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Reforming the EU approach to LULUCF and the climate policy framework

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ABSTRACT

We focus on recent progress in reforming the role of forests and other land use in the EU climate policy framework. EU inclusion of LULUCF (**L**and **U**se, **L**and-**U**se **C**hange and **F**orestry) in the climate policy framework still lags international developments, remaining at odds even with the United Nations Framework Convention on Climate Change's (UNFCCC) Kyoto framework. Though the EU has made some important changes that eclipse even the UNFCCC framework—in particular regarding the inclusion of cropland and grazing land management in mandatory EU-level carbon accounting practices—in other respects the EU has far to go. As part of a strategy for fulfilling emission reduction commitments within the EU burden-sharing agreement, Member states are not permitted to trade either in domestically nor foreign produced forest-based carbon credits. On the other hand, *both* the EU and the UNFCCC/Kyoto LULUCF frameworks remain distant from an idealized model that could facilitate increased climate change mitigation and a more efficient and balanced use of forest-based resources. Limiting the incorporation of forests in the climate policy framework has significant consequences for the cost and rapidity of emission reductions. Forest potential thus remains under-mobilized for climate change mitigation. In this context, we draw particular attention to the fact that forest-based carbon sequestration's potential contribution to *negative emissions* represents an important missed opportunity. In the context of ongoing discussions over the EU and UNFCCC's Post-Kyoto frameworks, we propose an all-encompassing LULUCF carbon accounting model incorporating *all* previously omitted carbon pools and activities, thus weighing LULUCF removals and emissions on a par with emissions from other sectors (industry, the energy sector, end-users). The successful integration of LULUCF into the EU climate policy and carbon-trading frameworks could dovetail neatly with emerging international climate change mitigation efforts.

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1. Introduction

The United Nations Framework Convention on Climate Change's (UNFCCC) Subsidiary Body for Scientific and Technological Advice (SBSTA) has invited Parties and admitted observer organizations to submit views on issues related to 'a more comprehensive accounting of anthropogenic emissions by sources and removals by sinks from Land Use, Land-Use Change and Forestry (LULUCF), including through a more inclusive activity- or land-based approach' (UNFCCC, 2012a).

Independently of the SBSTA discussion, the European Union and other countries are likewise actively engaged in thinking about how LULUCF can be more strongly integrated into the climate policy framework. In March 2012, the European Commission introduced a proposal for harmonizing LULUCF carbon accounting and the incorporation of Cropland and Grassland Management (CM and GM) in mandatory accounting (EC, 2012a). The Commission proposal was formally approved in March 2013. At the same time, the Commission published an Impact Assessment addressing the broader question of integrating LULUCF into the general EU climate policy framework (EC, 2012b). And in July 2012 the EU likewise responded to the SBSTA call (UNFCCC, 2012b).

Though SBSTA and EU efforts have developed independently, they are not unrelated. Moreover, the relative importance of the EU and the position it takes in international negotiations encourages us to consider these discussions in parallel. The current environment is ripe for significant reform of both the UNFCCC and EU LULUCF carbon accounting frameworks. As part of the next step to defining the UNFCCC's Post-2020 framework, a revised EU strategy could feed directly into current plans to conclude a general and potentially legally binding UNFCCC agreement in 2015 (or later).

This article focuses on the EU position regarding the future inclusion of LULUCF in the EU and international climate policy frameworks. In particular, we assess EU willingness to consider and develop a more comprehensive and firmly integrated LULUCF framework and how it might interact with ongoing international efforts. The EU has long resisted the inclusion of LULUCF in the climate policy framework. To-date, LULUCF-generated carbon credits still cannot be traded in the EU Emission Trading Scheme (EU ETS). And domestic, forest-based carbon credits further remain subject to substantial limitations resulting from the UNFCCC and Kyoto-based carbon accounting framework. Further, unlike other Clean Development Mechanism (CDM) credits, forest-based credits generated through the CDM cannot be traded in the EU ETS.

Significant untapped opportunities thus remain for achieving rapid and cost efficient emission reductions in the EU, as well as in the larger Kyoto and global climate mitigation frameworks. We evaluate the current EU proposals for a revised LULUCF strategy in the context of work on the "Incentive Gap" (IG, Ellison et al., 2011, 2013) and consider the potential for the full mobilization of forest-based LULUCF resources for the purposes of climate change mitigation. The IG measures the 'share of carbon sequestration (net removals) not incentivized in the regulatory framework' and measures this amount both for the activity Forest Management (FM) and across the broad range of LULUCF-based carbon pools and activities: harvested wood products (HWP), afforestation, reforestation and deforestation (ARD), cropland management (CM), grazing land management (GM), Wetlands and unmanaged forests. The IG concept thus highlights and operationalizes the share of *missed opportunities* embedded in the UNFCCC and Kyoto-based carbon accounting frameworks. The IG concept further highlights a potential framework for improving LULUCF carbon accounting and improving climate change mitigation efforts.

Though the EU has the potential to fully mobilize forest-based resources by fully integrating LULUCF into its climate policy framework, we argue the *full carbon value* of all forest-based activities is not currently recognized, in particular in the EU carbon-trading scheme. Full LULUCF integration would sit well with ongoing international efforts to integrate forests into the climate policy framework, in particular in the context of REDD+ (**R**educed **E**missions from **D**eforestation and Forest **D**egradation). We shed particular light on the important potential for a forest contribution to *negative emissions* typically neglected in climate mitigation strategies.

On the basis of an "idealized" carbon accounting model and its comparison with the UNFCCC's Kyoto Protocol (KP) framework provided in Section 1, we then address the international carbon-trading framework in Section 2. Section 3 analyzes support for and the development of EU strategies for integrating LULUCF into the climate policy framework. The fourth Section assesses the impact of the Post-Durban outcome on the EU Member states and its meaning for the potential mobilization of forest potential in the climate policy framework. This section first considers the new "cap" and then addresses the new Forest Management Reference Levels (FMRL). Section 5 provides a discussion of forest potential in the climate policy framework and assesses the particular singularity of *negative emissions*. We close with a discussion of the current EU strategy and some remarks on what a 'more comprehensive carbon accounting framework' might include.

2. The international LULUCF carbon accounting framework and our idealized model

Ellison et al. (2011, 2013) introduce a LULUCF carbon accounting model that attempts to balance interests across the various components of the forest value chain—in particular bioenergy, harvested wood products (HWP) and standing forests. In a balanced, climate-based model, all components of the chain should be equally weighted according to their *full carbon value* and thus their true climate change mitigation potential. From a climate perspective, forest resources would then more likely be used in a balanced and efficient manner and would be fully mobilized in the interest of climate change mitigation. The effective mobilization of forest-based resources for climate change mitigation is best facilitated with a strategy that places LULUCF on a par with other sectors (energy, industry, the non-ETS sector) in the climate policy and carbon-trading frameworks.

Because this model weighs all LULUCF emissions and removals according to their true climate change mitigation potential, each country would then have the option to achieve climate targets either by reducing emissions in other sectors, increasing removals in the LULUCF sector, or both. This should

Table 1 – Pre-, Post-Durban Rules for LULUCF carbon accounting and idealized model.

Kyoto rules LULUCF	Pre-Durban (CP1: 2008–2012)	Post-Durban (CP2: 2013–2020)	Idealized model
FM election	Voluntary	Mandatory	Mandatory
"*cap*" on FM carbon credits	3% of 1990 emissions, 15% of actual net removals (whichever smaller, or negotiated)	3.5% 1990 emissions	No cap
Reference level (accounting method)	Reference level = "0" (gross-net)	Projected, historical or reference level = "0" (net-net)	Estimate new baseline using average net removals in previous commitment period (continuous gross-net)
Carbon pools and activities	Many carbon pools and activities omitted (HWP, CM, GM, wetlands, unmanaged forests, etc.)	HWP included (limited by "cap"), but many carbon pools and activities omitted	Include all carbon pools and activities in one all-encompassing National Forest Inventory
Offsetting of net ARD emissions	Permitted	Not permitted	Collapse Arts. 3.3 & 3.4

Note: Under the Kyoto Protocol, stock changes in carbon pools are fully accounted under Art. 3.3 (Afforestation and Reforestation, AR and Deforestation, D), but discounted by a cap under Forest Management (Art. 3.4, FM). If FM was elected for the first commitment period (CP1), net emissions from ARD could be offset by net removals from FM. The idealized model strives to include and integrate all carbon pools without restriction.

promote greater efficiency and effectiveness in the mobilization and use of forest-based resources, thereby facilitating more rapid climate change mitigation.

Our *idealized* model presented in Table 1 (Ellison et al., 2013) differs substantially from current practice under the UNFCCC/Kyoto framework, in particular because it eliminates discounting in the LULUCF sector. To achieve a more balanced and efficient use of forest-based resources, the international policy framework must be substantially modified. In particular, all barriers to the mobilization of increased forest growth and forest-based carbon sequestration such as the *cap* should be removed. Moreover, all LULUCF pools and activities should be collapsed into one *mandatory* all-encompassing activity and inventory, and all forest-based sinks (and sources) should be weighted according to their true climate potential. Ellison et al. (2011, 2013) further argue the *full carbon value* of all LULUCF activities should be fully mobilized within the international carbon-trading framework.

Both the EU and the UNFCCC/Kyoto-based carbon accounting frameworks remain distant from achieving these goals. A significant "Incentive Gap" (IG) continues to block the effective mobilization of forest-based resources (Ellison et al., 2011, 2013). Although changes agreed in Durban raise the total share of permissible carbon credits—the "cap"—to 3.5% of 1990 greenhouse gas (GHG) emissions, a significant IG remains (Ellison et al., 2013).

Further reforms are necessary. At a bare minimum, Art. 3.3 (the net of Afforestation, Reforestation and Deforestation, ARD) and Art. 3.4 (FM) should be collapsed into a single category, thereby more strongly encouraging net removals and future forest growth under FM, where the lion's share of net removals occur (Ellison et al., 2013). Moreover, this would greatly strengthen the promotion of forest potential in what is genuinely the largest area of potential "*human-induced*" forest activity. Since both Art. 3.3 and 3.4 are powerfully linked to anthropogenic manipulation, concepts of human-induced vs. natural growth do not logically support their separation. Ideally, however, all caps and limitations should be removed from the system.

The "*idealized model*" ultimately attempts to provide a neutral framework within which individual countries can decide for themselves which forest-based activities should be favored. As Ellison et al. (2011, 2013) argue, what is not "counted" in the EU and international carbon accounting frameworks is not likely to figure in the thinking and strategies applied to forest-based resources. The current UNFCCC/Kyoto-based model ultimately favors bioenergy use, while the carbon sequestered in HWP or standing forests is not consistently counted or incentivized. The cap, in particular, significantly discounts standing forests, while emissions from bioenergy combustion are considered neutral. Since *restrictions* of this kind result in weighting sectors or pools differently, all restrictions should be removed. Though this problematic has been favorably modified under the Second Commitment Period (CP2), these changes do not go far enough.

The current strategy is likely to provide stronger incentives in favor of harvesting additional forest growth for bioenergy. Under the First Commitment Period (CP1), all biomass was assumed immediately oxidized and emitted to the atmosphere at the time of harvest. This favored bioenergy use compared with traditional forest based products. Under the CP2, HWP is subject to mandatory accounting using the "*Production approach*"–which credits increasing stocks in domestically produced HWP. Though this represents a step forward, as a carbon pool under FM, HWP remains capped and HWP from deforestation (Art. 3.3) is considered immediately oxidized.

The neutral framework we propose supports the broader diversity of potential climate change mitigation actions without disadvantaging individual country strategies. Moreover, for countries favoring the promotion of increased stocks in standing forests or HWP, this model would correct the accounting imbalance currently favoring bioenergy. Nor does this approach marginalize the option for countries choosing to maximize biomass production. Though the model does not inherently favor biodiversity protection or the development of protected areas over the optimal exploitation of forest-based resources, it does provide a framework in which countries and individual actors can more easily promote these options. The explicit advantage of this model is its potential for *optimizing* cost efficient and effective climate solutions and for allowing Parties to freely pursue alternative scenarios.

3. The international carbon-trading framework

Where LULUCF carbon accounting is concerned, the greatest variation from UNFCCC practice in the EU framework concerns the fact that EU Member states are *not* permitted to apply forest-based carbon credits toward their EU level emission reduction commitments (though these are *reported* to the UNFCCC) and they are further not permitted to trade in forest-based carbon credits within the EU Emission Trading Scheme (EU ETS).

The emerging international carbon-trading framework, however, clearly governs and incentivizes the integration of forests into the UNFCCC/Kyoto and international climate policy frameworks. Without this, for example, incentives for promoting both REDD+ strategies and forest-based carbon sequestration in Annex I countries are likely to be greatly diminished.

At the international level, commitment to incentivizing the world's forests in the carbon-trading framework is mixed. Based on the KP, countries have the right to trade in *Removal Units* (RMU's) from Afforestation, Reforestation and Deforestation (ARD, Art. 3.3), FM (Art. 3.4), and in *Certified Emission Reductions* (CER's) through CDM investments. RMU's and CER's are, for the most part, restricted to carbon removals generated under Art. 3.3. Tradable credits from carbon sequestration (net removals) under FM are limited by the ''cap'' (for all Annex I countries), by the Linking Directive (for all EU Member states), and are further not eligible under the framework of the CDM mechanism. This limits CER's to Afforestation and Reforestation efforts (Art. 12).

The vast majority of the world's forests, on the other hand, remains outside the carbon accounting framework and thus at best remains only weakly incentivized (Ellison et al., 2013). The incorporation of LULUCF into the international climate policy framework thus remains underdeveloped. To-date, only the voluntary forest-based carbon market, the New Zealand ETS and the California Forest Protocol and Carbon-Trading schemes potentially provide unrestricted frameworks for promoting forest-based carbon sequestration. On the European side, forest-based carbon offsetting is discouraged by the fact that forest-based CDM credits are not permitted in the EU's ETS.

The carbon-trading schemes emerging in the EU, Australia, California, New Zealand and other countries and regions are gradually diverging. While the New Zealand and California models are receptive to the inclusion of forest-based carbon credits and represent suitable vehicles for funding REDD+ opportunities, the EU model excludes forest-based carbon credits from the system and the UNFCCC/Kyoto framework imposes comparatively strict limits on which LULUCF-based carbon removals can be traded. This presumably has an important impact on REDD+ funding from EU Member Annex I states and slows any movement toward a potential future *global forest transition* (Meyfroidt and Lambin, 2011; Waggoner and Ausubel, 2001).

Some schemes are likewise becoming more disconnected from the UNFCCC/Kyoto agreement. After the 2012 Doha COP18 meetings, New Zealand declared its intention to leave the KP, suggesting its carbon-trading scheme will only be loosely connected with this system. The degree to which California emission trading will link with the UNFCCC/Kyoto framework is likewise unclear. Despite ongoing efforts to link carbon-trading regimes across the EU, Australia and possibly also the US (Zetterberg, 2012), increasing diversity in emerging carbon markets risks driving a wedge between those countries that accept and incorporate forest-based carbon credits and those that do not. Though the EU and Australia announced their intention to link their emission trading schemes in 2012, other regions remain outside this framework (http://ec.europa.eu/clima/news/articles/news_2012082801_en.htm).

Increasing diversity may have potentially negative effects on the ability to mobilize the world's forests in the international framework. Though the forest-based CDM market began to show rapid positive growth in 2010, the REDD market collapsed by 59% the following year (Ecosystem Marketplace, 2011, 2012). Many factors have contributed to this fall. The failure to conclude a successful and legally binding emission reduction agreement at the last five *Conference of the Party* (COP) meetings in Copenhagen, Cancun, Durban, Doha and Warsaw provides little encouragement for countries to engage in carbon-trading markets or invest in programs such as REDD+. Further, the list of Kyoto dropout countries is lengthening (Canada, Japan, Russia and now New Zealand) and the US never succeeded in ratifying its original 1998 KP commitment. Though some countries considered rejoining (Japan), commitment to the international framework is tenuous. Finally, the global economic recession had a significant impact on willingness to further develop climate mitigation strategies and the funding of carbon offsetting initiatives such as REDD+. All the above factors together contribute to one final explanatory factor—the collapse in carbon prices.

The successful incorporation of LULUCF into the EU's climate policy framework and the potential for trading FM and CDM forest-based carbon credits could go a long way to further mobilizing support for the inclusion of LULUCF and REDD+ in international bargaining frameworks such as the Post-Kyoto strategy. However, the potential integration of LULUCF into the EU climate policy framework may still be several years away. Moreover, future modifications to the EU forest-based CDM framework are not part of current discussions.

4. The developing EU position on LULUCF

The inclusion of forests in the KP carbon accounting framework has long been controversial. Though signed in 1997, the final decision regarding the inclusion of forests and forestry was not made until much later at COP 7 in 2001. Countries like Japan and others held up the process (Fry, 2002). Some were concerned LULUCF activities could undermine the environmental integrity of the KP and that forest rich parties could potentially abuse forest growth in order to escape their commitments to reduce emissions. The inclusion of LULUCF in the Kyoto framework has therefore included limitations on the role LULUCF can play—guided in particular by the ''*cap*'' on carbon credits under FM.

Though the FM cap has multiple aims (Ellison et al., 2011, 2013), limitations on the mobilization of LULUCF in the climate

policy framework may mean actors will not take advantage of forest-based resources in the climate change mitigation (and adaptation) framework and may make fewer attempts to minimize the impact of natural disturbances. This limits vast potential for forest-based carbon sequestration as well as for promoting adaptation and combatting deforestation. Such barriers are not in the spirit of the Kyoto enterprise. And since other strategies have generally been adopted to address disturbances or reduce the potential for taking advantage of historical growth (e.g. the FMRL), caps have ultimately lost their meaning in the general framework. Moreover, we have considerable difficulty viewing any stock changes in carbon sequestration as '*undeserved*': contributions to the net carbon sink are contributions to global climate change mitigation efforts.

To-date, however, LULUCF remains a secondary appendage in the climate policy framework: successful LULUCF-based carbon sequestration and emissions are *recorded* in UNFCCC reporting but *not accounted* in the EU burden-sharing commitment and emission reduction framework. Resistance toward the positive integration of LULUCF into the EU's climate policy framework and, in particular, into the EU ETS, persists. In revising the EU strategy for CP2 (2013–2020), the EU's 2020 Climate and Energy package did not even attempt to model the impact of incorporating LULUCF (EC, 2008: 36–7) and ultimately left LULUCF out of the EU climate policy framework. The EU ETS Directive (both the previous Directive (2003/87/EC) covering the first CP1 and the newer Directive (2009/29/EC) covering CP2, as well as the EU Linking Directive (2004/101/EC) do not allow the use of domestic forest credits, nor do they permit forest-based credits from CDM and Joint Implementation (JI) projects in the EU ETS. The Linking Directive (2004/101/EC) explicitly rejects the potential use of CER's and ERU's from LULUCF (see also Swedish EPA, 2006). Although Member states are not restricted from supporting CDM-based forest investments, the resulting carbon credits cannot be used to fulfill EU-level emission reduction commitments.

Despite widespread support for the incorporation of LULUCF in the EU climate policy framework, the ECCP (2010) and the Commission's Impact Assessment (EC, 2012b) note several difficulties including problems of uncertainty in the estimates of sequestered carbon, the lack of annually based LULUCF reporting cycles, and uncertainty over whether LULUCF should be incorporated into the EU's ETS or into the commitment mechanism. In addition to these, the European Commission's Impact Assessment (EC, 2012b) likewise points to the problem of inter-annual variation in net forest emissions (removals). Since the EU ETS currently requires information about individual installations (forest owners), incorporating LULUCF into the EU ETS could require some manipulation and would require a significant administrative apparatus. Further, the current EU ETS is based on annual compliance, while national forest inventories are based on longer-term cycles (ECCP, 2010).

There is likewise considerable antipathy toward any weakening of the EU ETS that might result from a possible reduction of carbon prices or reduced incentives to cut ETS sector emissions. Some worry individual countries could take advantage of LULUCF to minimize emission reduction requirements in other sectors, i.e. that integration of LULUCF into the EU ETS could weaken the pressures placed on high-emitting industries and the fossil fuel-based power sector to reduce emissions. Others are concerned about the potential "intensification" of LULUCF activities, whether by more intensive planting regimes or fertilization. Tensions between the competing uses of forest-based resources are evident at the heart of the European Climate Change Programme (ECCP) one of the EU-level bodies assigned the task of evaluating EU climate policy.

Many EU Member states and Annex I signatories are slow to accept change. Sweden, for example, like many EU Member states and Annex I countries, is resistant to modifications of the existing rules that may result in higher levels of uncertainty and risk. Moreover, intergovernmental decision-making on Kyoto practices requires consensus on the part of all participating Parties and signatories, thus encouraging incrementalism. Large changes in the Kyoto framework are difficult to pursue.

Among EU Member states, nine out of twenty-seven chose not to account for FM under CP1—Austria, Belgium, Bulgaria, Cyprus, Estonia, Ireland, Luxembourg, the Netherlands and Slovakia—and Malta failed to specify a cap. Though most EU Member states had caps that permitted the accounting of carbon removals under FM, the decision not to elect FM meant this share of carbon sequestration could not be counted and thus was not "incentivized". The 2011 LULUCF agreement reached in Durban renders FM reporting mandatory in CP2. Thus, although some countries exhibited a tendency to shield their forest resource from accounting, this option has now been foreclosed.

Maintaining a highly compartmentalized climate policy framework that explicitly rejects the trading of carbon credits across the growing number of pillars in the EU system weakens the potential cost-efficiency and effectiveness of the system. The current EU climate policy framework already does not permit the trading of carbon credits across the EU ETS, non-ETS and the renewable energy directive sectors. Moreover, countries can potentially land in the awkward position of over-fulfilling commitments in one segment, while still being required to make up for any deficiencies (falling short) in other segments (Ellison, 2011).

Influenced in part by background studies (Kuikman et al., 2011; IIASA, 2011), the EU has been considering the potential incorporation of forest carbon sinks in the climate policy framework. In March 2012, DG Climate Action issued a draft proposal on LULUCF GHG accounting rules that follows up on the Durban LULUCF agreement (EC, 2012a). This current initiative addresses the harmonization of LULUCF carbon accounting practices across the broad set of 27 EU Member states and the incorporation of Cropland and Grassland Management (CM and GM). The European Council and Parliament officially accepted this proposal and related legislation on Mar. 12th, 2013.

Harmonization above all affects the accounting of carbon stock changes in above and below ground biomass and soil organic carbon under CP2 and *mandatory* reporting on Cropland and Grazing land management activities (CM and GM). The current EU LULUCF initiative thus represents an important step beyond the 2011 Durban agreement in which Cropland and Grazing land management reporting remains "*voluntary*" and only ARD and FM reporting are mandatory. Subject only to "voluntary" reporting requirements under CP1, the majority of

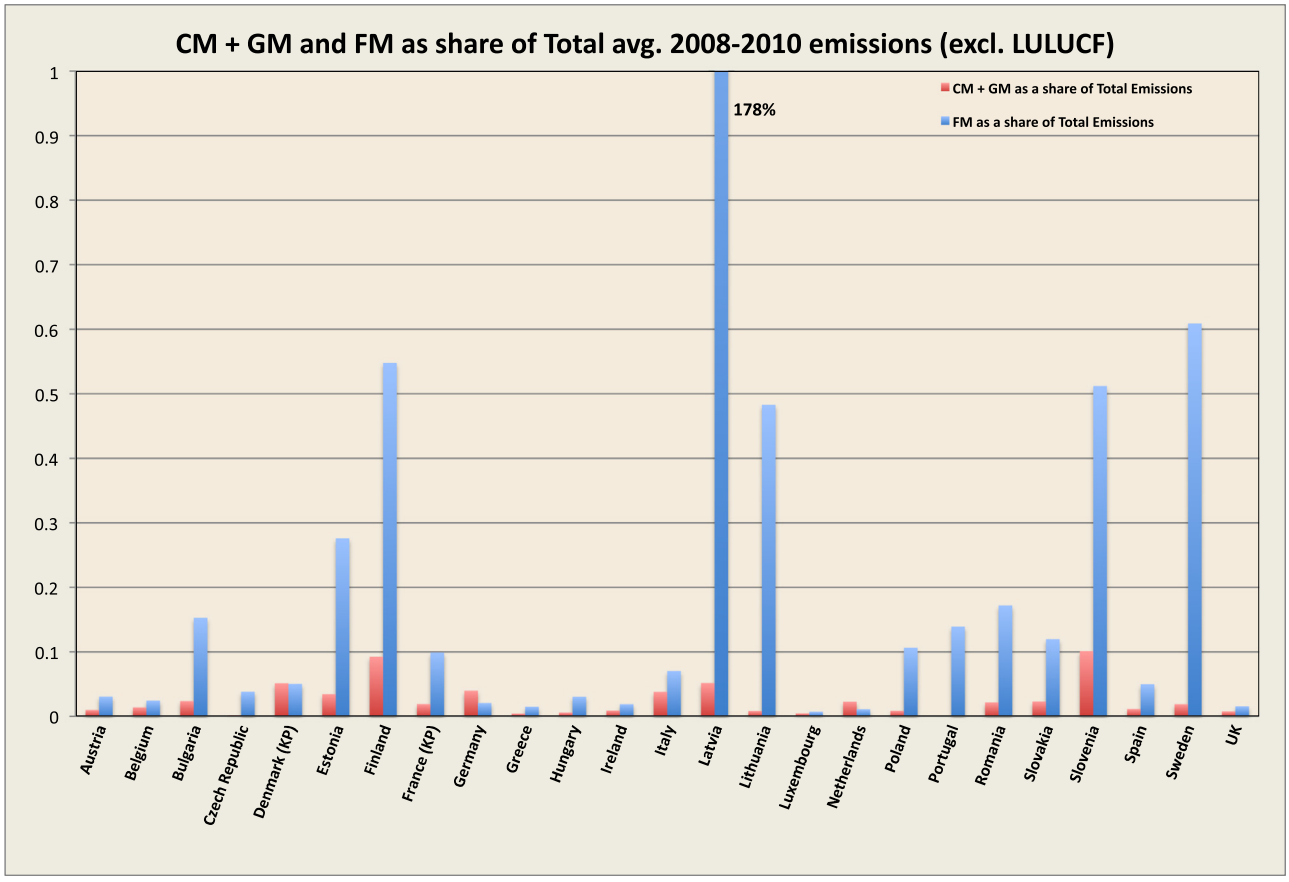

Fig. 1 – FM, cropland and grazing land management as share of total average 2008–2010 emissions (exclud. LULUCF). *Source*: Estimates for Cropland and Grazing land Management (CM and GM) are based on proxy estimates. Since few countries in the world have elected these activities, we use UNFCCC reported figures for Grassland, remaining Grassland, conversions to Grassland, Cropland, remaining cropland, and conversions to Cropland. FM and GHG emissions are based on UNFCCC submissions.

EU Member states (24–25/27) currently do not account for emissions and removals occurring on CM and GM lands.

As illustrated in Fig. 1, for a small number of EU Member states, annual net carbon removals/emissions under CM and GM activities exceed those under FM. Thus for states such as Germany, the UK, Denmark, Belgium, France, Bulgaria and others, the share of emissions under CM will likely weigh importantly and their inclusion should significantly impact future management practices. For other countries, the role of FM far outweighs the addition of new activities (Latvia, Sweden, Finland, Slovenia, Lithuania and others). Thus, while the incorporation of CM and GM represents a step forward, the largest carbon stock changes are still found in FM.

Beyond these steps, the European Commission is considering greater inclusion of LULUCF in its climate policy framework. Thus far however, based on official feedback, no timetable for future steps has been considered. Given the late date of the current decision, the EU cannot foreseeably conclude an additional agreement by the beginning of CP2. This means the EU can only consider further steps either midway during CP2—unlikely given the impact on ongoing accounting—or in preparation for a third commitment period beginning sometime in 2021.

The EC LULUCF report (EC 18) sets the stage for future potential incorporation of LULUCF into the EU climate policy framework, but stops short of making explicit recommendations about how this should be done. Possible strategies are spelled out in two European Commission reports (EC, 2012b,c). These include incorporation into: (1) the EU ETS, (2) the non-ETS carbon-trading framework (under the Effort Sharing Directive, ESD), and (3) the introduction of a new, but separate, LULUCF-based target and commitment mechanism. The Commission favors the 3rd option (EC, 2012b). This model isolates the potential impact of LULUCF on the EU climate policy framework by setting separate LULUCF targets and retaining the current segmentation between LULUCF and the EU ETS and non-ETS sectors.

EU discussion is partially driven by decisions at the international level. However, the failure to develop a more vigorous EU bargaining position may slow international progress. A more effective and efficient international and EU level framework for the integration of LULUCF, however, is possible. In the interest of continued progress on raising the forest carbon sink in both developed and developing countries and putting a stop to deforestation and forest degradation, a more effective and efficient LULUCF carbon accounting

strategy is required. The EU can play an important leadership role in this process.

Though uncertainty remains one of the key stumbling blocks in moving forward with greater mobilization of forest-based resources, the model proposed herein does not embody a greater degree of uncertainty than has already been accepted with the 2011 Durban LULUCF agreement. At the same time, eliminating barriers (the cap and the FMRL) and increasing the potential range of incentivized opportunities for emission reductions and carbon sequestration available to Member states—assuming commitments are changed accordingly (we cannot stress this point enough)—could positively support the aim of reducing emissions and mitigating future climate change.

5. Incentive Gaps and the mobilization of forest potential in the EU and UNFCCC frameworks

A fully developed position on the potential integration of LULUCF in the climate policy framework must of course address problems with the current UNFCCC/Kyoto framework. Though the European Commission has produced an initial reflective response to the SBSTA call for submissions (UNFCCC, 2012b), much remains to be said about the potential impact of the new LULUCF rules and potential paths for future reform. We first discuss the implications of the new ''cap'', then turn to an in-depth discussion of the new Durban FMRL. Given relative variation in forest practice and extent across EU member states, the following discussion is broadly representative of the general impact the Post-Durban Kyoto rules might have on other Annex I countries.

5.1. *The new ''cap''*

In equity terms, more consideration could have been dedicated to the new cap set in Durban. The new cap is set using the same method for all Parties (3.5% of 1990 base year emissions, excluding LULUCF) and was intended to increase incentives for carbon sequestration under FM. However, it remains unclear why heavy *per capita* emitters in 1990 should be rewarded with a higher cap than low emitters. Further, it remains unclear why FM caps should be entirely unrelated to forest cover or potential future growth: the new cap in no way considers the current share of forest cover under FM. Under CP1 (2008–2012) countries were permitted to adopt a cap equal to the smaller of two options (3% of 1990 emissions, or 15% of net removals in forests), or under certain circumstances could negotiate an alternative cap. No such adjustments, however, are included in the new model.

To illustrate the consequences of the 2011 Durban LULUCF agreement, we assume a 20% increase in total forest growth between CP1 and CP2 and convert this amount into CO2 equivalents ($MtonCO_2/yr$). Instead of using a projected reference line, we use the average forest growth at CP1 recorded in 2008 and 2009 as a baseline for estimating the outcome in CP2. Across all Annex I countries, during 2008 and 2009, countries averaged approximately 3% growth per year. Given 7 years of growth over the period 2013–2020, this would amount to approximately 21% total growth (based on a weighted average across all Annex I countries, however, the 2008–2009 growth rate is approximately 1.2% yr^{-1}). Others have previously estimated lower levels of forest growth (Böttcher et al., 2012).

Estimates that consider the effect of features such as forest age class structure and other variables may provide more accurate predictions of future forest growth for individual countries. However, it is important to emphasize that the growth estimate we employ is a theoretical tool intended to provide a framework for understanding the implications of the LULUCF carbon accounting rules for understanding the incentives countries and forest owners face. Though variation in the total amount of assumed growth will impact the estimated size of the IG, we are particularly concerned with the overall trend.

As illustrated in Fig. 2, the new cap creates a heavily skewed set of advantages and disadvantages, raising important questions about its logic, as well as its potential to encourage future forest growth. The red line in Fig. 2 indicates where a 15% cap on future estimated 2020 forest potential would fall for each of the EU Member states. While points along this line would indicate an *equitable* outcome and approximately equal burden sharing, the new caps are disproportionately distributed around the line.

In particular those countries with a relatively small share of forest cover are likely to benefit the most from the new model, some of them dramatically so. In particular, the Netherlands, the UK, Greece, Belgium, Luxembourg and several other EU Member states are clear winners from the new cap. The UK and the Netherlands are particularly advantaged. However, why the Netherlands should benefit more than the UK, or why these two countries should benefit more than countries like Denmark or Ireland with similar shares of forest cover remains obscure. And why these countries should benefit more than the set of ''*loser*'' countries remains equally obscure. All those countries with higher shares of forest cover have new caps equal to less than 15% of their estimated 2020 forest potential—sometimes *considerably* less.

Fig. 3 provides an indication of the degree of variation across EU Member states in the potential impact of the Post-Durban Kyoto rules. Each individual country column indicates an estimate of total potential future forest growth in 2020, distributed proportionally across net ARD, estimated bioenergy use and an area corresponding to FM net removals and/or HWP. Since we cannot know the future net distribution across FM net removals and HWP—i.e. we cannot know the *felling rate*—these two categories are represented as a single green bar (FM + HWP). In this context, however, current forecasts suggest a progressive increase in harvest (HWP) up to 2020 (harvest projections were used to inform FMRL estimations). Under CP2, ARD (since the compensation rule was removed in Durban), bioenergy, and that amount of forest growth and/or HWP corresponding to the new cap are *fully incentivized*.

As indicated in Figs. 2 and 3, the majority of EU Member states would presumably have little difficulty claiming the full cap (distance between blue triangle and green diamond). For countries like Sweden and Finland with comparatively small caps, there is even little incentive to be concerned about the cap. Moreover, depending on the felling rate, most or all HWP

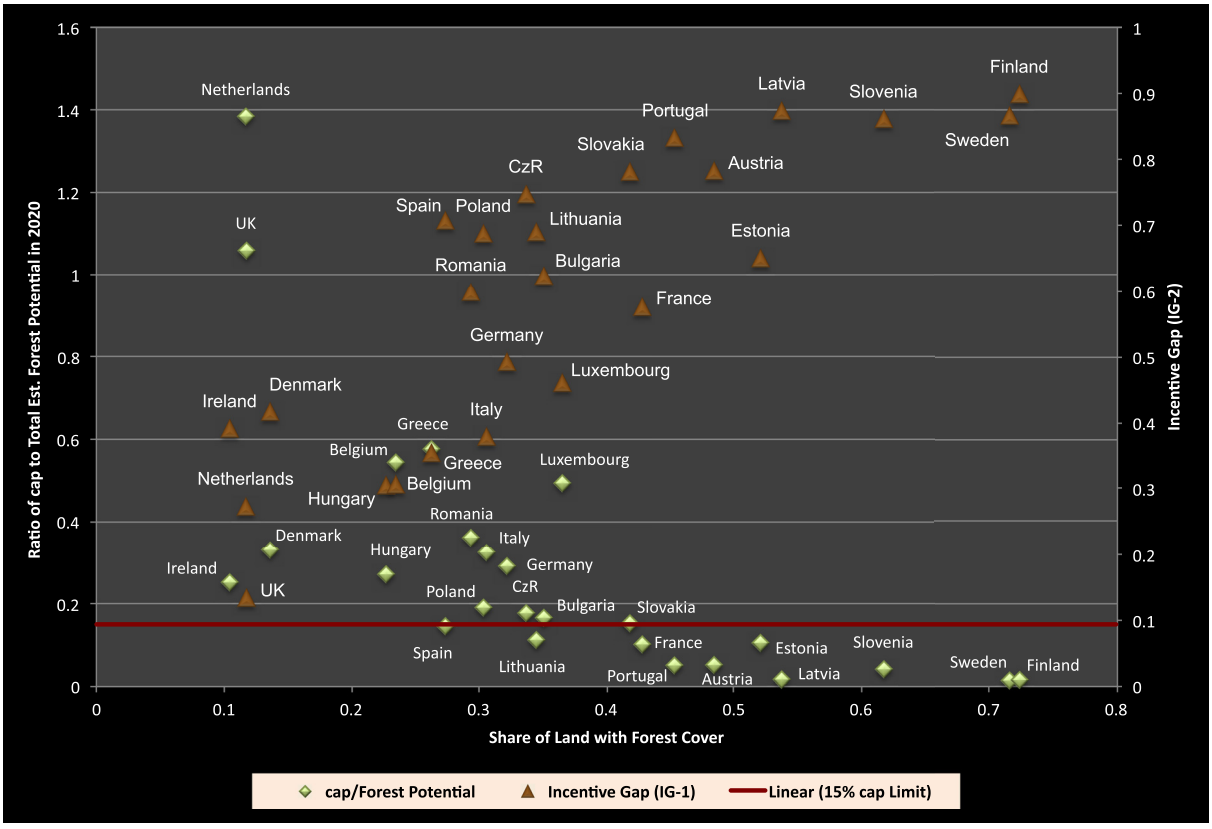

Fig. 2 – New durban caps relative to estimated forest potential in 2020 and the Incentive Gap.
Note: the new caps are represented as ratios relative to estimated forest potential in 2020 (green points). The estimated forest potential is based on an assumption of 20% forest growth by the year 2020 relative to the FM average in 2008 and 2009. The Incentive Gap (IG) measure used here is defined as the share of incentivized to non-incentivized forest potential and includes the "gray area" (FMRL) as non-incentivized (IG-2). We alternately define the Incentive Gap as:
IG-1 = 1 − [(FMRL + New Cap + ARD + BioE)/Total Growth] (*FMRL incentivized*)
IG-2 = 1 − [(New Cap + ARD + BioE)/Total Growth] (*FMRL non-incentivized*)

will ultimately not be eligible for carbon credits. On the other hand, many "*winner*" countries will find it virtually impossible to use up their caps. For the Netherlands, the new cap far exceeds potential estimated net removals and future growth under FM by a factor of 1.4, and in the UK by a factor of 1.1. Moreover, in contrast to the timber rich countries, any and all carbon sequestration—whether in standing forests or HWP—would remain eligible for carbon credits.

This has important implications for the ability of Parties and EU Member states to take advantage of potential forest-based carbon sequestration. This is further illustrated by the second set of reddish brown points in Fig. 2, indicating what we call the "*Incentive Gap*" (IG). In this particular measure, we include the "gray area" (FMRL) in the share of non-incentivized forest potential and express this as a share of total forest potential in 2020. IG-1 is of course strongly influenced by the size of the cap and is inversely related to the new cap. EU Member states with greater forest cover have disproportionately larger IG's. The IG is typically smaller if we exclude the "gray area" from the non-incentivized share (IG-2)). Whether the gray area under the FMRL should be included in estimates of the IG is debated in more detail elsewhere (Ellison et al., 2013). The basic trend, however, remains the same regardless of which IG measure is chosen.

The Durban system will inevitably lead both to gross inequities across countries and to severe imbalances in the accounting system. A large share of EU Member states will thus not be rewarded for any pursuit of increased forest growth, despite the important contribution they could make to climate change mitigation (and adaptation). Harvest will be encouraged. This highlights the negative advantages associated with upward limits on carbon credit eligibility. The current Durban cap fails to mobilize full future forest growth and climate change mitigation potential. The role and impact of the FMRL (the gray area in Fig. 3) is more complicated and is addressed below.

5.2. *The Durban FMRL*

The FMRL introduced in Durban imposes a host of problems that require deeper consideration. We divide these into two discussions; (1) the usefulness of modeled projections and their placement in the correct climate policy framework, and (2) the potential incentive structure created by the FMRL and the broader LULUCF framework.

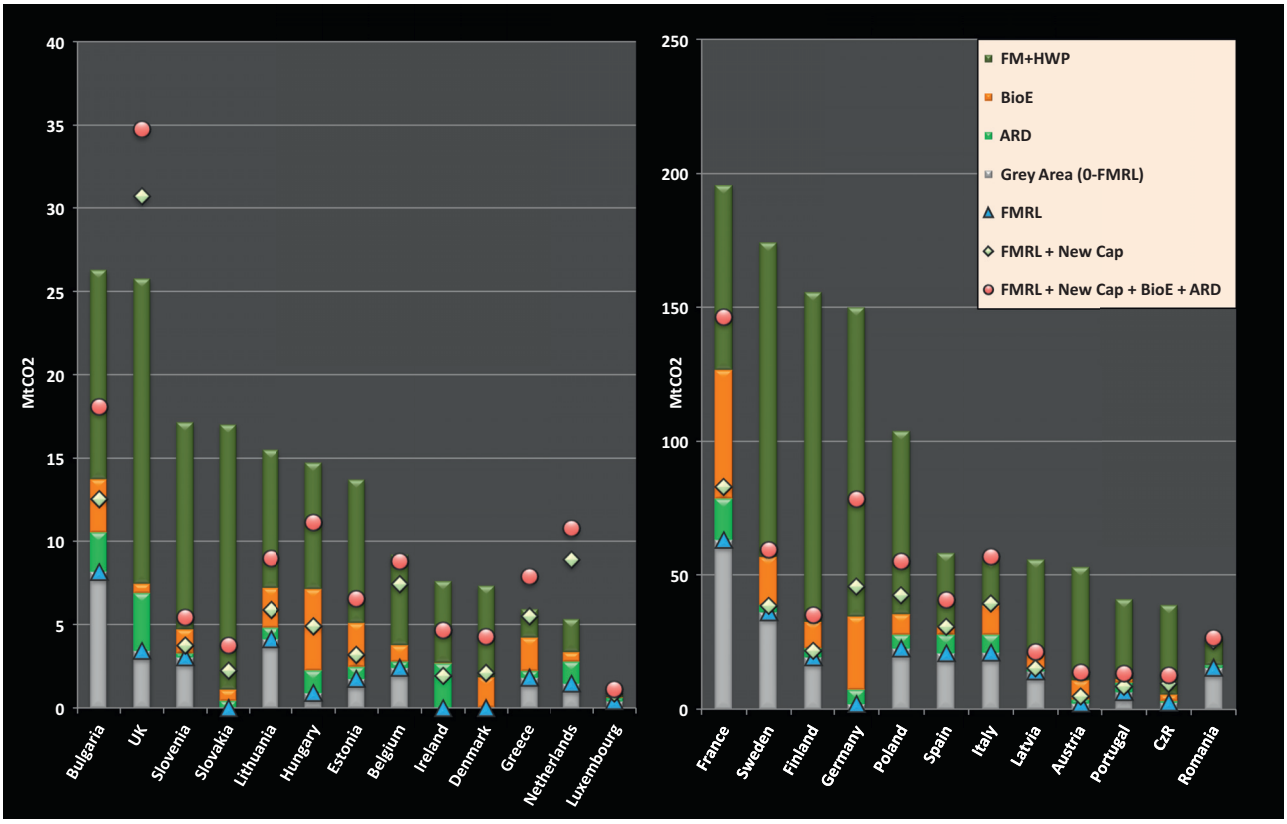

Fig. 3 – The Durban LULUCF rules and potential forest growth in 2020 (by Member state).
***Note*: Each column represents the total potential forest growth in living biomass at CP2. FM + HWP represents the projected growth remaining in managed forests above the reference level and/or used for wood products, excluding bioenergy harvest (BioE). AR represents the projected growth on afforested and reforested land, while D is the harvested part on deforested ARD land. The gray area represents the growth remaining in managed forests from zero up to the reference level (FMRL). Growth is projected proportionally across all categories (AR(D), FM + HWP and bio-energy) based on corresponding values in 2008 and 2009. IG-1 is represented in figure by the area above the red dots to the top of the dark green column and is considered to be "0%" for countries like the UK, Greece, the Netherlands, where both the cap (and the red dot) far surpass forest potential. IG-2, logically equivalent to IG-1 + FMRL, removes the gray area from IG-1.**

Using modeled projections as reference levels sets up a number of problems. For one, Parties can intentionally underestimate their potential to achieve future growth and thereby "create" potential carbon credits. Moreover, forest projections are subject to important uncertainties, raising doubt about the ability of countries to adequately estimate either future forest growth potential or future demand for biomass resources (and thus harvest rates). Finally, these projections—because they already embed assumptions about future demand and thus increases in the harvest—may ultimately reinforce this potential outcome and further discourage the realization of future growth potential.

Using modeled reference level projections for the purpose of setting general emission reduction commitments may be preferable (Ellison et al., 2013). Keeping the rule of crediting net removals (gross-net accounting) renders accounting consistent over commitment periods. Our preferred strategy is to use a form of *continuous gross-net accounting*. We propose using average net removals from the previous commitment period (CP^{-1}) as a means for estimating and zeroing the new baseline for net removal accounting in the subsequent accounting period (CP^{0}). The same model can also be used for adjusting country level emission reduction commitments, thereby eliminating bias in country projections and weakening incentives to lowball estimates of future growth potential.

With an adequate baseline and *adjusted* country level emission reduction commitments, Parties could be made eligible for any and all LULUCF-based carbon credits (net removals). In this way, and with the elimination of the cap, future growth potential (carbon sequestration in standing forests—"net removals") would be fully incentivized according to its real climate mitigation potential, thus lending it more weight both in harvest calculations and in the climate policy framework. Moreover, this strategy could potentially provide a framework for coordinating with current efforts to raise overall commitments for the 2030 EU climate policy framework (EC, 2013).

In combination with the elimination of any and all caps on net removals and the introduction of one all-encompassing LULUCF carbon pool (integrating all LULUCF activities and carbon pools into a single pool), such a strategy could

Table 2 – Post-Durban Kyoto LULUCF incentives: parties and landowners.

Scenarios	From – To)	Accounting options	Party/government perspective		Landowner perspective Incentives		Logic
			Incentives	Incentives to promote Growth/Harvest?	No pass-through	w/pass-through	
(1)	Up to FMRL	Debits Only	Harvest for bioenergy, HWP not significantly different from Standing Forest	G/H	Harvest for bioenergy	Standing Forests, HWP and Bioenergy	For Parties: fully incentivized. For Landowners: HWP, standing forests not incentivized w/o pass through.
(2)	FMRL – cap	Credits Only	Harvest for bioenergy, HWP not significantly different from Standing Forest	G/H	Harvest for bioenergy	Standing Forests, HWP and Bioenergy	fully incentivized
(3)	cap – Total FM removal	No Debits or Credits	Harvest for bioenergy	H	Harvest for bioenergy	Harvest for bioenergy	HWP, Standing Forests not incentivized

Note: The ''scenarios'' refer to where individual countries may end up in terms of; (1) failing to meeting the FMRL projection, (2) fulfilling the FMRL projection and being eligible for carbon credits under the cap, and (3) fulfilling the FMRL, making use of all available carbon credits under the cap, and producing additional net removals above the cap. The table assumes that Governments (''Parties'') to the KP face different incentives than Landowners.

potentially promote significant climate change mitigation (and adaptation). This would have the effect of fully incentivizing forest growth potential and fully rewarding all net removals, effectively balancing the full value of carbon sequestration in standing forests with competing uses. Moreover, the inclusion of all carbon pools in one all-encompassing model will increase incentives to care about and potentially undertake actions to combat potential emissions in other areas (e.g. unmanaged forests, peatlands, etc.). Without consistent accounting across all activities and pools, the impact of some is likely to be neglected or overlooked.

A second problem arises with interpreting the set of incentives created by the Post-Durban rules and, in particular, the FMRL. In Table 2, we present a discussion of the complex range of incentives faced by Parties and Landowners in EU Member states and the most likely outcomes resulting from the Post-Durban Kyoto framework. Though the Kyoto framework only incentivizes Parties, landowners ultimately make the decision whether to harvest based on a variety of economic incentives and personal preferences. The incentives Parties and Landowners face depend on where individual countries fall relative to their FMRL projections (commitments). Thus, under Scenario 1, countries fail to meet their FMRL commitments, while under Scenario 2, countries succeed in meeting their commitments and are eligible to receive some carbon credits under the cap. Finally, under Scenario 3, countries meet their FMRL's, are eligible for the full cap, and produce additional net removals.

In particular because LULUCF is not mobilized in the EU climate policy framework, no strategies have been developed for transferring incentives (pass-through) to landowners. Thus while Parties may face KP incentives, landowners may respond to potentially contradictory incentives. Compellingly, ''harvest for bioenergy'' is always preferred (financial incentives) unless the Post-Durban Kyoto incentives have been integrated into the domestic framework such that landowners receive benefits (or debits). Parties can choose different strategies for incentivizing Landowners. In addition to transferring carbon credits, governments can also centrally determine felling rates.

The second striking observation is that, independently of the goals accompanying the adoption of the FMRL—Scenario 1—the incentive to harvest either for bioenergy or for HWP is not significantly different from that for maintaining Standing Forest. Though harvesting above the reference line (in the gray *area*) results in debits, the potential financial return on harvesting for bioenergy and/or HWP represents an attractive alternative. Bioenergy is fully incentivized under this scenario (resulting in carbon neutral emissions) and HWP is likewise fully incentivized (it is recognized as a carbon pool under FM). Thus where Parties (Landowners) are eligible for carbon credits for net removals, Standing Forests, HWP and Bioenergy are relatively equally incentivized.

The incentives remain the same under Scenario 2, where Parties (Landowners) are eligible for carbon credits for net removals under FM. The situation changes dramatically, however, only under Scenario 3, where Parties (Landowners) are no longer eligible for carbon credits. In this case, harvesting for bioenergy will always be preferable over HWP or Standing Forests (neither of which are incentivized beyond the cap). Moreover, beyond the cap, Parties face strong incentives to promote forest growth in order to achieve larger harvests, while for Scenarios 1 and 2, Parties are likely indifferent between growth for growth's sake (G) and growth for Harvest (H).

Finally, under FM, the smaller the cap, the less Parties are incentivized to consider it in their planning calculations and the more likely they are to favor harvest. Timber-rich countries like Sweden with comparatively small caps will benefit little and will have significant difficulty estimating exactly where they are likely to land by harvesting specific

amounts of new forest growth. The coordination problem that arises across the government and the many small private landowners without centrally determined felling rates is easily imagined. Moreover, as indicated under Scenario 3, there are considerable disincentives to promote growth in standing forests above the cap. This can result in Parties strongly favoring/promoting harvest over fulfilling the cap. Some Parties may thus experience stronger incentives to harvest both above the cap and above the reference level.

The failure to effectively weight and incentivize the *full carbon value* of forest-based carbon sequestration in standing forests and HWP—whether due to reference levels or limits on potential carbon credits—means forests are not weighted according to their true climate mitigation potential. Thus, unlike other sectors where the value of one ton of CO_2 is equal to one ton of CO_2, forests would remain under-valued and thus under-utilized. As suggested in Table 2, this may not result in the most rational use of forest-based resources and may negatively alter outcomes.

6. *Negative emissions* and forest potential in the climate policy framework

The potential role of forests in promoting emission reductions is frequently either disputed or even completely ignored. One of the most recent reports to raise questions about the potential role of forests is UNEP's (2012) *Emissions Gap Report*. This report highlights the current ''gap' in international emission reduction commitments—based on Annex I and non-Annex I country pledges in the Copenhagen Accord—that must be closed in order to arrive at the proposed +2 °C global warming target agreed in Copenhagen. The authors argue that 'lenient LULUCF accounting rules' potentially explain a part of this emissions gap and suggest that 'minimizing the use of lenient Land Use, Land-Use Change and Forestry (LULUCF) credits and surplus emission credits would reduce the gap by approximately 3 GtCO2e' (UNEP, 2012: 4). Strict rules are in place when: 'allowances from LULUCF accounting and surplus emission credits will not be counted toward the emission reduction pledges' (UNEP, 2012: 12). This definition parrots the EU approach to LULUCF.

A recent joint report authored by the International Energy Agency, Nordic Energy Research and a number of regional research and energy institutes (Risø, VTT, etc.), ''Nordic Energy Technology Perspectives: Pathways to a Carbon Neutral Energy Future'' (IEA, 2013), indirectly makes a similar argument about the benefits of forest-based carbon sequestration. The term LULUCF does not even appear in the document and ''forests'' are only mentioned in connection with the advantages of bioenergy. While this report discusses and relies on the potential advantages of carbon capture and storage (CCS), it entirely neglects the natural process by which forests bind carbon to biomass through photosynthesis, naturally creating another important form of carbon sequestration.

The following example illustrates why the role of forests should not be neglected in the development of *Low Carbon Pathways*, and why, in particular, forests should be included and more effectively mobilized. We base our example on Sweden, where annual net LULUCF-sector removals currently compensate for approximately half of Sweden's CO_2 emissions, but are not explicitly '*counted*' or considered in the climate policy framework, either in Sweden or the EU. The example is broadly representative of the situation in a number of EU Member states where net annual forest growth (net removals) covers a large share of current emissions. In Latvia, for example, total annual net removals represent approximately 178% of annual GHG emissions (Fig. 1). Efficiently and effectively mobilized, this share could be even larger. As illustrated above, without adequate mobilization there are strong incentives to increase harvest.

The Swedish example provides a powerful illustration of the fact that the current UNFCCC/Kyoto LULUCF and EU carbon accounting and climate policy frameworks may not provide the optimal mobilization of forest-based climate change mitigation and adaptation potential. Fig. 4 is based on data from a recent Swedish EPA (2012) study that identifies potential emission reduction scenarios potentially enabling Sweden to achieve carbon neutrality by 2050. To these numbers and graphical representation, we add additional information about the potential role of LULUCF and the impact of the UNFCCC/Kyoto LULUCF carbon accounting rules both before and after the 2011 Durban LULUCF agreement.

For CP1 (2008–2012) the short, solid light green columns indicate total accountable net removals. The remainder of the column (cross-hatched green and white) designates the remaining net removals that cannot be accounted and for which Sweden is not eligible to receive carbon credits. This is a basic illustration of the Incentive Gap (IG): the larger share of net removals is not incentivized by the carbon accounting rules.

For CP2 (2013–2020), a lot has changed. First, above the new FMRL (''gray area''), Parties are not permitted to claim carbon credits but can be debited if the harvest rises *above* the reference line. On the other hand, Parties can claim carbon credits between the FMRL and the cap (the solid-red column below the FMRL), but are not eligible to claim carbon credits beyond the cap. Thus regardless of the potential Parties might have for achieving additional carbon sequestration, they remain ineligible to receive the benefits of this effort. As suggested in Table 2, since additional growth returns no credits, this may ultimately strengthen incentives to harvest above the cap and perhaps even above the reference level.

CP2 likewise helps to illustrate a second point. The logic behind the use of reference levels makes sense from the perspective of eliminating the potential for taking advantage of net removals that might have occurred anyway. Parties are only able to claim carbon credits below the reference line, net removals (what many consider ''historical'', or ''*undeserved*'') are thus potentially removed from the model. On the other hand, under this agreement, Parties are being encouraged to commit to specific levels of increased net removals that continuously raise carbon stocks, and thus to forego harvest. From this perspective, it remains unclear why Parties should go unrewarded for any increased forest growth (net removals) they achieve. After all, such removals provide a genuine climate mitigation impact. In this sense, the FMRL seems misguided and misplaced.

Fig. 4 illustrates the potential importance of forest-based carbon sequestration as a means of achieving *negative*

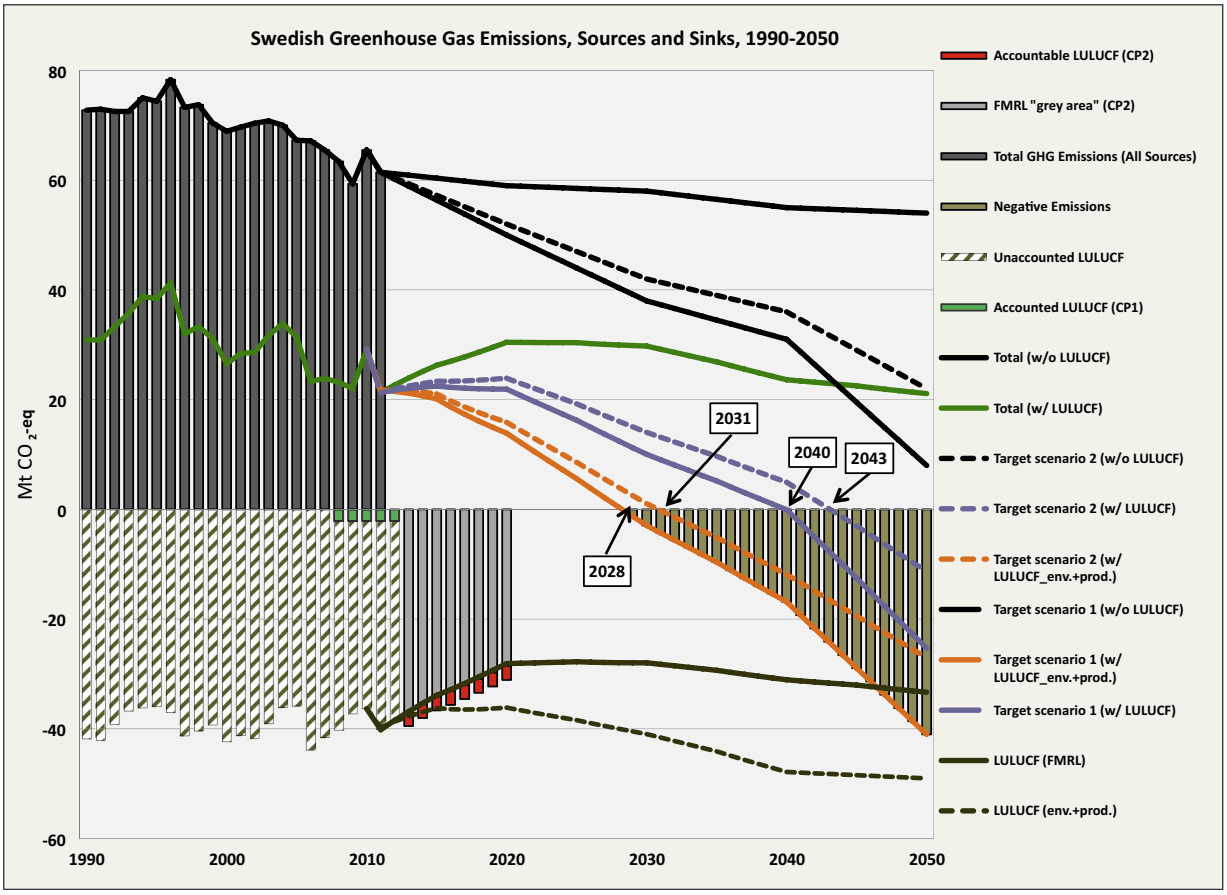

Fig. 4 – Swedish Emissions and the Role of Forests in Climate Change Mitigation.
Source: based on published data from a Swedish EPA (2012) report. The following estimates are added to this report: (1) an estimate of potential forest-based carbon sequestration (2013–2020) based on Sweden's UNFCCC reference level submission and the Swedish cap on accountable LULUCF in CP2; (2) estimates of potential "net" emissions based on the Target 1 & 2 Scenarios after considering the impact of LULUCF + env. + prod. net removals; (3) an estimate of the potential *Negative Emissions*, based on the "net" impact of Target + LULUCF scenarios; and (4) estimates for the HWP carbon pool have been incorporated in the Target Scenario results. The LULUCF scenarios investigated in the Swedish EPA study are based on estimates of the highest potential sustainable harvest and do not consider the potential impact of revised incentives or change in demand for forest biomass.

emissions. *Negative emissions* have been variously defined (Van Vuren et al., 2013; Rhodes and Keith, 2008; Möllersten et al., 2003; Obersteiner et al., 2001), either in terms of the added contribution of afforestation and reforestation, closed system contribution of biomass energy production with carbon capture and storage, the "permanent" removal of carbon from the atmosphere. We here emphasize the potential role of increased forest-based carbon sequestration in standing forests and HWP, in combination with the broad panorama of more traditional emission reduction pathways. In this sense, we define negative emissions for individual countries as the fact of 'removing more carbon from the atmosphere than is being poured into it'. I.e. we define negative emissions for individual countries as occurring when the balance of emissions and removals results in a net uptake of carbon from the atmosphere.

If Sweden is able to reduce emissions in the way suggested by either one of the two Target Scenarios (UNFCCC, 2012a; EC, 2012a) depicted above and is likewise able to grow additional forest—by additional forest preserve set-asides ("env."), additional fertilization ("prod."), or a combination of both—the net effect of additional carbon sequestration in standing forests (net removals) could pay the dividend of "*negative emissions*" (Sweden would sequester more carbon than it emits) by as early as 2029 (Target Scenario 1 + env. + prod.). As indicated, *negative emissions* are achieved somewhat later under the other scenarios (2030, 2041 or 2044). The key point is that *negative emissions* can be achieved and even possibly *improved upon* with the inclusion of standing forests in the climate policy framework.

Incentivizing the HWP carbon pool is likewise important. On average, the inclusion of the HWP carbon pool in the LULUCF scenarios increases the potential for achieving *negative emissions* and advances their achievement by approximately one year (Fig. 4 includes the HWP contribution). In Sweden, on average the HWP carbon pool represents approximately 14% of total net removals. However, since the "cap" is imposed equally on FM net removals *and* HWP, the

full mobilization potential of the HWP carbon pool is almost entirely marginalized.

The potential for achieving *negative emissions* is perhaps the strongest justification for getting rid of the cap and eliminating all remaining obstacles to the mobilization of LULUCF in the EU and UNFCCC/Kyoto climate policy frameworks. Due to the urgency of the climate challenge, some have begun to argue that only *negative emissions* can facilitate atmospheric CO_2 reductions sufficient to stay within the +2 °C global warming target (Moss et al., 2010; Milne and Field, 2012). Though this point is typically raised in discussions about carbon capture and storage (CCS) technologies, effective and efficient forest resource mobilization can *also* provide an important contribution. As illustrated by the Swedish example and data presented in Ellison et al. (2013: Table 6), considerable potential for future forest growth remains across Europe. For the most part without fertilization and within the same area, the total forest stock in Sweden, for example, has more than doubled over the period 1923–2013.

The Swedish emission reduction scenarios considered above represent a select array of potential future scenarios. Which path will ultimately be chosen remains unknown. More importantly, *none* of the scenarios considered, including those we have projected, adequately consider the potential impact of *improving EU and KP incentives on forest growth*. Full mobilization of the *full carbon value* in future forest growth could effectively help accelerate these relationships.

Finally, though the conventional view suggests only countries with comparatively large shares of forest cover can benefit, countries with comparatively low shares of forest cover and low amounts of net annual forest growth (net removals) may exhibit the greatest potential for future forest growth. Given the extent of required emission reductions by 2050 (80–90% or more), low forest area countries may have a more difficult time arriving at the *negative emissions* threshold. However both individual countries and the global community could benefit from incentivizing this potential.

7. Conclusion: a more comprehensive carbon accounting framework?

In the context of a ''more comprehensive accounting framework'' for LULUCF in the EU and Kyoto processes, the EU remains open to suggestions from all Parties and EU Member states. As the EU likewise appears to emphasize (UNFCCC, 2012a), what defines such a framework and how Parties should attempt to reply is ambiguous. In important ways, the SBSTA request for Party input places all features of the current LULUCF carbon accounting framework back on the table.

In the EU SBSTA submission (UNFCCC, 2012a) and in the documents relating to current EU efforts to re-define the role of LULUCF in the EU climate policy framework, specific parameters are rapidly being set. In particular, with respect to the linkage of the EU ETS with international carbon-trading frameworks, LULUCF and REDD+, the EU appears set on creating a separate system that would continue and further compound the current degree of separation and compartmentalization in the elements of the climate policy framework (ETS, non-ETS/ESD and LULUCF). Likewise, the Commission is not considering removing restrictions on the total amount of claimable LULUCF-based carbon credits; ''It was our understanding that most Parties do not consider *unconstrained gross net accounting* as a possible accounting option for the future and, therefore, it has *not been included as an option in the submission*. However, *constrained gross-net* (establishing a cap, discount, or other appropriate mechanism) *could be explored* as an option'' (UNFCCC, 2012a: our emphasis).

As the idealized model expresses (Table 1 above), both the EU and the greater Kyoto process should embrace a more expansive concept of LULUCF integration in the international climate policy framework. Such steps should involve serious evaluation of the limits set on future forest growth and forest-base carbon sequestration. We favor the elimination of all obstacles to the full mobilization of forest-based resources and the recognition of their *full carbon value*. Discounting the forest-based sector (cap and the FMRL) should be abandoned. Reference projections—or a suitable alternative such as average forest growth over the most recent commitment period (CP^{-1})—can alternatively be used for estimating future potential emission reduction commitments.

The general LULUCF carbon accounting approach should ideally be much broader, should incorporate all LULUCF-related activities—including unmanaged forests, wetlands and peat lands—and should not complicate this process with the far too complex estimation of additional reference levels in each forest activity. This would require countries to adopt untimely and costly approaches to LULUCF-based carbon management, thereby reducing the overall efficiency of the climate policy framework.

Table 3 highlights the basic differences between the EU position and our idealized model. Apart from the points noted above, we highlight that powerful incentives for mobilizing the full carbon value in forest-based resources are likewise most efficiently promoted by an international carbon-trading framework not closed to forest-based carbon credits.

The SBSTA call for Party submissions on a 'more comprehensive LULUCF accounting framework' provides an opportunity for further consideration of the potential role of LULUCF in the EU and international climate policy frameworks. The EU is actively considering potential improvements. The introduction, in particular, of harmonized LULUCF carbon accounting practices across the EU Member states and the introduction of mandatory reporting on CM and GM activities represents a step in the right direction. But much more could clearly be done. Moreover, the general framework for successful climate change mitigation faces the ever-present risk of disintegrating international cooperation. Much uncertainty thus shrouds the future role of forests in the global framework and requires an urgent and forceful response.

Regarding the EU climate policy framework, forests and their climate change mitigation (and adaptation) potential do not weigh equally with other mitigation pathways in the power, industry or non-ETS sectors and will not be freely tradable across the different EU action frameworks (ETS, non-ETS/ESD and LULUCF). However, in order to fully mobilize forest resource-based carbon sequestration, one unit of climate change mitigation must equal one unit of climate change mitigation, regardless of where improvements occur. And all carbon credits must be fully tradable across the

Table 3 – Comparison of EU positions and idealized model.

Issue	EU position	Idealized model
LULUCF accounting unbalanced with respect to emissions from other sectors (industry, end-users, etc.)?	Yes. The EU takes the position that LULUCF cannot be successfully integrated into the EU ETS and/or EDS frameworks. Thus the EU favors a system in which LULUCF is accounted separately and for which targets are likewise set independently from the ETS and non-ETS sectors. Moreover, forest-based carbon sequestration (net removals) is not counted toward EU-level emission reduction commitments, and trading in carbon credits across segments is prohibited.	No. LULUCF should be fully integrated into international carbon/emission trading frameworks. The principle of ''*full carbon value*'' should be fully integrated into this system. Carbon credits should be fully fungible across different segments of the climate policy framework. Relevant models, such as the California and New Zealand carbon trading schemes exist.
Inclusion of additional carbon pools?	The EU promotes an inventory framework broadly similar to the UNFCCC/Kyoto approach. The EU likewise favors further integration of remaining omitted carbon pools and has begun integrating CM and GM ahead of the UNFCCC. The EU will consider collapsing Art's. 3.3 and 3.4 into a single category but notes the need to limit accounting with the continued use of caps and other restrictions (such as the FMRL).	An all-encompassing model with mandatory reporting for all previously omitted and voluntary carbon pools. All emissions and removals should have the same weight as any other component in the carbon/emission trading schemes and should be based only on assumed climate mitigation potentials, without restrictions or caps.
Permanence	The problem of permanence requires restrictions.	Solved by debiting emissions (the same as for fossil fuel-based emissions).
Additionality	No credits for historically undeserved growth.	Credits for all removals and debits for all emissions. Not providing credits for FM or unmanaged land can create incentives for increased harvest and disincentives to address emissions, in particular on unmanaged lands.
Uncertainty	Uncertainty provides one of the principal justifications for discounting in LULUCF carbon accounting.	While estimates in individual years may be inaccurate, in the longer term and averaged over longer periods, the relative impact of uncertainty is diminished. Measurement accuracy is improving.
Natural disturbances	The EU basically supports the UNFCCC model adopted in Durban. As a strategy for protecting Parties from bearing the burden of natural disturbances, this model relies on the opportunity to omit land areas under FM and AR affected by natural disturbances from accounting.	It is preferable to incorporate all land and forest activities into one all-encompassing National inventory and to make the full carbon value of all activities fully fungible in international carbon trading. This will provide important incentives to address vulnerabilities in the LULUCF sector.
Harmonization with UNFCCC framework?	There are important differences. From our perspective, the most important is the different treatment of forest-based carbon sequestration and how fungible it is in carbon/emission trading frameworks. Thus far, EU proposals reject the idea of integrating LULUCF into the carbon/emission trading framework	LULUCF should be fully integrated into international carbon/emission trading frameworks. The principle of ''*full carbon value*'' should be fully integrated and all carbon credits should be fully fungible across different segments of the climate policy framework. The California and New Zealand carbon trading schemes provide relevant models.

Source: the EU position is based on our best knowledge of the EU's current goals, in particular as expressed in UNFCCC (2012b) and EC (2012b).

different segments of the climate policy framework. Without this, investors are not free to choose the most efficient and effective strategies, thereby slowing progress toward climate change mitigation. Achieving this goal in an international carbon-trading framework would provide the greatest potential for achieving the international goal of rapid climate change mitigation.

Forests offer tremendous opportunities for carbon sequestration and fossil fuel substitution. Moreover their value as biodiversity anchors, planetary lungs and their crucial importance as regulators of the terrestrial hydrologic cycle render them invaluable. The excessive limitations placed on the ability of Parties to take full advantage of the opportunities forest resources provide represent unnecessary obstacles to the goals of climate change mitigation and adaptation. Forests can play an important, even fundamental role in this process and can more importantly provide the singular contribution of *negative emissions*. While the new ''cap'' chosen in Durban increases incentives at the national level, there is little justification for remaining limitations. Ideally, these should be removed from the carbon accounting system. Even with the new and slightly larger cap, the magnitude of missed opportunities remains unacceptably large.

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