



Cultural ecosystem services provided by landscapes: Assessment of heritage values and identity

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ABSTRACT

This paper aims to provide a conceptual analysis of cultural ecosystem services and how they are linked to the concepts of landscape, heritage and identity. It discusses how these cultural ecosystem services can be assessed and integrated into spatial and physical planning. The paper presents two case studies to shed light on the assessment process. A case study from Sweden combines an analysis of ecosystem services with methods for documenting cultural heritage values in landscapes. A second case study from the Arafura–Timor Seas combines an analysis of cultural ecosystem services with methods for assessment of priority environmental concerns at the seascape scale.

We demonstrate that the methods from cultural heritage conservation provide tools for the analysis of historical values as well as historical drivers of change in landscapes that can add time-depth to more spatially focused ecosystem assessments. We propose that methods for valuation of cultural heritage and identity in landscapes are integrated into assessments of ecosystem services to inform policy making and physical and spatial planning for sustainable management of ecosystems and landscapes. This could also provide an approach for bringing about integrated implementation of conventions and instruments from the environmental and cultural heritage fields, respectively.

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1. Introduction

One of the main messages in the Millennium Ecosystem Assessment (MA) related to cultural and amenity services is that human cultures, knowledge systems, religions, heritage values, social interactions and the linked amenity services always have been influenced and shaped by the nature of the ecosystems and ecosystem conditions in which culture is based. At the same time, people have always influenced and shaped the environment to enhance the availability of certain valued services. MA recognises that it is artificial to separate these services or their combined influence on human well-being, but identifies six categories of cultural and amenity services provided by ecosystems and landscapes in order to facilitate valuation (MA, 2005).

Heritage values and cultural identity are two of the six categories of cultural ecosystem services recognised by the Millennium Ecosystem Assessment, the others being: spiritual services (sacred, religious, or other forms of spiritual inspiration derived from ecosystems); inspiration (use of natural motives or artefacts in art,

folklore, etc.); aesthetic appreciation of natural and cultivated landscapes; and, recreation and tourism (MA, 2005).

The Millennium Ecosystem Assessment states that the importance of cultural services and values is not currently recognised in landscape planning and management and that these fields could benefit from a better understanding of the way in which societies manipulate ecosystems and then relate that to cultural, spiritual and religious belief systems. MA also states that the ecosystem approach implicitly recognises the importance of a socio-ecological system approach, and that policy formulations should empower local people to participate in managing natural resources as part of a cultural landscape, integrating local knowledge and institutions (MA, 2005).

For terrestrial ecosystems, the most important direct drivers of change in ecosystem services in the past 50 years have been land-use and land cover changes. Landscape-scale approaches to reducing loss of ecosystem services and biodiversity have therefore become increasingly important (Sanderson et al., 2002). Sweden and other European countries have for example introduced specific forms of payments for the maintenance of grasslands with high cultural and natural heritage values (Hasund, 2009). However, local and traditional knowledge is often underutilized in decision-making about landscape and ecosystem management, which may contribute to loss of heritage values and cultural landscapes (Wu and Petriello, 2011).

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Numerous international initiatives are focusing on restoring provisioning ecosystem services in areas affected by land-use changes and biodiversity loss to ensure food and water security, e.g., programmes on support to combat land degradation in North-western China, Central Asia, Sub-Saharan Africa, Middle East and North Africa (GEF, 2009; Tengberg and Torheim, 2007). There is also a growing interest in regulating ecosystem services related to climate change, such as carbon sequestration in different types of ecosystems, including opportunities to protect carbon stocks in tropical forests, e.g. Reduction of Emissions from Deforestation and forest Degradation (REDD) (Miles and Kapos, 2008). However, cultural ecosystem services have generally been neglected by these initiatives due to the need for different scientific competencies and methods, including a historical perspective in the analysis.

A recent literature review and bibliometric analysis concluded that cultural ecosystem services have been assessed only marginally and therefore propose to link ecosystem services research with cultural landscape research to fill the knowledge gaps (Schaich et al, 2010). According to this view, the ecosystem services and cultural landscape research communities share a common interest in the demands people place on, and benefits derived from ecosystems and landscapes. Moreover, cultural landscapes are at the interface between nature and culture, tangible and intangible heritage, biological and cultural diversity. Gee and Burkhard (2010) also showed that the concepts of landscape (seascape, in their study) and place provided a useful conceptual bridge linking ecosystem functioning outcomes and cultural values in the ecosystem.

An overview of past efforts to value and protect ecosystem services concluded that more research is needed on developing non-monetary methods for valuing cultural ecosystem services and incorporating these into easy-to-use tools (Daily et al, 2009). An exclusive focus on the economic valuation of ecosystem outputs may indeed run the danger of narrowing the debate and hinder the development and application of the idea (Potschin and Haines-Young, 2011). In Sweden, the National Heritage Board has recently analysed opportunities of monetary and non-monetary valuation of cultural services but further empirical studies are needed (Soutukorva and Söderqvist, 2008). However, there have also been suggestions to remove cultural ecosystem services from the framework altogether (Fisher et al., 2009), while recognizing cultural and amenity values and benefits resulting from the other services.

The specific concept of ecosystem services is mainly based on natural science paradigms, which make it difficult to apply the concept in safeguarding of cultural ecosystem services. This is evident in published literature on ecosystem services that show a strong bias of studies carried out by researchers with the base in natural science and economics. One example is the MA publication (MA, 2005), which devotes two per cent of its total pages to cultural ecosystem services, and the assessment of The Economics of Ecosystems and Biodiversity (TEEB, 2010), which provides detailed economic analysis of ecosystem services, but no discussion of their intangible cultural values. One reason for this could be that the MA was designed to respond to government requests for information received through the multilateral environmental agreements (MEAs) and conventions—the Convention on Biological Diversity (CBD), the United Nations Convention to Combat Desertification (UNCCD), the Ramsar Convention on Wetlands, and the Convention on Migratory Species (CMS)—which are generally perceived to be the responsibility of the environment sector alone. MA focuses on the linkages between ecosystems and human well-being. The four main ecosystem services, provisioning, regulating, cultural and supporting services are inter-related in the MA concept, but, the literature shows clear tendencies of separating these categories in specialised research fields.

As defined by MA, cultural ecosystem services are one of the four main service categories. However, cultural services cannot be treated independently and depend on provisioning, regulating and

supporting services, at the same time as the expression of cultural ecosystems influences the way ecosystems are viewed and managed (MA, 2005). Interdisciplinary approaches are therefore needed to improve the understanding of cultural ecosystem services that takes into account the dynamic nature of human–environment interactions and possible synergies and trade-offs between cultural, supporting, provisioning and regulating ecosystem services.

It has been pointed out that conservation perspectives and heritage planning and management need to be better incorporated within regular planning processes, rather than operating on their own as isolated phenomena. This implies close cooperation with relevant sectors of society, such as social, ecological and physical planning (Engelbrektsson, 2008). As the Ecosystem Services Approach (e.g. Turner and Daily, 2008) is becoming a key tool in environmental decision making, there is a need for the discipline of conservation of cultural heritage to engage and influence the ecosystem services discourse. Existing international instrument for the conservation and management of cultural heritage includes the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage from 1972 that provides for the protection of the world's cultural and natural heritage places and the identification and nomination of cultural and natural properties of outstanding universal value. Furthermore, UNESCO Universal Declaration on Cultural Diversity (2001), UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (ICH; 2003) and UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions (2005) reveal an increased recognition of the importance of intangible heritage and cultural diversity within conservation and heritage preservation. These conventions aim at supporting conservation efforts, ownership, protective legal frameworks, and issues related to authenticity and how global initiatives can be implemented at a local level, where most ICH is located. The more recent European Landscape Convention (ELC), established by the Council of Europe in 2000, covers all landscapes and promotes the integration of landscapes in cultural, environmental, agricultural, social and economic policies, using a participatory approach (Jones and Stenseke, 2011). This further emphasises the need for methods and tools for integrated assessment of cultural and ecological values in the landscape to ensure informed policy making.

Against this background, this paper aims to:

1. Provide a conceptual analysis of cultural ecosystem services, especially how they are linked to the concepts of landscape, heritage and identity.
2. Discuss how these cultural ecosystem services can be assessed and integrated into spatial and physical planning.
3. Shed light on the assessment process through two case studies
 - South-western Sweden—identification of cultural ecosystem services through the use of established methods for documenting cultural heritage values in landscapes; and
 - Arafura–Timor Seas—combines an analysis of ecosystem services, including cultural ecosystem services, with established methods for assessment of priority environmental concerns, their impacts on human well-being and drivers at the landscape/seascape scale.
4. Provide some recommendations on the way forward with respect to integration of cultural heritage values and identity in ecosystem services assessments that form the basis for conservation planning and implementation, as well as policy making.

2. Conceptual analysis of cultural ecosystem services

We discuss below concepts central to the understanding of Cultural Ecosystem Services (CES) with special focus on two of the

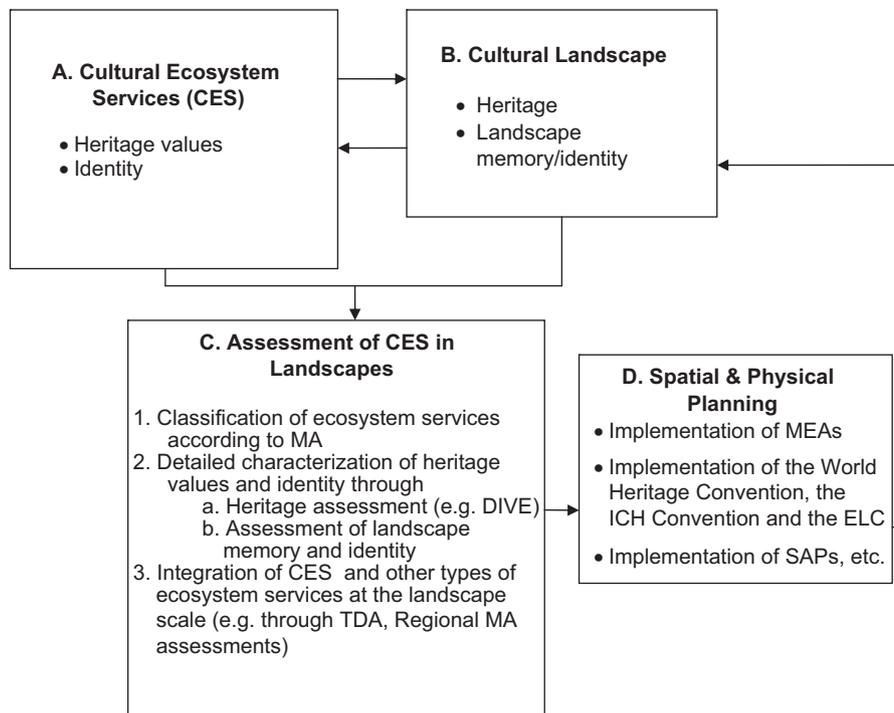


Fig. 1. Conceptual model of the linkages between Cultural Ecosystem Services and Cultural Landscape research.

MA categories: heritage values and identity. In Fig. 1, we attempt to link CES from an MA perspective to related concepts used in cultural landscape research following the approach proposed by Schaich et al. (2010). We also propose steps for assessing CES in landscapes to ensure their integration in spatial and physical planning.

2.1. Landscapes

Landscapes can be observed from many points of view. Within the Anglophone world, landscape is primarily understood as a visual feature, whereas the older Nordic concept *landskap* has a more complex meaning, including many different kinds of interactions between people and place. Within the natural sciences “landscape” commonly refers to the landforms of a region in the aggregate or to the land surface and its associated habitats at scales of hectares to many square kilometres. According to this perspective, a landscape is a spatially heterogeneous area and three important landscape characteristics to consider are structure, function and change (Turner, 1989). Landscape research conducted within the humanities and the social sciences tend to instead approach the subject from the perspective of the people who use, perceive, transform, debate and define landscapes. Landscape can be understood as an arena where conflicting interests meet, but also as sites of importance for people’s individual (Knez, 2006, *in press*) and collective (Lewicka, 2008) memories and identifications. Thus, physical places and landscapes comprise not only physical and spatial parameters but also psychological, social, historical and religious connotations (e.g. Graumann, 2002; Knez et al., 2009). Within contemporary landscape research, there is a clear focus on the complex and ever-changing character of landscapes, and the resulting challenges related to protection and conservation of landscapes (e.g. Jorgensen and Keenan, 2011; Saltzman et al., 2011).

For this paper, we adopt the definition of landscape provided by the ELC that defines landscape as an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. It includes land, inland water and marine

areas. It concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes. The ELC does not explicitly refer to ecosystem services, but advocates a cross-disciplinary approach that identifies, describes and assesses the territory as a whole (and no longer just identify places to be protected) and include and combine several approaches simultaneously, linking ecological, archaeological, historical, cultural, perceptive and economic approaches to support sustainable development of landscapes. In line with the MEAs, the ELC also adopts a participatory approach.

2.2. Cultural heritage and identity

Within the ecosystem services approach, cultural heritage values and identity are important aspects of cultural and amenity services as a whole, implying the non-material benefits people obtain from ecosystems through: spiritual enrichment; cognitive, emotional and social development; reflection; recreation; and, aesthetic experiences (MA, 2005).

Cultural heritage values is put forth within the MA as an important factor to consider within ecosystem management due to the fact that many societies place high value on the maintenance of either historically important landscapes (cultural landscapes) or culturally significant species. MA refers to heritage values mainly as special or historic features within a landscape that remind us of our collective and individual roots, providing a sense of continuity and understanding of our place in our natural and cultural environment. Heritage is thus conceptualised as landscape-related “memories” from past cultural ties, mainly expressed through characteristics within cultural landscapes (MA, 2005).

Within contemporary theory of conservation, cultural heritage is a broad and complex term, revealed in a global context by the evolving, more inclusive and integrated interpretation of the heritage concept within the World Heritage Convention in the last 30 years (Jokilehto and Cameron, 2008). Heritage can be understood as physical objects or places, something that has been passed on from generation to generation. But heritage also incorporates various practices and

intangible aspects such as language or cultural behaviour in a broader sense. This also incorporates ways to go about conserving things and choices we make about what to remember and what to forget, often in the light of a potential threat and in relation to future generations (Harrison, 2010). Cultural heritage is thus not only what former generations built up but also the way it is interpreted, valued and managed by contemporary society in our everyday life. Historical artefacts and the way practices are connected to historic features within landscapes are considered as heritage because we attribute values to them (Muñoz Viñas, 2005). Cultural heritage is therefore not static but is constantly changing and re-evaluated, interpreted in various ways by different actors.

By cultural identity, the MA refers to the current cultural linkage between humans and their environment (MA, 2005). Cultural diversity is dependent on a diversity of contemporary landscapes, generating place specific languages and traditional knowledge systems. Within contemporary psychology, cultural identity refers to the individual's sense of self as related to a range of social and interpersonal links and roles. According to Triandis (1994), culture is to society what memory is to individuals. In other words, culture includes traditions that tell *what has worked* in the past. It also encompasses the way people have learned to look at their environment and themselves, indicating a linkage between humans and their landscape. We stay *alive* by anchoring our existence to places, as pointed out by Casey (1993). A place and a landscape related memory has also been shown to comprise both personal (Taylor, 2010; Knez, 2006, *in press*) and collective information (Lewicka, 2008).

In the context of ecosystem services, we suggest a definition of cultural heritage as being features within landscapes significant in some way to the present, including not only historical objects or landscape features (cultural and natural) but also intangible aspects such as stories, knowledge systems and traditions, implying that an inclusive approach is crucial for sustainable management of landscapes. Both tangible and intangible heritage within the landscape help to maintain meanings and a sense of collective identity, emphasising the intimate linkage between cultural heritage and identity.

Within the ecosystem frame of reference, it is acknowledged that there is an artificial separation of the different cultural and amenity services. From above it is clear that the meaning/definition of cultural heritage as used in conservation/cultural landscape research stresses that “cultural heritage values” and “cultural identity” and several other CES categories defined by MA (such as spiritual and recreational values) are interrelated and overlapping. However, despite the conceptual and operational difficulties of breaking down different values into typologies as seen both within the MA and the cultural heritage concept, there is a need to facilitate assessment and integration of different values in planning and management of both cultural heritage and ecosystems. Fig. 1 illustrates the reciprocal links between the concepts of heritage values and identity as used by the ecosystem service research community and the concepts of heritage, landscape memory and identity as used by the cultural landscape research community. Based on the discussion above and on the proposal by Schaich et al (2010) to fill the knowledge gap on CES by linking ecosystem services research with cultural landscape research that has a long tradition in investigating non-material landscape values, we are henceforth treating the concepts in Boxes A and B (Fig. 1) as interchangeable.

3. Assessment of cultural ecosystem services

3.1. Ecosystem services approaches

There is a growing consensus that there is a need to assess the value of non-marketable goods and services from ecosystems to

balance the values from production related activities (Price, 2008; Vejre et al., 2010). The challenge with assessing cultural ecosystem services is their intangibility and non-use values, which often renders them difficult to classify and measure. Chan et al. (2011) use a spatial ecosystem services framework, which has similarities with the landscape approach. However, they recognize that it is not possible to map one service to one benefit for cultural services, as spiritual, inspiration and place values are not products of single experiences, but products of all manner of experiences associated with ecosystems. They therefore recommend more inclusive valuation approaches and integration with biophysical and economic service models.

The United Nations Environment Programme (UNEP) has recently published an Ecosystem and Human Wellbeing Assessment Manual (Ash et al., 2010). The purpose of the Manual is to guide ecosystem assessments by presenting “best practice” experiences. The target audience for the Manual is assessment practioners involved in designing and carrying out environmental or developmental assessments following the MA approach. The Manual mainly recommends quantitative methods and indicators for assessing ecosystem services and their trade-offs, which potentially is a problem for integration of cultural ecosystem services into the assessments. This can be illustrated by the presentation in the Manual of some indicators and possible proxies for the cultural ecosystem services assessed in MA-type assessment that for example include area of landscape in attractive condition and visitor opinion polls and number of visits to beauty spots (Scholes et al., 2010). However, an assessment of cultural ecosystem services also needs to include a historical perspective as well as the differing perspectives and perceptions of different groups of stakeholders that are not easily translated into quantitative indicators.

3.2. Assessing cultural heritage: methods and approaches within conservation

In recent years, the field of heritage preservation has started to develop more integrated approaches to site management and planning that provide clearer guidance for decisions related to physical planning and the sustainable development of landscapes. A values-based approach is most often favoured, which uses systematic analysis of the values and significance attributed to cultural resources and also places great importance on the consultation of stakeholders. Environmental economics research deals with heritage as a public good where intangibles are seen as transformative economical assets, adding economical values to assessments strategies (De la Torre, 2002; Navrud and Ready, 2002).

While it is officially endorsed only in Australia, the Burra Charter (Walker and Marquis-Kyle, 2004) is an adaptable model for site management also in other parts of the world because the planning process it advocates requires the integration of local cultural values. The main principles and procedures are based on the recognition of cultural significance, the associations between places and people, the importance of the meaning of places to people and the need to respect the co-existence of various cultural values, involving conflicts of interests and the co-management of cultural and natural significance of the same place. The distinction between the cultural and natural values is often separated for management purposes, but has proven inseparable especially within the context of indigenous/aboriginal issues. The approach thus has similarities both with the concept of cultural landscape management and the MA notion that ecosystems provides cultural ecosystem services together with more production oriented services, such as food and water, as well as climate and water regulation.

Contextual and integrated approaches to site management developed in Scandinavia are also based on the need to understand the entire landscape rather than separate fragments. The four-step DIVE-analysis (Describe, Interpret, Valuate and Enable) addresses some of the challenges which are encountered when viewing historic and cultural environments as both qualitative and functional resources (Riksantikvaren, 2009). The analysis focuses on urban and semi-urban heritage qualities as development assets, and uses terms and techniques such as time/space matrices, historic legibility, heritage integrity, and capacity for change. By means of the analysis one clarifies which social, economic, cultural and physical features have been and are important for the area's development, which physical traits have played and play a key functional and symbolic role, and which are of secondary importance. Time-depth and legibility are two concepts important within the DIVE analysis. Time-depth refers to assessment of the historical period that has most influenced the site/landscape—the older the period, the larger the time-depth. Legibility consists of the remnants and structures from historical periods that are found at the site/in the landscape. Legibility is used to describe the time-depth as well as for anchoring proposed changes in the present landscape.

It is characteristic for integrated site analysis, such as the Burra Charter or DIVE, to take into consideration the drivers of change through time, the tangible and intangible cultural qualities of the site and the way this is experienced and managed by stakeholders. These values-based methodologies derive from developments within heritage management aiming at addressing the policy-driven aspects of inclusive approaches and a broader perception of heritage.

Simultaneously there is a growing body of epistemological critique concerning the use and concept of heritage as well as the contemporary heritage planning practice, still seen as an expert-led activity concerned mainly with tangible aspects (Olsson, 2008). Heritage is separate from history (Lowenthal, 1985), and is often created in a process of categorisation (Carman, 2002). "Creating" heritage in that sense is a dynamic process that involves both an institutionalised, top-down planning process creating official heritage, and the bottom-up relationship between people, objects, places and memories creating unofficial forms of heritage usually at a local level (Harrison, 2010). Consequently, all places (landscape/seascape) have various meanings and significance depending on different perspectives. Places always have plural heritages, involving an inherent conflict concerning who defines and has the right to the official representation (Ashworth et al, 2007). The two processes of official and unofficial heritage processes and the relationship between them have given rise to critical heritage studies as an interdisciplinary field of research. Of particular interest is the somewhat uncritical, common-sense understanding of what heritage entails, often referred to as the Authorised Heritage Discourse (Smith, 2006). Results indicate that there is a need for a systematic analysis of possible, non-intended negative cultural effects of contemporary values-based integrated planning and management approaches such as the Burra Charter (Waterton et al., 2006).

Assessing cultural aspects of ecosystem services, in this case heritage and identity, certainly involves the risk of simplistic representations of what well-being may be for various stakeholders at different spatial scales, and this needs to be taken into consideration when developing interdisciplinary methods linked to the ecosystem services approach.

3.3. Integration of different types of ecosystem services in assessment and planning processes

For regional-level assessments, the UNEP Ecosystem and Human Wellbeing Assessment Manual (Ash et al., 2010) provides

guidance on how to link assessment scales and how to bridge knowledge systems and enable integration of indicators of different types of ecosystem services based on scientific as well as local and traditional knowledge. However, as discussed above, it does not provide much guidance on methods for collecting information on cultural ecosystem services related to cultural heritage values and identity. Our conceptual framework (Fig. 1) proposes ways of improving the integration of these CES into the overall assessment approach and this will also be further explored in the first case study presented below.

An earlier methodology for regional-level assessment, also developed by UNEP, is the Transboundary Diagnostic Analysis (TDA). A TDA is a widely-used tool within International Waters Projects funded by the financial mechanism of the MEAs—the Global Environment Facility (GEF)—used to assess priority environmental concerns in shared Large Marine Ecosystems (LMEs) and seascapes. The TDA is discussed here because of its spatial scale and applicability in seascapes, which is the marine equivalent of landscapes as defined in i.e. the ELC. The TDA uses the best available verified scientific information to examine the state of the environment, and the root causes/drivers for its degradation. It focuses on transboundary problems and identifies information gaps, policy distortions and institutional deficiencies (Sherman et al., 2009). The TDA provides the technical and scientific basis for the logical development of a Strategic Action Programme (SAP) that is based on a reasoned, holistic and multi-sectoral consideration of the problems associated with the state of and threats to transboundary water systems and resources (Pernetta and Bewers, 2012). A TDA is also a valuable process for multi-lateral exchanges of perspectives and stakeholder consultation as a precursor to the eventual formulation of a SAP. The applicability of the TDA approach to conduct integrated assessment of ecosystem services is tested in the second case study.

4. Case studies

This section presents two case studies that intend to highlight how identification of CES can be integrated into existing methods for documenting cultural heritage values in landscapes (e.g. DIVE) as well as methods for ecosystem-based assessment and management of larger landscapes/seascapes (e.g. TDA/SAP).

4.1. Glommen landscape—county of Halland, SW, Sweden

The first case study was conducted in two parts, focusing on *Glommen*, situated in the county of Halland in south-western Sweden, Fig. 2. *Glommen*, a former fishing village dating back to the late 19th century, is today a fast growing residential area due to its vicinity to both the sea and urban areas.

The initial assessment was done as part of a master thesis at the Department of Conservation, University of Gothenburg, with the purpose of documenting cultural heritage values of an area within *Glommen* using the DIVE methodology. The case study area, called *Långaveka*, consists of ten properties along a road structure dating back to the early 1800s surrounded by pastures, agricultural fields and a Natura 2000¹ nature conservation area. *Långaveka* was at the time subjected to a new local development

¹ Natura 2000 is an EU wide network of nature protection areas. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats. Natura 2000 is not a system of strict nature reserves where all human activities are excluded. Whereas the network will certainly include nature reserves most of the land is likely to continue to be privately owned and the emphasis will be on ensuring that future management is sustainable, both ecologically and economically. The establishment of this network of protected areas also fulfills a Community obligation under the CBD.



Fig. 2. Space-time matrix showing an overview of Glommen and the case study area, Långaveka.

plan involving 35 new properties to be built on former agricultural fields currently used for pasture (Karlsson, 2008). Långaveka had no official conservation status although the physical plan for the area acknowledges it's built up structures as characteristic for Glommen as a whole. Thus, using the terminology of the European Landscape Convention, the case study area would be characterized as an everyday landscape.

The DIVE methodology propose a time/scale matrix as an initial state of reference for further discussions with relevant stakeholders about aspects of the cultural heritage that needs to be addressed within future developments. The time-scale matrix is used not only to organize collected data, but also to analyse how societal changes have affected the structures and functions (landscape and local level) and expressions (detailed/object level) at the site. Aerial photographs, historic and contemporary maps, historical records, semi-structured interviews with key informants (living in the area, part of the local historic society and working within the planning department of the municipality) and quantitative inventories of the built environment were systemised and analysed within the matrix (Karlsson, 2008). The aim was to put historical features and contemporary values of the site in its societal context, to highlight qualities and identify resources for future development, and to draw attention to the cultural heritage values of the area, identified by stakeholders and expert analysis.

As a second step of analysis, the cultural values model (Stephenson, 2008) also used by Gee and Burkhard (2010) was used to further examine Långaveka, since it provides an integrated conceptual framework for understanding the potential range of values present within a landscape. It assumes that culturally valued aspects of a landscape comprise relationships, practices and forms, embedded within temporality. Cultural values within a landscape are thus often identified as tangible and intangible, implying some value aspects as time related (often identified by those with longer experience of a particular landscape). The term *surface value* are the perceptual response to the directly perceived

forms, relationships and practices, while *embedded value* arise out of an awareness of past forms, practices and relationships, i.e., heritage.

The time/scale matrix was re-used (Table 1), summarizing the historical legibility of the area (results of direct and indirect drivers of change through time still visible today). Based on the collected and systemised data, surface and embedded values including possible ecosystem services within the cultural landscape were identified. The incorporation of cultural ecosystem services within the matrix was done by re-analysing the original material through triangulation of information using the original case study and expert analysis by experts from the fields of conservation of cultural heritage and environmental conservation, respectively.

The result from the first part of the study showed that the area has retained the character from the 1870s despite extensive exploitation of adjacent areas. This was mainly due to the intact ownership of land and continuous use and appreciation of functions and aesthetics of the landscape and the built environment. At first, the nature conservation area proved not only to have important natural values such as birdlife, intrinsic aesthetic values and recreation possibilities, but was also considered valuable because it functioned as the visual connection to the sea and the lighthouse, an important landmark of cultural heritage value. The remaining agricultural field currently used for pasture was not in the first stages of analysis identified by immediate stakeholders as an important part of the cultural heritage of the area, although it had contemporary use-value. However, when addressing the area as a landscape and looking at the development of Glommen as a whole, the open fields proved to have a more noticeable position, as an important supportive component to the legibility of historical features of the area, giving the site its distinctive character.

The DIVE methodology promotes a landscape approach to identifying and assessing cultural heritage values. The case study attempts to demonstrate how the DIVE method and its time/scale

Table 1
Time/scale matrix summarizing the historical legibility of the area (A) with identified surface/embedded values as well as ecosystem services on different scales (B).

A Drivers of change	Landscape (<i>Glommen</i> as a whole)	Local (case study area)	Detailed/object (within case study area)
<p>1965–2007 Economic shift: Continued housing developments inland. Increasing land-use change on former agricultural land. Regulations concerning natural environments within <i>Glommen</i> have been passed, but no official regulation of cultural heritage exists.</p> <p>1925–1965 Economy less dependent on agricultural land and fishing industry. Population growth increased traffic with new roads.</p> <p>1800–1925 Development of economy based on small scale agriculture and fishing industry.</p>	<p>Legibility <i>Glommen</i> as a whole constitutes a growing residential area with extensive housing developments. Rapid development creating homogeneous character within new areas, architecturally distinct from previous built up areas.</p> <p>Legibility Housing developments inland towards north and west of new major road with distinct homogenous architecture.</p> <p>Legibility Farmhouses inland and traditional architecture along the harbour.</p>	<p>Legibility Former agricultural land within case study area develops into grazing land for horses.</p> <p>Legibility Traffic diversion leaves the case study area fairly unexploited. The architectural and structural main character of the place is left unaltered.</p> <p>Legibility Cluster of houses along the most important road leading from inland towards the coast, still intact with open surrounding landscape.</p>	<p>Legibility House expansions. One building is demolished.</p> <p>Legibility The mill turns into living area with necessary alterations. A few new houses built up. Barns reused as garages.</p> <p>Legibility The road structure, adjacent traditional farmhouses and a mill, stone walls marking properties.</p>
B	<p>Surface values Built environment with architectural and environmental diversity, with extensive contemporary housing developments alongside preserved historical and natural features.</p> <p>Embedded values and ES Economy connected with fishing industry still part of the identity of <i>Glommen</i> as a whole. The diversity of aesthetic expressions and the clearly distinguishable identities within the area stimulates inspiration considering time-depth and historical information within the landscape as a whole. Gradual alteration of the natural ecosystems from a near pristine ecosystems along the coast providing habitat for biodiversity as well as supporting and regulating ecosystem services into agricultural land, residential areas, etc. with loss of supporting and regulating ecosystem services and increase in provisioning and cultural ecosystem services.</p> <p>The current diversity within the community consisting of both green and built up areas are vital for the well-being of residents and visitors reflected in the use of the case study area for recreational walks and increasing house prices, and maintain regulating and supporting ecosystem services related to climate, water, pollination, etc.</p>	<p>Surface values Due to absence of physical planning, the case study area develops slowly, creating a heterogeneous character when compared to newly constructed areas. The case study area thus remains architecturally and structurally distinct from adjacent development areas, being part of a cultural landscape with heterogeneous historical features, managed by immediate stakeholders. The use value of the area used for keeping horses also serves as a structural precondition for understanding the development of the area. Embedded values and ES The clear historic legibility relates to a sense of place identified by immediate stakeholders, associated with traditional knowledge systems relating to former economies and features within the cultural landscape. Green open spaces provide regulating ecosystem services related to pollination and biodiversity.</p>	<p>Surface values Historical features from the period 1800–1925 are most characteristic within the case study area. Buildings with traditional architecture, stone walls marking limits of properties, intact integral road system etc. are visible and understood within case study area. New features or house expansions are integrated within an architectural tradition with maintained characteristics considering scale, colour, placement etc. Embedded values The consistent architectural traditions are part of an appreciation for characteristic building traditions within the community with strong links to the local landscape. Vivid memories and stories told about former uses and functions.</p>

matrix can be used to identify ecosystem services relating to cultural heritage information. The central idea of an ecosystem services approach is for assessments to be inter- and transdisciplinary, where no individual component should be looked at in isolation. There is a seemingly linear analytical logic of the ecosystem services approach, viewed as something of a “production chain” linking ecological and biophysical structures and processes at the start and aspects of human well-being at the end, by Potschin and Haines-Young referred to as “the cascade analogy” (Potschin and Haines-Young, 2011) adapted by De Groot et al. (2010). However, valuation is not the final outcome of an assessment. Rather, value should be seen as one of the essential elements that should be considered in any full analysis

of an ecosystem service. The value people place on natural surroundings can be triggered and connected to the ecosystem in many different ways. To move away from well-being as something of a one-dimensional “Black box” (see Fig. 4) at the end of the line of an ecosystem service assessment (Fish, 2011), there is a need to understand how well-being maps back onto the services that nature provides. Through the identification of what people value as cultural heritage on a landscape scale, significant biophysical processes and structures can be recognised and problematised (Potschin and Haines-Young, 2011). After extensive land use changes as shown in the matrix, the open space have diminished and serve different, but still important purposes today.



Fig. 3. Map over the Arafura and Timor Seas region, showing provinces in Indonesia and State boundaries.

The matrix presented in Table 1 only constitutes part of the initial steps of the DIVE method, but using our conceptual framework (Fig. 1), it nevertheless illustrates how cultural ecosystem services can be identified using an analysis of cultural landscapes and place-specific analysis of cultural heritage. Heritage within the case study area are to a great extent dependent on, as well as a result of, the symbiosis with the historical development of its natural surroundings, agricultural development, and the built up environment still visible and used within the area. The case study thus illustrates that the DIVE methodology can provide a tool for identifying CES within an everyday landscape. The concepts used within the field of conservation of cultural heritage, describing material and immaterial heritage values associated with the cultural landscape, could thus serve as a springboard for further research on heritage values within the ecosystem services concept. The subsequent step would be to better integrate the analysis of CES's (cultural heritage values and identity) with other types of ecosystem services to inform physical planning at the landscape scale, which is a challenge that will be explored in the next case study. Furthermore, in-depth analysis of cultural identity, which can be linked to individual landscape memory, also requires the integration of methods from the field of psychology amongst others.

4.2. Arafura–Timor seascape, southeast Asia

The second case study comes from Arafura and Timor Seas (ATS) that are linking the Indian and Pacific Oceans and playing an important role in global ocean circulation (De Deckker et al.,

2003), Fig. 3. At the regional scale, the ecosystems of both seas are important players economically and ecologically for the four littoral nations bordering the ATS: Australia, Indonesia, Timor Leste and Papua New Guinea. The case study is drawn from an international programme for the Coral Triangle in Southeast Asia, and a project under the programme entitled Arafura and Timor Seas Ecosystem Action Programme (ATSEA) that are funded by the Global Environment Facility, the financial mechanism of the MEAs (ATSEA, 2012; Tengberg and Cabanban, in press; Zavadsky et al., 2011).

The TDA² methodology used for the ATSEA programme follows GEF International Waters best practice guidance,³ which has been combined with the ecosystem services framework developed by the MA that links environmental degradation to loss of ecosystem services and impacts on human well-being. The methodology thus consists of the following steps:

1. Identification and initial prioritisation of transboundary problems.
2. Gathering and interpreting information on impacts on ecosystem services and human well-being of each problem.
3. Causal-chain analysis based on the MA framework that identifies direct and indirect drivers of loss of ecosystem services.
4. Completion of an analysis of institutions, laws, policies and projected investments.

² Transboundary Diagnostic Analysis.

³ <http://iwlearn.net/>.

The priority environmental concerns, which were identified, include (Alongi, 2011)

1. Unsustainable fisheries and decline and loss of living coastal and marine resources.
2. Modification, degradation and loss of coastal and marine habitats.
3. Marine and land-based pollution (e.g. marine debris, sediments, oil spills).
4. Decline and loss of biodiversity and key marine species.
5. Impacts of climate change.

As part of the TDA, a Causal Chain Analysis (CCA) was conducted to identify the direct and indirect drivers of the priority transboundary problems and their impacts in the Arafura and Timor seas. The participants in all the TDA meetings held in Indonesia, Timor-Leste and Australia are listed in Annex 2 in the TDA report (ATSEA, 2012). The CCA was developed in two participatory workshops with experts from the four participating countries with backgrounds in fisheries, environmental conservation, social anthropology, law and law and planning. The CCA sessions of these workshops were led by the lead author of this paper, who also revised the GEF TDA methodology to better integrate the ecosystem services concept, a need that was recently identified in a global review of the concept of large marine ecosystems and its institutional relevance for ecosystem-based management and development (Tengberg and Andreasson, 2012).

Australian experts were drawn from: the Australian Institute of Marine Science; Charles Darwin University; Australian Fisheries Management Authority; Northern Territory Government; Department of Sustainability, Environment, Water, Population and Communities.; Northern Territory Fisheries Department of Resources; and Australia National University. Indonesian experts were from: Centre for Fisheries Management and Fish Conservation; Centre for Marine and Coastal Resources Research and Development; Bogor Institute of Agriculture; Indonesian Institute of Sciences; University of Pattimura; University of Padjadjaran; University of Fisheries; University of Indonesia; Indonesian Tuna Fisheries Association; and Coral Triangle Centre. Timor Leste participated with five experts from the Ministry of Agriculture and Fisheries. Papua New Guinea only participated in the second workshop with three experts from the National Fisheries Authority, as they were not yet a full member of the ATSEA programme. The CCA was also informed by the already completed biophysical, socio-economic and governance assessments for the ATS (Alongi, 2011; Ariadno, 2011; Stacey et al., 2011). Finally, the completed TDA and CCA were validated by the Regional Scientific Committee of the ATS project before being officially endorsed by the Project Board comprised of official government representatives and the United Nations.

The CCA methodology developed for the Arafura and Timor seas TDA was based on a combination of the approach used by the Global International Waters Assessment, the Orange-Senqu TDA and the MA (GIWA, 2002; MA, 2005; ORASECOM, 2008). The methodology aims to link the sectors and drivers of transboundary problems with the impacts of the problem on ecosystem services and human well-being. The advantage of this approach is that it aids in the identification of well-targeted interventions that can address both institutional and technical solutions to the problems.

The causal-chain analysis for Priority Environmental Concern 2 is presented in Fig. 4. Decline and loss of biodiversity and key marine species have serious impacts on the functioning of the overall ATS ecosystem and the services it can provide.

Impacts include

- Negative impacts on provisioning ecosystem services include loss of food production from key coastal and marine habitats, loss of access to timber from mangroves for housing, fuel and boats, reduced income and loss of genetic resource.
- Negative impacts on cultural ecosystem services include loss of cultural identity associated with certain habitats, including ability to carry out cultural and spiritual practices, such as burials in mangroves, loss of tourism and recreational opportunities, loss of educational opportunities, decline in local ecological knowledge, skills and technology pertaining to habitat management, and loss of opportunities for social and cultural capital (e.g. women gathering/ harvesting together).
- Loss of regulating ecosystem services include loss of hydrodynamic barriers and protection from erosion from storm surges by mangrove swamps, loss of connectivity among habitats, decline in coastal water quality, decline in freshwater quality from groundwater salinization, as well as reduction in carbon sequestration in mangroves and sea grass beds.
- Impacts on supporting ecosystem services include loss of nursery function of habitats, alteration of nutrient cycling, reduction in primary and secondary production, increase in acidsulfate soils, and change to microclimates.

The loss of these ecosystem services also have negative impacts on human well-being in terms of loss of access to safe food and water, and traditional medicine, which affects health. It also leads to loss of livelihood opportunities and increased vulnerability of coastal communities, as well as reduced social security caused by break down of social systems and cultural norms. Direct drivers in the Mining/ Energy and Transportation sectors that need to be addressed include oil spills and pollution, mining in sensitive areas, and development of infrastructure, such as ports and roads. In the capture fisheries sector, destructive fishing, practices involving bottom trawling, dynamite and cyanide fishing, etc. are key problems coupled with overharvesting and market demand for marine species. Indirect drivers that need to be addressed include lack of regulations and enforcement as well as safety standards, market demand, overlapping mandates between sectors, local development and lack of best practice.

This case study clearly demonstrates the central role of cultural ecosystem services in an overall assessment of ecosystem services at the landscape/seascape scale (Fig. 1, C.1). The great number of CES that are being lost due to environmental degradation as identified in the participatory workshops demonstrate in itself the significance of this category of ecosystem services and the need to take CES into consideration in trade off analysis of different ecosystem services. However, there are still considerable challenges involved in quantifying CES and further qualitative assessments need to be undertaken. According to our conceptual framework the loss of cultural identity associated with the loss of certain habitats, such as mangroves, could for example benefit from place-based assessment of CES using tools from the field of cultural heritage studies and psychology (Fig. 1, C.2). In the case of Australia, where 70% of the remote northern coastline is owned by indigenous people that account for around 25% of the total population in the Australian part of the ATS region, the Burra Charter could become linked to the assessment of CES, just as in the case of the DIVE method in the first case study. In the ATS region, co-management of cultural and natural significance of the same place is of paramount importance and the preservation of cultural heritage goes hand-in-hand with implementation of the MEAs, such as the CBD and the Ramsar convention (Fig. 1, D).

The analysis of ecosystem services undertaken for the ATS region will be used is currently being used to formulate a Strategic Action Programme for the seascape that will address threats to all types of

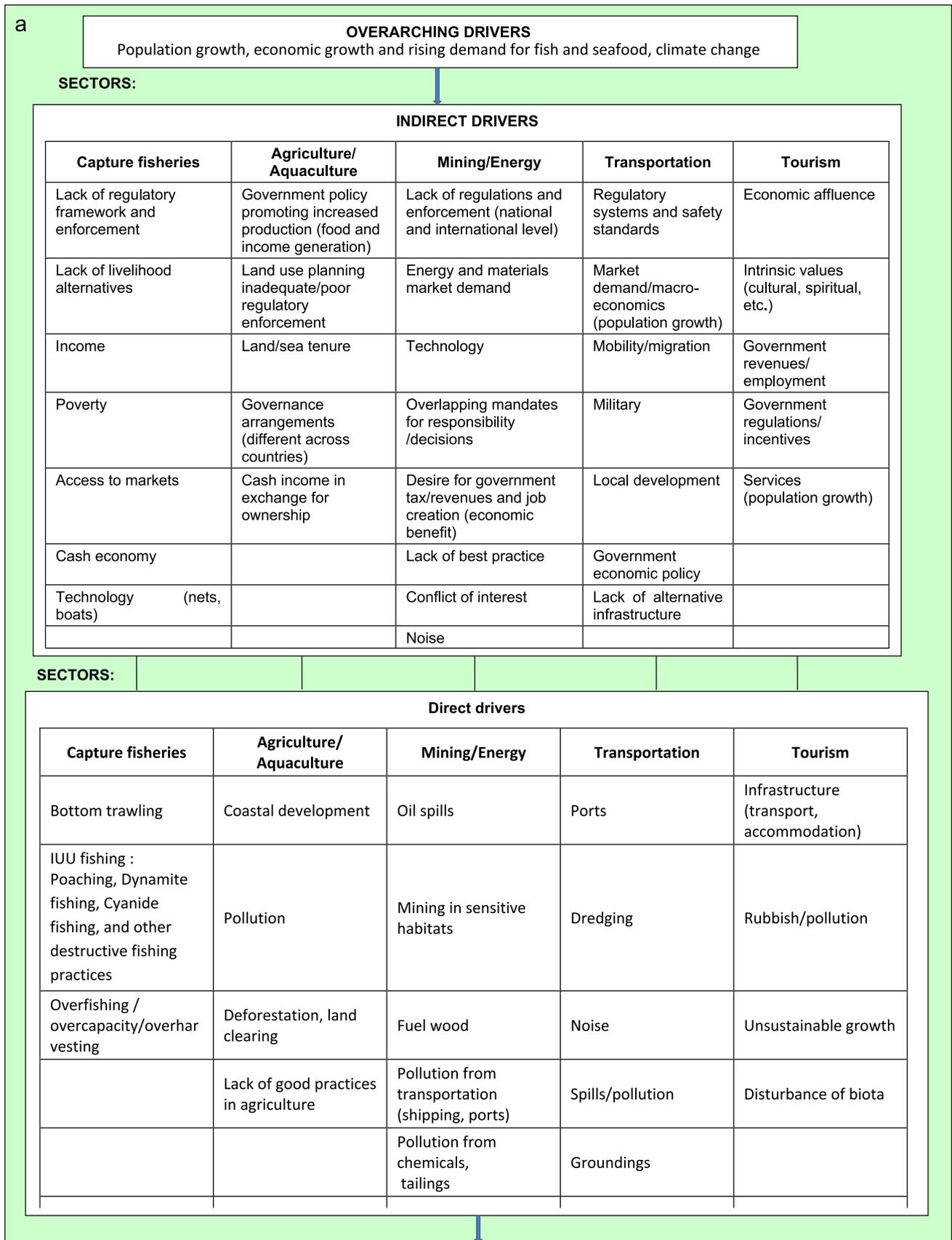


Fig. 4. (a) Causal chain analysis for modification, degradation and loss of coastal and marine habitats in the ATSEA; (b) Causal chain analysis for modification, degradation and loss of coastal and marine habitats (continued).

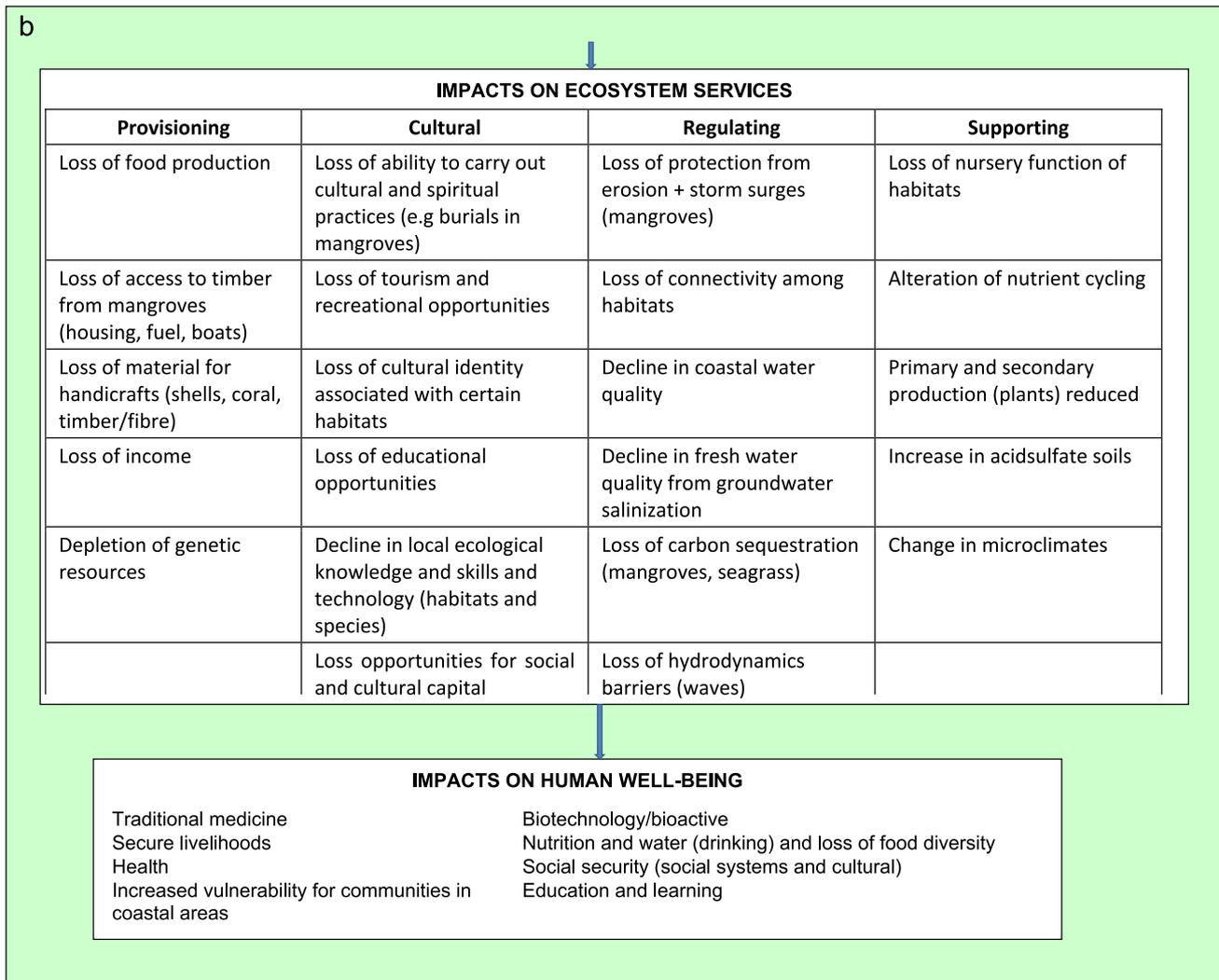


Fig. 4. (continued)

ecosystem services important for environmental sustainability and human well-being, including CES. This clearly demonstrates that in situations when it is not possible to undertake a quantitative assessment of ecosystem services due to constraints such as the intangibility of many CES, policy relevant recommendations can still be made based on qualitative assessments and trade-off analysis made by stakeholder groups representing different perspectives.

4.3. Discussion of case study results

In spite of differences of scale (local and regional), type of landscape (cultural landscape and seascape) and methods from different disciplinary perspectives (DIVE and TDA) the case studies presented above provide some general lessons. Starting at the local level, analyses of cultural heritage still often emphasise architectural and material aspects of the environment, although new participatory methods are developing rapidly within the cultural heritage sector to capture local perceptions and values. CES and equivalent terms of intangible values used within the field of conservation of cultural heritage, could serve to address embedded values for further analysis using existing tools for assessment of cultural heritage values, such as DIVE, as demonstrated in the *Glommen* case study. DIVE or other value-based assessment methods could potentially also be applied in the Arafura and Timor seas region. The ecosystem services framework developed by the Millennium Ecosystem Assessment also highlights

other types of ecosystem services generated by contemporary landscapes, which adds to the understanding of interlinkages between CES and other ecosystem services and nature.

At the regional level, the subsequent step would be to better integrate the analysis of CES—cultural heritage values and identity—with other types of ecosystem services to enable trade-off analysis to inform physical planning at the landscape scale. The ATS case study provides an approach for integrated assessment of ecosystem services allowing identification of different types of ecosystem services, even when quantitative information is not available. It could also become a useful tool for linking the loss of ecosystem services to driving factors in key sectors. On the other hand, the DIVE method as well as similar methods from cultural heritage conservation, provide tools for the analysis of historical drivers of change in landscapes important to understand when devising management and conservation strategies at the landscape scale. This would add time-depth to the more spatially focused TDA approach and the MA-type assessments discussed in the UNEP Ecosystem and Human Wellbeing Assessment Manual.

5. Concluding discussion

There is a need to bridge the gap between the ecosystem services approach promoted in recent years by international

organizations in the implementation of the MEAs (i.e. CBD and UNCCD), and cultural landscape and heritage research promoted by the World Heritage and ICH Conventions, and the ELC. For example, the Swedish Environmental Protection Agency, sees opportunities to handle some of the issues related to the implementation of the ELC in its work to meet the environmental targets linked to inter alia the implementation of the CBD. But it also emphasises the risk that this approach may make it more difficult to reach the environmental targets due to additional requirements (SNH, 2011). This kind of attitude risks creating a parallel path for the implementation of cultural landscape and heritage related conventions that is separate from that of the environmental conventions, despite the expressed need to work across disciplines and to link nature conservation with cultural heritage preservation and to integrate information on cultural ecosystem services with that related to provisioning, regulating and supporting services.

Both sides have much to learn from the other. The so far quite simplified notion of cultural ecosystem services among the ecological research community could be enriched by many decades of research on cultural landscapes and their heritage values adding a historical perspective to the analysis of ecosystem services and the design of management and conservation strategies. Cultural landscape research could, on the other hand, benefit from a practical tool for analysis of different values and their trade-offs at the landscape scale based on the ecosystem services framework and the four types of ecosystem services it distinguishes among—provisioning, regulating, cultural and supporting ecosystem services.

There is a need to move away from the sectoral approach to management and preservation of cultural heritage and link it to conservation of landscapes and ecosystems, also ensuring harmonised implementation of relevant international instruments, such as the ELC and CBD as well as other relevant action plans and conventions. This paper identifies possible ways for enhancing collaboration and integration across disciplines in conservation of cultural heritage and nature, but further efforts are needed to bridge the gap between different approaches and scientific traditions. It is also recognised that there is a need to gather evidence of how values of heritage can be better understood and related into economic terms and systems, which could be accomplished through a number of case studies in different settings and planning situations (Engelbrektsson, 2008). It is at the same time essential to acknowledge the critical heritage discourse in order not to simplify or generalise neither heritage nor environmental issues. One major challenge concerning both conservation of heritage and ecosystem services is describing the exact spatial extent of a particular service and who should be incorporated in the value assessment and why. It is our intention to gather further evidence from new case studies on how to assess and integrate the tangible and intangible values of cultural heritage in ecosystem services assessments and to link this to conservation planning policy making related to sustainable development and management of landscapes.

We conclude that

- The ecosystem services approach provides a useful tool for bringing different disciplines together to identify the heritage values of a landscape/seascape from different perspectives.
- Our study confirms previous results showing that the concept of cultural ecosystem services can be combined with cultural landscape research.
- We propose that established methods for valuation of cultural heritage and identity in landscapes are integrated into assessments of ecosystem services to inform policy making and physical and spatial planning for sustainable management of

ecosystems and the environment. Temporal and spatial drivers of change need to be integrated into the analysis of CES.

- Combining methods as suggested in our conceptual framework can provide an approach for integrated implementation of international conventions and instruments from both the environmental and cultural heritage fields, such as the CBD, the UNCCD and the World Heritage and ICH Conventions as well as the European Landscape Convention. This is becoming even more urgent given the global challenges of adapting to climate change and rapid land-use change.

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