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Interactive comment on "Mangroves in peril: unprecedented degradation rates of peri-urban mangroves in Kenya" *by* J. O. Bosire et al.

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Q: The conclusion that peri-urban mangroves in Kenya are generally experiencing greater degradation rates than the global or countrywide average is unsubstantiated. In the first line of the Discussion, the authors state that the goal of the study is "to investigate the hypothesis that peri-urban mangroves are experiencing higher degradation rates far exceeding the global mean of 1–2% pa commonly reported in literature." However, the authors only examine 2 stands of mangroves in the same region of Kenya, and no evidence is given to support the argument that these results can be extrapolated to peri-urban mangroves in other parts of Kenya, much less the world. The very high levels of deforestation documented by this study could be a local-scale phenomenon. The authors should change the description of their main goal in the Abstract, Introduc-

tion, and Discussion or provide evidence that these deforestation rates are typical of peri-urban mangroves across Kenya A: The global mean cover loss of mangroves is well documented and thus not disputed (fx Giri et al. 2011, Duke et al. 2007, FAO 2007, Spalding et al. 2010 etc). Because of known human pressure typical of big cities compounded with urban informal settlements in developing countries, this normally has an effect on resource use. As clearly stated, we only used the two mangrove creeks adjacent to the biggest coastal city in Kenya as a case study to indicate that peri-urban mangroves are likely to be suffering from more intense human pressures in addition to natural threats. Kirui et al. (2013) found an average of 0.7% annual loss of mangroves in Kenya, while this study which targeted peri-urban mangroves found rates of 2.6 – 5.1% annual cover loss. This is a strong statement made by this study and other subsequent studies elsewhere can build on this. The use of the word "Kenya" doesn't necessarily mean that the study covered the whole of Kenya, but should instead be understood to mean the study was conducted in Kenya.

Q: The authors argue that mangroves in Tudor experienced indiscriminate and uncontrolled harvesting while mangroves in Mwache experienced selective harvesting based on size class distributions and observations of illicit distillers in Tudor, but none of the other mechanisms are addressed. The authors also imply that IOD events cause mangrove mortality, but don't discuss the mechanisms by which this occurs or the spatial scale of this mortality. In p. 13386, lines 17-21 the authors suggest that Avicennia marina cover has increased due to its tolerance for a wide range of environmental conditions, but again do not describe the environmental factors that would allow Avicennia to outcompete other species. Finally, there is no discussion of whether the drivers of mangrove degradation in Tudor and Mwache apply to other peri-urban mangroves in Kenya. A: The indiscriminate harvesting in Tudor was evidenced by vast open cleared areas and even harvesting of young trees actually confirmed by the very high cover loss of 87% (5.1% per annum), while Mwache was less open and had trees scattered even in open spaces thus suggesting selective felling in the latter. The IOD event caused mortality by smothering of roots due to sedimentation and water impounding. Avicennia

marina is widely known to have disinjunct zonation and tolerate a wide tidal amplitude including thriving at the latitudinal limit of mangroves. These adaptations make the species resilient to colonize harsh conditions where other species may not thrive. They also tolerate very high salinities and thus grow in conditions, which other species can't withstand. We couldn't have had a detailed discussions as to the relevance of these drivers in other mangroves in Kenya because such extrapolation couldn't have been scientifically sound and when done, caution ought to be exercised, which is what we did in our discussion.

Q: Specifically, the main conclusion is unsubstantiated, the drivers of the observed losses in mangrove cover are not adequately discussed, and there are numerous grammatical errors A: The reviewer has noted minor grammatical errors, which can be very easily improved. These will be addressed immediately permission is granted to correct final manuscript. Concerning the drivers of change, the only driver which hasn't been directly confirmed but alluded to is pollution due to industrial and domestic discharges but referred to in Omar et al (2008). Other drivers e.g. sedimentation and high human pressure have been documented e.g. Kitheka et al. 2002, Bosire et al. 2006, Omar et al. 2008. When revising, we'll drop pollution as a driver.

Q: Throughout the Abstract and Introduction the term "degradation" is used in reference to mangroves. To me, degradation suggests that mangroves may be experiencing reductions in quality as well as outright mortality. However, the manuscript appears to only address deforestation (both anthropogenic deforestation and, briefly, climate- induced mortality). Is there evidence that mangroves in the study area are experiencing other forms of degradation (e.g. reduced growth rates, lower reproductive output)? If so these types of degradation should be addressed in the Introduction and Discussion. In any case, the term "degradation" is vague, and should clarified in the Introduction. A: Yes the term degradation can vary in meaning, which must be understood within context. This is a term whose use is already well established in forest ecology/production or ecosystem assessment and thus its use here doesn't at all confuse. In this context,

it is used to refer to cover loss and also stand structure. However, the main emphasis in our discussion is on cover loss, which was the focus of this paper. No confusion by readers is foreseen as to the meaning of this widely used term.

Q: There are problems with wording and sentence structure throughout the manuscript, especially in the Introduction section. I've identified many of the major errors in the detailed comments (see below), but the manuscript would benefit from an additional thorough round of grammatical edits. A: As stated above, the grammatical errors identified are minor and will be dealt when doing final revision to ensure coherence, clarity and completeness.

Interactive comment on Biogeosciences Discuss., 10, 16371, 2013.