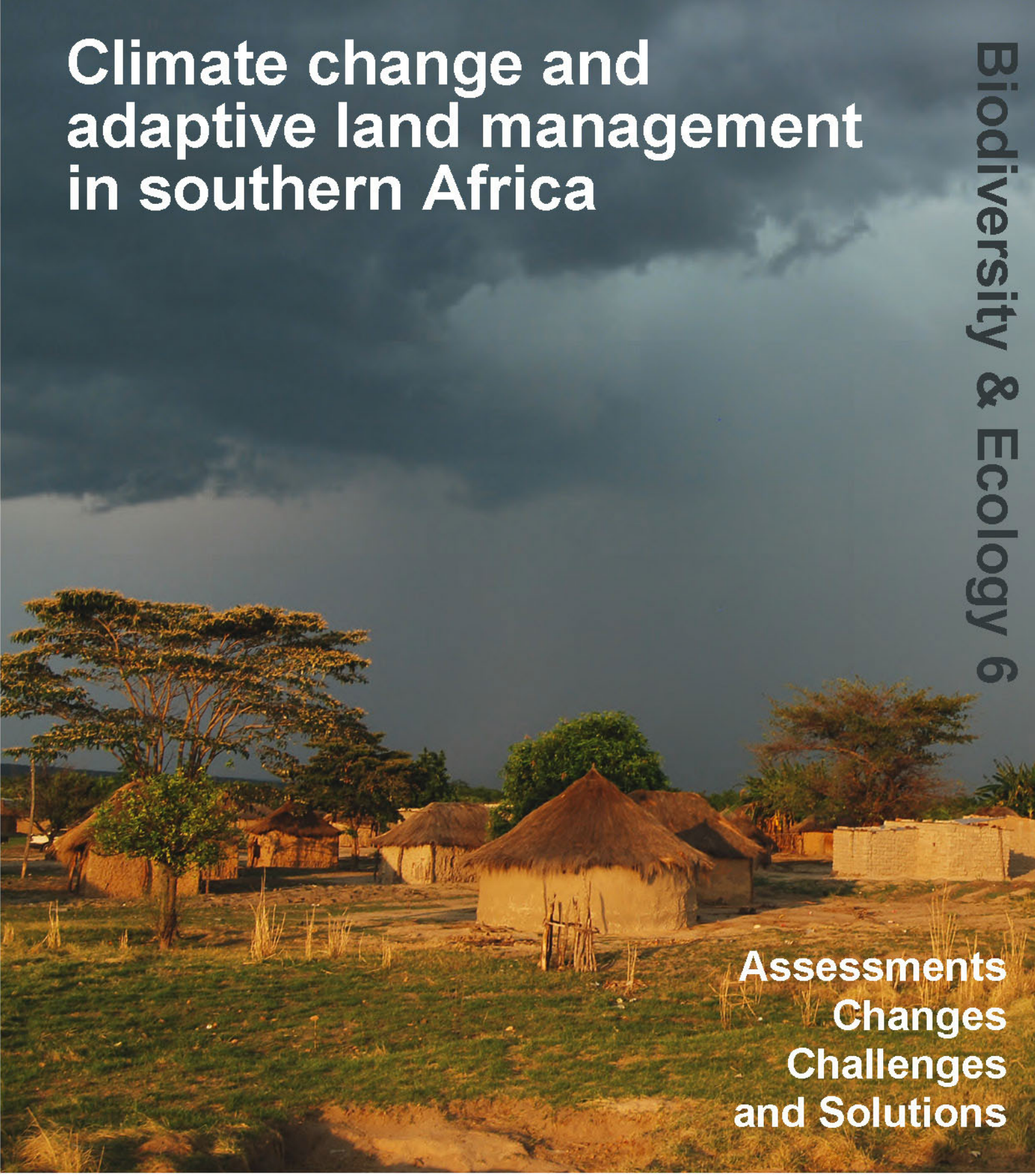
# Climate change and adaptive land management in southern Africa

Biodiversity & Ecology 6



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# Climate change and adaptive land management in southern Africa

## Assessments, changes, challenges, and solutions

Edited by


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# Seeing deforestation in Zambia – On the discrepancy between biophysical land-use changes and social perception

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**Abstract:** Zambia has been losing about 250,000 ha of forest annually. The actors said to be responsible for this trend include charcoal producers and shifting cultivators. This widely shared understanding is flawed, however, and instead reflects a Zambian way of 'seeing deforestation', which is introduced in this paper. This paper shows, through the combination of ethnography and remote sensing, that deforestation detected from afar does not necessarily reflect local perceptions, a phenomenon that has fundamental implications for the way forest loss is addressed in Zambia.

**Resumo:** A Zâmbia tem vindo a perder cerca de 250000 ha de floresta anualmente. Os responsáveis referidos são, entre outros, os produtores de carvão e os agricultores itinerantes. Porém, esta percepção amplamente partilhada é incorrecta, reflectindo antes uma maneira Zambiana de "ver a desflorestação", a qual é introduzida neste artigo. Este estudo mostra, através da combinação de etnografia com detecção remota, que a desflorestação detectada à distância não reflecte necessariamente as percepções locais, o que tem implicações fundamentais para a forma como a perda florestal é abordada na Zâmbia.

## Introduction

The issue of deforestation has remained one of the major global challenges of the early twenty-first century. Globally, Zambia is among the most affected countries (Hansen et al., 2013), with reportedly 250,000 ha of forest lost annually (GRZ, 2011; Vinya et al., 2012; see Kamelarczyk & Smith-Hall, 2014) – although numbers vary substantially among the different sources because some sources consider only, for example, abrupt year-to-year changes (e.g., Hansen et al., 2013). In this paper, we define deforestation as long-term forest loss that may be caused by any human activity or natural phenomenon, be it a clearcut that occurs during a very short time or long-lasting degradation processes that eventually lead to a substantial loss of forest cover. The local populations of Zambia's Central Plateau have witnessed the decrease in forested land, particularly since 2011. As spaceborne sensors observe large areas at once with regular repeat frequency, they nowadays form the backbone of many environmental monitoring initiatives (such as REDD+) and are able to provide an objective source of time, location, and extent of deforested areas. Among the 197 successfully launched earth observation missions (as of December 2013; Belward & Skøien, 2015), the Landsat mission occupies the leading role for environmental monitoring (Roy et al., 2014) for a number of reasons including a spatial resolution (30 x 30 m) that is in congruence with the size of many processes on the Earth's surface, a reasonable revisit frequency (16 days), historical data availability (since 1984), and an open data policy.

While deforestation has been a widely acknowledged challenge and anthropogenic actions have been identified as a major cause of such transformations, the precise underlying practices (which are themselves indistinguishable in remote sensing imagery) have remained largely unexamined and are currently being debated (Gumbo, 2014; Kokwe, 2012; Kokwe & Mickels-Kokwe, 2012; Mwitwa et al., 2013). However, the people said to be responsible for 'indiscriminate cutting' and the ongoing 'rampant deforestation', as it is repeatedly called, are quickly presented. Researchers, farmers, forestry officers, politicians, NGO workers, and journalists all argue that charcoal producers and practitioners of shifting cultivation, locally known as *Chitemene*, are the

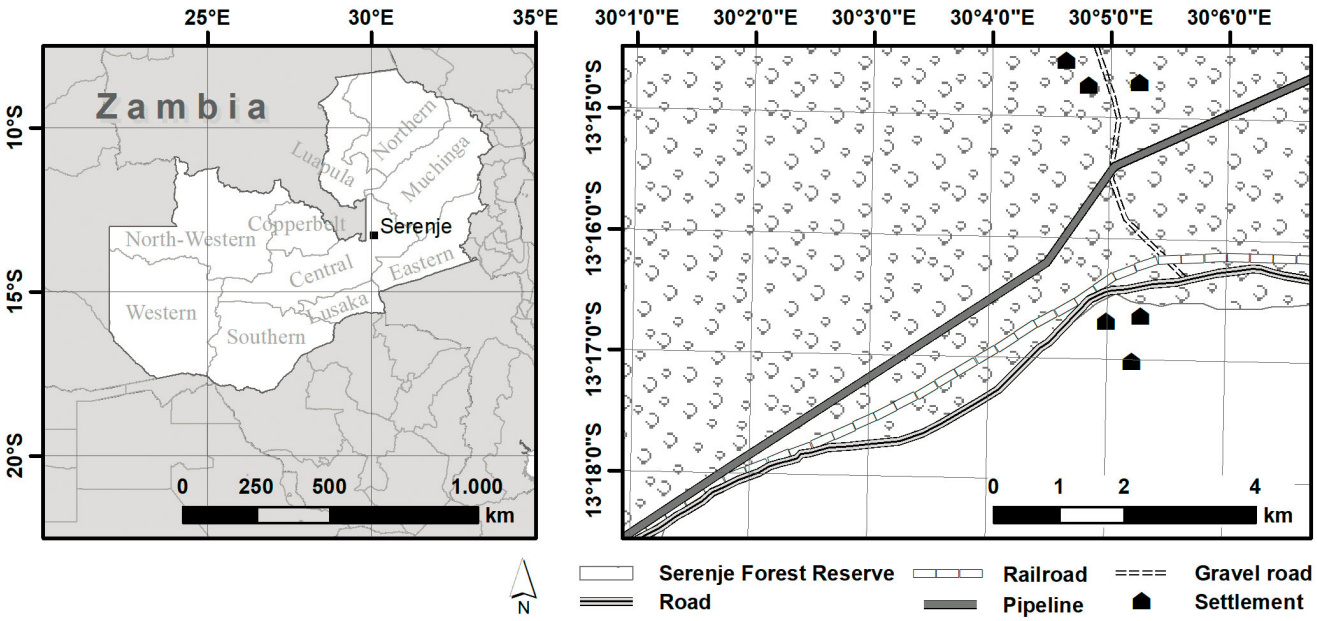


Figure 1: Study area in Central Province, Zambia.

alleged 'ignorant agents of deforestation' (Munro, 2009, p. 110). The paper at hand questions this dominant perception.

Deforestation might seem to be a rather straightforward phenomenon, one that is tangible, clearly visible, and detectable from afar. In contemporary Zambia, however, it has been conceptualized in a very particular way that is not necessarily congruent with what researchers are detecting with remote sensing data. This has crucial implications for policymakers, as the following pages will demonstrate.

## Methods

### Study area

To investigate local forest loss, fieldwork has been carried out on Zambia's Central Plateau in a rural community adjoining the Serenje National Forest, a protected forest reserve. The wider region, endowed with high annual rainfall (> 1000 mm/yr), is characterized by a mosaic of *Miombo* woodlands, streams, and villages, whose residents' major livelihood is subsistence and small-scale farming with a heavy emphasis on white maize.

### Combining ethnography and remote sensing

The lead author spent about 12 months in 2014 and 2015 in the community mentioned above. As several practices leading to forest loss constitute a criminal offence according to, for example, the Forest Act (2015), long-term research was essential to establish rapport with various stakeholders. During fieldwork, the author applied a variety of methods well established in anthropology: he carried out a census with more than 80 different households, focus group discussions with participatory exercises, and semistructured and narrative interviews, all in addition to the constant core method, participant observation. Fieldwork was conducted not only within the village but also, amongst other places, along the highway, in marketplaces, and in a number of local, district, provincial, and national government offices across the country. This allowed for a more nuanced understanding of how local people and their conduct are embedded in and influenced by the wider political, economic, and sociocultural structures. Moreover, he undertook a review of literature, the media, and unpublished material at national research institutions.

In addition to extensive fieldwork, satellite imagery were visually analysed to bring in a complementary perspective. Frantz et al. (2016) have compiled a comprehensive Landsat dataset for the years 1984–2014 for the area under investigation (Röder et al., 2018). This preprocessing converted the at-satellite radiance to surface reflectance in order to ensure radiometric consistency across space and time as well as to ensure that the subsequent visual interpretation of land change processes was not compromised by atmospheric influences.

Satellite imagery of the study area, a sequence of Landsat images covering the research area in late May/early June (1995, 2005, 2010, 2011, 2012, 2013, 2014), is provided in Fig. 2. The black stripes originate from a sensor failure of the enhanced thematic mapper plus the onboard Landsat 7 (Markham et al., 2004) and cannot be removed reliably.

The images are displayed as false colour composites, where different parts of the electromagnetic spectrum are mapped to RGB space to visually enhance surface characteristics (red: near infrared, green: shortwave infrared, blue: red). Photosynthetically active vegetation appears in dark red, bright red tones are grasslands, and darker red tones are forests/woodlands. Blueish tones are unvegetated surfaces. As Landsat integrates the electromagnetic signal over 30 x 30 m for each pixel, spectral mixtures are apparent. For example, the amount of green/blue mixed with red indicates the density of the vegetation, where pure red denotes closed stands and intrusions of green or blue point to decreased vegetation cover.

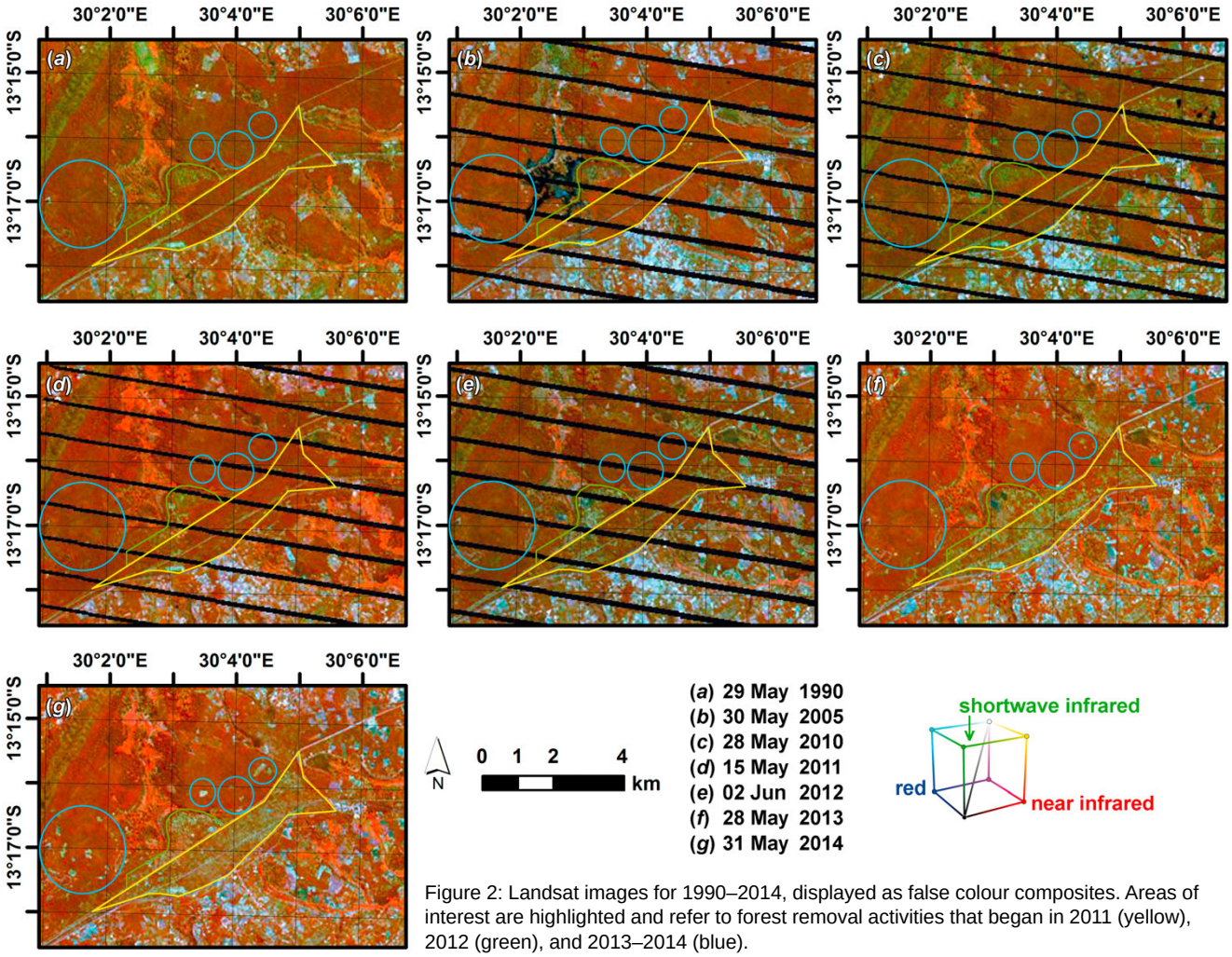


Figure 2: Landsat images for 1990–2014, displayed as false colour composites. Areas of interest are highlighted and refer to forest removal activities that began in 2011 (yellow), 2012 (green), and 2013–2014 (blue).

To demonstrate that deforestation occurs throughout the whole country, Landsat-based deforestation data from Hansen et al. (2013) were summarized for Zambia and are presented in Fig. 3. It should be noted that this dataset aimed only to detect sudden (year-to-year) stand-replacing forest loss; as such, more gradual forest loss as depicted in Fig. 2 is underrepresented and the depicted deforestation rates (in most years) are substantially lower than the often-mentioned 250,000 ha per year (see introduction). Nevertheless, a recent study by Schneibel et al. (2017) – in a similar study area in the Angolan part of the *Miombo* belt – demonstrated that gradual forest loss is not less abundant than stand-replacing losses.

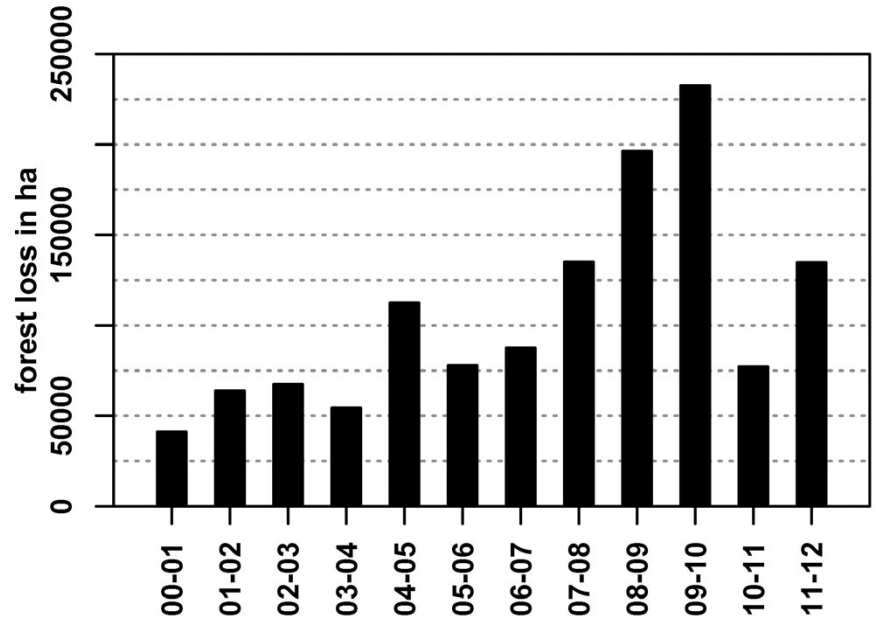


Figure 3: Stand-replacing deforestation rates for Zambia (Hansen et al., 2013).

## Results

### Observed forest loss

The satellite images prove that large parts of the *Miombo* were still intact in 1995, especially in the forest reserve (see Fig. 1; contiguous dark red area in Fig. 2 on imagery a). During the next 15 years, the forest extent did not change substantially, but from 2011 on, forests began to be cleared in the area between the pipeline (see Fig. 1; and yellow box in Fig. 2) and the settlement to the south. This abrupt encroachment was partly due

to, first, the laying off of forest guards and paramilitaries monitoring the pipeline, and, second, an increased demand for charcoal from urban areas as a result of electricity load shedding. Since there are hardly any alternative energy sources such as gas, those households connected to the grid now resorted to charcoal for heating and especially cooking.

In 2012 areas to the north of the pipeline (south of the floodplain) were also increasingly deforested (see green box in Fig. 2). From 2013 onwards, the deforestation rate rapidly increased, and as of 2014, the only intact part of the forest reserve is east of the floodplain/north of the pipeline, although isolated patches of deforestation are already apparent there (blue circles in Fig. 2). When fieldwork was completed in late 2015, the cutting of trees had continued. This trend is apparent not only for the study area but for the whole of Zambia – and for the greater region in general. While forest loss is even higher in the Democratic Republic of the Congo, Tanzania, Mozambique, and Angola (Hansen et al., 2013), the national-scale data (Fig. 3) reveal that Zambian deforestation rates are amongst the highest in the world, and continue to increase.

## Destructive practices

Stakeholders argue that charcoal producers and practitioners of shifting cultivation, locally known as *Chitemene*, are the main agents of deforestation (e.g. BBC, 2012; CIFOR, 2014; GRZ, 2010; Independent, 2016; Lusaka Voice, 2014; USAID/Zambia, 2016). Seeing bags full of charcoal lining Zambia's roads or piled in the markets will inevitably be associated with deforestation, just as local phrases for 'cutting trees' or 'losing the bush' will first and foremost evoke pictures of charcoal kilns. This biased understanding is constructed already at primary school, when charcoal burners, along with 'backward' and 'destructive' *Chitemene* farmers, are blamed during class. Even though the charcoal-deforestation nexus is not well researched in Zambia (Gumbo et al., 2013, p. 52), it nevertheless features prominently in discussions of deforestation. This view has paid the most attention to areas customarily occupied by 'the rural poor'. This, in turn, reflects the 'discourse of local blame' also observed in other deforestation contexts, which has itself been a characteristic of the strong discourse on tropical deforestation (e.g., Fairhead & Leach, 1996; Leach & Scoones, 2015; Munro, 2009; von Hellermann, 2013). While several studies on deforestation have been carried out all across Zambia, they have often only replicated the same claims (Gumbo, 2014), thus creating a widely shared consensus on the 'culprits' without regard to regional differences or the complex underlying driving forces. Fieldwork, however, has clearly revealed, first, that slash-and-burn farming hardly exists anymore in the research area and, second, that charcoal is more often than not merely produced 'opportunistically'. As such, it is a by-product of agricultural expansion and driven by massive load shedding of electricity in urban areas, especially Lusaka.

## Productive and constructive practices

Yet there are a number of practices, which also entail forest loss, that are *not* perceived to be part of deforestation. When forests give way to gardens or cropland in order to feed the nation, for example, that trend is literally seen as 'productive', just as the development of open-pit mines or softwood plantations is. Equally, when trees are brought down by loggers or in the course of infrastructure developments (e.g., for the creation or expansion of roads, settlements, or power line corridors), a positive attitude prevails, as the project is 'constructive' – and 'inevitable' if one is to keep pace with those 'already ahead' within and outside of Zambia, as local residents in the research area put it.

From the perspective of the government, *legality* is a crucial factor as well: legal logging, for example, is not seen as problematic. Even more, it is represented, often implicitly, as being less harmful and even sustainable, even when occurring on an industrial scale. Accordingly, the encroachment into the Serenje National Forest was, by most villagers and employees of the district forestry office, not explicitly condemned per se, but rather seen as problematic because of its *illegality* (cf. EC, 2014, p. 34), and 'destructive' charcoal production. Seeing vast agricultural fields, which often entail the production of charcoal, however, is unlikely to trigger thoughts about deforestation, but rather admiration. When discussing Zambia's extensive private and National Farm Blocks with center-pivot irrigation and upcoming softwood plantations, both local residents and forestry officers were usually surprised by the authors' undifferentiated understanding, asking, 'But this is not deforestation, is it?!' (Fieldwork assistant, July 31, 2015, pers. comm. on Great North Road, Mkushi District). This attitude is due to the notion that when rural spaces are developed, industrialised, or urbanised, this cannot, by definition, be an example of or contribute to deforestation (cf. Munro, 2009, p. 111). In contrast to the 'destructive' cutting of trees, mechanized practices transforming the land carry the promise of development in the widest sense of the word. According to this understanding, urban load shedding that causes the increased production of charcoal for its urban consumers and forest clearing by absentee landlords for agricultural speculation hardly feature in the narratives surrounding deforestation. While urban elites, including government officials, have also encroached on Serenje National Forest, they themselves would hardly label it deforestation. Arguably, they do not do so not in order to distract from their activity, but because they do not see their 'productive' activities as part of the 'real' problems. In line with this understanding, the appropriation of land for 'productive' activities will not be labelled 'encroachment', but rather be supported by the government, which at times even interferes with the actual mission of both the Forestry Department and the parastatal environmental agency ZEMA (e.g., Chu et al., 2015; Kneen, 2013; Mickels-Kokwe & Kokwe, 2015, p. 131; cf. von Hellermann, 2013, p. 131). Moreover, opponents to such activities can be charged by the government with 'hindering development' (Miller et al., 2016), which indicates that economic growth is given priority over halting forest loss. This, in turn, has been symptomatic of the dominant discourse on deforestation, as it has evolved around the aspirations and agendas of Development (Munro, 2009, p. 114).

### Summary: deforestation revisited

While all practices mentioned can be seen to have both positive and negative outcomes, there is a clear understanding of whether the cutting of trees for certain ends is actually productive or destructive, which entails corresponding moral judgements and feelings. Importantly, only practices widely and unambiguously perceived to be destructive are linked to deforestation. Thus, *deforestation* is not simply a term that describes activities involving forest loss, but rather 'an emotive notion that evokes a complexity of [specific] images and understandings' (Munro, 2009, p. 109). Deforestation, henceforth written with a capital D, is a value-laden concept bound to a set of collectively shared associations (cf. Munro, 2009, p. 109), or – as Leach & Mearns (1996) have put it more judgementally – to orthodoxies, anecdotes, assumptions, myths, and received wisdoms. This particular understanding, which is not equal to *forest loss,* means that productive or constructive practices are hardly recognized as contributing to the challenge of Deforestation, and thus receive little attention, not to mention blame, regardless of their actual impact on the forests. Arguably, productive or constructive practices are disregarded because of the dominant discourse. While the oft-quoted 250,000 hectares are the result of *all* deforesting practices, many of these are neglected in discussions of Deforestation, and, most importantly, in the interpretation of the phenomenon.

## Discussion

### Combating forest loss?

This dichotomy of 'good' and 'bad' practices outlined above does not just represent but also continually feeds into and thereby structures the way Deforestation is talked about and understood in Zambia (cf. Arts & Buizer, 2009, p. 342). It is not relevant whether the underlying ideas are true or false, but rather that they do exist (Arts et al., 2010, p. 58), as they are taken up and thus sustained by the media, politicians, researchers, development agencies, interpersonal communication, and educational institutions (cf. Leach & Mearns, 1996; Leach & Scoones, 2015, p. 15; Munro, 2009; van Dijk, 2003, p. 86), whether through texts or pictures, both implicitly and explicitly. This then has the power to influence behaviour and attitudes and ultimately shape policies, laws, institutional arrangements, and other discourses (Arts & Buizer, 2009, p. 341; Arts et al., 2010; Hajer, 1995; Keller, 2012; Klein, 2004). The Zambian discourse on Deforestation is therefore not just words that *describe* something, but it also has ramifications for the real world: the answer to the question 'What needs to be done to curb the high rates of Deforestation?' is obviously influenced by the discourse – 'certain types of action seem more self-evident than others' (Arts & Buizer, 2009, p. 342). Since 'productive' or 'constructive' activities, which also entail forest loss, are not acknowledged as problematic in the first place, they receive little if any attention in the fight against forest loss, even when thousands of hectares are clear-felled, which itself happens within a short period of time and renders regrowth extremely difficult and slow, if not impossible (cf. Equinox, 2005, pp. 51, 134). It should be noted that this is different from degradation caused by charcoal production only, for example (Chidumayo, August 3, 2015, pers. comm. in Makeni). Even if forested areas are to be conserved within mining or farming sites, the gross impact on biodiversity and ecosystem services is considerable (Franks & Hou-Jones, 2016). While the REDD+ projects of Zambia and many other countries are geared towards 'unsustainable' farmers and charcoal producers, other causes of large-scale forest loss remain unaddressed (Leach & Scoones, 2015). Particularly whilst large-scale farming and mining are portrayed as having a localized impact only, the production of charcoal is said to be ever-expanding country-wide. Beyond doubt, the *commercial* production of charcoal has its share in forest loss, yet if one is to comprehend – and address – Zambia's high deforestation rates, 'productive' and 'constructive' practices need to be taken into account as well. Against the background of Zambia's aspiration to become a prosperous middle-income country by 2030 (GRZ, 2011; ZDA, 2015, p. 3), however, certain practices are likely to be either deliberately or unconsciously overlooked in the future as well. In that regard, (large-scale) farming, the development of private and industrial softwood plantations, and copper mining are to take a prominent role.

In particular, this last is of tremendous importance for the national economy, providing thousands of jobs, education, and health services and being the largest taxpayer (FQM, 2016; GRZ, 2014, p. vii). Against this background, operations are likely to continue, expand further, act as a pull factor with destructive trigger effects, and be backed up by both popular opinion and the government. Importantly, the latest large-scale mines have been developed in North-Western Province – a region about 80% of which is covered by mature *Miombo* woodlands, with a low population facilitating the unopposed expansion of mines (van Alstine et al., 2011, p. 6). While a number of negative ramifications have been acknowledged in the environmental impact assessments and elsewhere (Husselman, 2008, p. 2; Mwitwa et al., 2013; Vinya et al., 2012; ZEMA et al., 2013), Deforestation is usually downplayed and ascribed to the rural poor (e.g., Equinox, 2005; FQM, 2014; FQM, 2016; KML, 2015; MMMD, 2016, pp. 42 ff.; URS, 2012). Equally, national policy documents and land use assessments mention a number of environmental threats, yet Deforestation or the loss of trees is not listed (Campbell et al., 2010, p. 22; Lindahl, 2011). Even the government's latest report on 'environmental degradation caused by mining activities' (GRZ, 2014), as well as the most recent 'environmental threats and opportunities assessment' commissioned by USAID/Zambia (2016), failed to mention the loss of trees, habitat, and biodiversity related to mines *at all*.

### Conclusion

The current understanding of Deforestation in Zambia is flawed and simplistic and can be changed only if long-standing assumptions are rethought and tested on the ground. The discourse is likely to undergo change in the future, though it is usually a tardy process (Arts et al., 2010, pp. 58, 70). Researchers can contribute

to this shift from both afar and nearby by investigating 'productive' and 'constructive' practices and analysing their precise impact. Moreover, urban agents and a wide range of underlying drivers such as, among others, load shedding, energy policies, governance, land rights, agricultural policies and politics need to be included in the analysis as they have all contributed to the status quo. In this regard, the monograph by Parduhn (University of Hamburg, unpubl. data), an in-depth analysis of forest loss in and around the Serenje National Forest, is one such contribution. It cautions that it is crucial for all stakeholders to understand what is meant by deforestation and what is not, to ensure that discussions start from a common understanding, based upon which reasonable and meaningful policies can be formulated. In the long term, international incentives such as REDD+ will otherwise be jeopardized as remote sensing–based forest loss rates will remain at a high level – even if 'Deforestation' practices cease altogether. 'Writing against' the dominant representation is not an easy undertaking, yet it is crucial if forests are to be protected.

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