Recently burnt-down stretch of forest near Yangambi in central Congo Basin (Leuven, 2016).

A Multi-Instrument Approach to Preventing the Advancement of Unsustainable Land-System Change in the Congo Basin

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Target recipient: United Nations Environment Programme (UNEP)

The UNEP organizes the UN Environment Assembly, the highest-level decision-making body on environmental issues, which has the ability to bring together various stakeholders and proclaim a need for immediate measures to ensure the protection of the Congo Basin forests from deforestation.

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Executive Summary

The planetary boundary of land-system change refers to agricultural expansion and intensification contributing to global environmental change, with harmful effects on humans' well-being and global sustainability. Compared to other tropical forests, the forests of the Congo Basin have seen the least amount of deforestation in the past; however, present deforestation rates are among the fastest worldwide. The detrimental ecological effect of land-system change is undeniable—spanning biodiversity loss, changes in albedo, surface temperature, precipitation, and climate change. Realistically, the agricultural potential of the Congo Basin is too large for it not to become utilized. Thus, immediate action to prevent unsustainable land-system change is crucial and must use a multi-instrument approach to achieve the best results. Effective policies span institutional reform, international agreements, REDD+ investment, the expansion of plantations into non-cultivated land or old plantations, and the support of smallholder farmers through measures such as subsidization and smallholder-industry partnerships.

Glossary of Terms

Albedo: Indicates the extent to which a surface reflects solar energy. A value of 0 means the surface absorbs all energy. A value of 1 means the surface reflects all energy (NSIDC, n.d.).

Ectothermic: An organism that relies on its environment—as opposed to internal chemical reactions—to gain the heat it requires to function (Biology Dictionary, n.d.).

Evapotranspiration: Process whereby liquid water is converted to vapor, both from the ground and from plant tissue (FAO, n.d.).

Roughness length: The height above the ground where wind speed becomes zero. Approximately equal to a tenth of the height of surface roughness elements (e.g., trees, grass) (WMO, n.d.).

Sensible heat flux: The transfer of heat that occurs because of the different values of air temperature and sea or ground temperature (Stull, 2000).

Trophic level: Indicates the position of organisms in the food chain. The lowest level presents the producers (i.e., plants), the next is herbivores, followed by primary and secondary carnivores (Encyclopedia Britannica, n.d.).

The Empirical Analysis

Introduction to land-system change in the Congo Basin

The nine planetary boundaries identified by Johan Rockström and other environmental scientists in 2009 create a framework of limits within which humans can continue to safely operate for generations to come, while avoiding major human-induced environmental change. Land-system change is one of these nine boundaries: the authors maintain that agricultural expansion and intensification "contributes to global environmental change with the risk of undermining human well-being and long-term sustainability" (Rockström et al., 2009).

The Congo Basin, which spans Cameroon, the Central African Republic, DR Congo, the Republic of Congo, Equatorial Guinea, and Gabon, encompasses about 70% of Africa's forests, including the world's second-largest tropical rainforest, covering almost 200 million hectares (Megevand et al., 2013:1,29). The Basin also stores 46 billion tons of carbon—around 25% of the global carbon stored in tropical forests (Mosnier et al., 2012:506; Megevand et al., 2013:15).

Figure 1: Congo Basin forests (Global Forest Atlas).

Around 30 million people inhabit the forests, while 75 million—from over 150 ethnic groups—depend on them for food, health, and livelihood uses (Megevand et al., 2013:1). The Basin also exhibits the most biodiversity in Africa, with over 400 mammal and 1,000 bird species (WWF, n.d.).

Between 2002 and 2012, the average yearly deforestation rate in the Congo Basin forests was 0.2%—significantly lower than that in dry African forests or the Amazon Basin (Global Forest Atlas, n.d.). However, since 2015, the growth rate of agricultural production in the Basin has been the highest worldwide (Jordan, 2017). A study suggests that by 2050, deforestation in DR Congo will reach 5,400 km² per year—similar to that in the Brazilian Amazon. This would lead to a 60% (3.8 billion ton) rise in carbon emissions (Sonter and Galford, 2015).

The causes of land-system change include agro-industrial plantation (e.g., rubber, palm oil); cash crop farming; subsistence farming, especially slash and burn agriculture; agricultural expansion by smallholder farmers; industrial and illegal/informal logging; infrastructure development; mineral extraction; and biofuels (Tegegne et al., 2015; Megevand et al., 2013).

The Congo Basin is an obvious future endeavor for multinational companies, given its cheap land and labor and insufficient natural resource regulations. In fact, recent land area acquired by multinational companies in the Congo Basin is greater than the area of Costa Rica and is used mostly for oil palm and soy crops (Jordan, 2017).

The ecological evidence

Compared to grasses or agricultural crops, tropical forests exhibit lower albedo, greater evapotranspiration rates, and higher roughness lengths (Shuttleworth et al., 1989). A study investigating the effects of complete deforestation of the Congo Basin found an albedo increased by 0.05, a 42% decrease in precipitation in western Congo Basin, a 10% increase in precipitation in the eastern part, and an overall drier and cooler climate (Bell et al., 2015:5721).

A study found that the expected deforestation for 2050 causes an average ground surface warming of 0.7°C, the temperature increase being directly proportional to the deforestation intensity (Akkermans et al., 2014:2714). The authors also found a reduction in precipitation; and attributed the changes to reduced evapotranspiration, resulting from modifications in sensible heat fluxes and albedo. Moreover, models of the surface warming reached temperatures of up to 3°C. This creates a significant difference to physiologically optimal temperatures for many animal species (Akkermans et al., 2014).

Surface warming notably affects tropical animal species; especially species of amphibians, reptiles, fish, and insects, which are ectothermic (Deutsch et al., 2008). Additionally, although birds are not ectothermic, they are also susceptible to endangerment; especially poor dispersers, such as the Congo peafowl (Figure 2), as they are less able to move to more optimal regions (Sekercioglu et al., 2012). Finally, the physiology of mammals (including humans) is less vulnerable to surface warming; however, they are indirectly affected because they rely on the directly affected species on lower trophic levels (Akkermans et al., 2014).

Moreover, between 2002 and 2015, the number of forest elephants in the Congo Basin dropped by 60%, mainly because of increased ivory poaching (Sandler Clarke, 2016). Experts suggest that this is an indirect result of deforestation: the more fragmented forests are, the harder it is for elephants to hide from poachers (Sandler Clarke, 2016).

Figure 2: The Congo peafowl (Wouters, 2008)

Figure 3: Elephants in Gabon are at greater risk of ivory poaching each day that unsustainable land-system change occurs (Ruggiero, 2013)

Assessment of the Empirical Evidence

Institutional factors

A study that surveyed 50 national experts from Cameroon and the Congo suggested that institutional factors have the greatest impact on deforestation and forest degradation (Tegegne et al., 2015). Institutional issues in the Congo Basin countries can lead to more land-system change—especially from subsistence farming and industrial or illegal/informal logging—because of corruption, vested interests, insufficiency of regulations and law enforcement, and the absence of national land-use plans (Tegegne et al., 2015; Cerutti et al., 2013).

Transparency and anti-corruption policies are imperative, as the international community is reluctant to invest in countries with unstable or corrupt institutions (Mosnier et al., 2012). Moreover, the Basin countries can learn from the Amazon, where the development of law enforcement in soy and beef supply chains was one of the successful measures to reduce deforestation (Nepstad et al., 2014).

The EU's Forest Law Enforcement, Governance and Trade (FLEGT) Voluntary Partnership Agreement (VPA) has made successful progress in ensuring that timber exported to the EU is legally obtained, while encouraging governance reform and transparency (Tegegne et al., 2015). The VPA is implemented by several Congo Basin countries (Cameroon, CAR, Congo), while others (DR Congo, Gabon) are undertaking negotiations (EU FLEGT Facility, 2018).

REDD+

The aims of the REDD+ program include expanding protected areas, reducing illegal logging, and promoting sustainable forest management, as the international community financially supports developing countries that are willing to combat deforestation and forest degradation (Mosnier et al., 2012). If successfully implemented, the program may halve deforestation by 2050 (Megevand et al., 2013).

Current financing of the Congo Basin countries falls under phase 1 of the mechanism. The core financial provision is expected to come once there are "measured, reported, and verified results" (Megevand et al., 2013:15). This poses a challenge for the Congo Basin, as it is difficult to calculate baseline levels against which to measure success in emissions reduction. Historic baselines may not convey the full extent of effort required to combat recent deforestation pressures (Megevand et al., 2013; Mosnier et al., 2012).

Forest management

Sustainable Forest Management (SFM) is the process of managing forests while ensuring biodiversity conservation and climate change mitigation, without hindering future productivity or damaging ecosystems (FAO and ITTO, 2011). Forest Management Plans (FMPs) are plans of the logging of an area, aiming to achieve maximum harvest rates, while ensuring that new

specimens are mature before they are logged again (Brandt et al., 2015).

Theoretically, FMPs should limit deforestation and forest degradation, as they promote selective logging over large areas, as opposed to intensive logging (Brand et al., 2015). However, studies found that logging activities can expand into intact forests because of the high specificity of selective logging requirements (Brandt et al., 2014). Research shows that spreading logging activities over large areas is more detrimental to biodiversity than conducting these activities in smaller areas (Edwards et al., 2014). Therefore, the growing global demand for sustainably-managed timber may generate unexpected and devastating repercussions for the Congo Basin.

Smallholder farmers

Smallholder farmers hold a crucial role in the current state of the Congo Basin forests; hence why experts in Cameroon and the Congo endorse policies that subsidize smallholders and facilitate partnerships between smallholders and the industry (Tegegne et al., 2015). Such partnerships fulfill the need for large-scale operators, while ensuring land tenure security and sustainable development opportunities for smallholders. Through these partnerships, they may access technical assistance, cheaper inputs, and credit (Tegegne et al., 2015; Nkongho et al., 2014).

Thailand provides an example of support for smallholders leading to economic benefits. When the government initiated a large land titling program and began supporting research, credit, and producer organizations, the country saw a significant expansion in rice production areas and a major increase in exports (Megevand et al., 2013).

Recommendations

Institutional factors

The UNEP can encourage other countries to form agreements like the EU FLEGT VPAs with the Congo Basin. Nonetheless, policy-makers must consider that research suggests that illegal/informal logging will continue to be a principal driver of deforestation in the Congo Basin (Tegegne et al., 2015). Therefore, any attempts to reinforce FLEGT or similar agreements should consider the local context and adapt technical approaches as suitable.

Organizations such as the UNEP, FAO, and UNDP can assist governments of the Congo Basin to foster effective dialogue and collaboration; increase transparency; and reform regulations, especially pertaining to forest management. Further, they can promote a culture of transparency and accountability within the public, to ensure sustainable change. Lastly, they can consult governments and other national stakeholders to approach development projects with a consideration for the long-run environmental repercussions of land-system change. For example, the 2005 Rural Sector Development Strategy in Cameroon is one project where the government could have benefited from assistance. The project aimed to extend agriculture into forested areas

to achieve a 50% rise in production by 2015 (Tegegne et al., 2015).

REDD+

In 2016, the Central African Forest Initiative signed a letter of intent for $200 million for REDD+ investment in DR Congo (UNDP Geneva, 2016). The other Congo Basin countries need such investments, such as bilateral agreements with REDD+ donors (e.g., Norway, who invested in Brazil, Indonesia, and others). Without these, governments will continue to be reluctant to undertake measures against forest degradation and deforestation (Tegegne et al., 2015). The UNEP can act as an intermediary between the Congo Basin countries and potential donors, to foster trust and sustainable investment.

Moreover, on the issue of measurement, many developing countries (e.g., the Coalition for Rainforest Nations) support a mixed approach to measurement (Mosnier et al., 2012). Given that the baseline level can either be determined by a historical rate of deforestation or a modeled future rate, an approach that incorporates both the historical rate and national circumstances is optimal.

Forest management

A study found that the ratio of cultivated to non-cultivated, non-forested area (that is suitable for cultivation) in Cameroon and the Congo is 1.45 and 0.14, respectively; whereas the world ratio is 3.37 (Deininger et al., 2011). Therefore, agro-industrial plantations can be expanded into these non-forested areas without increasing deforestation; moreover, old plantations can be rehabilitated and re-used for plantation (Megevand et al., 2013; Tegegne et al., 2015).

Smallholder farmers

The UNEP and other UN organizations can encourage and support Congo Basin countries to empower and subsidize smallholder farmers, as well as establish fair partnerships between smallholder farmers and large-scale operators.

Such policies may be inspired by the Nucleus Estate and Smallholders Scheme (NES), from Southeast Asia, or the ‘Alliances’ from Colombia. The latter foster the partnership between oil palm companies, which own industrial plantations and build mills; and smallholders, who become shareholders of the mills when they join the partnership with their own land (Nkongho et al., 2014).

Conclusion

The Congo Basin forests are at a crucial turning point in history. Decision-makers must consider the lessons learned from Amazonian and Southeast Asian rainforests, where industrial agriculture ravaged rainforests, caused forest fires, and destroyed biodiversity (Sandler Clarke, 2016). A similar scenario is bound to occur in the Congo Basin, unless we undertake preventive action. Realistically, the agricultural potential of the Congo Basin is too large for it not to become utilized. However, policies spanning institutional reform, international agreements, forest management reform, and smallholder farmer support are essential in promoting what may be our last chance at remaining within the planetary boundary of land-system change.

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