

Review

Developing a Tool for Landscape Sustainability Assessment—Using a New Conceptual Approach in Lebanon

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Abstract: In the absence of a holistic view of landscape sustainability, credible data and consistent information are needed to help decision-making and support adaptive landscape management. This course of events highlights a strong need for a tool (system of standards and controls) that can be used by multiple stakeholders (such as NGOs, public authorities, cooperatives, associations, higher education institutes, etc.) to analyze the state and sustainability of landscapes, predict any impact of new projects on the landscape, and develop urban and peri-urban planning policies. However, while consolidated tools of assessment exist, they exhibit complexity in their references. Existing assessment tools also lack specificity and are primarily limited to qualitative approaches. Although large sets of indicators are available and can be adopted, it is crucial to select a new set of non-conventional indicators that provide a holistic view of the various dimensions of the landscape. This review article aims primarily to discuss relevant models and prerequisites in order to later develop landscape indicators to complement—and in many cases—replace existing agro-ecological indicators. Landscape indicators will serve as a baseline for the proposed tool, which will employ a mixed methodology based on both qualitative and quantitative indicators. Additionally, various environmental and landscape indicators are presented and compared to identify the best reference to landscape sustainability. Various fields of application for indicators-based tools and the scales on which they can be applied are also considered. In particular, Lebanese landscapes exhibit variability in characteristics and possess a unique identity with genuine natural and built landscapes. Only recently has there been an increasing interest in sustainability assessment, particularly in relation to Lebanese Landscapes. Unfortunately, there is a likely gap in the studies, planning, and policies related to these landscapes. A tool that can evaluate, protect, conserve, and propose concrete solutions for these landscapes are needed more than ever.

Keywords: landscape indicators; landscape sustainability; landscape assessment; weighting and aggregation



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1. Introduction

The term “Landscape” was considered in many disciplines like environmental sciences, agroecological sciences, socioeconomical sciences, and territorial policies. Landscape is multipurposed [1], thus many theories are applied. It is a geographically wide area that correlates with human perception [2] due to the aesthetic appearance and the many visible structures of a territory [3].

Landscape plays a rudimentary role in the environmental, ecological, social, economic, international reputation, and cultural aspects [4], affecting populations and creating a unique value [5,6]. On the economical level, for example, the value of a landscape can reflect the tourism, branding and productivity, attractiveness for residents and investors, etc. On the sociocultural level, the landscape can reflect the quality of life, identity, historical connectivity, and cultural values. More precisely, the heritage value of a certain landscape can, for example, be used for recreational values and for conservation planning and management [7].

Also, a given landscape is the result of how a population uses it and perceives it [8,9]. At the same time, it is impacted by natural processes and man [10], who has shaped it over millennia by his activities. Hence, landscapes are dynamic and in continuous change [8,11,12], and develop interactively with the human societies occupying it [13]. So, it became a necessity to claim their right and responsibility toward landscape protection, management and planning [4].

Landscapes are crucial for the quality of life in both the urbanscape and ruralscape, in degraded and high quality scapes, in the outstanding beauty scape, and in the everyday scape. It can also be considered as a tool for integration [14].

So, “looking after landscape is no longer about preservation . . . change can be positive if planned and managed well” [11]. Furthermore, landscapes can (i) return broad commodities that are essential to humans, like resources (as raw materials, wood or food), (ii) support climate regulation, (iii) fulfil aesthetic, recreational even educational prospects, and (iv) create conservation opportunities [15].

But, to fulfil the landscape remit, we need to discuss all landscape facets, starting from landscape policies to landscape management planning, providing robust means of measuring the sustainability outcomes of landscapes, and landscape assessment systems.

1.1. Landscape Policies and Framework

In accordance with the awareness about natural resources, many innovations have started to show at the landscape level. It became essential to integrate any agriculture activities, all environmental effects and the rural livelihood outcomes with the landscape [16]. Here arises the need to “Measure” the landscape and identify actions. Landscape policies reflect the public and international authorities’ awareness [17], and more importantly identify the landscape quality and reach out toward landscape sustainability.

Firstly, when it comes to protecting a landscape, actions are directed toward preserving the distinctive features of the landscape. Differently from landscape planning actions, strong progressive actions are needed in this case to improve, correct, or even create landscapes. This is a turning point intended to integrate landscapes into local planning policies, and then into surrounding policies and regional planning.

In other words, policies and activities must take landscape values into account. In Europe, for instance, the following two regulations represent landscape policies [4]: The European Landscape Convention (ELC) and the Strategic Environmental Assessment (SEA) Directive. They are meant to regulate any plan or program affecting territorial and landscape plans [17].

More recently, Article 5 of the 11th Council of the Europe (CoE) mentioned that landscapes should be recognized in the law as a drastic component of people’s surroundings. Also, Article 6 entitled the implementation of the specific measures set out can establish landscape policies beyond protection and aimed at landscape management and planning.

In the case of Portugal, Law 80/2015 establishes the necessary measures when it comes to landscape heritage and takes into account the transactions between private owners of rural areas.

In summary, landscapes must be adopted in territorial management systems. It is key to sustainable living environment and successful territorial policy, yet the role of regional and inter-municipal or municipal spatial plan must be considered in this matter. We recommend (i) the integration of the landscape in policies at both the local and regional level, (ii) promoting the value of the landscape, and most importantly (iii) considering and incorporating the landscape in natural resource and territory management.

Nevertheless, as landscapes are constantly changing, collecting information about, identifying, and evaluating landscapes can help in monitoring the evolution of landscapes and their role in the territorial dynamics. To do so, we must consider the different facets of the landscape and identify a method to assess the changing landscape.

1.2. Landscape Facets

A landscape is where geography and ecology converge [18], an approach to spatial development [4], and a quality of the surroundings of individuals and societies [18]. Landscapes have their own order, rhythm, and temporality, different from human life cycles but in relation to them [19]. Landscapes show different dimensions, different themes, and different facets. Facets of the landscape were examined by the CoE [20] and some are briefed in Table 1. It can vary from spatial thinking to collective spaces and cultural assets, or even awareness, educational, and designed landscapes.

Table 1. Facets of the landscape.

Facets of the Landscape		Description	Referencing CoE Expert
1.	Urban, suburban & peri-urban landscapes	Where the city is considered through spatial thinking as a whole, and integration with the landscape will be held vertically and horizontally.	Bruns D. [20]
2.	Road landscapes	Are collective spaces with a character of their own, hosting daily life and creating positive scenery through valuable landscapes.	Echániz I. [20]
3.	Tree-lined avenues in the landscape	Are landscape feature and cultural asset meriting conservation, relevant to offering safety, improving the landscape and the avenue climate.	Pradines C., Association "Trees and Roads" [20]
4.	European local landscape circle studies	Are analytical studies of 7-steps where groups or individuals can analyze their landscape and be aware of changes in their landscape, and thus participate in the process.	O'Regan T. [20]
5.	Landscape and education for children	Is education on general aspects of the landscape applied in primary and secondary schools.	Castiglioni B. [20]
6.	Training of landscape architects	Recommendations on curricula and educational structures, combining natural and social sciences with skills in planning and landscape design.	Sarlöv-Herlin I., European Council of Landscape Architecture Schools [20]
7.	Landscapes and ethics	Instrument for the regulation of social relations, and the protection of rights in landscape management and preservation.	Kuleshova M. & Semenova T. [20]

We have mentioned so far the different perceptions of landscapes since they are impacted by society, either directly or indirectly. We also mentioned the perpetual change in the landscape, which can sometimes lead to its degradation, and the need for considering landscape policies to properly improve landscapes. Furthermore, the existing frameworks for territorial planning, policies, and decision making do not take close consideration of the landscape as a whole. Still, there is a need for a holistic view of landscapes and their sustainability. Consolidated tools of assessment are also needed to (i) help decision making and (ii) support adaptive landscape management.

Regardless of the complexity of the references, tools to assess landscapes do exist, but the existing tools are mostly qualitative and environmental and agro-ecological indicator-based. In this research, we are seeking a mixed method that additionally considers quantitative landscape indicators.

We will describe and discuss in the below sections the relevant philosophies about landscape sustainability and assessment, the main models, the prerequisites, and the various fields of application.

2. Materials and Methods

We reviewed papers published in international scholarly & peer-reviewed publications indexed by the USEK library search engine from January 2012 to March 2023 with a focus

on articles examining the use and development of landscape indicators and how they can be weighed and aggregated.

We considered a key term literature review and adopted “Landscape indicators”, “Landscape Sustainability” and “Landscape assessment” from Sowińska-Świerkosz [21]. These key terms were allied by “or” to take account of all commonly used designations for landscape indicators, landscape indicators type and landscape indicators development. We also combined the term “tools” in our search to end up with the following key search: “(“LANDSCAPE INDICATOR” OR “LANDSCAPE SUSTAINABILITY” OR “LANDSCAPE ASSESSMENT”) AND (“TOOLS”)”.

This review is limited to the disciplines of agriculture, architecture, ecology, and environmental science. These disciplines are directly related to landscape, have influence on landscape, and prerequisites might be found. Most results were relevant to the tools applied in land changes, environmental indicators, and agriculture. Our aim was mainly to identify landscape indicators, their use, development, and participation in the tools of assessment, which explains the exclusion categories mentioned below in Table 2.

This methodology was adapted from Moher et al. [22] and described in Table 2. In total, 181 sources were relevant to our research objectives. Only 178 articles were identified from the search, and 10 additional articles were also identified from other sources. Each result was evaluated to compile the recent literature and its relevance to the use and development of landscape indicators as tools for developing landscape quality and sustainable landscaping [6].

Accordingly, 111 articles were excluded for being non-relevant to sustainability tools, landscape sustainability, or landscape indicators, or because they were not accessible. No duplicates were noticed. After excluding the non-relevant articles, 77 articles were identified as relevant to our research objectives.

Table 2. Methodology adopted for the search review.

Identification		Screening		Included	
From Search	From Other Sources	Duplication Removal	Search Result Excluded	Reason to Exclude	Qualitative Synthesis
178	10	188 screened 0 duplicates	50	No tools data	6
			20	No landscape indicator	
			15	No landscape data	
			10	Not accessible	
			9	Not related to sustainability of landscapes	
			7	No landscape policies data	

3. Results

The landscape is starting to be included in the policies themes and in the assessment framework. Still, there is a lack in tools adopting landscape indicators and only 77 articles were relevant to our research objectives: sustainability, tools of assessment, landscape sustainability assessment, and landscape indicators.

To this matter, we will firstly present what sustainability is and then emphasize measuring sustainability outcomes, focusing on landscape-level sustainability assessments. Also, common tools will be described in this section, with the emphasis on (i) common tools for general sustainability (e.g., EIA Environmental Impact Assessment, FSA Farm Sustainability Assessment, and METT Management Effectiveness Tracking Tool) and (ii) known tools for landscape sustainability (e.g., LCA Landscape Character Assessment, LPS Landscape Character Assessment, LQ Landscape Quality, LVIA Landscape & Visual Impact Assessment).

3.1. Meaning of Sustainability

Two perspectives on the sustainability concept are commonly known in the field of sustainable development and environment literature [23]. The first considers sustainability as an aspiration rather than a state [23], in the sense that sustainability is the “direction towards the goal”, and not measured in absolute terms [24,25], while the second considers sustainability as “an achievement”. In this second case, sustainability is well-defined and can be measured with the use of particular criteria and defined indicators [6,26,27].

Remarkably, the two mentioned perspectives consider the definition of sustainability as a “three pillar concept” i.e., considered at a time the three dimensions of sustainability are as follows: social, economic, and environmental [28,29].

3.2. Sustainability Assessment Approaches and Tools

Sustainability assessment is a process [6,28] that helps decision makers and policy makers to reach sustainability and decide what should or should not be made to reach a more sustainable society [30,31]. In short, sustainability assessment provides decision makers with integrative environmental and social systems [31,32]. It considers micro- and macroscales to anticipate the short- and long-term implications of a proposed project, a suggested plan, or intended policy [33].

In other terms, it is a dynamic process that considers alternative trajectories to prioritize sustainable actions at a particular time and place [34]. To assess sustainability, there is a wide range of approaches and tools, depending on the context and scale of analysis [35], and these were discussed by Buytaert et al. [36]. Some of the commonly used sustainability assessment approaches and tools are briefed in Table 3.

Table 3. Common tools of assessment: context and scale of analysis.

	Common Tools	Context	Scale of Analysis	References
(i)	EIA Environmental Impact Assessment	Before decisions are taken	Sites or processes	[37]
(ii)	FSA Farm Sustainability Assessment	Self-assessed	Farm	[38]
(iii)	METT Management Effectiveness Tracking Tool	Scorecard questionnaire	Protected area	[39]

3.3. Landscape Sustainability Assessment

To define landscape sustainability, we should firstly consider the landscape-specific ecosystem services in the long term. Secondly, the landscape must be able to constantly provide services that are essential to maintain and improve human wellbeing [40].

But regardless of the absence of common methods for (and indicators of) assessments, and despite the heterogeneity of the approaches, landscape sustainability assessment offers great opportunities [31] to be adopted in new policies or to renew political and planning culture.

The first sustainability assessment used in this regard was the Environmental Impact Assessment EIA for intervention projects, which was reinvented as Strategic Environmental Assessment SEA for territorial programs and landscape programs with an effect on the environment [41]. The latter showed importance in strategic decisions of plans, policies, and programs but unfortunately, it remains mostly voluntary for the landscape approach [41]. Brief descriptions and details about both of these tools, in addition to other environment and landscape sustainability assessment tools, are summarized in Tables 4 and 5.

Most tools known about general sustainability and Landscape sustainability were based on qualitative approaches. We noticed a diversity of uses, going from adaptive and transformative to managerial and development, but none of the tools were holistic.

While sustainability at the agricultural level greatly inspired our research on landscape indicators, the case of FSA (known in French as IDEA or Indicateurs de Durabilité des

Exploitations Agricoles) that, as other Agri-based policies and quantitative assessments, established the multipurpose use of agriculture and attributes the significance of ecological values, in addition to the scenic and recreational value of the rural landscape [42].

Nevertheless, our interest in this study emphasizes the use of landscape indicator-based assessments, as is the case of SEA. However, there is a need for quantitative formalization of the landscape, without excluding the qualitative part. According to Fisher [43], landscape plans in Germany were prepared to be used as a state of the environment and help defining development objectives.

It is only since the mid-1990s that landscape plans were used, in parallel to land use plans, to identify and overcome potential impacts [31,34,42]. Still, achieving landscape sustainability entails persistent corrections, as a result of changing societal priorities [23].

Table 4. Common tools of assessment of general sustainability, description, and use.

Tools		Brief Description	Use	Qualitative/ Quantitative	Reference
EIA	Environmental Impact Assessment	Environmental decision making that provides all needed information on the expected impacts of projects prior to execution, thus intended to prevent potential negative impacts and propose alternative solutions.	Facilitate informed and transparent decision-making on whether or not a proposal should be given approval to proceed.	Qualitative	[37]
FSA v4	Farm Sustainability Assessment (version 4)	Covering three dimensions of sustainability, IDEA is a 41-sustainability-indicator-based method, used by farmers in a process of sustainability at farm self-assessment, for possible progress towards increased sustainability.	Educational, research, farmers, agro-ecological development.	Qualitative and Quantitative	[38]
METT	Management Effectiveness Tracking Tool	Scorecard questionnaire on management of protected area to propose rapid adaptation	Effectiveness and adaptive management.	Qualitative	[39]

Table 5. Some common tools conventionally used in the assessment of Landscape Sustainability in particular.

Tools		Brief Description	Use	Qualitative/ Quantitative	Reference
LCA	Landscape Character Assessment	Recognizes and classifies the uniqueness of a landscape based on distinctive elements or characteristics, and monitors changes and understands development.	Region-specific and stakeholder-orientated identification the basic structures of landscape biophysical components and cultivation patterns.	Qualitative	[44]
LPS	Landscape Performance Series	Proposes solutions to reach a sustainable landscape through platforms to help landscape designers and landscape agencies weigh performance.	Transforming landscape design and development processes.	Quantitative	[45]
LQ	Landscape Quality	Relevant to values and direct use of landscape resources.	Analyzing and combining what the public is perceiving, the opinions of stakeholders, and the requirements proposed by experts.	Qualitative	[4]
LVIA	Landscape & Visual Impact Assessment	Helps professionals identify the impact of new projects on landscape views.	Involved in the design of the landscape and subsequent proposals of management.	Qualitative	[46]
SEA	Strategical Environmental Assessment	Evolution of EIA towards sustainable outcomes, taking landscape in the account.	In landscape management to enhance multi-stakeholder dialogues.	Qualitative & semi-quantitative	[43]

3.4. Defining Landscape Indicators and Their Arising Need

The need for Landscape Indicators (LIs) resulted from the necessity to evaluate and monitor various landscape aspects and their interconnected nature—human—over time, since landscapes are the interaction between the different social aspects of a population and a geographical area [47]. But, the different components of the landscape trace a specific identity, and subject it to considerable pressure. LIs are thus vital tools in identifying the qualities and criticalities of a particular area [9], and single features that express landscape change over space or time [44].

However, covering all landscape facets (the so-called dimensions of a landscape) needs interdisciplinary approach, which is a rarity in previous studies, where most published papers focused only on one or two dimensions. Also, most landscape assessments using indicators relied on the ecological indicators that differ greatly from LIs.

Transferable (not universal) LIs are favored by landscape characters (related to the characteristics of an area) [44] and are an ideal reference of assessment and monitoring [48] in that they provide decision makers and restoration practitioners with a greater understanding of modifying landscape patterns [49].

Considered as indexes, numerical values based LIs have quantifiable characteristics [50], allowing a large set of data to be minimized to a simple measure [51]. Like all indicators and indices that were developed to measure sustainable development [52], LIs are used in key international sustainability, particularly in landscape sustainability studies [20,53].

3.5. Relevant Landscape Indicators and Categorization

Differently from the ecological indicators that use field observations, landscape indicators emphasize land cover [49,54], landscape character [50], aspects of landscape perception, and can define social perceptions [51]. Most importantly, they take into consideration the objective and subjective approach of landscape [55].

Also, indicators and indices developed for sustainable agriculture were applicable to landscape sustainability studies but remain copious and difficult to measure [23], especially in a landscape that is interpreted as a scheme of eco-mosaics with a perceptive and identity realm. Therefore, we should merge the sustainability indicators mentioned above with historic [56], visual–social perception indicators [57] and land use indicators [54,58] to be able to explain all landscape facets and meet the current study objectives.

Before revealing the indicator sets found in the literature review, we will elaborate in Table 6 the indicators proposed in the Farm Sustainability Assessment. This method was selected from the existing tools for general and landscape sustainability to show the details of the sustainability indicators used to evaluate while using this method.

FSA is based on three pillars and five key properties relating to the sustainability of agriculture [59]. The selection to showcase FSA relies on similarity with the proposed tool. It adopts a mixed methodology, an indicator base, and a quantitative method.

According to this table, several indicators can be adopted as landscape indicators (indicated by yes), while others show no direct relevance to landscape. However, none of these indicators were not tested until later stages in the research.

The second indicator-based set for sustainability in agricultural farming is based on five key properties [59]: robustness, autonomy, capacity to produce and reproduce goods and services, territorial embeddedness, and global responsibility. They are also indicators, however, analytical and qualitative indicators; all relevant to landscape.

Table 6. Farm Sustainability Assessment indicators and their relevance to landscape.

Pillar	Component	Indicator	Relevant Landscape indicators
Three pillars or dimensions of sustainability	Diversity	Annual crop diversity	Yes
		Tree crop diversity	Yes
		Animal diversity	
		Safeguard of animal and vegetal diversity	
	Organization of spaces	Crop rotation	Yes
		Plot management	
		Ecological buffer zones	Yes
		Environmental and landscapes safeguard	Yes
	Agricultural practices	Stocking rate	
		Fertilization	
		Pesticides	
		Veterinary treatments	
	Natural resources	Management of the livestock effluents	
		Soil management	Yes
		Water resource management	Yes
	Energy	Organic matter management	
		Energy dependence	
		Renewable energy	Yes
	Quality	Quality of the products	Yes
		Rural buildings	Yes
Landscape and territory		Yes	
Short supply chain and related activities	Short food supply chain		
	Related activities		
	Work	Yes	
Work	Work	Yes	
	Sustainability of employment	Yes	
	Training	Yes	
Ethic and social development	Livestock management		
	Associations and social implications	Yes	
	Cooperation	Yes	
Culture and education	Waste management		
	Accessibility to the farm spaces	Yes	
	Sustainable use of materials	Yes	
Economic viability	Education	Yes	
	Value of production	Yes	
	Added value	Yes	
	Persistence	Yes	
	Farm ability to generate income	Yes	
	Income per family worker	Yes	
	Independence	Yes	
	CAP independence		
Autonomy			
Diversification	Diversification of the production	Yes	
	Business diversification	Yes	
	Multifunctionality	Yes	
Multifunctionality	Multifunctionality	Yes	

The literature reveals available landscape indicator sets, summarized in Table 7, and provides a categorization of indicators. According to Valánszki [60], their number is limitless and only a few studies explain how they can be used [57] and whether the measurement is quantitative or qualitative, with a stress on the choice of appropriate landscape indicators [50,61].

Table 7. Categorization of relevant Landscape Indicators (LIs) according to countries.

Country of Origin	Methodology	Relevant Landscape Indicators	Uses
Europe	Policies establishment	Landscape diversity Landscape quality Landscape character	Landscape-related concepts
Asia	Four indicators sets of performance	Improved landscape livelihoods Improved ecosystem services Improved resource efficiency in land use Supply of food and other products	Landscape at different scales Landscape sustainability management
Catalonia	Ten indicators	Transformation of the landscape Landscape diversity Landscape fragmentation Economic value of the landscape Knowledge of the landscape Landscape satisfaction Landscape sociability Landscape and communication Public and private action in the field of conservation Application of instruments of the landscape legislation	Landscape quality
Netherland	Landscape Perception and assessment	Unity Functional organization Possibility of using landscape for own activities Historical character Natural character Spatial dimensions Sense impressions	Landscape appreciation Landscape perception
Italy	European Landscape Character	Coherence Openness Diversity	Landscape character Landscape policy
United Kingdom	Emerging indicators	Land cover Cultural pattern	Future monitoring at Landscape scale

The Landscape Observatory of Catalonia (CLOt), for example, proposed a set of indicators that measure the physical changing of the landscape, the social perception, and the implementation of landscape policies [62]. Other sets dealt with only one aspect [43].

In general, indicators that describe the landscape well, particularly the characterization of the landscape, are well-studied in Europe [57], particularly in terms of the rural landscape. The objectives here were to evaluate the effects of agricultural policies, favoring land use and ecological aspects, discarding landscape-related indicators, and ignoring urban and cultural landscapes.

In the following sections, the categories used by the main European studies, in the common models of landscape quality, and those elaborated by the Landscape Observatory of Catalonia will be presented.

3.6. Landscape Indicators in the European Studies

The practical use of landscape indicators is becoming familiar in European assessments [55]. The interest relies on two main points: (i) the large diversity of landscape characteristic in a specific region, and (ii) landscape-related concepts increasingly expressed by policy institutes.

Several countries followed the European countries and developed advanced methods to trace policies and land use mapping [32], but landscape indicators were still not well adopted. However, several technics were developed and are now commonly used in

determining landscape structure (case of Geographic Information System GIS), mostly in countries that have implemented Landscape Character Assessments [61].

3.7. The Four Indicators Sets of Performance

The Center for International Forestry Research CIFOR prepared a simple set of four groups of indicators of performance [23]. They can be applied across landscapes at different scales.

According to Baral and Holmgren [23], “If all four of these are stable or improving, then we are making progress to meet sustainability targets” and using indicators from each of these groups can together assess landscape performance to stakeholders, decision makers, landowners, and policy makers. Applicable to any landscape system, this framework defined sustainability measures of landscape performance in order to identify whether a landscape is sustainably managed or if any changes are needed to reach landscape sustainability.

3.8. Selection of Indicators by Landscape Observatory of Catalonia CLoT

Ten indicators were developed by CLoT, which aided in creating a basic proposal for landscape quality in Catalonia [62], as a reduced list to guarantee their effectiveness (Table 8).

Table 8. Relevant landscape indicators from the Landscape Observatory of Catalonia CLoT.

Indicator	Brief Description
1. Transformation of landscape	Analysis of changes in the natural and cultural characteristics of landscape which alter its value or its appearance.
2. Landscape diversity	Evolution of the richness of landscape configurations.
3. Landscape fragmentation	The result of a process of breaking and splitting into pieces the continuity of a landscape and its coherence.
4. Economic value of the landscape	The capacity of a landscape to convert its features into productive resources of diverse economic value.
5. Knowledge of the landscape	The level of recognition and interaction with the landscape which a given population experiences.
6. Landscape satisfaction	The level of satisfaction or dissatisfaction with their landscape of the population living in a given area.
7. Landscape sociability	Makes it possible to ascertain social relations in its widest sense in relation to the landscape and generated by the landscape.
8. Landscape and communication	Approximation to the communicative dimension of the landscape.
9. Public and private action in the field of conservation	Monitoring public policies and private actions in the field of landscape conservation, management and planning.
10. Application of instruments of the landscape legislation	Evaluating instruments such as landscape catalogues or guidelines real contribution to public policies in landscape conservation, management and planning.

3.9. Case Studies from Netherland, Italian and English Landscapes

Landscapes in the mindsets of Dutch, Italian, and English studies are not reduced to a physical aspect that can be measured, analyzed, monitored, or mapped. It is a human being’s relation to his environment through beliefs, emotions, and senses. This explains the objective or physical qualities of a landscape in correlation with the subjective, perceptual, and sensory qualities [63].

The qualitative participation in the Netherlands was based on landscape appreciation and perception [64]. Using the Scales for Landscape Perception and Assessment SLPA methodology, the descriptions given by the public were adopted to explain all of the

social, physical, and functional factors that influence them [65]. The outcome was the “seven qualities of landscape”, which are unity, functional organization, possibility of using landscape for own activities, historical character, natural character, spatial dimensions, and sense impressions.

From the Italian perspective, landscapes are also considered to be what is perceived by the population and results from natural factors and human action in a given area. Italian landscape indicators for sustainable management only became consolidated with the new cultural context of the ELC [66].

What was just mentioned in the Dutch and Italian methodology is unlikely in the UK’s regulation of environmental standards, which monitors a set of indicators with designated criteria. However, they were able to develop 158 “emerging indicators” for future monitoring at landscape scale [67].

4. Discussion

Firstly, this study showed the increasing interest in landscape-related concepts and adoption in policies, and which landscape indicators can be developed to help assessing the sustainability of landscapes [6]. They are a non-conventional approach that can be developed at local, national, and regional scales.

A holistic approach for assessing the sustainability of landscapes is still missing [68]. Even though, a large set of LIs do exist, it might be difficult to select indicators aimed at managing and monitoring the landscape, especially since it is crucial to select a new set of non-conventional indicators that can (i) take into account visual and social indicators, (ii) express qualitative and quantitative values, and (iii) give an overview on the different landscape dimensions.

The interest in the European landscape assessment approach relied mainly on the similarity in the diversity of landscapes with the country of this current study, Lebanon. It is unlikely that there is a gap in the studies on Lebanese landscapes and their sustainability and assessment. They were only mentioned in the National Master Plan of Lebanese Territory NPMLT that underlines the most important landscapes of Lebanon and emphasizes the importance of being “a part of a general policy” [69], without going further than this. Plus, landscape sustainability is only recently becoming an interest for Lebanese researchers in the landscape field, and many attempts toward landscape policy are nowadays under discussions.

Lebanon—a full voting member in the United Nations General Assembly since 1945—has established several international agreements and ratifications in this course (Table 9), but these are mostly within the framework of sustainable development and the resource conservation of the Lebanese terrestrial landscapes.

Most agreements are used at either the territory or reserve level. In the first case, agreements are meant for preservation or protection purposes, while in the second case, for management purposes. An exceptional national commitment to the Sustainable Development Goals SDGs must be highlighted since Integrated Landscape Management is applied.

Nevertheless, the Lebanese law 130/2019 reinforces the establishment of new protected landscapes (Table 10). Considered as an essential pillar of development policy and ecotourism, Law 130/2019 consists of 23 articles aiming the prevention and protection of the natural areas in Lebanon. Five main categories are observed with no clear consideration to landscape integration, rehabilitation, or enhancement. Unfortunately, the law in Lebanon is devoid of the landscape dimension, leading to a lack in urban and rural planning, and creating inequalities and a dominance of privilege over the landscape.

Table 9. International agreements that apply to the Lebanese terrestrial landscapes.

Agreement	Publishing by Lebanese Government	Brief Description	Use	Reference
1. National Physical Master Plan of the Lebanese Territory	Decree 2009	Defines the principles of developments of territory and proposes facilities and sites of planned activities.	Territory	[69]
2. Convention on Biological Diversity	Ratification 1994 Law 360	Sustainably uses BD and develop national strategies and action plans.	Reserve	[70]
3. UNESCO Convention on Protection of Cultural and Natural Heritage	Adhesion in 1990 Law 19	Identification, protection, and preservation.	Reserve	[71]
4. The UNESCO Man and the Biosphere Program		Develop and strengthen models of sustainable development, communicate experiences, and lessons learned.	Biosphere reserve	[72]
5. Convention on Climate change 2015, updated in 2020	Adhesion	Reducing greenhouse gas concentrations to avoid man-made interference with the climate system.	Territory	[73]
6. Convention on Combat Desertification	Ratification 1996	Strategic and technical recommendations for mitigating the impact of desertification.	Territory	[74]
7. Land Degradation Neutrality	Initiative	the implementation of sustainable land management practices and institutional and legislative measures	Territory	[75]
8. Sustainable development goals	National commitments	Accomplishing the SDGs with Integrated Landscape Management.	Territory	[76]
9. Forest and landscape restoration	Initiative	Encouraging an integrated landscape management restoring resources and services provided by the landscape.	Forest	[77]

Table 10. The protected areas in the Lebanese Law.

Category	Description	Party Involved	Legal Instrument
1. Nature Reserves (Mihmiyat)	A terrestrial or marine zone created to conserve an ecosystem or endemic species.	Supervised by the Ministry of Environment MoE	Law
2. Natural Sites and Monuments	An area encompassing sites of natural or cultural importance.	Protected by the MoE	Decree
3. Protected Forests	Protected sites.	By decision of the Ministry of Agriculture MoA	Law 85/1991
4. Protected sites (Hima)	Managed and assorted by community.	By decision of the Ministry of Agriculture MoA	Municipal Decision
5. Natural Parks	A partially inhabited rural territory, with exceptional natural and cultural heritage, with the combined "strict conservation" and "sustainable use" system applied.	Under the supervision of the Ministry of Environment MoE	Law 130/2019

Community contribution is highlighted in the above table, mainly in the Hima category, where protection and management of site is initiated from the community. The different existing laws have not yet mentioned landscape preservation. However, with citizen participation, the Lebanese state can enhance, classify, and protect landscapes.

Last but not least, we must underline the drastic need for a reference to the value of Lebanese landscapes, both in urban and rural areas, defining all landscape strategic frameworks. Preserving the landscape suggested herein contributes to the preservation of the visual identity and genuineness of the natural and built landscapes of Lebanon. The proposed tool in our research (the LSA Landscape Sustainability Assessment) will present a directive toward reaching sustainability and a standardization of the changing

Lebanese landscapes. Landscape indicator-based, LSA will help propose concrete solutions, conservation, and/or correction at different scales.

5. Conclusions

Many issues have been raised, including the increasing interest in landscape-related concepts and the need to adopt them in territorial and management policies. Also, in the presence of different tools, a complexity of reference is shown within a chaotic field of application. Yet, most approaches are qualitative and based on environmental/agro-ecological indicator.

Therefore, to objectively and quantitatively assess landscape sustainability, a need arises for a new tool based on a new adaptive set of indicators. The selection of indicators will be based on existing and inventive indicators to show the best reference to landscape sustainability. That is the case of Landscape Indicators.

Some of the large sets of indicators can be adopted, but an adaptive method should be applied. That is why what has been offered so far in terms of landscape indicators can be a good example for Lebanese Landscape Indicators (LLIs) and provide clear signs of the success or failure of proposed project and policies. They will guide decision makers to prioritize the landscape and identify the weaknesses and discrimination of strength in the landscape.

LLIs must communicate clearly and precisely the features of a landscape to the citizens of Lebanon in order to facilitate and improve their understanding. Accordingly, a mixed and holistic methodology will be applied and different data types will be needed to fully contribute to the identification of landscapes, furthering the knowledge of existing challenges.

One must know that Lebanese landscapes show variability in characteristics, in physical aspects, and in functional requirements and they present a unique visual identity and genuine natural and built landscapes. They are an exceptional scenic reprieve in an integrative community, worthy not only management and design, but also conservation. They can be a great inspiration for an ideal set of landscape indicators.

Last but not least, the development of a non-conventional and holistic tool for the assessment of landscape sustainability is widely needed. Landscape Indicators are the main component for the success of the proposed tool and could be used by multiple stakeholders (such as NGOs, public authorities, cooperatives, associations, higher education institutes, etc.) to analyze the state and sustainability of landscapes, to predict the impact of new projects on the sustainability of the surrounding landscape, and finally to develop urban and peri-urban planning policies which respect the evolution of the landscape while keeping other attributes of quality.

Further studies have already been initiated to ensure the development of this tool, to settle the right set of landscape indicators, its various implementation, and further enhancement.

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