What role should land and forests play in the Paris agreement?

Policy brief
December 2015

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1. Introduction

Forests and land have long been recognised for their contribution to mitigating climate change, thanks to their important role in storing carbon. Those who live in and depend on forests are increasingly recognised to be the best guardians of these ecosystems, and are therefore a vital part of the climate solution.

The role forests and their guardians play in mitigating climate change is now brought to the fore by discussions about long-term global goals for reducing emissions – a crucial element of a new global agreement, set to be decided at COP 21 in Paris. Among the proposals under discussion are goals of achieving «net zero» emissions or global «climate neutrality»; targets that equate mitigation efforts in the land sector with emission reductions in other sectors.

Most of the scenarios for global emission reductions presented in the latest report from the Intergovernmental Panel on Climate Change (IPCC) indicate the need to increase carbon sequestration to limit warming to 2˚C or 1.5˚C. Many of these scenarios assume widespread use of carbon sequestration through various carbon dioxide removal (CDR) technologies. Most CDR technologies are projected to place very high demand for land in order to achieve this and could therefore have severe negative impacts on food security, local livelihoods and human rights. Moreover, sequestration of carbon into land-based ecosystems is at risk of being reversed – a risk that is expected to increase with climate change.

However, if done in the right way, increased carbon sequestration could yield multiple important benefits. Replenishing the planet's natural carbon stores and restoring landscapes can protect biodiversity and help meet global targets, such as those set by the Convention on Biological Diversity and the Sustainable Development Goals. Recognizing, securing and reinstating land rights for indigenous peoples and local communities is a direct means of achieving this. In many parts of the world, biodiverse ecosystems that are owned and managed by these groups have been proven to contain more carbon than forests where rights are unclear or monoculture plantations and therefore do more to mitigate climate change.

In short, forests and land-use presents a number of unique challenges as well as opportunities for climate mitigation, making the land sector fundamentally different from other sectors in climate policy.

With large opportunities as well as significant risks to climate mitigation in the land sector, governments meeting in Paris to discuss long-term goals for emission reductions face a number of challenges. They need to formulate goals that simultaneously ensure a rapid phase-out of fossil fuel emissions, halting emissions and increasing sequestration in the land sector – while at the same time ensuring that land-based mitigation is achieved in an ecologically sound way, recognizing the role that communities and indigenous peoples play in protecting and restoring forests.

In this policy brief, we provide recommendations for the formulation of such a goal. Our recommendations draw on new research by Stockholm Environment Institute (SEI) that investigates the role of the land sector in global mitigation efforts.[1] In the following sections, we summarize the main findings of SEI's research, discuss their policy implications, and provide recommendations for COP 21.

2. How much does the land sector contribute in recent mitigation scenarios?

Most emission scenarios examined by the IPCC and more recent research, assume that a large amount of carbon dioxide will need to be removed from the atmosphere over the course of this century in order to keep global temperature rise below 2°C or 1.5°C. Such «carbon dioxide removal» (CDR) is sometimes referred to as «negative emissions». Potential CDR technologies range from highly speculative (e.g., direct air capture and ocean-fertilization), via technologically unproven (e.g., Bioenergy with Carbon Capture and Storage, BECCS), to well-known (e.g., carbon sequestration in land-based ecosystems through reforestation or ecosystem restoration).

In their analysis, SEI highlights three levels of risks associated with being dependent on CDR measures for meeting long-term climate goals. First, some of the measures on which current models rely are as yet unproven. Second, even for existing technologies or those available in the future, the ecological and social costs of deploying them on the scale that is assumed might be unacceptably high. And third, even if CDR measures can be undertaken without adverse ecological and social consequences, the risk remains that carbon benefits will be temporary and that the sequestered carbon might be returned to the atmosphere as a result of human activity or climate change.

The report argues that mitigation strategies are highly risky if they rely on the future large-scale deployment of negative emissions before we have high confidence that such options will be technically feasible, ecologically and socially acceptable, and reliably permanent. Such a strategy could strand us at a late date with an insufficiently transformed energy system, an exceeded carbon budget, and a carbon debt that cannot be repaid.

Table 1
Required carbon sequestration in analysed emission scenarios

	Probability of meeting target	Carbon sequestration over the century
2°C	> 66%	0 – 900 GtCO2
1.5°C	> 50%	450 – 1,000 GtCO2

Modelled emission scenarios from the published literature that meet the 2°C or 1.5°C targets are based on a wide range of CDR requirements (see Table 1), with the higher levels (approaching 1000 GtCO2) possibly unachievable or even in excess of the planet's biophysical capacity. However, a number of scenarios show pathways for meeting the temperature targets at far lower levels of CDR. Specifically, many modelled pathways can meet the 2°C target, and even 1.5°C, relying on a total removal of 480 GtCO2 or less, provided that fossil fuel emissions are brought to zero more rapidly.

3. Mitigation options in the land sector: Assessing potential and risks

While the lower levels of carbon sequestration at which the 2°C target can be met may not exceed basic biophysical constraints, they still present a significant global challenge. They require measures that will affect large areas of land, increasing the potential for serious social and ecological risks on areas such as

impacts on food security, biodiversity, and the rights and livelihoods of indigenous peoples and local communities.

The SEI report reviews existing literature on mitigation potential from various options in the land sector in order to assess which measures we can currently have some confidence will be feasible at the necessary scale and with socially and ecologically acceptable consequences. Table 2 summarizes the mitigation options that were assessed, and quantifies a set of less risky options that might contribute to meeting the required carbon sequestration over the course of the century.

Table 2

Mitigation options	**Summary of SEI assessment**	**Cumulative sequestration by 2100**
Halting emissions from the land sector by 2020	Stopping emissions from deforestation and forest degradation, and minimizing emissions from degraded peatlands through re-wetting, would yield multiple benefits, and should therefore be given the highest priority.	Large emissions avoided (no sequestration)
Ecosystem restoration (defined as accelerating the natural recovery of degraded forests)	Significant mitigation potential. Additional benefits such as biodiversity, watershed maintenance and improved livelihoods. Potential adverse effects relate to existing land uses such as shifting cultivation. A cautious approach that allows for such considerations, might anticipate about half of the more optimistic assumptions for carbon sequestration may be achieved.	330 GtCO2
Reforestation/ afforestation (defined as the establishment of forests on lands that no longer have capacity for natural regeneration)	Large potential for carbon sequestration, but also large risk of ecological impacts. Scale of reforestation therefore needs to be constrained to avoid competition with food security and other land uses; negative impacts on land rights and local livelihoods; and to ensure that reforestation takes place in areas that are geographically appropriate from a climate, biodiversity and land-use point of view. An ambitious approach might consist of meeting the Bonn Challenge to reforest 150 Mha by 2020 and expanding efforts to meet the New York Declaration on Forests goal to reforest an additional 200 Mha by 2030.	150 GtCO2
BECCS (In order for bioenergy to be considered a CDR measure it must be combined with technology to capture and store carbon)	Potential negative impacts on food security has led to recommendations for avoiding dedicated use of land for bioenergy, instead prioritizing wastes and residues. Bioenergy from wastes and residues are not considered suitable for BECCS, due to dispersed sources. A precautionary approach would currently assume no contribution from BECCS to carbon sequestration, until it is proven feasible at commercial scale, and bioenergy feedstocks can be sustainably produced in socially and ecologically acceptable ways.	0 GtCO2

In addition to the options summarized in the table, SEI briefly considers measures such as landscape restoration, soil carbon sequestration, and reducing demand for agricultural products through dietary changes. While some of these are likely very important, they are not quantified due to uncertainties in measuring (landscape restoration); uncertainties in policy implementation (dietary changes); and high risk of reversals (soil carbon). It would be risky to count on the future availability of these measures before these uncertainties are resolved.

Based on the consideration of these measures, SEI conclude that emission scenarios for 2°C or even 1.5°C can indeed be achieved by relying only on carbon sequestration measures that do not require unproven technologies, and that can conceivably be implemented with significant ecological and social benefits, while avoiding adverse impacts. There is still a risk of such impacts, however, in particular if measures are not well-designed, geographically appropriate, and implemented through broad, multi-stakeholder participation that ensures local ownership. Moreover, the risk that carbon sequestration will be reversed is inherent to land-based mitigation, highlighting the need to further minimise the reliance on such mitigation approaches for meeting climate stabilization goals.

4. Policy recommendations

In our view, the analysis summarized above holds several important messages for policy makers.

The good news is that it is still feasible to limit warming to 2°C – and even return to 1.5°C or less – without relying on unproven and potentially dangerous technologies for negative emissions. Stopping emissive activities in the land sector, such as deforestation and peatland drainage, and increasing the sequestration capacity of land-based ecosystems through ecosystem restoration and cautious reforestation efforts, holds the potential to contribute sufficiently to climate change mitigation that these temperature targets may be met.

The warning, however, is that urgent, deep reductions in fossil fuel emissions are required in order for this to be the case. If emissions from fossil fuels are not brought down to zero within a very short timeframe, the amount of increased carbon sequestration needed will very likely exceed key social and ecological constraints. This reinforces the need for an ambitious and unambiguous target for phasing out fossil fuel emissions, and for separately specifying the action that needs to happen in the land sector in order to reduce emissions within acceptable social and ecological limits.

The gap between assumptions about «negative emissions» in some scenarios for greenhouse gas emission reductions and the physical, social and ecological limits to this potential highlights the need for such limits to be recognised and reflected in policy formulations and targets, as well as the modelling that underpins them.

This has a number of policy implications:

1. Reducing emissions from fossil fuels must be a top priority of climate policy on all levels. Unless fossil fuel emissions are brought to zero as soon as possible, the pressure on irresponsible and dangerous mitigation action in the land sector will increase. Any delay in phasing out fossil fuels also increases the risk of climate change-induced carbon emissions from land-based ecosystems, further limiting the potential role that the land sector can play in sequestering carbon and jeopardizing the permanence of existing carbon stocks.

2. In the land sector, too, the first priority should be reducing land use emissions as close as possible to zero. The existing carbon storage capacity of land-based ecosystems must be protected, and emissions from activities such as deforestation, forest degradation, and peatland drainage must be stopped. Established international goals, such as the goal of halting deforestation by 2020, already provides a basis for refocusing efforts on this. Previous initiatives to stop forest loss provides a number of important lessons:

- Securing land rights for indigenous peoples and local communities, and improving forest governance, are the most effective means of ensuring long-term forest protection.
- International drivers of deforestation and degradation must be addressed, by tackling investment flows, commodity supply chains and demand side drivers, i.e. consumption of agricultural products.
- Scaled-up international finance is needed in order to stop deforestation and forest degradation. Offsetting fossil fuel emissions against land-based carbon sequestration will however run counter to the need for ending emissions in both sectors and to minimize risks of reversals. Trading land-based carbon in carbon markets is therefore not a suitable way of raising the required levels of finance for land sector mitigation.

3. Additional carbon sequestration should be achieved through ecosystem restoration, which in most cases has a number of other potential benefits. Reforestation, on the other hand, can have either positive or negative impacts on biodiversity, hydrological cycles and resource use, depending on the scale and location of reforestation efforts and whether customary land rights are respected, and should therefore be treated with more caution.

4. Dietary changes might make considerably larger amounts of land available. With a majority of the world's agricultural land used for livestock, reduced consumption of animal products in developed countries, most notably beef, would make it possible to actually increase food security while substantially reducing land use demands and greenhouse gas emissions.

5. Achieving the emission reductions and additional sequestration that is outlined above, while at the same time addressing the unique challenges of the land sector requires a comprehensive approach to land-use planning, which is not focused solely on mitigation action. A broad framework must be established for the development and support of policies and measures to enhance and protect land-sector resources and the wealth of benefits derived from those resources. This will require coordinated institutions, internationally as well as across various levels of government, and improved governance capacity.

What does this mean for negotiations in Paris?

1. Any long-term global goal must give a clear and unequivocal message about phasing out fossil fuel emissions. Goals that include references to «net zero» or «climate neutrality» open the door to offsetting fossil fuel emissions against carbon sequestration in the land sector, increasing the risk of irresponsible mitigation action and reversals of carbon benefits. Such goals should therefore be avoided.

2. Specific goals for the land sector are needed, in addition to bringing fossil fuel emissions to zero. These should build on existing international targets that will contribute to responsible mitigation in the land sector – in particular halting deforestation by 2020 and other relevant targets in the Sustainable Development Goals, as well as targets under the Convention on Biological Diversity to restore degraded ecosystems.

3. The agreement must explicitly recognize the special circumstances of the land sector in terms of the integrity of natural ecosystems, food security and the security of indigenous peoples' and local communities' land tenure, in particular with regards to the potential risks posed by climate actions, as well as the impacts of climate change itself. The agreement should make comprehensive land-use planning the preferred approach to achieving climate mitigation and adaptation goals, and to balance them against other policy goals, in the land sector.

4. The agreement must ensure that human rights and the rights of indigenous peoples and local communities are upheld, and must ensure the participation of these groups at all levels of climate policymaking. A rights-based approach to climate action will increase the potential for achieving multiple social and ecological benefits in the land sector, while avoiding the more risky mitigation options.

[1] Sivan Kartha and Kate Dooley, «The risks of relying on tomorrow's 'negative emissions' to guide today's mitigation ambition.» SEI working paper, 2015. Boston, MA: Stockholm Environment Institute. Available for download at http://bit.ly/1jySOZ9

Funding from Norad and the European Commission is gratefully acknowledged for this work.
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