

# **The Role of Bioenergy and BECCS in Nationally Determined Contributions and Long Term Strategies**

**February 2026**

## **Disclaimer**

*This analysis was conducted by a consultant on behalf of RSPB. Any errors or inaccuracies are the responsibility of the consultant.*

## **Introduction**

The use of woody biomass for energy has significantly expanded in recent years. This has put the world's forests under increasing pressure. It is also bad for climate progress. Burning wood for energy releases more carbon dioxide than burning fossil fuels. It damages forest carbon stocks, significantly and permanently reducing them. While those forests may partially recover, data shows that they are likely to never recover to previous levels. Even sustainability schemes founded by the bioenergy industry itself acknowledge that carbon stocks may only recover after several forest cycles of 20-100 years each, meaning upwards of 40-300 years in total.<sup>1</sup> In fact data now shows that forests in the global north are on course to change from being overall carbon sinks to overall emitters of carbon dioxide by the second half of this century.<sup>2</sup> The bioeconomy has been identified as a major driver of this forest degradation.<sup>3</sup>

The Brazil Presidency of COP30 made it clear that the 'bioeconomy' was one of its priorities, and during COP30 persuaded 23 countries to join the Pledge to Quadruple Sustainable Fuels.<sup>4</sup> This Pledge targets increasing sustainable fuel use fourfold from 2024-2035. It does not specifically mention use of woody biomass for energy purposes, referring mostly to fuels for surface transport, aviation, industry and to hydrogen. However, the natural consequence of an expansion of that magnitude would be greater use of wood for heat and power, as well as energy crops. The Pledge gives little to no consideration to the land use, biodiversity, water or carbon impacts of this goal (in fact the word 'forest' is not mentioned at all). It does say that carbon accounting principles should be aligned and that sustainable agriculture and biodiversity conservation should be promoted. However, the majority of the pledge is focused on initiatives to increase the use of so-called 'sustainable fuels' with little attention paid to whether they provide genuine benefits to the climate or to the safeguards needed for them.

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<sup>1</sup> Sustainable Biomass Program, 2023, *Glossary of Terms and Definitions*, [https://sbp-cert.org/wp-content/uploads/2023/05/SBP\\_Standards\\_Glossary\\_v2.0\\_final.pdf](https://sbp-cert.org/wp-content/uploads/2023/05/SBP_Standards_Glossary_v2.0_final.pdf)

<sup>2</sup> Climate Analytics, 2024, *Climate impacts in Northern Forests*, <https://ca1-clm.edcdn.com/publications/Climate-impacts-in-northern-forests.pdf?v=1714381265>

<sup>3</sup> European Scientific Advisory Board on Climate Change, 2024, *Towards EU climate neutrality: progress, policy gaps and opportunities*, <https://climate-advisory-board.europa.eu/reports-and-publications/towards-eu-climate-neutrality-progress-policy-gaps-and-opportunities>

<sup>4</sup> October 2025, Belém 4X Pledge on Sustainable Biofuels, [https://www.gov.br/mre/en/contact-us/press-area/press-releases/launch-of-the-belem-4x-pledge-on-sustainable-fuels/2025-10-23\\_cop30-declaration\\_sustainable-fuels.pdf](https://www.gov.br/mre/en/contact-us/press-area/press-releases/launch-of-the-belem-4x-pledge-on-sustainable-fuels/2025-10-23_cop30-declaration_sustainable-fuels.pdf)

The use of forests for woody bioenergy, or converting land to energy crops, poses significant environmental risks - to biodiversity that depends on forests or other natural habitats, to land-based carbon stocks, to ecosystem services, and to people who manage or rely on these ecosystems, and to water resources.<sup>5</sup> Governments have agreed global targets to halt and reverse the loss of biodiversity by 2030. The use of biomass for energy, especially forest biomass, will take the planet in the wrong direction.

Biomass energy is increasingly common in Nationally Determined Contributions (NDC) and Long Term Strategies (LTS). These documents - submitted to the UNFCCC by national governments - are important because they set out the high-level and detailed pathways countries plan to take to transition to low-carbon economies and to reduce emissions.

Some NDCs and Long Term Strategies refer to bioenergy, biomass, or Bioenergy with Carbon Capture and Storage (BECCS). They do not always specify whether this will be burning wood or other feedstocks (for example energy crops). This assessment has focused on references to using bioenergy for power, heating and cooling and using biomass with carbon capture technology.

At a global level the use of biomass for energy has expanded and is expected to grow in coming years.<sup>6</sup> A handful of major economies have spent nearly one quarter of a trillion dollars (\$250 billion) on biomass subsidies in the last 22 years.<sup>7</sup> Across different IPCC scenarios that limit global temperature rises to 1.5C, BECCS is planned to be used for anywhere from 0-22Gt of CO<sub>2</sub> removal *per year*.<sup>8</sup> However, this huge reliance is simply used to make the numbers add up. There are no functioning BECCS projects worldwide and the current global scale of CCS (including for oil and gas) is tiny in comparison. It is many orders of magnitude smaller than global deployment of CCS would need to be to achieve the required removals. Also by comparison, countries' actual plans for using BECCS (see analysis below) are far smaller than these global IPCC models. But they are still large enough to potentially require millions of hectares of land use.

Bioenergy is often referred to as a low-carbon energy technology or as one of a range of renewable energy technologies. Where BECCS is mentioned, it is referred to as a form of Negative Emissions Technology or Greenhouse Gas Removal. The assumption is that BECCS power plants would include carbon capture technology, with the CO<sub>2</sub> then used (for other industries), stored or buried (e.g. below the seabed). Governments often assume this would provide an instant negative emission, because plants have previously absorbed the carbon dioxide, removing it from the atmosphere. In reality, this is not true. It simply moves

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<sup>5</sup> Mackey, B. and Lindenmayer, D. B., 2025, *Burning Forest Biomass Is Not an Effective Climate Mitigation Response and Conflicts With Biodiversity Adaptation*, *Climate Resilience and Sustainability*, 4(2), [https://www.researchgate.net/publication/394128725\\_Burning\\_Forest\\_Biomass\\_Is\\_Not\\_an\\_Effective\\_Climate\\_Mitigation\\_Response\\_and\\_Conflicts\\_With\\_Biodiversity\\_Adaptation](https://www.researchgate.net/publication/394128725_Burning_Forest_Biomass_Is_Not_an_Effective_Climate_Mitigation_Response_and_Conflicts_With_Biodiversity_Adaptation) and Cut Carbon Not Forests, 2022, *Impacts of Biomass on Biodiversity: Letter from Scientists to World Leaders*, <https://cutcarbonnotforests.org/wp-content/uploads/2023/11/Impacts-of-Biomass-on-Biodiversity-Scientist-Letter.pdf>, (accessed February 2026)

<sup>6</sup> 2024, Environmental Paper Network: Biomass Action Network, *Burning Up the Biosphere: A global threat map of biomass energy development (2024 Update)*, <https://environmentalpaper.org/wp-content/uploads/2024/11/threat-map-2024-1.pdf>

<sup>7</sup> <https://environmentalpaper.org/2025/10/burning-billions-for-biomass/>

<sup>8</sup> 2019, Fajarday, M. et al., Imperial College London, *BECCS deployment: a reality check*, <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/BECCS-deployment---a-reality-check.pdf>

carbon dioxide from a forest to under the sea. Cutting down the trees actually reduces the carbon stock of the forest and its ability to absorb more carbon dioxide. We now know that - contrary to some claims - older forests are better at absorbing carbon dioxide than younger ones.

Burning wood in a power plant generates more carbon dioxide per unit of energy than fossil fuels like coal. Direct and indirect land use change mean that using energy crops or woody biomass most often increases emissions.<sup>9</sup> There is clear evidence that in Europe harvesting wood for energy is driving long-term declines of forest carbon-stocks.<sup>10</sup>

Even with carbon capture technology, BECCS would damage forest carbon stocks for years or decades, leaving the atmosphere worse off and *increasing* climate change. Forest carbon stocks may partially recover as trees regrow, but may never reach previous levels. BECCS would not provide negative emissions for many decades, if ever.<sup>11</sup>

Assumptions that burning woody biomass is carbon neutral stem from guidance issued by the Intergovernmental Panel on Climate Change. That guidance states that biomass energy emissions should not be counted in the energy sector (even if they are greater than fossil fuel emissions) in order to avoid double counting, and that biomass emissions should only be counted in the land use sector. However, the guidance also says that biomass energy emissions should be quantified and reported as a memo item. This guidance comes from several decades ago when the use of biomass for energy was much smaller in scale, and was mostly used within-country. Now that its use has expanded exponentially, and a large global trade has developed, this accounting approach no longer makes sense.

It cannot be assumed that biomass emissions will be properly counted in the land use sector. Forest carbon accounting is complex and quantifying emissions from forests is far harder than those which come out of a power station and can be counted to the exact tonne. The assumption that woody biomass energy is instantly carbon neutral makes no sense - in many cases it is assumed to be instantly carbon neutral based on what might happen to forest carbon stocks in another country, at a landscape level, over the coming decades. Assessing references to biomass, bioenergy and BECCS can help to understand the level of current and planned reliance on these technologies.

## **Methodology**

The UNFCCC's portals for Nationally Determined Contributions (NDCs) and Long Term Strategies (LTSS) were used to obtain these documents, and the Climate Watch website was

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<sup>9</sup> Mackey, B. G., et al., 2025, *Burning Forest Biomass is Not an Effective Climate Mitigation Response and Conflicts With Biodiversity Adaptation*, Climate Resilience and Sustainability, <https://rmets.onlinelibrary.wiley.com/doi/10.1002/cli2.70015>

<sup>10</sup> European Scientific Advisory Board on Climate Change, 2024, *Towards EU climate neutrality: progress, policy gaps and opportunities*, <https://climate-advisory-board.europa.eu/reports-and-publications/towards-eu-climate-neutrality-progress-policy-gaps-and-opportunities> and Jonsson, R., 2024, *Strategic wood availability in Europe*, <https://pub.epsilon.slu.se/34879/1/jonsson-r-20240827.pdf>

<sup>11</sup> NRDC, 2024, *The BECCS Hoax: Using Bioenergy with Carbon Capture and Storage is a Bad Bet for the United Kingdom's Net Zero Goal*, [https://www.nrdc.org/sites/default/files/2024-10/BECCS\\_UK\\_Report\\_R\\_24-09-A\\_03\\_locked.pdf](https://www.nrdc.org/sites/default/files/2024-10/BECCS_UK_Report_R_24-09-A_03_locked.pdf)

used to find NDCs.<sup>12</sup> This analysis was originally done in November 2025. It was updated in February 2026 to reflect a large number of updated NDCs that had been submitted.

159 NDC documents were searched. Long Term Strategies (of which there are fewer) were searched manually for these keywords. 79 LTSs were searched. This was done in February 2026 using NDCs and LTSs available at the time.

Several NDCs were excluded due to a language barrier. Those in English, French and Spanish were analysed.<sup>13</sup> Eight NDCs were excluded on the basis of their language (however some of these do have LTSs in English so the Parties may be included on the basis of their LTS, but not their NDC).<sup>14</sup> EU countries do not have standalone NDCs as they fall under the EU, although some of them do have standalone LTSs.

Where a country had both an NDC and an LTS, both were analysed. However, for the purposes of calculations, an LTS (which is more detailed) was assumed to override an NDC (even if the LTS is older than the NDC).

There were three exceptions to this - where a Party had an NDC that mentioned bioenergy or BECCS yet had an LTS that *did not* mention them; there are Chile, the European Union and Zimbabwe. In all other cases, where a country had both an NDC and LTS available, bioenergy or BECCS was mentioned at least in the LTS, or in both documents.

## **Results**

### **NDCs**

Of all 159 NDCs analysed, 76 mention biomass/bioenergy (47%); while only 1 mentioned BECCS (1.8%). This means that of all NDCs, 49% mention either biomass/bioenergy or BECCS.

### **LTSs**

Of all 78 LTSs analysed, 41 mention only biomass/bioenergy (52%), 20 mention both bioenergy/biomass *and* BECCS (25%), and 4 mention only BECCS without mentioning biomass/bioenergy (5%). This means that a total of 65 of them mention biomass/bioenergy or BECCS or both, which is 83%.

### **NDCs and LTSs combined**

Combining all documents and excluding duplicates - i.e. where a country had both an NDC and LTS available the NDC was excluded based on the presumption that the LTS was the more detailed document - there are 184 Parties are covered. Where a Party had an NDC

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<sup>12</sup> UNFCCC, webpage (accessed February 2026), *NDC Registry*, <https://unfccc.int/NDCREG> and UNFCCC, webpage (accessed February 2026), *Long-term strategies portal*, <https://unfccc.int/process/the-paris-agreement/long-term-strategies> and Climate Watch, webpage (accessed February 2026), *Explore Nationally Determined Contributions (NDCs)*, <https://www.climatewatchdata.org/ndcs-explore>

<sup>13</sup> The author's first language is English, and speaks French and Spanish.

<sup>14</sup> Belarus, China, Iraq, Kazakhstan, Kuwait, Russian Federation, Uzbekistan, Ukraine.

and an LTS, it was nearly always the case that *both* documents mentioned biomass/bioenergy - and therefore the NDC was removed, deferring to the more detailed LTS.

There were three exceptions - Chile, the European Union, and Zimbabwe - where biomass/bioenergy is mentioned in its NDC but not in its LTS, and therefore its NDC was included instead of its LTS. This is likely explained by these three NDCs being much more recent than the Parties' LTSs.

Of all 184 NDCs and LTSs combined (removing duplicates), 96 mention only biomass/bioenergy (52%), 21 refer to both biomass/bioenergy and BECCS (11%), while 4 refer to just BECCS without mentioning biomass/bioenergy (2%). This means that 121 NDCs/LTSs refer to either biomass/bioenergy or BECCS or both, which is 65%.

### **Possible Land Use Implications**

A paper published in *Nature* says that 3.3GtCO<sub>2</sub>e of BECCS removals per year would require, at low end, 380Mha of bioenergy crops, or up to 700Mha.<sup>15</sup> This means that somewhere between 115-212Mha of bioenergy crops are needed for each GtCO<sub>2</sub>e of removals.

In the NDCs and LTSs analysed, very few specify how much they might rely on BECCS. Of those that refer to BECCS, the following provide exact figures or ranges for how much BECCS will be used:

Canada 73MtCO<sub>2</sub>e removals per year by 2050

Denmark 1MtCO<sub>2</sub>e per year from 2030 onwards

Finland 14MtCO<sub>2</sub>e per year by 2050

France 16MtCO<sub>2</sub>e per year by 2050

UK 58MtCO<sub>2</sub>e per year by 2050

USA LTS shows 500MtCO<sub>2</sub>e of Removals by 2050 - assuming half of this is BECCS is 250MtCO<sub>2</sub>e per year

In separate reports Australia has referred to using 38MtCO<sub>2</sub>e per year of BECCS<sup>16</sup>

**This means a total of 450MtCO<sub>2</sub>e (0.45GtCO<sub>2</sub>) per year by 2050 of BECCS from just this handful of countries.**

Based on conversion factors from the *Nature* study this would require a conservative estimate of 51Mha of land using bioenergy crops. It could be as much as 95Mha. This is equivalent to more than all the arable land in Canada, estimated to be around 45 million hectares (varying slightly depending on the year and the source).<sup>17</sup>

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<sup>15</sup> Harper, A, et al., 2018, *Land-use emissions play a critical role in land-based mitigation for Paris climate targets*, Nature Communications, 9 (2938), <https://www.nature.com/articles/s41467-018-05340-z>

<sup>16</sup> Redfearn, G., Guardian, 2021, 'A farce': experts dismiss government claims a controversial and unproven technology will cut emissions by 15%, <https://www.theguardian.com/environment/2021/nov/19/a-farce-experts-dismiss-government-claims-a-controversial-and-unproven-technology-will-cut-emissions-by-15>

<sup>17</sup> *Supra* note 6 (Nature)

Our analysis corroborates findings by other studies. Notably, the Land Gap report analysed NDCs and found that only a small number specified use of BECCS. The estimated land use of these in the study is 61Mha - which sits in the middle of our 51-95Mha range.<sup>18</sup>

## **Discussion**

Of 184 NDCs and LTSs combined (and removing duplicates) 65% of them mention bioenergy/biomass or BECCS or both. In NDCs alone the proportion was just 49%, and in LTSs alone the proportion was 83%.

The share of NDCs mentioning biomass/bioenergy and BECCS has risen compared to when this analysis was first done. In November 2025 it was 39%, it has now risen to 49%, showing a trend of rising plans for using bioenergy.

These results show that biomass/bioenergy and BECCS are more likely to be referred to when a country has provided a more detailed LTS than when it has submitted just a high-level NDC. This also suggests that the absence of bioenergy within an NDC does not mean a country won't be using it - since often it is absent from an NDC but present in an LTS.

This shows that a very large share of countries are already using, or plan to use, biomass or bioenergy in some way, and a handful explicitly mention BECCS as part of their low-carbon pathway.

The majority of mentions of bioenergy and BECCS were about the country's current or future use of that technology. For many countries this was a reference to medium or large-scale use of biomass for power or heating. However, for many developing countries this referred to present-day use of biomass as the main or sole source of cooking or heating for large proportions of the population. In such places it is important to recognise that a sustainable and just transition is needed away from biomass that does not disadvantage people whose livelihoods, lives, or main source of energy relies on biomass. In these NDCs and LTSs there was often a reference to replacing cookstoves with more efficient models to reduce biomass use, or transitioning away from the use of biomass altogether.

There are positive signs that many developing countries recognise the harmful impacts bioenergy is having on their forests. In countries where biomass is currently used in rural areas there are plans for a transition to its use in a more centralised and industrial way and to deploy more efficient cookstoves that use no biomass at all, or use it more efficiently. Quite often these NDCs (predominantly from developing countries) recognise that using forest biomass is leading to deforestation or impacting on carbon sinks. For example Angola's NDC refers to the domestic use of biomass causing deforestation on the outskirts of villages and says that it is often used unsustainably without replacing the felled trees; however it also refers to installing 500MW of centralised biomass capacity that will use wastes and residues. Congo's NDC says the country is suffering from deforestation, caused in part by unsustainable biomass use. Eritrea's NDC also says that energy demand is heavily reliant on biomass, leading to deforestation. Liberia's NDC says that biomass energy

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<sup>18</sup> Dooley, K., et al., 2024, *Over-reliance on land for carbon dioxide removal in net zero pledges*, Nature Communications, <https://landgap.org/downloads/2024/s41467-024-53466-0.pdf>

is contributing to climate change through deforestation, and at the same time is an energy source that is vulnerable due to climate change impacts on forests. Nigeria's NDC says that solid biomass is the main driver of deforestation in the country, and that a just labour transition is needed for existing jobs in the charcoal and firewood sectors. In Uganda 99.5% of primary energy for households comes from biomass. The transition in a country such as Uganda is more complicated - the aspiration is to increase the sustainability of biomass uses, transitioning away from the use of forests to the creation of sustainable "woodlots" across the country to provide fuelwood. Serbia's LTS states that since 2010 there has been an increase in the use of biomass, and that from 2010-2015 the carbon absorption role of the forest sector declined by 19% due to the use of biomass for energy. Meanwhile Portugal's Long Term Strategy acknowledges that increasing the use of biomass in industry will involve trade offs with air quality. Nonetheless the country is still targeting an increase in installed biomass power capacity from 0.8GW to 1.8GW by 2050.

Some countries have different levels of biomass use in different scenarios - Austria's Long Term Strategy uses biomass in most scenarios, but in one scenario that includes no biomass imports. Some countries have significant plans to increase the role of bioenergy in heating. Cambodia says that displacing coal depends on the availability of biomass, meaning that its transition away from fossil fuels is inherently tied to biomass. Other countries already have a large reliance on biomass and plan to expand it in future, such as Vietnam which already has 570 Megawatts of installed capacity by 2020 and plans for more. In Georgia's LTS it says that biomass has played a tiny role in electricity production - just 0.3% - but the potential is seen as 11TWh of electricity generation and woody biomass is seen as the most interesting untapped resource. Bosnia and Herzegovina's LTS says bioenergy will be a key source of power and refers to afforesting 2,500 hectares of land per year to provide biomass, and installing 700 Megawatts of new biomass heating plant capacity, with an untapped potential of 2 million oven-dried tonnes of biomass that could be used. The UK is one of the leading users of biomass in the world, with its LTS saying that biomass is a "key energy carrier".

France has a biomass strategy which targets 450TWh of electricity from biomass by 2050, while acknowledging that biomass resources are limited, there will be competition between different sectors, and that the country should avoid importing deforestation through biomass - by 2050 two thirds of the biomass used in France will come from the agricultural sector.

Indonesia's NDC refers to a programme to develop the use of degraded land for bioenergy and to support "sustainable biomass plantations", but there are few other mentions of bioenergy.<sup>19</sup> It also refers to developing green fuels from biomass to drop in alongside existing fossil fuels and replace fossil fuel consumption, which can refer to co-firing biomass with coal in individual power plants.

A handful of countries refer to CCS technology without mentioning biomass. But at times these are countries that already use large amounts of biomass - for example Latvia's Long Term Strategy refers to future development of CCS without mentioning BECCS. But the country is already a heavy user of biomass and producer of wood pellets for export.

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<sup>19</sup> October 2025, Second Nationally Determined Contribution: Republic of Indonesia, [https://unfccc.int/sites/default/files/2025-10/Indonesia\\_Second%20NDC\\_2025.10.24.pdf](https://unfccc.int/sites/default/files/2025-10/Indonesia_Second%20NDC_2025.10.24.pdf)

Slovakia's Long Term Strategy is similar in mentioning a role for CCS without mentioning BECCS, but the country relies heavily on biomass for power. Canada's NDC refers explicitly to using BECCS; Denmark explicitly says that BECCS will capture 0.9 million tonnes of carbon from 2030 onwards; in 2050 Finland is targeting 14 MtCO<sub>2</sub> per year of emissions captured by BECCS and in France it will be 16 MtCO<sub>2</sub> per year by 2050. The UK is targeting up to 58 MtCO<sub>2</sub> of removals from BECCS by 2050 - one of the highest figures of any country.

The land use implications of this possible reliance on BECCS are substantial. While they are not at the level of IPCC models (running into billions of hectares) they would nonetheless require significant changes to global land use patterns. This could jeopardise carbon stocks in forests or other ecosystems, habitats or space for the restoration of ecosystems and biodiversity, as well as food production.

The share of NDCs and LTSs that refer to biomass/bioenergy, and the small number that mention BECCS, are large enough that stronger safeguards must be put in place. This must be done at both the national and international level.

## **Conclusion**

The use of biomass and bioenergy is already widespread, including for providing power and cooking in households in developing countries. Its use is likely to grow, with a large number of countries mentioning it in NDCs and LTSs. Many of these plans refer to large increases in its use for household power, heating and cooking, as well as plans to significantly increase its centralised and industrial use for power and heat. In many cases NDCs and LTSs refer to increasing the use of woody biomass; at other times it is unclear what biomass feedstocks will be used, and in many cases there are references to using energy crops, agricultural residues or wastes.

Using bioenergy, especially with forest biomass which is the focus of this report, provides little to no climate benefit in most cases. Using any biomass from forests for energy production should be ruled out by countries.

Only a small number of countries mention the use of Bioenergy with Carbon Capture and Storage, or allude to its use. However, the land use implications of that BECCS alone would be significant. The land use implications of bioenergy, with or without carbon capture technology, could be significant. In turn the impacts on communities, water resources, biodiversity and food security could be significant. Due to direct and indirect land use changes, especially on forests, using forest biomass may produce no climate benefit or even make climate change worse.

Governments should acknowledge the risks of bioenergy and biomass. The Intergovernmental Panel on Climate Change must issue unequivocal and headline guidance making clear that using wood biomass from forests for energy is not instantly carbon neutral and increases emissions in the medium term for years or decades.

The Belém Pledge contains little to no mention of environmental or social risks of biomass nor of safeguards that should be put in place. Setting a top-down, apparently arbitrary, goal

for increasing the use of biomass is unwise. Countries are pursuing a roadmap for a Transition Away from Fossil Fuels - but significant risks exist that this will simply be a transition into so-called “sustainable” or “transitional” fuels, which are effectively bioenergy. The use of biomass for energy, especially forest biomass, will take the planet in the wrong direction.

Instead the use of biomass should likely be scaled back from current plans in NDCs and LTSs, given the unrealistic land use impacts. As a result of COP30 there are ongoing processes addressing deforestation and the transition out of fossil fuels. These processes must ensure that they build in protections for forests from harmful bioenergy and that they do not promote bioenergy as an alternative to fossil fuels. Many countries plan to pursue biomass, but have not yet used it. There is still time for most of the world to leapfrog harmful biomass energy.