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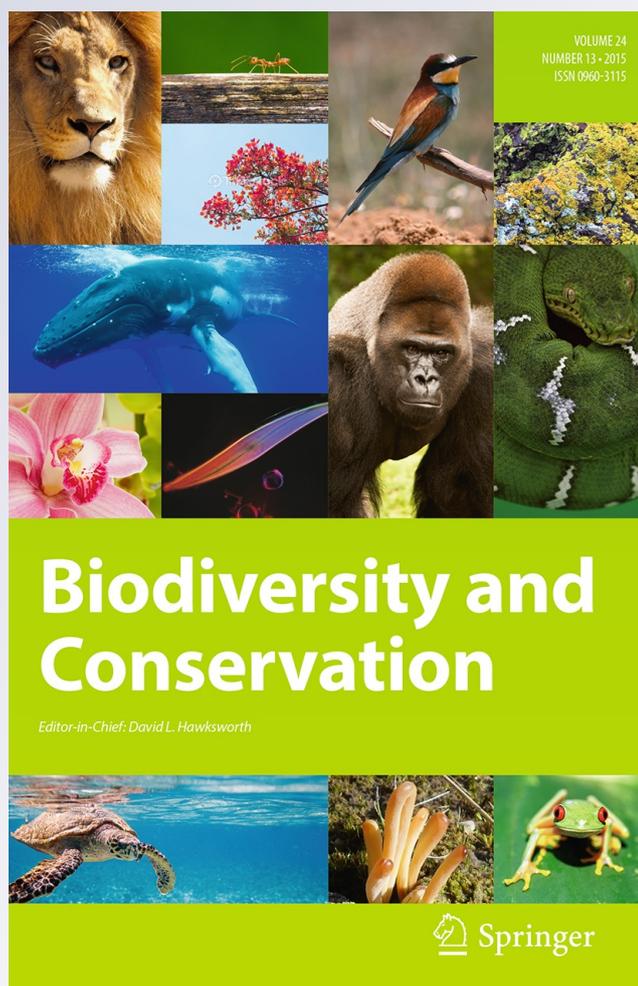
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Landscape and biocultural diversity

Mauro Agnoletti¹ · Ian D. Rotherham²

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With the convention on biological diversity (CBD) office in UNEP acting as global focal point for biodiversity, and UNESCO acting as global focal point for cultural diversity, the two institutions launched in 2010 the *Joint Programme on the Links between Biological and Cultural Diversity (JP-BiCuD)* to strengthen the linkages between biological and cultural diversity initiatives, and to enhance the synergies between interlinked provisions of conventions and programmes dealing with biological and cultural diversity at relevant scales. The first meeting for the implementation of the Joint Programme was held in Florence (Italy) in April 2014 and produced a declaration to promote the Joint Program in the European Continent. The scientific committee received 165 paper proposals. The selection operated by the Steering Committee accepted 63 papers considered highly relevant for the topic of the conference and also 11 posters, from 25 countries. The expert meeting for the drafting of the final declaration was attended by 42 experts from 14 countries and about 33 organizations, including FAO, ICOMOS, IUCN, and IUFRO among others. The Florence Declaration (UNESCO and SCBD 2014) was drafted taking into account the results of the conference works, and has not only produced political indications for the implementation on the Joint Programme, but also indicated some of the most important issues concerning research activities for the promotion of the concept of biocultural diversity:

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✉ Mauro Agnoletti
mauro.agnoletti@unifi.it

¹ Laboratory for Landscape and Cultural Heritage, School of Agriculture, University of Florence, Via San Bonaventura 13, Firenze, Italy

² Department of the Natural & Built Environment, Sheffield Hallam University, City Campus, Howard Street, Sheffield S1 1WB, UK

1. The current state of biological and cultural diversity in Europe results from the combination of historical and ongoing environmental and land use processes and cultural heritage;
2. Since it assimilates economic, social, cultural and environmental processes in time and space, the European landscape is predominantly a biocultural, multi-functional landscape. As such, it provides a crucial and effective space for integration of biological and cultural diversity for human wellbeing, including in the context of rural territories;
3. Landscapes rich in biocultural diversity are often those managed by small-scale or peasant farmers, traditional livestock keepers/pastoralists, and small-scale/artisanal fishermen;
4. To better understand the dynamic interplay between biological and cultural diversity at the landscape level and its implications for livelihoods and well-being, there is need for enhanced interdisciplinary and trans-disciplinary research of the links between biological and cultural diversity at the national and sub-national levels, including their historical background.

The Florence Declaration was presented to the Conference of the Parties of the CBD in Pyeongchang, Republic of Korea in October 2014, as well as during the ICOMOS general assembly, in Florence, in November 2014. The declaration presents a very strong reference to the concept of biocultural diversity. In terms of publications, since 1984, scientific articles have cited cultural and biological diversity, but it is only since the end of the 1990s that clear reference to “biocultural diversity” is found, with a peak of publications in 2012. Most of the publications refer to one or more of three main themes: the correlations between biodiversity and linguistic diversity, the tools for measuring the state of biocultural diversity, and the persistence and the loss of biocultural diversity (Loh and Harmon 2014).¹ However, these studies rarely take into consideration the results of the integration between nature and culture affecting the biodiversity in terms of species and habitats. There are also suggestions for the implementation of these approaches in terms of management and assessment of biodiversity in cultural landscapes and different conservation strategies. Additionally, there is a need for a deeper understanding of how these links have affected species and habitats, and for revision of the current tools for the protection and the management of resulting biocultural diversity. The Declaration indicated the landscape level as the most appropriate perspective for understanding and applying this concept, with a particular reference to the Europe. The rural landscape is predominantly a biocultural multi-functional landscape, providing a crucial platform for integrating biological and cultural diversity for human well-being. This approach provides the best basis for interpreting the relationships between cultural and biological diversity, considering landscape functions.

At the world level, besides CBD and IUCN, important conservation programmes where the concept of biocultural diversity could be introduced are the UNESCO World Heritage List (WHL) and FAO's Globally Important Agricultural Heritage Systems (GIAHS) programme (Koochafkan and Altieri 2011). Presently, these programmes do not specifically address biocultural diversity, although most of the biodiversity included in the areas protected clearly has a cultural origin (Agnoletti 2014). In the dossier prepared for the inclusion of the proposed sites in these conservation programmes biodiversity is still

¹ Professor Asami Shikida, Introduction to the Kanazawa-Ishikawa model. Interdisciplinary Biocultural Approach. Paper presented at the UNU-IAS OUIK symposium: The Ishikawa–Kanazawa Biocultural Region A model for linkages between biological diversity and cultural prosperity. Kanazawa (Japan), 28-5-2015.

assessed according to the traditional wildlife and natural habitats approaches. In most cases, even in the cultural landscapes of the UNESCO WHL, what is not farmed land is usually considered natural or semi-natural, but rarely as a biocultural entity. In the FAO GIAHS, the focus is more on the traditional practices related to farming, but the assessment of biodiversity in the applications is also mostly focused on the same approach, as also the actions listed in the management plans.

The biocultural diversity concept presents an opportunity to revise some of the current approaches to biodiversity, recognizing the wider meaning of this term and the need for a revision of the current conservation strategies. While UNESCO, FAO, and the CBD might adapt their guidelines in the near future, the 28 member states of the European Union can surely be considered as the best ground for a political implementation for the existing conservation tools in Europe. There are 35 signatory countries of the European Landscape Convention and 28 countries apply the EU Habitat Directive. This makes the European Continent probably the part of the world where the most important tools for biodiversity and landscape conservation have been developed to date. However, among the policy tools, it is important to also include spatial planning, applied in single European countries, often addressing landscape and nature conservation. The Habitat Directive (together with the Birds Directive) forms the cornerstone of Europe's nature conservation policy. It is built around two pillars: the Natura 2000 network of protected sites and the strict system of species protection. The articles of the directive and the rules for the designation of the sites into the NATURE 2000 network are clear about the aims, which are to contribute towards ensuring biodiversity maintenance through the conservation of natural habitats and of wildlife in the European territory of the Member States to which the Treaty applies. However, it does not consider biocultural diversity and landscape mosaics as a goal of conservation. A similar problem can be found in the European Criteria for Sustainable Forest Management, where values associated to landscape and biodiversity play a very minor role as well as the cultural features of forests and woodlands (Agnoletti and Santoro 2015). Nevertheless, the role of traditional forest related knowledge in shaping the forests and their biodiversity in Europe and across the world has already been stressed in several publications (Parrotta and Agnoletti 2007). Europe, as in many other places in the world, is basically a cultural landscape (Rackham 1986; Antrop 1997; Parrotta and Trosper 2012) and the cultural origin of the European Union territory has been recognized by the European Commission at least since 1999, when only 5 % of the territory was classified as natural (Agnoletti 2014). In this respect, that the Natura 2000 network covers 20 % of the European territory, poses questions about the naturalness of the areas included, as well as on the features and the origin of biodiversity, not only in the protected Sites of Community Interest (SCI), but in the entire EU territory, as in other parts of the world. The European landscape is a rich heritage built up over thousands of years that, while continuing to develop, still retains evidence of its historical origin. Furthermore, it maintains an important and active role in society and economy. The many ways in which human beings have shaped the natural landscape over the centuries has produced some of the most representative manifestations of the continent's many different cultural identities. As described by Elands et al. (2015), a recent large-scale genetic study of 3000 individuals from 36 European countries revealed that despite having lower genomic diversity than other regions, Europe's geography is reflected in its genetic composition with remarkable precision. This interdisciplinary study suggests a possible important contribution of human genetics to the understanding of biodiversity, especially in rural landscapes affected by long-term traditional practices.

Many of the world's "primary forests" and biodiversity "hotspots" are located in regions with a high diversity of local populations who manage their natural resources based

on distinctive cultures and their associated traditional knowledge and wisdom. In other rural environments a long history of integration of forestry and agricultural activities has created land-use forms and biological diversity that is closely connected to complex landscape patterns. Cultural landscapes often show a high level of habitat diversity tighten into a versatile mosaic produced by the application of different management regimes, and the introduction of a great mixture of species over the years, that came to meet specific economic, social, or environmental roles. Failure to effectively and coherently address culture and history may very well be an emerging weakness that needs to be reconciled. This is necessary to give the public and local communities confidence in the protocols designed to recognize well-managed landscapes and in moving towards the goals of sustainable management. The practical implementation of nature conservation strategies in rural territories affected by centuries of human influence, without a redefinition of biodiversity targets, taking into consideration the historical relationships between traditional agricultural practices and animal and plant species may result in conflicts with local populations. On the other hand, considering biocultural diversity and recognizing the need to conserve key habitats resulting from the reciprocating influences between people and nature, might help solve some contradictions between landscape and nature conservation. This would also help to counter-balance the widespread belief that abandonment of cultural landscapes to supposedly more ‘natural’ successions is inherently and intrinsically good for ‘conservation’ and the environment. Increasingly, this misinformation is promoted though some both popular and scientific texts.

The rural landscape as a biocultural resource

Historical rural landscapes, especially those presenting a high heterogeneity, are often related to traditional practices and provide important examples for understanding biocultural diversity. They usually maintain complex land-use mosaics, such as those existing in Europe in the nineteenth century before agricultural industrialization resulted in increasingly homogeneous land-cover characterized by intensive monocultures and afforestation of abandoned lands. Agnoletti et al. (2015) show that traditional features associated with landscapes having a historical value can be found in many regions of the world, including temperate, subtropical, and tropical countries. The diversity of these mosaics can be considered a common feature of this type of landscape. Furthermore, their conservation is not necessarily associated with the existence of traditional societies or perceived “underdevelopment”; in many cases this aspect should be formally included in conservation tools. In this respect, the establishment of the National Register of Historical Rural Landscapes and Traditional Agricultural Practices in Italy, although seen as only related to the conservation of cultural landscapes, is currently the only initiative specifically designed to conserve the biocultural diversity associated with traditional landscapes.

As discussed by Baiamonte et al. (2015), traditional systems hold ancient races of cultivated plant species whilst simultaneously supporting all organisms generally associated with natural and semi-natural ecosystems. Because of their history and the resulting social and economic context of the territory, traditional Sicilian agro-ecosystems are within a heterogeneous mosaic that includes significant elements of naturalness sprawl interspersed in cultivated areas. Due to their biological characteristics and spatial distributions, these phytocoenoses contribute significantly to the ecological connectivity of agricultural landscapes. Baiamonte et al. took for their case study the characteristics of the cultural and

natural landscape of the Madonie Mountains (Sicily). This region is a noted biodiversity hotspot in the Mediterranean. Applying GIS techniques, these researchers analysed relationships between naturalness and the presence of rare, endemic, or threatened species. The findings highlight significant interaction between traditional land mosaic structures and biodiversity. In particular, the evidence generated suggests, that a traditionally managed landscape may support a rich biodiversity and that this can be disproportionate to the area covered.

In considering rural land use and biodiversity, Bürgi et al. (2015) take empirical examples, from China, Greece, and Switzerland, to demonstrate the relevance of conceptualizing land-use intensity (LUI) to generate insights into the interconnectedness of people and the environment. They note how, in recent years, the term biocultural diversity has been promoted to raise awareness for culture-biodiversity interrelationships. They suggest that whilst in general the term may be difficult to conceptualize, it is possible to investigate specific connections between biodiversity and culture. Their paper focusses on land use, a term that is culturally coined but which has far-reaching implications for biodiversity, it also asserts that any specific impacts of land use on biodiversity depend on intensity of use. This intensity can then be considered and analysed in different ways; in which context they note the importance of the observational scale of any phenomena. The work concludes by offering different approaches on how Land Use Intensity (LUI) may be conceptualized, and detailing a conceptual framework to reflect the range of scale for relationships between land management and biodiversity.

Addressing the cultural landscapes of the island of Mallorca from *circa* 1850 to the present, Marull et al. (2015), describe the application of an intermediate disturbance-complexity approach to land-use change using ecological functionality as a proxy of biodiversity. This study considers the human appropriation of photosynthetic capacity of a landscape as a measure of disturbance, along with a selection of land metrics at various spatial scales. In order to identify the main socioeconomic drivers and the governing agencies, the research considered local land-use changes. A second-degree polynomial regression was derived to link socio-metabolic disturbance and landscape ecological roles through jointly assessed landscape patterns and processes. By showing a hump-shaped relationship where the highest level of landscape complexity (heterogeneity/connectivity) was attained when disturbance peaked at 50–60 %, confirming the proposed intermediate disturbance-complexity hypothesis. This approach demonstrates the usefulness of transferring the concept of intermediate disturbance to Mediterranean cultural landscapes. Furthermore, this finding indicates the need for the conservation of heterogeneous and well-connected, land-use mosaics. With a positive interplay between intermediate farming disturbances and land-cover complexity, it is suggested that a wildlife-friendly agro-ecological matrix will support high organismal biodiversity.

According to Amici et al. (2015), changing land-use is a major transformational force in the landscape today resulting in novel ecosystem components. Especially in developed areas, there has been a rapid decline in the traditional dynamic equilibrium between human intervention and natural ecological dynamics. Such changes generally follow the intensification of human activities or abandonment by traditional agriculture, and the consequent regeneration of more 'natural' systems. Historically, the trends and patterns do not also follow the intuitive path, as Tipping (2005) shows for southern Scotland. As climate deteriorated, responding to raised nutrients in eroded soils under increased precipitation, the local farming communities moved higher up the mountainside. This is counter to the expected and predicted abandonment of higher ground when climate worsens. However, the twin processes of intensification or abandonment may both lead to reduced ecological

complexity at the landscape scale, with significant implications for organismal biodiversity. Amici et al. (2015) address the relationship of land-use changes to contemporary diversity of plant species in the protected areas network of the province of Siena, in Tuscany (Italy). In this region, historic human activity and rapid structural changes at landscape scale perhaps make classic ecological models less able to predict distributions and changes. Their findings indicate that abandonment of typical, traditional human activities in these landscapes leads to the conversion of a complex structural matrix into a uniform, monotonous system. The results confirm what has already been reported by the monitoring system developed for the Tuscan landscape (Agnoletti 2006), showing a widespread phenomenon of reforestation in this region reducing landscape diversity up to 80 % in some areas, as also reported by Agnoletti et al. (2015). This reduced the overall diversity of the study area to produce a landscape characterized by homogeneous large areas dominated by secondary forests, often defined as semi natural by nature conservation managers, or modern agricultural settlements. Focusing on forest succession resulting from land-use change, there was a decreased species richness as stand age increased and an associated rapid loss of non-forest species. The process was probably determined by ongoing changes in habitat structure and the relatively slow colonization by genuinely forest species. With rapid loss on the one hand, but slow recolonization on the other, there is a net reduction of organismal diversity rather than a simple displacement of one community by another.

Batista et al. (2015) applied GIS spatial analysis and multi-level approaches, and provide guidelines for the integration of the different cultural and biological values in a holistic approach to landscape conservation. They present a conceptual model using results from the Évora Region in southern Portugal. This case study includes a richly diverse bio-cultural landscape with archaeological sites including old, field networks and farms spanning several epochs. The region also has multi-functional cultural landscapes with high-value agro-forestry-pastoral systems (the *montados*). Utilising earlier research, the authors identify the best-preserved areas with old cadastral systems, ecological corridor networks, and the most important *montados* landscapes. This study also presents guidelines for the development of an interpretation centre for the cultural and biological components of the region.

High organismal biodiversity is often retained in landscapes where farming practices have preserved many 'traditional' features. Babai et al. (2015) assess the impacts of conservation and agri-environmental regulations on the sustenance of selected elements in traditional hay meadow management in two such cultural landscapes, in the Gyimes in Romania and Órség in Hungary. Data gathered by semi-structured and structured interviews and discussed later with local farmers showed small-scale extensive farming to be largely overlooked in current regulatory frameworks. This applied both to landscapes where traditional farming was still active as well as to ones where it has been lost or transformed. This suggests that there is a case for providing better support for traditional farming. These authors considered approaches such as increasing the spatial scale of regulations, taking a wider consideration of socio-ecological systems, and issues such as region-specific regulations. They then argue that in landscapes with traditional, small-scale farming still present, decision-makers should acquire a better knowledge of local management practices and traditions rather than impose top-down alien practices on these farmers.

The traditional features of landscapes and their long history, as described in several papers presented in this Special Issue, are further explored by Hresko et al. (2015) for

Slovakia. Those authors identified specific textures with various patterns of landscape mosaic, with a certain degree of orderliness or regularity of landscape elements at different hierarchical levels. They consider such physiognomically distinguishable parts of the landscape to be “landscape archetypes”, each with a particular geodiversity and biodiversity, at different scales and hierarchical levels. Each archetype bears traces of origins, changes, and pressures of human activities in real-life conditions, which with the interactions of environmental factors characterize the cultural identity of the Western Carpathian Mountains.

Landscapes in and around the urban–rural interface

Elands et al. (2015) address issues of biocultural diversity in urban environments. They assert that the recognition of strong links between biodiversity and cultural diversity have been predominantly associated with traditional land-uses in tropical countries. However, the concept need not be restricted to such situations and biocultural diversity is a concept through which to explore interactions between people and nature in industrialised and globalised societies. Elands et al. explore the biocultural diversity of 20 European cities through a review of urban planning policies. They assessed the extent to which biocultural diversity is recognized and applied in urban planning and governance. Furthermore, they evaluated the biocultural diversity present in the selected cities in order to gauge the recognition or otherwise of the resource. In spite of the emerging recognition of the biocultural diversity concept, it emerged that it was hardly reflected in the policies of city authorities. Whilst the sampled interviewees provided many examples of the recognition in policies of both biodiversity and cultural diversity, the combined concept of biocultural diversity was mostly overlooked. This study highlights two manifestations of biocultural diversity in urban Europe, both associated with ecological features and cultural values. Spatially, urban biocultural diversity is understood to have two levels: (1) city level which is the domain of governmental policy makers who discuss biocultural diversity in green space networks; and (2) site level which is the domain in which citizens participate in decision-making and the management of green spaces. The former tended to be rather static and the latter were more aware of cultural dynamics.

Following that broader analysis of biocultural heritage in urban centres, Kučera et al. (2015) focus on a specific aspect of biocultural interaction. They studied the relationship between urban–rural gradients and the animal species present. The study specifically addresses the issue of urban green spaces in relation to bird conservation, a commonly reported phenomenon. However, their work addresses the avifauna of a small town, rather than in the more commonly studied context of a substantial city. In their case study, a small spa town, landscape protection supports biocultural diversity though nature conservation with respect to the urban bird populations. The researchers evaluated the impacts of microhabitats with particular reference to trees and shrubs along urban–rural gradients. The results demonstrated that the urban–rural gradient in this small town was not as significant as reported for cities. This finding was attributed to the more complicated, multi-layered vegetation structure found in the town. In terms of management practice, the authors noted the importance of vegetation continuity from the periphery to the town centre that reduced the tendency for isolated green spaces in the conurbations. Mixed deciduous and coniferous trees with spatial heterogeneity were important for small songbird species, confirming the role of highly humanized urban environments for bird species and the

usefulness of the term “biocultural diversity to describe this phenomenon”. Additional work involved a survey of park users to ascertain their awareness and appreciation of the songbirds. This highlights the importance of songbirds to park visitors, and serves as an indicator of social benefit derived from bird diversity.

Cevasco et al. (2015) draw attention to dissimilarities in the approaches of conventional historical researchers nurtured on global environmental history, as opposed to historical ecology. In the former, bio-diversification processes, as subjects of historical study, are largely ignored or subsumed into general observations concerning global change. In other cases, they are embedded in presumed ahistorical ‘traditional’ economies and practice systems. They assert that in the field of environmental and cultural conservation studies, such broad assessments are necessary prior to multi- or inter-disciplinary applications seeking to answer “common questions”. Bio-diversification processes may be considered at different timescales in, for example, paleontological and palaeo-ecological studies. In these cases, the changes studied include matters of evolutionary diversification. With recent calls for the adoption of historical perspectives in environmental and conservation research, bio-diversification processes might be addressed through specific historical and historiographical topics. Cevasco et al. suggest that a broader debate is required. Consequently, their paper discusses issues emerging from studies of bio-diversification processes in which connections between cultural and biological diversity are considered at the individual landscape level. They comment on field and documentary evidence collected during multi-disciplinary historical ecology studies of sites in the northern Apennines and the Pyrenees. Their site-based research indicates that key drivers in associated biodiversity changes at the sample sites have been medieval and post-medieval changes in management practice, as well as the development of practices of environmental resource production. They suggest that historical ecology approaches, applied locally, can raise key questions, which differ from those of the traditional archival and textual based historian. The methodology adopted in a locally based approach should use specific historical analyses, documentary, and archival sources, together with archaeological and sedimentary evidence. This answers key questions, but interestingly, also generates new research paradigms.

The biocultural nature of landscape and the consequences of severance

A major issue for sustainability and for the conservation of both nature and heritage has been the failure of planners, and of researchers whose work informs the planning process, to recognise the duality of the landscape they seek to influence. In this context, both intensification and abandonment are regarded as cultural severance (Rotherham 2009). According to Rotherham, long-term Europe-wide studies of the eco-cultural nature of landscapes and their biodiversity, have demonstrated the importance of the bio-cultural heritage. A major question, which then emerges, is in the definition of “nature”. In this sense, the human perception and psychological construct of what are ‘natural’ landscapes is often misleading. This issue becomes more than an intellectual exercise because it then influences, if not determines, the human response to landscape management. Misunderstanding of ecosystem processes and of related biodiversity in terms of the reality of the cultural aspect of ‘landscape’ becomes especially troublesome. There is a desire for wilder future landscapes (Adams 2003; Rotherham 2014) and their numerous environmental benefits are undoubted. However, abandonment of ‘eco-cultural landscapes’ is frequently

confused with ‘re-wilding’ or ‘re-naturing’, and this becomes particularly problematic. When traditional and customary uses and utilisation of landscapes occur, there is often a dramatic and rapid decline in the associated ecology (e.g. Amici et al. 2015; Baiamonte et al. 2015). In these situations, the end of tradition (Rotherham 2013), especially where confused with re-wilding, inherently leads to the demise of important and often unrecognised bio-cultural heritage (e.g. Elands et al. 2015). In practice, much biodiversity depends on and derives from long-term, predictable, sustainable, traditional or customary land uses. A loss of cultural heritage may result when traditional land-use systems decline or end, and this can be associated with a speedy decline in organismal biodiversity. Indeed, because long-term, predictable human activities have transformed environments, biocultural landscapes under traditional or customary management frequently hold the most significant and diverse ecological resources. As traditional and customary land systems decline the problems for nature conservation and heritage, already seriously threatened, become much worse. Rotherham argues that this is perhaps the most serious threat facing nature conservation in the 21st century. Additionally, such landscape transformations have dramatic and often detrimental impacts on human rural communities and economies.

The research papers published in this Special Issue propose different conceptual frameworks for understanding and assessing biocultural diversity. In order to be effective, these require better collaboration among different disciplines; something not always easy to achieve. Although good examples of interdisciplinary research exist, the present situation is not able to deal with global issues. Collaboration across faculty divides is difficult because of institutional disincentives. In particular, while it is widely recognised that sustainability studies need to benefit from collaboration between the human and social sciences on the one hand, and natural and technical sciences on the other, such collaboration happen only rarely. While advances have been made in the conceptualisation and practice of inter-disciplinary research in fields such as sustainability and nature conservation, approaches have tended to frame inter-disciplinarity as actor-led. This is instead of trying to understand that complex problems cutting across disciplines may require new epistemological frameworks and methodological practices beyond any one discipline (Holm et al. 2012). In this respect, a landscape approach allows consideration of the results of integration of environmental, economic, and social systems in time and space and the more general process of “environmental bio-diversification” that influences environmental resources (Agnoletti 2014).

Dedication

This Special Issue is dedicated to the memory of Oliver Rackham (October 17, 1939–February 12, 2015). He was a Life Fellow of Corpus Christi College, Cambridge (UK). He spent over 30 years studying Landscape in an interdisciplinary manner, bringing together cultural, historical and ecological dimensions, inspiring a generation of scientists. He will be greatly missed by all who knew him and had the honor to work beside him.

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