67 Schwartz, M.W. *et al.* (2009) The precautionary principle in managed relocation is misguided advice. *Trends Ecol. Evol.* 24, 474
68 Vitt, P. *et al.* (2009) Assisted migration: part of an integrated conservation strategy. *Trends Ecol. Evol.* 24, 473–474
69 Martin, R. (2008) Deforestation, land-use change and REDD. *Unasylva* 230, 3–11
70 Miles, L. and Kapos, V. (2008) Reducing greenhouse gas emissions from deforestation and forest degradation: global land-use implications. *Science* 320, 1454–1455
71 Parish, F. *et al.* (2008) *Assessment on Peatlands, Biodiversity and Climate Change: Main Report*, GEC and Wetlands International
72 Perillo, G. *et al.* (2009) *Coastal Wetlands: an Integrated Ecosystem Approach*, Elsevier
73 Alongi, D.M. (2009) *The Energetics of Mangrove Forests*, Springer
74 Cotula, L. *et al.* (2009) Land grab or development opportunity? Agricultural investment and international land deals in Africa, IIED/FAO/IFAD
75 von Braun, J. and Meinzen-Dick, R.S. (2009) *"Land Grabbing" by foreign investors in developing countries: risks and opportunities. IFPRI Policy Brief 13*, International Food Policy Research Institute
76 GRAIN (2008) Seized! The 2008 land grab for food and financial security. GRAIN Briefing. (http://www.grain.org/briefings/?id=212)
77 De Schutter, O. (2009) *Large-scale Land Acquisitions and Leases. Special Rapporteur on Food*, UN Human Rights Council

0169-5347/$ – see front matter
doi:10.1016/j.tree.2009.10.003 Available online 26 November 2009

Letters

A reality check for designer biofuel landscapes

Matthew J. Struebig[1,2], Gary Paoli[3] and Erik Meijaard[4]

[1] School of Biological & Chemical Sciences, Queen Mary University of London, Mile End Road, London, E1 4NS, UK
[2] Department of Biology, Universiti Brunei Darussalam, Jl. Tungku Link, Gadong BE1410, Bandar Seri Begawan, Brunei Darussalam
[3] Daemeter Consulting, Jalan Burangrang No. 5, Bogor 16151, Indonesia
[4] People & Nature Consulting International, Vila Lumbung House No. 6, Jalan Raya Petitenget 1000X, Kerobokan, Badung 80361, Bali, Indonesia

Koh *et al.* [1] advocate use of 'designer landscapes' to maintain biodiversity and livelihoods in oil palm biofuel plantations. By promoting agroforestry as a revenue source for local people and a buffer to conservation set-asides within plantations, the authors seek to balance economic, social and environmental values of multifunctional landscapes. However, they present little evidence to show that their solution is in any way optimal for these values. We argue that the approach is highly context-dependent and constrained by socio-political and biological realities. Its promotion will unlikely yield long-term conservation benefits in a biofuel setting, and may even prove counter-productive.

Advocating designer landscapes for biofuels is risky business for conservation, because perceived benefits depend on prior land-cover. The approach is most appropriate when government decisions to convert forest have already been made. Forest conversion has catastrophic biodiversity outcomes [2,3], but some losses could be avoided, as Koh *et al.* suggest, by persuading estate managers to retain and connect forest remnants (a micro-level decision). Much greater benefits to biodiversity and local livelihoods, however, will come from establishing new plantations on degraded lands, while improving forest protection [3,4]. Planting degraded lands, under the 'land sparing' model, reduces the need to spend conservation resources on implementing multifunctional landscapes, but could also still leave room for such design, through restoration of vegetation mosaics to enhance biodiversity and connectivity.

Corresponding author: Struebig, M.J. (m.struebig@qmul.ac.uk).

Where forest conversion licenses have been issued, a designer approach could potentially alleviate some biodiversity and livelihood losses, but widespread promotion of agroforest buffers may prove counterproductive. Even if agroforests in plantations could maintain high biodiversity values, something that is unlikely for oil palm [5], without strong markets and/or outside financial incentives, adoption of this method would be unlikely when intensive farming promises higher returns for less effort. Such designer landscapes risk reverting back to near monoculture, with associated biodiversity losses. Further, as well as facilitating wildlife–human conflict [6], agroforest buffers would encourage forest access for hunting and agricultural encroachment, putting at risk the wildlife values that the remnants were designed to maintain [7]. Experience promoting biodiversity in palm plantations indicates that preventing forest access is probably the most wildlife-friendly policy an estate manager can employ, especially where hunting is widespread [8]. Thus, while in principle there is some room for a designer approach where oil palm replaces forest, partnering with local communities to rehabilitate degraded lands could yield greater conservation benefits than agroforestry [5].

There is no silver bullet to safeguard conservation values in plantations, so our solutions must be context-driven to maximise the likelihood of success. It is evident that enhancing conservation values in existing plantations is a weaker strategy than efforts to maintain them in new ones [2,9]. Yet, widespread promotion of the designer approach within a certification framework risks signalling to producers that clearing all but a few forest patches and then planting economically valuable trees

around them is sufficient for conservation. There is real danger that companies will focus these gestures on established plantations at minimal cost, but continue to clear forests for new estates elsewhere. In fact, there are signs this may be happening already (http://www.elti.org/storage/Maitar1.pdf).

We reiterate that major biofuel conservation successes can only be achieved by keeping plantations out of forests and other habitats of high conservation importance. Landscape-level application of the High Conservation Value (HCV) concept prior to plantation development, as required for new plantings by the Roundtable on Sustainable Palm Oil (RSPO-http://www.rspo.org), and supported by national toolkits (http://www.hcvnetwork.org), has the potential to guide this spatial planning, but authoritative HCV maps are needed together with improved commitment from RSPO members and producer governments. Political and financial incentives to clear forests remain strong, and government land-use planning does not always allow concessionaires to maintain large areas of non-agricultural land [10]. We commend efforts to evaluate various agricultural landscape designs, but directing new plantations away from forest remains the fundamental issue, and is something that makes economic sense to local governments [4]. The battle for biodiversity in the tropics is unlikely to be won through micro-level landscape design. In reality, it is changes to macro-level land-use planning that will significantly minimise losses of forest-dependent values.

References

1 Koh, L.P. *et al.* (2009) Designer landscapes for sustainable biofuels. *Trends Ecol. Evol.* 24, 431–438
2 Fitzherbert, E.B. *et al.* (2008) How will oil palm expansion affect biodiversity? *Trends Ecol. Evol.* 23, 538–545 (doi:10.1016/j.tree.2008.06.012)
3 Danielsen, F. *et al.* (2009) Biofuel plantations on forested lands: double jeopardy for biodiversity and climate. *Cons Biol.* 23, 348–358
4 Venter, O.E. *et al.* (2009) Carbon payments as a safeguard for threatened tropical mammals. *Cons. Letters.* 2, 123–129
5 Phalan, B. *et al.* (2009) Conservation in oil palm landscapes. *Cons. Biol.* 23, 244–245
6 Nyhus, P. and Tilson, R. (2004) Agroforestry, elephants, and tigers: balancing conservation theory and practice in human-dominated landscapes of Southeast Asia. *Agr. Ecosyst. Environ.* 104, 87–97
7 Laurance, W.F. *et al.* (2002) Ecosystem decay of Amazonian forest fragments: a 22-year investigation. *Cons. Biol.* 16, 605–618
8 Maddox, T. *et al.* (2007) *The Conservation of Tigers and Other Wildlife in Oil Palm Plantations*, Zoological Society of London
9 Koh, L.P. (2008) Can oil palm plantations be made more hospitable for forest butterflies and birds? *J. Appl. Ecol.* 45, 1002–1009
10 Sheil, D. *et al.* (2009) *The Impacts and Opportunities of Oil Palm in Southeast Asia. What do We Know and What do We Need to Know?* Center for International Forestry Research, Bogor, Indonesia

0169-5347/$ – see front matter
doi:10.1016/j.tree.2009.07.014 Available online 15 September 2009

Letters Response

Checking the reality check

Jaboury Ghazoul[1], Lian Pin Koh[1] and Patrice Levang[2]

[1] Institute of Terrestrial Ecosystems, ETH Zurich, Universitaetsstrasse 16, Zurich 8092, Switzerland
[2] Institut de Recherche pour le Developpement (IRD) and Center for International Forestry Research (CIFOR), PO Box 0113BOCBD, Bogor 16000, Indonesia

Let us be clear at the outset that we fully support efforts to direct new plantations away from forests, and our designer landscapes proposal is not a mutually exclusive alternative. Let us also be clear that the history of oil palm expansion, as well as its future (based on current land-use designations), has been and will continue to be the transformation of forest to plantation. Barring sudden and dramatic changes in this trajectory it will be necessary to consider new approaches to land management that integrate rural livelihoods and conservation with intensive production systems. Thus, we would like to agree with Struebig *et al.* [1] but a reality check prevents us from doing so.

We promote the designer landscapes concept in recognition of the failure of other systems of land management to deliver optimality of multiple land use objectives. We recognize that local geographic, socio-political and biological realities will shape the appropriate implementation of such an approach at local scales, but also emphasise that the designer landscapes approach can shape decisions at larger scales. Nevertheless, we recognize the need for rigorous debate among scientists, oil palm producers and consumers, local communities and decision makers to determine appropriate strategies for mitigating biofuel expansion impacts on rural livelihoods and biodiversity. In this vein we very much welcome the comments from Struebig *et al.*, even though we respectfully disagree with their thesis.

Struebig *et al.* favour land sparing, the establishment of intensive plantations on degraded land, as a more effective approach to conservation. The nub in Struebig *et al.*'s argument is that they do not define degraded land. A land sparing approach that intensifies oil palm production on abandoned, unproductive cleared land is very different to oil palm intensification within productive and diverse agroforestry landscapes supporting substantial human populations. Land sparing is a potentially promising conservation approach if people displaced from 'degraded' land (by which we take to mean former natural forests) do not clear forest elsewhere, *and* if governments rescind decisions that allocate forest land for oil palm development—a current reality to which the designer landscape concept responds.

We reiterate that agroforestry biodiversity benefits will vary given the diversity of agroforestry systems and biodiversity responses to them. We also agree that intensive

Corresponding author: Ghazoul, J. (jaboury.ghazoul@env.ethz.ch).

production presents economic challenges to agroforestry. While not wishing to understate the economic challenges of viable agroforestry in such contexts, the resistance of many agroforestry communities to oil palm expansion attests to their viability [2–4]. In a worst case scenario agroforests at the margins of High Conservation Value (HCV) areas will indeed be converted to oil palm, resulting in the system espoused by Struebig *et al.* of intensive production directly abutting HCV areas. We recognise the risks (wildlife conflicts, hunting and encroachment) inherent in our approach, but argue that a strict land-sparing and/or HCV combination would be subject to similar risks. Indeed we argue that agroforestry buffers would act as social barriers to further expansion of oil palm, in that this would necessitate encroachment on agroforest land and undermine the services and resources agroforesters derive from the adjoining natural forest. Our vision is a working landscape mosaic that serves the needs of companies, local communities and conservation within areas already slated for oil palm development [5]. This stands against a purely plantation–HCV matrix which excludes people and offers only protected zones which few can access, appreciate and benefit from.

Struebig *et al.*'s penultimate paragraph betrays a misunderstanding of our concept which needs clarification. We use the 'designer' appellation deliberately to imply careful evaluation and designation of land uses according to social, economic and ecological needs, an approach that is too late for existing established plantations, but which would avoid the scenario they fear for future plantations.

The unrealistic simplicity of Struebig *et al.*'s vision is reflected by their emphasis of a forest and non-forest dichotomy, a view that fails to capture the complexity of existing land-uses in much of the tropics. In some regions this dichotomy may be appropriate, and land sparing a potentially advantageous response, but we do not believe that this will be so for very large swathes of land that encompass a variety of land use systems and livelihood interests.

References

1 Struebig, M.J. *et al.* (2010) A reality check for designer biofuel landscapes. *Trends Ecol. Evol.* 25, 7–8
2 Koczberski, G. and Curry, G.N. (2005) Making a living: land pressures and changing livelihood strategies among oil palm settlers in Papua New Guinea. *Agr. Syst.* 85, 324–339
3 Kusters, K. *et al.* (2007) Towards solutions for state vs. local community conflicts over forestland: The impact of formal recognition of user rights in Krui, Sumatra. *Indonesia. Hum. Ecol.* 35, 427–438
4 Therville, C. (2008) *Dynamics of Rubber Agroforest Conversion in Bungo District. Perception Survey and Spatial Analysis (Jambi Province, Indonesia)*. Center for International Forestry Research
5 Koh, L.P. *et al.* (2009) Designer landscapes for sustainable biofuels. *Trends Ecol. Evol.* 24, 431–438

0169-5347/$ – see front matter
doi:10.1016/j.tree.2009.07.015 Available online 15 September 2009

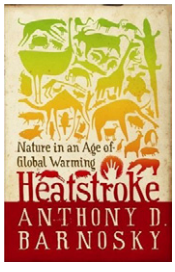
Book Review

No going back for species and ecosystems

Heatstroke: Nature in an Age of Global Warming by Anthony D. Barnosky. Island Press/ Shearwater Books, 2009. US$26.95 hbk (269 pages) ISBN 10: 1597261971, ISBN 13: 9781597261975

Phoebe Barnard[1,2] and Guy Midgley[1]

[1] Climate Change & BioAdaptation Division, South African National Biodiversity Institute, Private Bag X7, Claremont 7735, South Africa
[2] Climate Change Vulnerability & Adaptation Programme, NRF-DST Centre of Excellence at the FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700, South Africa



These are times both terrible and exhilarating, and for none more than conservation biologists. We are confronted by compound pressures on biodiversity worse than any seen before in human history, and our ability to respond is limited not only by a collective failure of vision, but also by economic, social and political turbulence. We are increasingly conscious of at least one window of opportunity, a coherent global response to climate change, shutting faster than we can leap through. As we know, we are the first generation able to understand the changes we have caused, but the last with the chance to influence the course of many of them [2].

Before facing these uncomfortable truths, *Heatstroke* looks deeply into 'the past's 'crystal ball' on climate change and biodiversity. Understanding the severity and speed of past changes is essential to assessing future risk. Barnosky, a Berkeley palaeoecologist, sketches how biodiversity might respond not only to climate change, but also to compound environmental change threats, which collectively present 'non-analogue' conditions to those experienced in evolutionary history. There have been 39 glacial–interglacial shifts over the past two million years. Most warming events happened over timeframes of perhaps 5000 years, rather than the past century or two of accelerated climate change, and most marked a transition between cold times and warm, rather than warm times and hot, as we face today. It will probably be hotter by 2050 than at any time previously in human history and, by 2100, than at any time in the past 3 million years. As Barnosky notes in a radio interview about the book, there is probably not a familiar species existing today which has experienced such a climate. These non-analogue conditions already appear to be taking some species outside their tolerance zones [1].

Corresponding author: Barnard, P. (barnard@sanbi.org).