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Cultural ecosystem services provision in response to urbanization in Cameroon

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ABSTRACT

In Africa, cities are unable to accommodate population growth within their current administrative limits, putting pressure on ecosystem services (ES) in peripheral areas. Existing ES related studies in the region were conducted in East and South Africa, and rarely focused on cultural ES in peri-urban areas. This study aimed to assess changes in the value of cultural ES in two peripheral areas of Yaoundé, Cameroun. It applied the concept of ES through participatory geographic information systems (PGIS) to understand how the value of cultural ES has changed over time and how residents perceive it. It also considered the impact of land management by relating changes in ecosystem service provisioning areas (SPA), with the current land tenure system. We focused on two study areas, Mbalngong and Nkozoa, which were selected for their high urbanization rates. PGIS activities were conducted during twenty semi-directive interviews and one workshop per site. We found that the provision of ES decreased by more than 90% within an 18-year period, from 2000 to 2018. The lack of randomness in the distribution of ecosystem services showed that SPA had distinct functions for residents, but that this was not taken into consideration in planning decisions. We showed that current land management strategies are influenced by the land tenure system and do not incite landowners to preserve their parcels and associated SPA. While direct subsidies may not be appropriate, other approaches such as community land trusts may be more advisable for the preservation of SPA.

1. Introduction

Africa is the fastest urbanizing continent on the planet; by 2040, it is expected that the urban population will have doubled to reach a billion, at an annual growth of up to 4% (Lall et al., 2017). However, cities are unable to accommodate this growth within their current administrative limits, which, in turn, puts pressure on ecosystems in peripheral areas and satellite towns (Briggs and Mwamfupe, 2000; Schlesinger et al., 2015; Chenal et al., 2018). Despite the need to preserve the diversity of ecosystems near cities to ensure human well-being, many ecosystem service provisioning areas (SPA) now overlap with potential building zones in peripheral areas (Haase et al., 2012; Baró et al., 2017). Ecosystem services (ES) can be defined as "the benefits that people derive from biodiversity and ecosystem functions" (Wu, 2014). The Millennium Ecosystem Assessment defined ES using a typology of "supporting", "regulating", "provisioning", and "cultural" (MEA, 2005), but studies suggested the risk of double counting between supporting services and other ES (Grunewald and Bastian, 2014: 46; Haines-Young and Potschin, 2010). The common international classification of ecosystem services (CICES) attempted to overcome this by classifying ES into three main categories: provisioning, regulation and maintenance, and cultural (Haines-Young and Potschin, 2011). Recently, Díaz et al. (2018) argued for a paradigm shift from the concept of ES to the notion of nature's contribution to people (NCP) to '*recognize the central and pervasive role that culture plays in defining all links between people and nature*'. However, some authors argued that the ES approach was not failing to engage perspectives from social sciences, and that recent work on cultural attempted to address the complexity of socio-ecological systems (Braat, 2018; Maes et al., 2018). To build on existing work and strengthen scientific cohesion, this study uses the concept of ES, and is based on the CICES classification. The evaluation of ES reflects the dynamic relationship between humans, the environment and the socio-economic context (Fagerholm et al., 2012).

Most of the ES-related studies on Africa have been conducted in Kenya, South Africa and Tanzania (Wangai et al., 2016). Fagerholm et al. (2012) assessed cultural ecosystem services in a rural village in Tanzania. Research on rural contexts was also conducted in Ethiopia (Dorresteijn et al., 2017), northern Kenya (Cuni-Sanchez et al., 2016) and southern Madagascar (Von Heland and Folke, 2014). Nevertheless, it is widely accepted that more attention should be paid to urban and

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peri-urban ES in order to tailor resource management decisions and policies to mitigate the demographic and land-use impacts of the increase in population density in peripheral areas (Derkzen et al., 2017; Wangai et al., 2016).

While the majority of studies in Africa focused on more than one ES, provisioning ES dominated all ES categories. Cultural ES are the least studied category (Wangai et al., 2016). However, cultural ES are frequent in peri-urban and rural areas, where the landscape is important for customs, rituals or beauty, and their associated values vary along the urban-rural gradient (Fagerholm et al., 2016; Bagstad et al., 2017). Few studies assessed the evolution of cultural ES in a rapidly urbanizing city (Estoque and Murayama, 2013; Thiagarajah et al., 2015). However, it is important to understand whether the value of cultural ES has changed due to urbanization, and how residents perceive it.

The provision of cultural ES can be largely influenced by land management (Karrasch et al., 2014; Le Maitre et al., 2014). In the context of fast urbanization, sustainable land management is a major challenge. Despite many research conducted on the topic, land management remains a key issue in urban planning and urban management (Kalabamu, 2000; Tura, 2018). It is often addressed from an anthropological or financial perspective, which may fail to capture broader considerations such as the environment or wellbeing (Batungi and Rüther, 2008; Ghebru and Lambrecht, 2017; Thebe and Rakotje, 2013). In Africa, a large share of the urban population is clustered in peri-urban areas, where agricultural land has been converted to building zones by customary landowners (Mouafo, 1994). Urban dwellers are pushed towards peripheral areas due to the high cost of land or rents in the city center (Sawyer, 2014). Customary landowners are key players of the land market in peripheries, where administrative and financial monitoring is less effective than the city center (Choplin, 2006; Trefon, 2009, pp 15–36). They are often the only land providers, and sell untitled parcels to an increasing number of newcomers (Andreasen et al., 2017; Mabin et al., 2013). The customary land tenure system is tolerated, but the city is growing outside current administrative boundaries and tensions arise between public, private and rights about land ownership (Mabin et al., 2013). In that, land resources are considered as financial products, and an increasing strain is put on the provision of ES. The land tenure system is key to land management. However, the concept of ecosystem services could provide an important alternative to current land management approaches.

Participatory approaches are helpful in assessing the social complexity of cultural ES and are particularly useful in data-poor regions. Such tools are useful for including residents' perceptions, uses and values as part of a spatially explicit approach. Participatory GIS (PGIS) are frequently used in developing countries (Brown and Kyttä, 2014). While many studies use PGIS to elicit ecosystem services in Africa (Brown and Fagerholm, 2015; Wangai et al., 2016 for recent review), few studies have used it to assess the evolution of cultural ecosystem services in peripheral areas in developing countries.

Yaoundé, the capital of Cameroon, has the country's highest population growth rate, at 5.4% per year (Ndock Ndock, 2013). While ES-related research remains scarce on Cameroon, Awono et al. (2014) conducted a study on payment for ecosystem services and the implementation of the REDD + policy in two villages in south and east Cameroon. Review papers on the relationship between the land tenure system and the implementation of REDD + briefly address ecosystem services (Larson et al., 2013; Sunderlin et al., 2014). However, to our knowledge, no such study has been conducted in Yaoundé yet.

The aim of this study is to assess changes in the value of cultural ES in peripheral areas of Yaoundé. The objectives are: 1) to understand how the value of cultural ES has changed over time and how residents perceive it, and 2) to test how ES can be used for improving land management, and for planning in peri-urban areas.

2. Methodology

2.1. Study area

Yaoundé, the administrative and political capital, is divided into seven subdivisions (Yaoundé I, II, III, IV, V, VI and VII), with hundreds of districts. It had an estimated population of 90,000 in 1952, 570,000 in 1984 and 2.8 million in 2015 (United Nations, 2016). With an annual growth rate of 3%, the city welcomes 80,000–90,000 new inhabitants every year. Consequently, estimates of the total urban area show an expansion from 89.1 km^2 in 1984 to 287.2 km^2 in 2015, putting additional pressure on SPA in a context that does not provide adequate economic, social and environmental responses (Kemajou and Chenal, 2018; Lall et al., 2017). Located in the equatorial zone, in a hilly, vegetated area (between 750 m and 1200 m above sea level), Yaoundé is geographically complex, which was a major challenge in the city's spatial development. Several decades ago, hills and the vegetation cover were important assets for the city (Franqueville, 1968 : p118), but today they are increasingly used for cultivation of food crops, especially in peri-urban areas (Temple and Moustier, 2004). However, geography alone does not explain its spatial development. The urban planning documents developed over time had limited success in supporting the city's growth due to financial and administrative constraints, and an unclear land tenure system (Kemajou and Chenal, 2018; Tabué Youmbi et al., 2009). The current city's growth is mainly due to the informal sector encouraged by the leeway in the interpretation and application of legal documents. Like other African cities, Yaoundé is growing beyond its current administrative limits, for the most part in an uncontrolled way (Chenal, 2015), which leads to the loss of SPA through land degradation, deforestation and land use conflicts (Tiafack and Mbon, 2017). Based on the recommendations of local urban planning and environmental experts, the villages of Mbalngong and Nkozoa were identified and chosen for their high rates of urbanization. Mbalngong, located in the southwestern part of the city at the border of Yaoundé III, has a surface area of 548-hectares (ha). Nkozoa has a surface area of 1048-ha and is located in the northern part of the city, at the border of Yaoundé I (Fig. 1). The autochthons who live the two villages belong to the Beti ethnic group. More specifically, autochthons in Mbalngong are from the Ewondo people, whereas those in Nkozoa belong to the Etoudi people. In both cases, they are the traditional landowners in the village. Prior to 2000, the villages had no allochthon. Individual crops were prominent key food sources. Since 2000, however, there has been an exponential increase in demands from allochthons from the northern and western parts of the country. No official administrative boundary existed at either site. As such, we established and digitized them for PGIS activities (Fig. 1).

2.2. Data collection

The study combines PGIS activities, expert interviews and the use of GPS devices to validate the areas located by the participants. PGIS activities were divided into individual interviews and workshops. We used this combination of methods because all have been well established in the field and can also be tailored to the study context, given the geographical scale and possibility to get around by foot at the study sites (Brown and Fagerholm, 2015; Ramirez-Gomez et al., 2015). PGIS are useful for eliciting the idiosyncratic aspects of cultural ecosystem services. Hardcopy geographical and/or cartographical maps were often used during personal interviews and/or workshops, but are most suitable for the local scale or when targeting a specific group of people (e.g. experts). Higher response rates are usually observed with hardcopy maps than with open online mapping (Karimi et al., 2015). Hardcopy maps are preferable for practical reasons and due to technical limitations on site. Given the context of the study, we chose to use hand-drawn polygons to represent the location of ecosystem service provisioning areas (SPA). Polygons are suitable for small samples at the