

Review and challenges in the economic valuation of green spaces

Capucine Chapel^{1,2*}  • Mohamed Hilal²  • Julie Le Gallo² 

¹ *Université Clermont Auvergne, CNRS, IRD, CERDI*

² *CESAER UMR1041, INRAE, Institut Agro, Dijon, France*

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Abstract

Green spaces provide a variety of ecosystem services to society and the environment. This paper provides an overview of the literature on the valuation of green spaces, focusing on their advantages and limitations. We conclude with a number of challenges ahead.

Keywords: green spaces, non-market valuation, environmental gentrification

JEL Classification Codes: Q01, Q51, Q57

1. Overview: from the importance of green spaces to political agendas

From Square Restif-de-la-Bretonne, the smallest square in Paris (42 square metres), to the Amazon Rainforest National Park covering almost 39 million hectares in Brazil, green spaces in their many forms significantly enhance the quality of life and well-being of individuals. However, human activities threaten these areas. Increasing urbanisation and urban sprawl are major contributors to the loss of green spaces, with 10 million hectares of forest worldwide lost annually between 2015 and 2020 (FAO, 2022). These trends exacerbate existing inequalities in access to green spaces across various spatial scales. For instance, in 2018, 77% of Oslo's territory was covered by green infrastructure, compared to only 17% in Athens (EEA, 2022).

Simultaneously, social demand for green spaces is rising globally, as evidenced by the boom in nature-focused tourism. Great Smoky Mountains National Park, located between Tennessee and North Carolina, set a visitor record in 2021, surpassing the 14 million visitor milestone for the first time (Bascou, 2022). Green spaces serve as popular spots for relaxation and leisure, making daily accessibility a crucial factor for residents. Seven out of ten Europeans consider

* Corresponding author. E-mail: capucinechapel.pro@gmail.com.

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proximity to green spaces essential when choosing where to live¹. The COVID-19 pandemic underscored the public's need for natural environments and the disparities in access to them.

Political decision-makers are addressing these issues at various levels. At the international level, the Sustainable Development Goals (SDGs) established by the United Nations in September 2015 make green spaces vital for achieving several goals, in particular Goal 3 "Good Health and Well-being", Goal 11 "Sustainable Cities and Communities", Goal 13 "Climate Action" and Goal 15 "Life on Land". At the European level, the European Commission's Green Pact for Europe and the "Biodiversity 2030" strategy aim to expand protected areas and enhance urban green infrastructure (European Commission, 2020). Nationally, countries are enacting legislation to protect natural areas. For instance, France's "Zero Artificialisation Nette" (no-net-land take) policy seeks to halt the net loss of natural and agricultural land. Locally, cities worldwide are enhancing green spaces through various initiatives, like Paris's "permis de végétalisation" (revegetating licence), Vancouver's "Green Streets," and San Francisco's "Street Parks", which support community-driven greening efforts.

However, achieving the set goals remains challenging and costly. Understanding the benefits of green spaces is crucial to justify financial investment and address controversies. Studying the economic costs and benefits of green spaces is essential for ensuring effective implementation and long-term success. This article provides an overview of the environmental valuation literature related to green spaces and the challenges that lie ahead.

2. Understanding Green Spaces: Definition, Evolution, Costs, and Benefits

There is a lack of consensus in academic literature in economics on the precise definition of green spaces, influenced by geographical and temporal context. Taylor and Hochuli (2017) observe that fewer than half of economic studies provide a definition, identifying six types that focus on aspects such as vegetation, colour, land use, and services. Green spaces present a diversity of scales and forms (Ignatieva & Mofrad, 2023; Panduro & Veie, 2013), from small neighbourhood parks to vast national forests, found in both urban and rural environments. Some studies (Morancho, 2003) adopt a strict definition limited to parks and gardens, while others (Saphores & Li, 2012) include cemeteries and blue spaces like lakes and water bodies. This inconsistency in terminology complicates comparisons across studies.

Despite definitional challenges, the significance of green spaces for human health, environment and well-being is well recognised. Green spaces provide various ecosystem services to society and the environment, categorized into four main functions: support, supply, regulation and cultural services (Millennium ecosystem assessment, 2005). These services yield numerous amenities and positive externalities and can be grouped into four areas: environmental, social, health and economic.

Environmental benefits: green spaces are crucial for regulating local climates. Urban green spaces help mitigate heat islands, lowering temperatures by nearly 1°C (Bowler et al., 2010). Plants in green spaces absorb CO₂, helping limit global warming, and release oxygen, maintaining atmospheric balance. They absorb pollutants like PM10 (Selmi et al., 2016),

¹ "Jardins et espaces verts, l'exception culturelle française ?" – Enquête Unep-Ipsos 2013.

support biodiversity by providing habitats for local species, help prevent soil erosion, regulate the water cycle, and reduce flood risks (Nielsen et al., 2013; Sorace & Gustin, 2010).

Social benefits: green spaces, as meeting and gathering places, foster interaction and inclusivity enhancing social cohesion and community bonds (Peters et al., 2010; Wan et al., 2021).

Health benefits: green spaces offer peaceful refuge. Proximity to nature and green spaces helps to reduce stress, anxiety and depression (Roe et al., 2013; Ward Thompson et al., 2012), which improves mental health. These spaces also promote physical activities through walking, jogging or cycling, crucial for active lifestyles. Barboza et al. (2021) suggest that larger exposure to green spaces could prevent many premature deaths in European cities.

Economic benefits: attractive spaces increase property values of neighbouring properties, stimulating local property markets and rising tax revenues (Panduro & Veie, 2013). The rise in the price of housing near green spaces stems from supply and demand factors (Jung, 2023; Lang, 2018). The presence, but also the scarcity, of green spaces reduces the amount of land and housing available nearby. At the same time, demand is boosted by the growing appeal of the benefits offered by these areas. As a result, limited supply and growing demand drive up prices. This premium is then reflected in property taxes. Harnik and Crompton (2014) estimate that parks in Washington City generated 6.95 million euros in property tax revenues. Furthermore, the creation and upkeep of green spaces generate jobs in landscaping and environmental management while attracting visitors and boosting local businesses, especially in tourism, hotels and restaurants.

Green spaces can also have some negative effects. Poorly maintained or inadequately lit areas may become, or be perceived as, breeding grounds for illegal activities or crime, compromising the safety of visitors and residents (Kimpton et al., 2017). Individuals sensitive to allergens from grass and trees may experience allergic reactions (Cariñanos & Casares-Porcel, 2011). Inappropriate maintenance can lead to the proliferation of invasive and harmful species or over-exploitation of natural resources (Jang et al., 2020; Semeraro et al., 2021). Additionally, preserving green spaces can create land constraints in urban areas, limiting property development and increasing pressure on housing markets. These restrictions together with the capitalisation of green values on the property market lead to a rise in property prices, making it accessible only to a certain wealthier social class (Hilber, 2017), resulting in green or environmental gentrification (Rigolon & Németh, 2020). Finally, the costs of creating, maintaining and managing green spaces can burden public finances (Choumert & Salanié, 2008; Fratini & Marone, 2011).

Establishing new green spaces represents a significant opportunity cost for the urban planner, as it requires allocating limited financial resources and land. The development of green spaces often competes with potentially more profitable uses, such as residential or commercial areas (Votsis, 2017). Consequently, assessing the benefits as well as the costs of these spaces is essential informed for political decision-making.

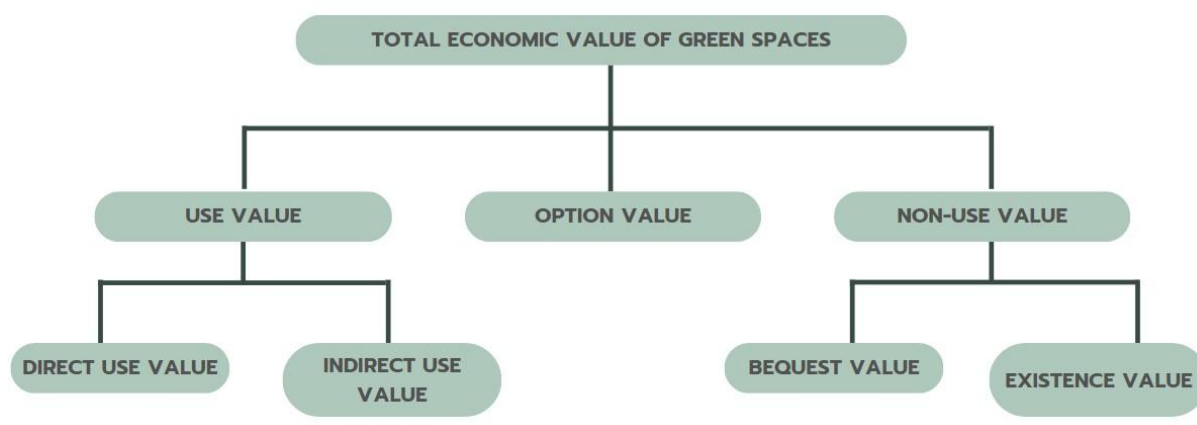
3. Economic evaluation methods for green spaces

Green spaces are classified as non-market public goods due to their non-exclusive and non-rival nature. They are generally accessible to all community members without financial

exclusion, and one individual's consumption does not diminish availability for others. These characteristics, along with the positive externalities they generate, mean that green spaces often rely on public funding or donations for their creation, maintenance and management, making them susceptible to underfunding, underproduction, and overuse.

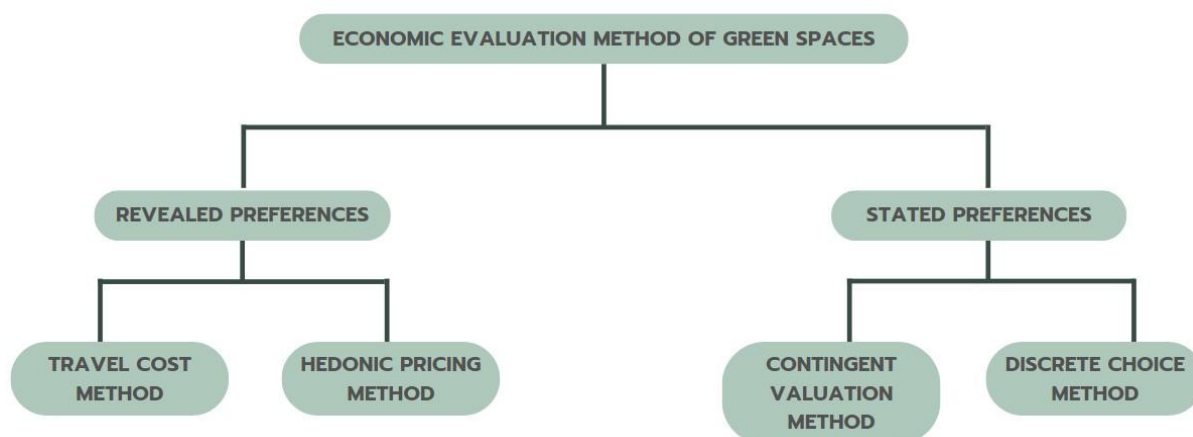
Consequently, public policies play a crucial role in ensuring the optimal production of these goods. Political decisions regarding green spaces should be informed by a comprehensive assessment of their benefits related to associated costs. While the significant costs of installation and maintenance are easily quantifiable, the often indirect benefits are more challenging to measure. Therefore, a thorough assessment of both direct and indirect benefits is essential. The literature on environmental valuation provides tools and methods to quantify the economic benefits of green spaces (Adamowicz, 2004; Pearce et al., 2002). As illustrated in Figure 1, the total economic value of an environmental asset comprises the sum of its use value, its non-use value and its option value (Peterson, 1987).

Figure 1. Decomposition of the total economic value of green spaces



Source: authors

Use value represents the economic benefits that individuals derive from the use or consumption of an environmental asset. It includes direct use values associated with the immediate consumption of resources, such as tourism, and indirect use values associated with the indirect benefits they provide, such as climate regulation. In the case of a nature park, the direct use value encompasses the satisfaction visitors experience when walking or picnicking. Non-use value reflects the indirect or non-material benefits individuals attribute to the environmental asset without direct usage. It can be further categorized into inheritance value, reflecting the desire to pass on these assets to future generations, and existence value, associated with the satisfaction of the simple existence of the asset. For instance, the non-use value of a pristine lake may stem from the desire to preserve it as a healthy ecosystem, even without direct interaction. Lastly, option value represents the value attributed by individuals to the possibility of using this good or benefiting from its ecosystem services in the future, even if immediate use is not intended.

Figure 2. Classification of economic valuation methods

Source: authors

To understand the economic value of these environmental resources, non-market valuation methods are needed. These methods reveal individuals' preferences, necessary for calculating the effective social demand for green spaces. Non-market valuation methods fall into two broad categories: stated preferences and revealed preferences (see Figure 2). Stated preference methods involve structured interviews, where individuals are asked to choose between various environmental or health outcomes and monetary compensation to assess their preferences. This includes contingent valuation (Carson, 2013), wherein individuals express their willingness to pay for specific environmental improvements, and discrete choice surveys, which present different scenarios for selection. Conversely, revealed preference methods rely on actual decisions made by individuals to infer their preferences and values regarding non-market goods. These methods include transport cost methods, which analyze travel behaviour, and hedonic pricing methods, which examine purchasing behaviour. Each method has its advantages and limitations, and the choice of method should align with the specific context of the study and the available data. Ultimately, these methods should allow us to approximate the utility of individuals through variation in their surplus calculated in monetary units. This is referred to as willingness-to-pay when the surplus is positive and willingness-to-receive when it is negative.

Table A1 in the annex presents real-life examples of estimated values for various types of green spaces, across different regions of the world, employing diverse valuation methods.

4. Challenges

The literature on the valuation of environmental goods has grown significantly in recent decades (Adamowicz, 2004; Guijarro & Tsinaslanidis, 2020; Olukolajo et al., 2023). While the benefits derived from green spaces are widely acknowledged, the magnitude of these effects varies considerably across studies, influenced by geographical area, time period, methodology, and metrics used. The multidimensional, non-market nature, along with the indirect benefits of

green spaces, continues to present challenges for both current and future research.

One major challenge in valuing green spaces is the geographical scope of existing studies. Often, research is confined to specific areas, such as individual cities or small zones, which limits the generalizability of findings to broader contexts or populations (Bishop et al., 2020; Kabisch et al., 2015; Viti et al., 2022). Additionally, there is a notable bias toward urban green spaces, with rural areas receiving less attention despite their ecological and economic importance (Yao et al., 2012). This limited focus creates gaps in understanding the comprehensive benefits provided by green spaces.

Another significant challenge pertains to data and model specification decisions within these studies. Bishop et al. (2020) highlight the importance of these choices, particularly regarding the metrics used to assess the benefits of green spaces. For instance, Nesbitt et al. (2017) identify 31 different metrics in cultural ecosystem service assessments, underscoring the need for a common framework to facilitate comparisons across studies. Similarly, Bishop et al. (2020) advocate for selecting amenity measures that effectively capture the characteristics valued by individuals. They also emphasize emerging methodologies, such as causal inference techniques and machine learning, as promising tools to address limitations in green space valuation, including selection bias, omitted variable bias, and model misspecification. These methods enable more robust analyses of causal relationships and clarify the impacts of green spaces on various outcomes.

A further limitation in applying hedonic pricing methods is the frequent omission of the second stage of the model, which estimates demand curves based on coefficients from the first stage. The absence of this second step complicates the derivation of welfare estimates and the full capture of consumer surplus generated by green spaces (Netusil, 2010; Sheppard, 1999). This limitation restricts the understanding of actual demand for green spaces and the heterogeneity of preferences across different groups.

Despite several studies attempting to capture the economic value of green spaces, fully accounting for it remains challenging. Direct benefits, such as recreation, are easier to quantify, while indirect benefits, such as ecosystem services (e.g., air purification, carbon sequestration, psychological well-being), are harder to measure and often underestimated (Tinch et al., 2019). Consequently, most studies likely capture only a fraction of the total value that green spaces provide.

This paper concludes with a focus on environmental justice as a critical yet underexplored area in green space valuation. Access to green spaces often reflects socio-economic inequalities, with low-income and marginalized communities having limited access to high-quality spaces, exacerbating health and social disparities (Viti et al., 2022). Additionally, green space development can lead to green gentrification, where improvements result in rising property values and the displacement of lower-income residents, concentrating benefits among wealthier groups (Gould & Lewis, 2016; Wolch et al., 2014). To mitigate these issues, urban planning must incorporate policies that ensure affordable housing and equitable access, ensuring that green space expansion promotes equity rather than reinforcing existing inequalities.

Appendix. See online at: <https://doi.org/10.17811/ebl.14.1.2025.63-74>.

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