands for space (e.g., housing development versus nature protection). For example, in The Netherlands, which is densely populated and highly urbanized, the concept of multifunctional land use has been applied in the urban environment such as the Amsterdam South Axis (Zuidas) project and is gradually being applied in the rural environment as well in developing nature parks and water management areas^{24), 37), 45)}.

Landscape ecological planning (LEP) is arguably a means to achieve multifunctional landscapes. LEP refers to “planning of ecologically sustainable landscapes; considering the spatial structure of the system, the flows of energy and materials among system components and between the system and its surroundings, and the evolution of the system over time—explicitly including the values, actions and impacts of humans” (p. 213)³¹⁾. Greenways, ecological networks, and ecological (green) infrastructure are examples of planning concepts/strategies that can support multiple objectives^{4), 15), 16), 19)}. LEP can take advantage of naturally occurring processes—for example, a natural wetland area can provide various ecosystem services at once, such as flood control, wildlife habitat, nutrient regulation, and recreation—as well as intentionally design/plan areas that would support multiple functions. In the next section, we will examine how greenways and ecological networks, as example concepts and strategies, can provide multiple functions.

2. Examples of Landscape Planning that Can Accommodate Multiple Functions

Greenway planning is an example of planning that can address multifunctional landscapes^{1), 8), 10), 12), 14) ~16), 41)}. Ahern¹⁾ argues that greenways are “planned, designed and managed for *multiple* purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable land use” (emphasis added). Ahern³⁾ lists three theoretical principles that may allow greenways to act multifunctionally. One of them is the hypothesis of the co-occurrence of greenway resources. According to the hypothesis, in any cultural landscape, many important abiotic, biotic, and cultural resources are concentrated along corridors such as river valleys, ridgelines, and coastlines²⁾. For example, a Native American trail may run close to a natural bank of a river, which is important for protecting riparian vegetation, accommodating natural flooding regimes, being a conduit for animal movement, and providing access to sports

fishermen—these are all functions provided by the river bank if protected. A greenway can be developed along the river corridor to protect ecologically significant and natural areas (greenway resources) and provide historical heritage and cultural values (a Native American trail is an example of a cultural resource), at the same time allowing appropriate level of both passive and active recreation (another greenway function). Lewis’s environmental corridors (regional patterns of steep slopes, wetlands, and surface waters) are another example that supports this claim that important natural and cultural resources tend to be concentrated in linear corridor patterns in a landscape²²⁾. When a greenway is developed by connecting these resource-rich areas, it can arguably support multiple purposes, appealing to diverse constituents with various recreational, cultural, and ecological needs/objectives. Also, developing greenways on these resource-rich corridors is strategically advantageous because the greatest amount of resources can be protected with the least amount of land²⁾.

Another theoretical basis of greenways is the concept of compatible or synergistic multiple use^{2), 3)}. For example, Lewis²²⁾ saw the potential of environmental corridors to provide open space, recreation, enjoyment, and environmental education (i.e., to increase public’s awareness of the landscape) as well as to protect important natural and cultural resources. This concept of linked linear corridors providing multiple functions, developed around 1960, was later applied to greenway planning. The Emerald Necklace, designed by Olmsted in 1878, which later became part of the Boston Metropolitan Park System, is another early example of what now can be called greenways with multiple functions (e.g., recreation, preservation of the natural landscape, and management of water quality)^{9), 11), 13), 29)}. Greenways can accommodate compatible multiple uses and, at the same time, take advantage of the synergy they create by building wide constituents and thus support for greenways from respective user groups (e.g., joggers, bicyclists, nature conservation groups, home owners near greenways, sports fishermen, etc.)^{1), 2), 18), 41)}.

Ecological corridors, which are component of ecological networks and which are part of greenways³⁾, are also multifunctional by definition¹⁹⁾. The functions of ecological corridors include: aesthetics, social and psychological well-being, education, recreation, and ecology¹⁹⁾. Multifunctional habitat networks try to include many landscape functions when reconnecting the remnant habitats, facilitating animal movement⁴⁷⁾. Opdam *et al.*³¹⁾ argue that ecological network can provide a coherent large-scale spatial structure of ecosystems needed for biodiversity conservation in Europe. They conclude that extending the ecological network concept with multifunctional indicators is a promising step towards sustainable landscape development and stakeholder decision-making.

Van der Windt and Swart⁴⁶⁾ argue that because of the involvement of multiple actors (e.g., policy-makers, scientists, various stakeholders, and citizens) in developing the ecological corridor and the related Dutch National Ecological Network on the national and regional levels, the ecological corridor has obtained a robust, multifunctional character. The ecological corridor has become multifunctional to serve the different interests of multiple actors; it has become a robust framework

because the involvement of multiple actors in the development process can foster a sense of ownership and thus, commitment to the process of corridor development^(5), 41).

Satoyama, or coppice woodlands on the hillsides in Japan, once actively managed by villagers as a common land for collecting fuel woods and making charcoal, edible and medicinal plants, and litter for agricultural fertilizers, were largely abandoned after WWII as the reliance on fossil fuels increased and farmers moved to cities to look for jobs⁽⁴⁰⁾. Researchers and policy-makers have their eyes again on *satoyama* for its potential to provide multiple functions. They include wildlife habitat, recreation, environmental education, amenity, nature conservation, water retention and purification, air purification, etc.^(40), 43), 44).

Greenways are evolving to provide more and more functions; there has been a paradigm shift from a single-resource protection to multi-purpose greenways as an asset/resource to a community/region^(8), 12). Besides recreation, transportation and nature conservation, “modern greenways are expected to provide many other benefits—from environmental education to neighborhood enhancement to water quality protection”⁽¹⁰⁾. Machado *et al.*⁽²⁵⁾ note, “In an expanding urban world greenways are an [*sic*] useful and appropriate planning strategy to create a multipurpose ecological framework supporting ecological, cultural, recreational and aesthetic values.” There seems to be an agreement among researchers about the importance of and necessity for multiple-purpose greenways for building a wider support-base among local residents and various stakeholder groups^(3), 18), 41) and for creating more sustainable landscapes^(1), 2).

Ahern⁽¹⁾ argues that greenways can show various ways of combining compatible uses as well as separating incompatible ones. For example, spatial separation can be used when conflicts in site related objectives arise when planning multifunctional networks⁽⁴⁷⁾. The strategies such as temporal and spatial separation of uses to deal with incompatible uses will be discussed in more detail later.

3. When Multiple Uses Conflict

Some areas are intrinsically suitable for multiple land uses⁽²⁸⁾ and some uses (e.g., passive recreation and nature conservation) can coexist in the same area without conflict or competition for space or resources. When there are multiple demands for the same land, the challenge shifts to accommodating multiple *competing/conflicting* demands/uses; it is much easier to satisfy multiple *compatible/complementary* uses (e.g., water quality protection, protection of environmentally fragile lands, and passive recreation) that can coexist on the same parcel of land. We argue that even competing/conflicting uses can coexist with wise strategies and management schemes such as temporal phasing and spatial shifting used, for example, managing natural resources for multiple objectives/uses (e.g., timber harvesting, providing habitat for wildlife, permit-controlled hunting, water quality protection, etc.). These strategies/schemes are elaborated in Section 4 below.

Land uses are classified as conflicting or contradictory when (1) they compete for space/time or resources and thus when (2) a particular use decreases the value of conflicting use(s)

and the benefits that the users receive. The types of conflicts can be categorized into time or space conflicts, and use conflicts based on their nature (Table 1). Time conflicts arise when the time of use (e.g., certain times of a day, a season, even years) required by the intended uses/activities overlaps for the same space (Figure 1). For example, the preservation of historical heritage, which is ongoing, can be disrupted by a fair that promotes a different objective. Time conflicts are more likely to occur at a particular site or with regards to the use of facilities; they are less likely to occur over a broad area. Since the longer the time period is considered, the greater the number of land uses can be provided^(24), 33), time becomes less of a constraint in a long time frame—use of the fourth dimension to increase multifunctionality.

Figure 1. Time conflict. Conflict is created by the complete/partial overlap of the time required by each use to use the same site/facility.

Space conflicts are created when required space for certain activities/uses overlaps at the same time, or for some time of their use (Figure 2). For example, the protection of riparian vegetation to accommodate wildlife habitat and movement conflicts with neighboring agricultural land use (partial overlap) or providing active recreation and transportation along the river.

Figure 2. Space conflict. The space required by two or more uses (activities) overlaps. The hatched area is where the conflict occurs.

Use conflicts are perhaps the most common land use conflicts. Use conflicts arise when uses that are essentially incompatible, such as active recreation and nature conservation, and a waste incinerator and a kindergarten, compete for space/time (e.g., occur next to each other, on the same parcel of land, or about the same time) or resources. In a forested landscape with a couple of lakes, for example, use conflict may arise between powerboat use on the lakes and forest bird conservation. Both uses rely on the same resources, the whole forest landscape, but the nature of their use (one is more active and the other is protective) creates the conflict. In an urban land use example, heavy industry and residential land use are not compatible at all. It is usually preferable to locate residential and recreational areas at some distance from industrial areas since noise

and pollution can cause nuisance.

In sum, in areas where multiple land uses can be supported, multifunctionality can be increased by combining compatible uses. The problem arises when these uses are competing/conflicting for space/time or resources. The types of conflicts that arise can be categorized into time, space, and use conflicts. Time and space conflicts are like the two sides of a coin: time conflicts focus on the temporal aspect of a conflict and space conflicts on the spatial aspect. In time conflicts, what is conflicting is the time of use in the same space. In space conflicts, the space needed for specific uses or activities overlaps at the same time. Time conflicts usually arise with regards to the use of a particular site/facility, not over a broad landscape. In use conflicts, incompatible or contradicting uses compete for space, time, or resources. The strategies to address these conflicts depend on whether or not space is limited and on the nature of conflicts (Table 1).

4. Strategies to Deal with Competing/Conflicting Uses

The challenge of developing multifunctional landscapes involves dealing with competing/conflicting land uses for scarce space or resources. The types of strategies that can address these conflicts (i.e., time or space conflicts, and use conflicts) may include: temporal, vertical, and spatial (horizontal) separation of uses, limiting access, and controlling the use by the number of permits (e.g., hunting and boating) to prevent the overuse and exploitation of resources (Table 1).

Time conflicts at a particular site/facility can be resolved by temporal phasing or temporal separation of uses. Temporal phasing refers to allocating uses over time (day, season, year, etc.). There are different phases of use for the same space. For example, the use rules of a park can specify that vehicular traffic is only allowed in the mornings and the evenings; the park is to be used by pedestrians, bicyclists, and rollerbladers during the daytime. Temporal phasing intends to alleviate the demand (in this case, different movement modes) for the same space by separating out competing uses temporally. Time conflicts over a broad landscape, although much less common, can also be mitigated by the temporal separation of uses. In the end, when the time period (the fourth dimension) is extended to a year, several years, and decades, time becomes less of a constraint to achieving multifunctionality. If extending a time frame does not solve the problem, as in the example of the conflict between historical heritage preservation and a fair that promotes a different objective, either a fair can be held at another site (spatial solution) or the nature of the fair can be changed to the one that is more compatible with historical preservation.

Alternatively, when space is not limited, spatial shifting can be used to alleviate the stress on resources. Spatial shifting can be used for a single intensive use such as slash-and-burn agriculture, which moves around in a landscape every couple of years. Spatial separation of uses can be used for multiple competing/conflicting uses. For example, competing uses can be spatially separated so that they do not interfere with one another (more examples of this later). While spatial separation of uses requires a large enough area, *stacking* is a strategy used when space is a limiting factor. It literally means

stacking competing uses on top of one another such as an underground storage, a deck parking, and a rooftop garden—the use of the third dimension. Interestingly, stacking can also create positive synergy from the combination of supposedly competing/conflicting uses as in the case for mixed-use development. Mixed use is a strategy often applied to urban development/infill projects by the New Urbanists to encourage an efficient use of space, to produce positive synergetic effects by attracting a variety of people and activities to create lively streets, and to provide residents their daily needs (a grocery store, laundry, barber, café, place to live and work, etc.) within a walking distance, thus reducing the need to travel^{7 24}. Mixed use can be called stacking because different uses (e.g., first floor retail and second floor office/apartment) are vertically separated. Mixed use can also be achieved through integrating segregated uses in close proximity²⁴. Mixed use is an integral part of multiple land use in the city²⁴. Another example of the third dimension (vertical space) to reduce land use conflicts is overpasses/underpasses. Overpasses and underpasses for wildlife movement across busy roads use vertical space for vehicular traffic, faunal movement, and waterflows (for underpasses)³⁸. Human crossings can also be combined in the use. This is another site-based example of providing multiple uses.

Spatial separation of uses is a strategy to deal with multiple competing/conflicting uses when space is not limited. It is also a strategy to deal with land use conflicts in general. Spatial separation of uses means literally separating contradicting uses at some distance. Its variants include: (1) creating a buffer area or physical barriers between conflicting uses and (2) developing multiple zones for different land uses. A solution for the example of the conflict between powerboat use and forest bird conservation in a forested landscape (see Section 3 under use conflicts) may be to create buffer areas around the lakes in order to reduce the noise and the presence of people and their activities, and to focus on conserving forest-interior birds. Creating buffer zones between conflicting uses may be a useful strategy. Another solution might be to limit the use of lakes during certain times of a day and/or control the use by the number of permits. Another strategy to manage the whole forest landscape might be designating some areas of the forest as strict conservation areas prohibiting human access and other areas as buffer zones to protect the core conservation areas, and others as more active zones of human activities. This strategy of developing multiple zones for different activities can be applicable to a broad landscape to mitigate land use conflicts.

The caveat here is that by recommending the creation of multiple zones for different uses (activities), we are not advocating the traditional zoning approach. Historically, the zoning code was developed to enforce the segregation of land uses (residential, work, recreation, and transport) in the urban environment^{24, 33}. Creating multiple zones is a way to deal with multiple contradicting land uses at a broad spatial scale. By having multiple zones, a variety of uses can be accommodated in a given area. The spatial separation of uses and the creation of multiple zones may result in a single use of a particular site/space; however, at a broad scale, they would

facilitate multiple uses. We would emphasize that these are the strategies to deal with multiple *competing* uses.

For the industrial vs. residential/recreational land use conflict example, strategies to mitigate/reduce the negative effects (e.g., noise, “ugly” sight) of industrial land use may involve: (1) separating uses at some distance, (2) creating physical barriers (a wall or a berm, vegetation), and (3) adding ornamental plants to increase the aesthetics. Separating the contradicting uses at some distance or erecting physical barriers is a useful strategy since the degree of nuisance usually takes the form of a decaying function of distance. For example, the negative effects of highways (e.g., noise, air pollution, road salt, heavy metals, and car oil) on the neighboring land uses can be reduced by building berms and/or walls.

Finally, limiting access to various degrees and using permit to control use are both a means to control the amount and intensity of use to protect the natural and cultural resources from overuse and exploitation. All the strategies described so far may be applied to urban areas where land is more limited and thus the competition for the land is higher. The types of conflicts and their examples, and the types of strategies to address these conflicts and their examples are summarized in Table 1.

In sum, we have argued that even competing/conflicting uses can coexist with wise strategies and management schemes and have proposed three primary strategies to deal with time, space, and use conflicts. These strategies are temporal, vertical, and spatial (horizontal) separation of uses. Time conflicts, more common in a particular site/facility, can be resolved by the temporal separation of uses, using the fourth dimension of multifunctionality. Space conflicts can be resolved by stacking or the vertical separation of uses, using the third dimension of multifunctionality. Use conflicts can be dealt with the space/time strategies, the spatial separation of uses, developing buffer zones or physical barriers between conflicting uses, and developing multiple zones for different activities/uses. Other strategies to deal with competing land uses include limiting access and controlling the use by the number of permits.

5. Conclusion

The key to developing multifunctional landscapes are strategies and management schemes that would allow the co-existence of *competing* objectives or uses. The types of conflicts concern temporal, spatial, and use aspects. The strategies/schemes to address the conflicts include: temporal phasing, vertical separation of uses, spatial shifting, spatial separation of uses, limiting access, and the use of permit to control use (Table 1). Deciding on the strategy to employ depends on whether or not space is limited and on the nature of conflicts.

When space is limited, temporal phasing or temporal separation of uses is used to deal with time conflicts. Vertical separation of uses such as stacking and overpasses is also a strategy to deal with time, space, and use conflicts when space is limited. When space is not limited, spatial shifting can be used to reduce the stress on resources caused by a single intensive use; spatial separation of uses can be used for multiple,

Table 1. Types of conflicts and their examples, types of strategies to address the conflicts and example strategies. The three corresponds with one another within each column.

		Types of Conflicts	
		Space/Time	Use
Example Conflicts		Protection of riparian vegetation conflicts with neighboring agricultural land use (partial overlap) or providing active recreation and transportation along the river. (The space conflict) Preservation of historical heritage is disrupted by a fair that promotes a different objective. (The time conflict)	In a forested landscape with a couple of lakes, the use of power boats on the lakes conflicts with the conservation of forest birds. Industrial land use vs. residential/recreational land use
Types of Strategies	Space is limited	Temporal phasing or temporal separation of uses (the fourth dimension) Vertical separation of uses (the third dimension) such as stacking and overpasses/underpasses	Creating buffer zones between conflicting uses Limiting access Using permits
	Space is not limited	Spatial shifting (for a single intensive use) Spatial separation of uses (for multiple competing uses)	Locating conflicting uses at some distance; creating physical barriers between them Developing multiple zones for different uses/activities All the space/time strategies
Example Strategies	Space is limited	The park use is limited to pedestrians, bicyclists, and rollerbladers during the daytime, and open to automobiles only in the mornings and evenings. Vegetation restoration is phased out to mimic a natural succession (e.g., prairie-mix first, then shrubs, followed by shade-tolerant trees). Mixed use (e.g., underground garage, retail on the first floor, and offices/apartments above) Highway overpasses/underpasses to facilitate animal crossing	Creating buffer areas around the lakes to reduce the impact of human activities and to focus on the conservation of forest-interior birds. Limiting access to various degrees Use control by the number of permits (e.g., hunting and boating)
	Space is not limited	Slush-and-burn agriculture Livestock grazing Protection of riparian vegetation can be achieved by leaving some buffer strip along the neighboring agricultural land use; by designating some areas for active recreation and transportation, or buffering transportation by a row of trees.	Separating industrial and residential use at some distance; creating physical barriers (a wall or a berm, vegetation) between the conflicting uses Multiple zones in a forested park can be: active recreation areas, passive recreation/nature observation areas, environmental education areas, and nature protection areas

competing uses. Variations of the spatial separation strategy include: (1) creating a buffer area or physical barriers between conflicting uses and (2) developing multiple zones for different land uses. These strategies/schemes are useful for the co-existence of uses that are by nature contradictory or

competing for the same resources (i.e., space, time, and use); the management would be easier for the uses that are complementary or by nature conducive to co-existing uses, such as passive recreation, aesthetics, historic site preservation, environmental education, and the protection of environmentally fragile areas (e.g., groundwater recharge areas, steep slopes, riparian vegetation, flood plains).

Multifunctional landscapes are in turn the key to developing sustainable landscapes. LEP is a tool to achieve multifunctional landscapes. We have demonstrated, using greenways as an example, that LEP can address not only the ecological aspect of sustainable landscape development but also socio-economic, cultural, recreational and aesthetic aspects^{(1), (10), (23), (25)}. This is why LEP is suited to address sustainable landscape. When abiotic, biotic, and cultural resources existing in a corridor form are connected by greenways, they can be conserved and utilized in a spatially-efficient manner⁽³⁾. The synergy of multiple uses helps build a broad coalition of support from diverse user groups. This support is crucial for the maintenance and continued existence of the landscape. Multiple land use also facilitates an efficient use of time and space, which is the especially attractive feature in urban landscapes where space is limited and a land mosaic is fine and heterogeneous. The multiple functions^{(27), (30), (36), (39), (48)} provided by the open space (e.g., agricultural lands, secondary-growth forests, parks, and river banks) in urban regions⁽¹⁷⁾ can contribute to improve the quality of life of the residents. Garnering a coalition of support for these multifunctional landscapes would help them become more sustainable. To study multifunctional landscapes, inter- and transdisciplinary approaches to landscape research are required, bridging human and natural sciences^{(32), (42)}. In the urbanizing world, multifunctionality of a landscape is a key concept to be considered in sustainable landscape design and planning.

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