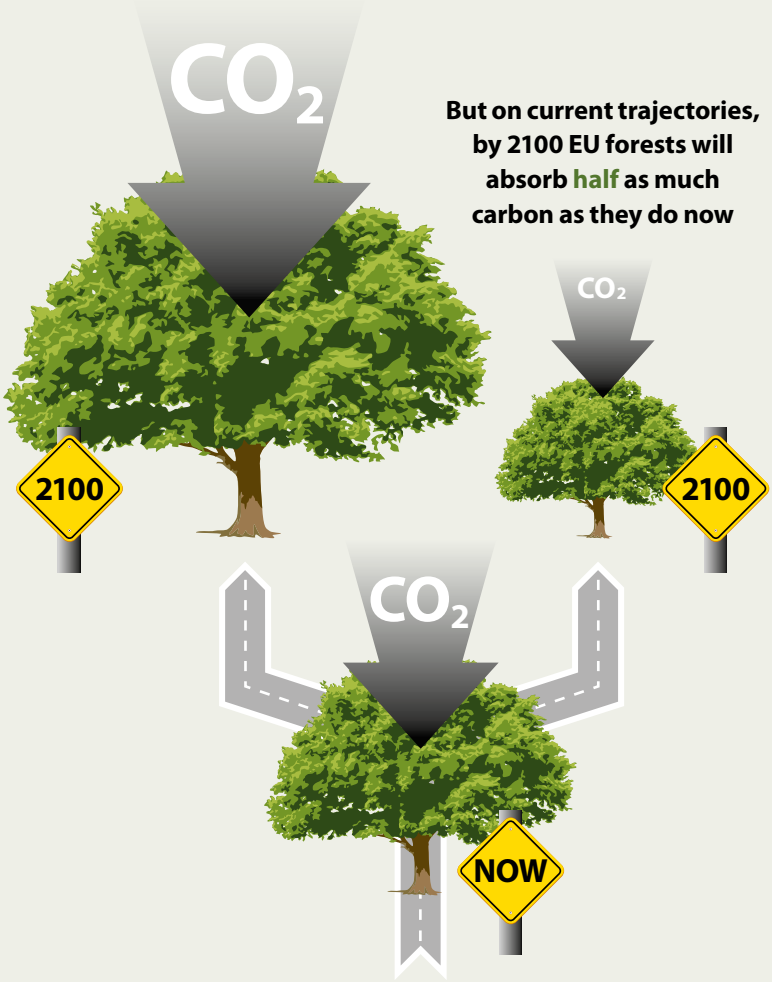
Protect and restore:

How forests can help the EU tackle climate change

To meet the Paris Agreement goals, the EU would need to roughly double the amount of carbon its forests absorb by 2100

But on current trajectories, by 2100 EU forests will absorb half as much carbon as they do now



Forest restoration in EU climate policy

The struggle to achieve international climate goals is also a battle to protect and restore our land and forests.

When we degrade them, the carbon dioxide emissions are substantial[1], but when we restore them they remove the climate-changing gas better than any technology currently invented. Each year, forests in the EU remove 10 per cent of the EU's emissions.

The international climate goals were decided in Paris when 195 governments agreed to limit global temperature rise to "well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius." Such wording is important since at 2 degrees warming we lose the coral reefs that directly support 500 million people; whole islands in the Pacific become uninhabitable; water availability is severely reduced; droughts increase; crops are put at risk, and far more. If we go for the stronger and safer 1.5 degree option – and unless we fully decarbonise in the next three years – we will need to remove carbon dioxide from the atmosphere, allowing us to enter a period of 'negative emissions'.[2] Relying on negative emissions is extremely risky, so it is essential that we continue to focus on reducing emissions as fast as possible.

Recent EU climate policies, notably the LULUCF Regulation and the Renewable Energy Directive, will not get us anywhere near negative emissions. In fact, their combined effect will likely reduce EU forests' ability to absorb carbon.[3] On the positive side, however, the EU has also approved the Energy Union Governance Regulation which aims for the EU to balance emissions and removals as early as possible, before going into negative emissions.

The next important milestone will be EU's 2050 decarbonisation roadmap, which will set out how the EU will meet the international climate goals. This briefing explains why the roadmap should be used to encourage the restoration of land and forests. It proposes steps that the EU should undertake regardless of the need to remove carbon dioxide. These are win-win actions that will remove carbon dioxide, nurture local economies, and make Europe more resilient to climate change.

Restoring **Finland's** forests could absorb **3x** more CO_2 by 2100

Restoring **Germany's** forests could absorb **2x** more CO_2 by 2100

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Why restore EU forests?

To avoid dangerous climate change, the EU's land and forests must remove more carbon from the atmosphere and store it – but with each passing year, they are becoming more degraded and less able to do so. The EU's managed forests are already absorbing 10 per cent less carbon in 2015 than they did in 2009, and according to the EU's projections, by 2050 they will be absorbing *less than half* the carbon they took up at the beginning of the century.[4] This is the opposite of where we need to go.

Cutting down old forests and replacing them with newly-planted trees – as is the current trend across the EU – is a disaster for the ability of forests to remove and store carbon. When we cut down old forests, we not only lose the huge amounts of carbon they were already storing – we also damage the ability of the forest to soak up carbon, since older trees absorb carbon at a faster rate than younger trees. It takes centuries for new trees to grow big enough to re-absorb all this lost carbon, and to remove carbon at the rate they used to – if they are ever allowed to grow to maturity, which at the moment they generally are not.

Protecting and restoring EU forests will allow them to fulfil their full potential of removing and storing carbon.

It will also achieve many co-benefits.

Helping end biodiversity loss

Globally, forests are home to 80 per cent of the world's plants and creatures. Intensifying agriculture and forestry are the main reasons why biodiversity is declining in Europe, and the situation is bleak. Of those forests with protected status (Natura 2000), only 15 per cent of EU forest habitat types are in favourable condition; the rest are degraded. This is not only a problem for plants and animals: biodiversity loss is as bad for human well-being as the climate crisis.

Definitions of natural carbon removal options

Restoration of degraded forests is enabling the recovery of a forest from overharvesting or other degradation. It aims to recover the ecological functionality of the landscape. For this reason, it does not include planting of monocultures.

Reforestation refers to the planting of trees on deforested or degraded lands.

Afforestation refers to planting trees on lands which, historically, have not contained forests.

Agroforestry or **silvopastoralism** refers to the practice of combining woodland with agricultural crops or grazing.

In a single year, a large, old tree can absorb **the same amount of carbon** as a mid-sized tree has absorbed **over its entire lifetime**.

Improving soil and water quality and carbon storage

More than 20 per cent of EU forests are kept standing for their ability to protect water and soils. Soil is the world's largest terrestrial carbon store. There is about 2.5 times more carbon in European forest soil than in European forest trees. Forest management practices like tilling and lowering the species composition reduce this carbon pool. The soil in mature forests stores significantly more carbon than soils from areas that have been clear-cut.

Forests also maintain mountainsides. Mountainous countries such as Slovenia, Italy and Austria have all had soil erosion caused by logging. Forests disturbed by fires and logging have seen soil loss as high as 26.6 per cent. This makes soil less fertile and decreases agricultural productivity in surrounding areas. Monoculture forests also typically have less nutrients in the soil.

Increasing climate resilience to droughts, flooding and fires

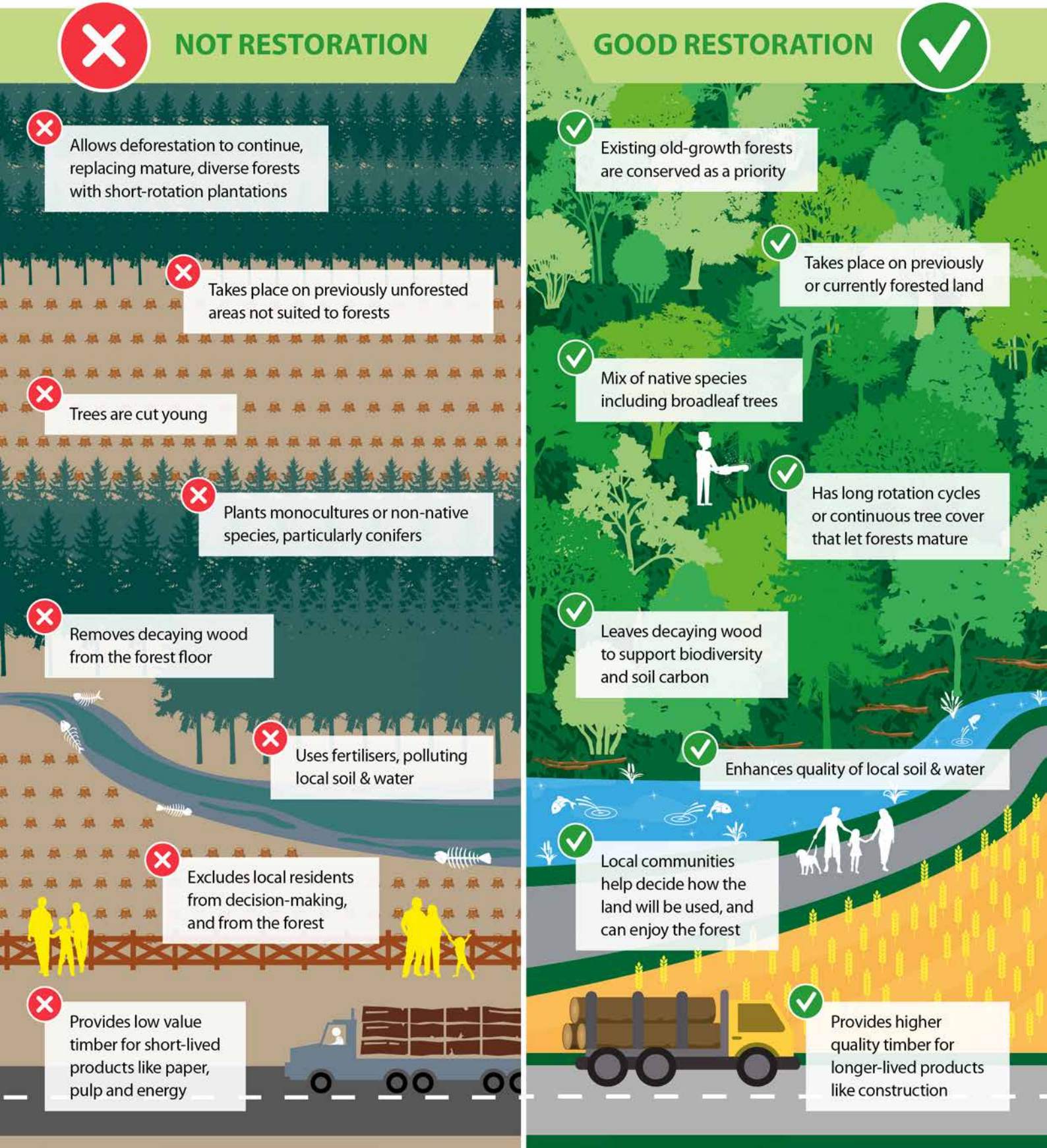
Diverse natural ecosystems are an insurance policy against climate change. Scientists have found that forests with many tree species grow at a faster rate, store more carbon and are more resistant to pests and diseases which become more frequent with a warmer climate.

Climate change is predicted to increase flooding. European forests have a key role to play in flood management: 4.5 per cent of European forests are considered floodplain forests which have a significant role in water retention.

As the world gets warmer, forest fires will also get worse. They are a natural phenomenon, to which boreal and Mediterranean forests have adapted, and many species even depend upon, but warming means fires are larger and more intense than before. Severe forests fires have occurred in young dense

How to restore forests, communities and rural economies

Restoration should aim at resilient outcomes, be they social, economic or environmental. Across the EU, rural communities are opposing monoculture plantations and asking for more sustainable forestry that takes account of local concerns and priorities.



forests and monoculture plantations – such as the recent spate of forest fires in Portugal that have been linked to the expansion of eucalyptus plantations, tragically killing over one hundred people. Old-age forests are associated with less severe fires.

Good for human health and wellbeing

Forests are good for air quality because they extract a wide range of pollutants emitted by traffic and industry. In Barcelona, green spaces contribute substantially to reducing particulate pollution, and in Florence they have reduced ozone pollution.

Other health benefits include that spending even short times in a forest improves people's mood, cardiovascular health and reduces blood pressure and stress. Green spaces are also linked to increased physical activity, reduction in obesity, and lower levels of crime and violence.

The role restoration could play in the 2050 decarbonisation roadmap

By 2021, we will most likely have missed our opportunity to achieve the 1.5 degree goal through emissions cuts alone, so entering a period of negative emissions will be necessary. The faster the EU moves away from fossil fuels and land-use emissions, the less negative emissions we will need.

The EU has a finite amount of land with a finite ability to store carbon. It is therefore essential to use its limited potential to the maximum effect. The more ambitious our emissions cuts, the more easily we can reach climate targets. Conversely if we allow sectors such as aviation to continue polluting with the promise of forest offsets, it will put the 1.5 degree climate target out of reach.

It is therefore essential not to conflate negative emissions with carbon offsets. One gives us our last chance to meet the 1.5 degree target, the other consigns us to a 2 degree world, or worse.

Scientists estimate that to meet 1.5 degrees, we will need to remove between 450 and 1000 gigatonnes (Gt) of carbon dioxide. The upper end of the range is improbably high, given biophysical limits and the risks of negative social and economic impacts, hence the need to decarbonise as fast as possible and not rely on this volume of negative emissions.

What percentage of the negative emissions challenge the EU – as a historic polluter – should deliver is a political question. Based on cost-optimal models, two scientists, Oliver Geden and Glen Peters, have estimated that the EU's burden would be 50 Gt of cumulative carbon dioxide removals until 2100.

But is that achievable?

More research needs to be done, but it is possible to extrapolate what could be achieved through different methods:

■ Restoration and natural forest management

Based on a literature review of existing studies, the Stockholm Environment Institute has estimated that globally, extensive ecosystems restoration could provide 220-330 Gt of carbon dioxide removals.

In the EU, countries such as Germany have been shown to be capable of almost doubling the carbon dioxide their forests absorb (generating **2.4 Gt** of additional negative emissions between now and 2102).[5] This is not by expanding the forest area, but by decreasing harvesting levels by 25 per cent, lengthening the time between harvests, encouraging more broadleaf species in areas dominated by conifers, and protecting high-biodiversity areas.

Other research has found that allowing forests in Finland to restore by reducing harvesting would allow them to absorb 209 per cent more carbon dioxide, with additional benefits for biodiversity.

There are no figures for the potential of forest restoration for the whole of the EU, but these national figures already give some idea. Peters & Geden's estimate of how much carbon dioxide the EU needs to remove – 50 Gt – translates to roughly doubling the amount of carbon dioxide EU forests currently remove. In Germany, restoring forests would almost double the amount of carbon they absorb, and in Finland it would triple. If figures within this range were possible for other European countries, and they weren't used to offset emissions elsewhere, forest restoration could nearly deliver the carbon removals Peters and Geden say are needed.

Photo: Tero Laakso

Clear-cut forest in Pälkäne, Finland, in September 2017. Clear-cutting is still the main forest management method used in Finland, despite its environmentally and socially destructive effects.

Forest protection

Increasing EU forest reserves to 7 per cent (up from 2 per cent currently) could remove almost **2 Gt** of carbon dioxide by 2050.[6]

Reforestation

Forest carbon can also be increased by **reforestation** – the active planting of trees on totally deforested land. Reforestation in the EU has the potential to remove roughly **40 Gt** of carbon dioxide between now and the 2060s.[7] These figures include reforestation of animal-grazing pastures, but not croplands – meaning meat consumption would need to reduce.

As with all attempts to change land-use, reforestation runs many risks and thus would need to follow the basic principles of good restoration (see graphic on page 3). Reforested areas should not be cut down for short term uses (such as bioenergy), as these emissions are then immediately released back into the atmosphere, negating the positive climate effect. They should be biodiverse (not monocultures), planted only on lands suitable for forests (not undermining other ecosystems), and they should not reduce the albedo effect of the landscape.[8] Studies show that if such issues aren't taken into account, the climate contribution of afforestation/reforestation remains moderate or even harmful.

How to restore forests by improving forest management: examples from the EU

Finland

Finland is proud of its high forest cover, but the figures on paper hide a story of old-growth areas being clear-cut and replaced with less biodiverse managed plantations. Rotation forestry based on clear-cutting is the main forest management method in Finland. This is not only devastating to nature and the climate, but also to local people. Social acceptance of clear-cutting is reaching breaking point, with 78 per cent of Finns disapproving of the practice, and a civil society movement calling for state-owned forests to abandon it.

In the same country however, you see forest restoration and natural management approaches that enhance biodiversity (such as increasing tree species diversity or decaying wood).

One promising option could be to swap clear-cutting for continuous cover cultivation. Only 15 per cent of Finnish state owned forests are currently managed using continuous-cover methods. Such management benefits wildlife, but also increases carbon, delivers equal or higher revenues, and benefits local berry picking.

But it is important to keep in mind that no management regime can secure ecosystem services like unmanaged forests.

Ireland

Since the 1980s, County Leitrim in North-West Ireland has slowly become blighted by tall, dark, impenetrable walls of trees. Over the past few decades, the Irish government has provided generous incentives – approved by EU State Aid rules – to encourage the plantation of Sitka spruce trees which now cover 17 per cent of County Leitrim.

The spruce plantations have devastated both the local environment and farming communities in County Leitrim. No birds sing in them and they grow so tall and dark that they block out the sun. Sitka spruce – a North American species – is so acidic that falling pine needles damage the soil, affecting the productivity of the surrounding agricultural land. The fertiliser used to encourage faster growth of trees is poisoning local streams and groundwater.

There is a way to turn this situation around. Some foresters are starting to pursue an approach which involves slowly replacing spruce plantations with a mix including native species and then using continuous cover forestry, rather than clear-cutting them all at once. This practice is better for both the local environment and local people.

The Irish government and EU should stop granting subsidies to the forestry industry – which is already more than profitable on its own – but rather use the money to encourage more protection, enhancement of native broadleaf trees, and participatory and inclusive planning that encourages local livelihoods. With a change of heart, forestry can become a motor for local economic development and job creation, rather than something where benefits flow to outsiders, whilst communities fragment.

The bitterness that Ireland's pursuit of Sitka spruce has generated is tangible. People are angry about the clear-cutting, the water and soil pollution, the impacts on their agricultural production, the sell-off of locally-owned farmland to absentee investors, the fragmentation caused to formerly tight-knit farming communities, and the total failure to give them a say in the way their local world is being transformed.

■ Restoring wetlands and improving farming and grazing practices

Further negative emissions could be generated from restoring wetlands or adopting agroforestry approaches. This briefing note has not investigated these questions. It is clear though that there is an urgent need for EU-wide estimates for the carbon we could remove by taking these steps.

Beware of myths and false solutions

Bioeconomy and substitution

Some suggest that a growing 'bioeconomy' can contribute to climate change mitigation by replacing more fossil fuels and high-carbon materials with biomass, promoting increased harvesting levels to meet this increased demand. Mobilising more biomass through increased forest harvests can, however, have negative impacts on forests, including their ability to remove carbon dioxide. The trade-offs therefore need to be taken into account.

The reality is that 70 per cent of all wood used in the EU goes to short lived products such as bioenergy or pulp and paper. In such cases the carbon is released back into the atmosphere immediately or within a year, and takes decades to centuries to be re-absorbed. This causes twice the harm because as well as the stored carbon being released into the atmosphere, the cut forests are also no longer able to remove additional carbon.

Allowing forests to be cut for short-lived products therefore risks producing even more emissions than burning fossil fuels.

In Finland, over a 100-year period, using wood for materials and fossil fuel substitution was shown to be a net source of carbon. The forests' lost ability to remove carbon was not compensated by the avoided emissions. Studies from Canada show similar results.

The EU should therefore be careful about promoting a growing bioeconomy because of the potential trade-offs, notably on the climate and environment.

Bioenergy with Carbon Capture and Storage

Although forest restoration has many benefits, it receives far less attention than other carbon dioxide removal approaches, such as **Bioenergy with Carbon Capture and Storage (BECCS)**. BECCS is a controversial option firstly because it is far from clear that it will ever become technologically feasible at scale, and secondly because it has massive social, environmental, biodiversity, climate and financial costs. It is based on the false assumption that the use of forest biomass is carbon neutral. Scientists are clear that bioenergy leads to emissions, which puts into questions whether BECCS has the potential to be a negative emissions technology at all. EU climate models should therefore not rely on BECCS.

Policy recommendations: how can the EU support forest restoration?

The EU and Member States need to set national targets to restore forests. This could begin by setting European commitments under the Bonn Challenge – a global initiative which aims to restore 150M hectares of deforested and degraded land by 2020, and 350M hectares by 2030. Restoration targets should also be enshrined in the EU's climate and biodiversity policies.

Whichever way it is done, the EU should only support restoration that aims for social, economic and environmental benefits, and it should always encourage meaningful participation of local people and civil society.

Policy recommendations

The EU 2050 decarbonisation roadmap must

Show ambition

- **Reduce emissions rapidly to reduce the reliance on carbon removals as far as possible**
- **Consider the EU's historical role in releasing carbon dioxide when agreeing its role in achieving negative emissions**
- **Prohibit the use of forests as offsets.**

Ensure strong governance

- **Include milestones for what needs to be achieved by 2030, and every five years thereafter**
- **Propose differentiated and ambitious targets for forest protection, forest restoration, natural forest management, wetland restoration and agroforestry.**

Assess potentials

- **Include a full analysis of the EU-wide carbon removal potential from forest protection, forest restoration, natural forest management, wetland restoration and agroforestry**
- **Ensure EU modelling exercises take into account the impact that biomass harvesting has on the EU carbon sink, including the effect of substitution**
- **Take a precautionary approach when promoting the bioeconomy because of the potential trade-offs, notably on the climate and environment.**

Restrict biomass use and reliance on BECCS

- **Restrict public incentives for short-lived uses of wood such as bioenergy**
- **Not rely on BECCS technology to achieve large scale negative emissions.**

Endnotes

1 40 per cent of present-day anthropogenic radiative forcing can be attributed to land use change. https://www.atmos-chem-phys.net/14/12701/2014/acp-14-12701-2014.pdf

2 Negative emissions are where more emissions are removed from the atmosphere than are put in.

3 See http://fern.org/LULUCFRegulationResult and http://fern.org/REDIIresponse

4 https://ec.europa.eu/transport/sites/transport/files/media/publications/doc/trends-to-2050-update-2013.pdf; see also https://www.birdlife.org/sites/default/files/attachments/can_europe-lulucf-position_10.12.2016.pdf

5 The annual sequestration rate being 56.3 Mt CO_2 between 2012–2102.

6 Annual sequestration rate being 64 Mt CO_2.

7 Annual sequestration being 1.1 $GtCO_2$ for 30 years.

8 The albedo effect is the process where light colour surfaces reflect sun light back to the space which cools the planet and darker surfaces absorb more of the sun's heat, leading to higher levels of warming. Conifer forests are generally darker than other types of landscapes and thus have a lower albedo.

Further reading

- Risks of negative emissions are outlined in Fern report Going Negative
- Fern report Return of the Trees shows the global role benefits of forest restoration
- Fern film Putting Down Roots shows how forest restoration transforms lives
- Fern literature summary on the role of land in limiting warming to 1.5 degrees
- NGO statement on principles for good forest restoration

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This briefing has been produced with the financial assistance of the European Union, the European Climate Foundation and the Ford Foundation. The contents of this publication are the sole responsibility of Fern and can in no way be taken to reflect the views of the European Union, the European Climate Foundation or the Ford Foundation.