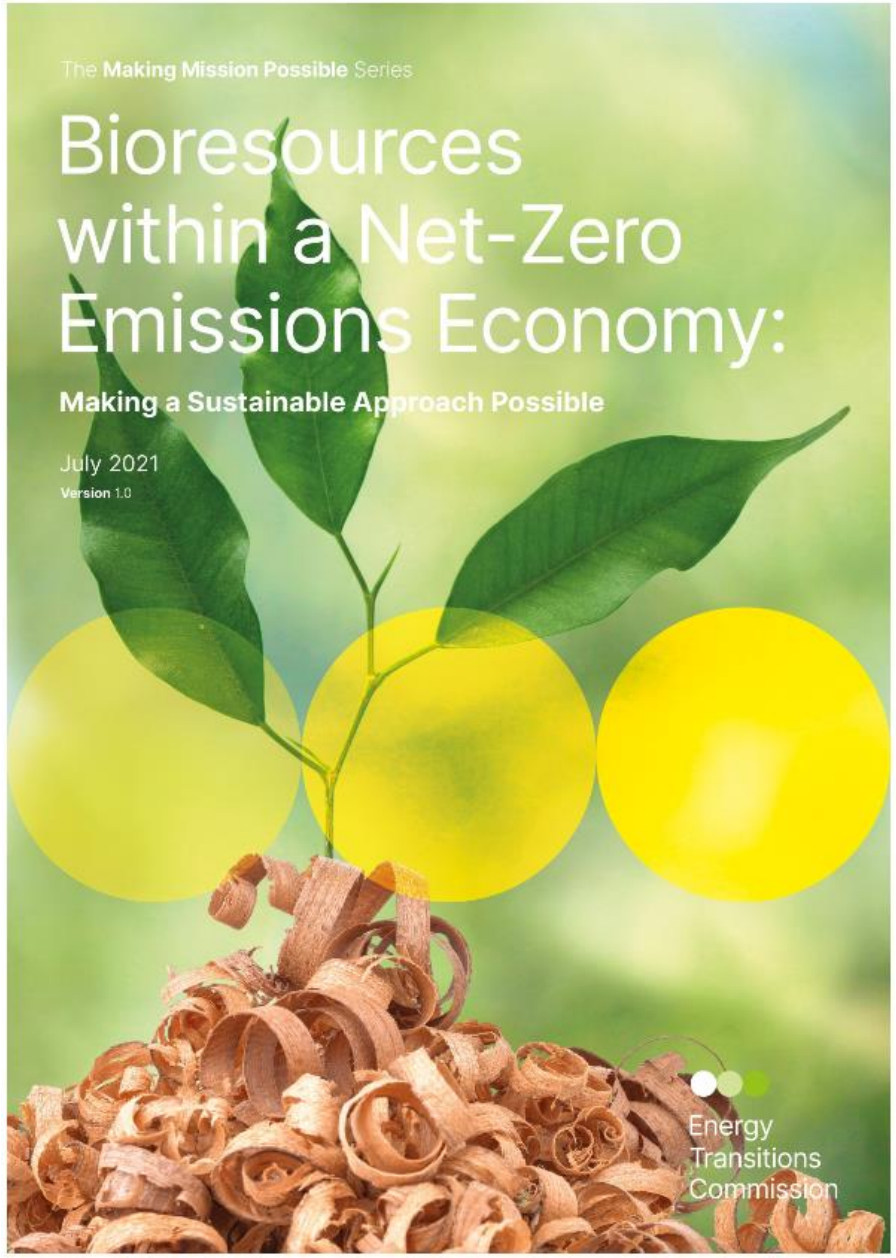


Rapidly increasing demand for bioresources is likely to outstrip sustainable supply, undermining climate mitigation efforts and harming biodiversity, unless alternative zero-carbon options are rapidly scaled-up, clear sustainability standards for biomass are enforced and use of bioresources carefully prioritised.

Supply of sustainable, low lifecycle emission biomass is constrained by competing uses of land

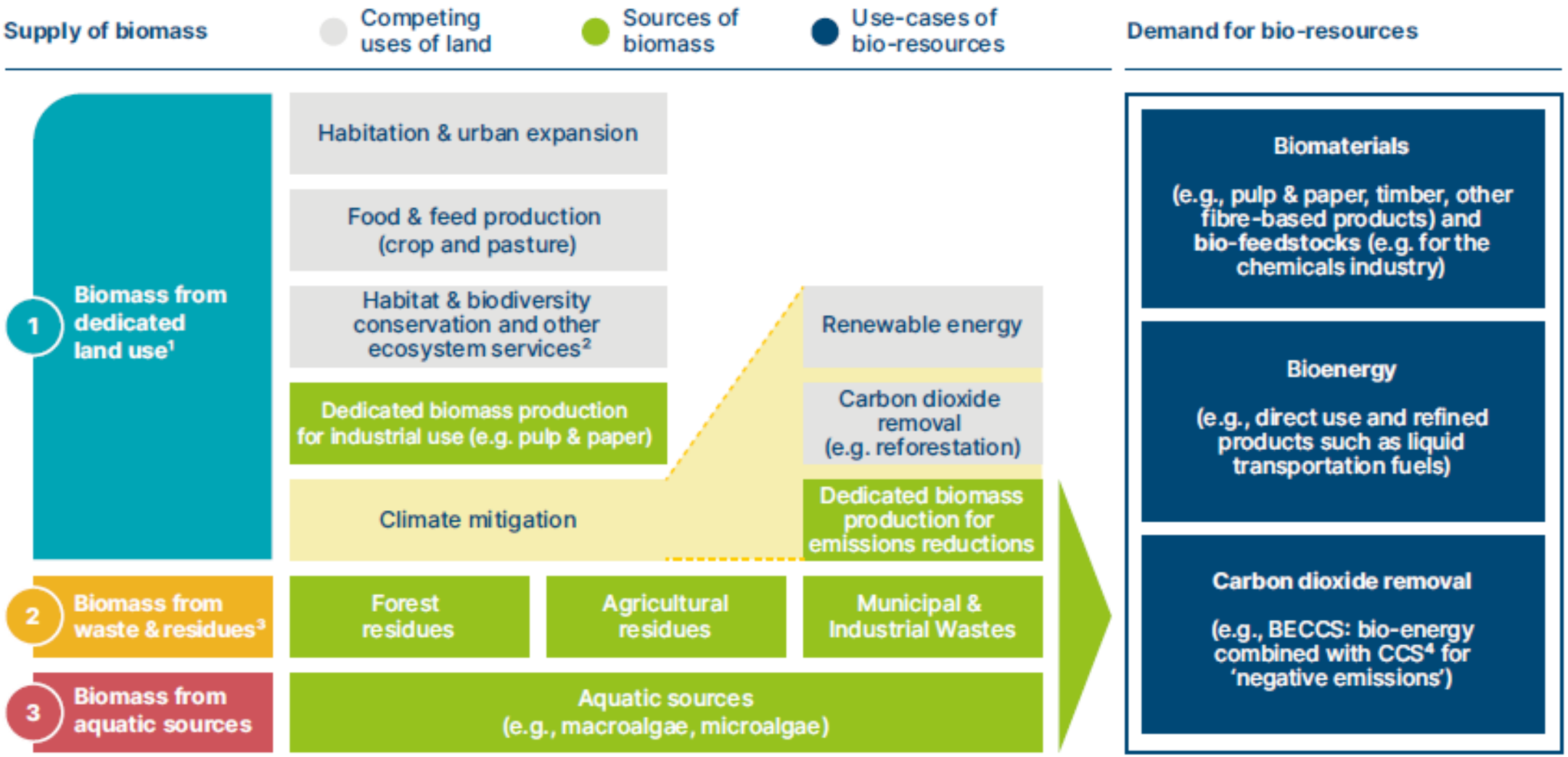


Exhibit 2

NOTES: [1] Parallel uses of land (e.g., double-cropping and forest/landscape management) can reduce competition between uses of land by combining biomass production with agriculture or ecosystem services;
[2] Includes ecosystem services such as nutrient cycling, soil quality maintenance, water regulation, erosion mitigation, water and air purification, recreation, etc.;
[3] Biomass from waste and residues are generated as a bi-product of using land for other primary purposes listed in group 1, e.g. agriculture, human habitation;
[4] BECCS: bioenergy with carbon capture & storage (CCS)

SOURCE: SYSTEMIQ analysis for the Energy Transitions Commission

What is sustainable biomass?

Avoid competition with other critical uses of land

No competition with other critical uses of land

Produced with low lifecycle emissions

No deforestation or peatland conversion

Target degraded land, with little plant growth

Respect growth periods which will delay supply

Close-to-zero emissions collection, transportation and processing

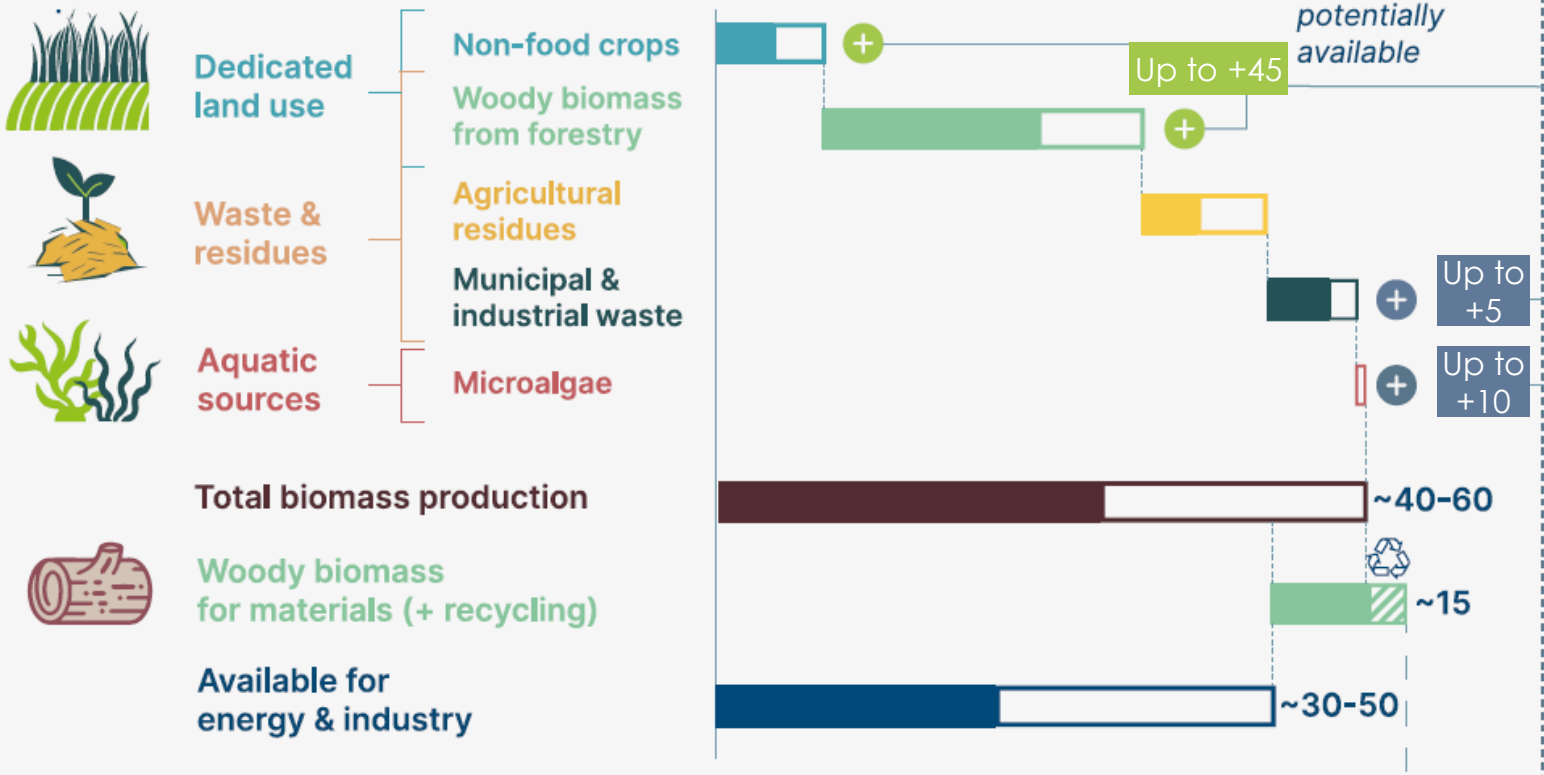
Account for other critical environmental and social considerations

No environmental or social harm

Only a limited amount of biomass can be relied upon for climate mitigation unless we make ambitious changes in consumer behaviour and/or develop new sources

WHAT WE CAN RELY ON: A CONSTRAINED SUSTAINABLE SUPPLY

Global sustainable biomass supply in 2050 – ***Prudent estimate***
EJ primary energy per year – *Illustrative scenario*



EXTRA BIORESOURCES IF RADICAL CHANGE HAPPENS

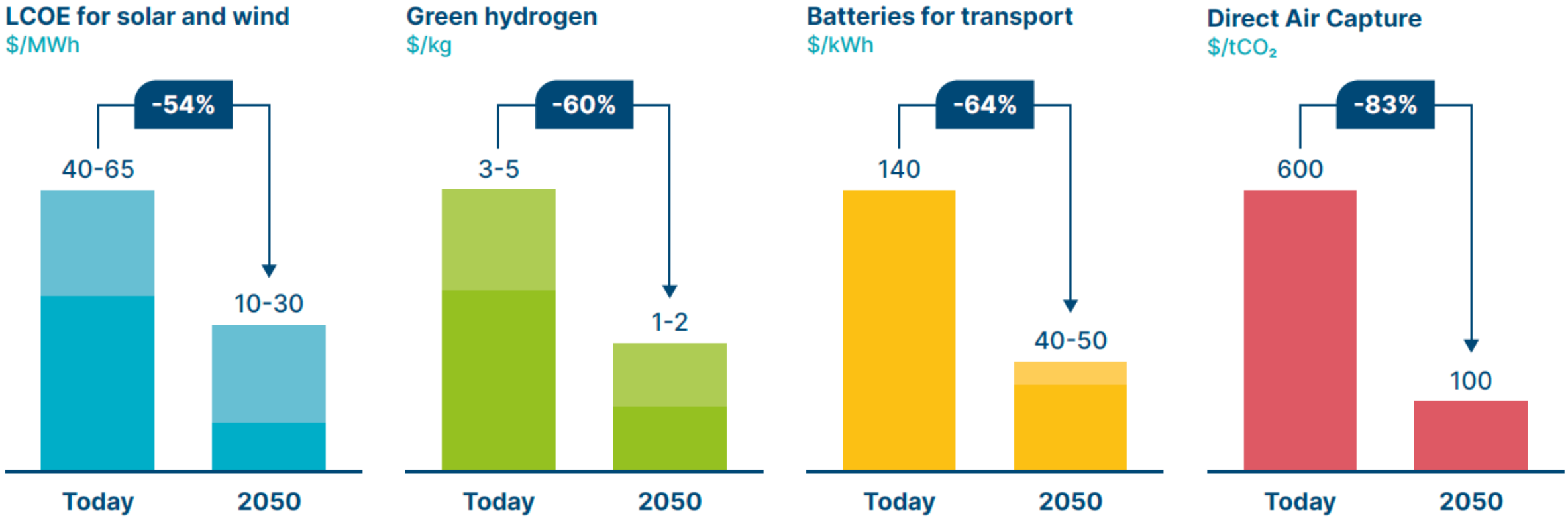
More available land
(Accelerated by biotechnologies)

- Dietary shift away from meat
- More productive plants (traditional crops, algae)
- Less food waste

New sources available

- Increase collection of organic waste
- Development of macroalgae (seaweed) for energy

How do non-bio, low-emissions options compare?

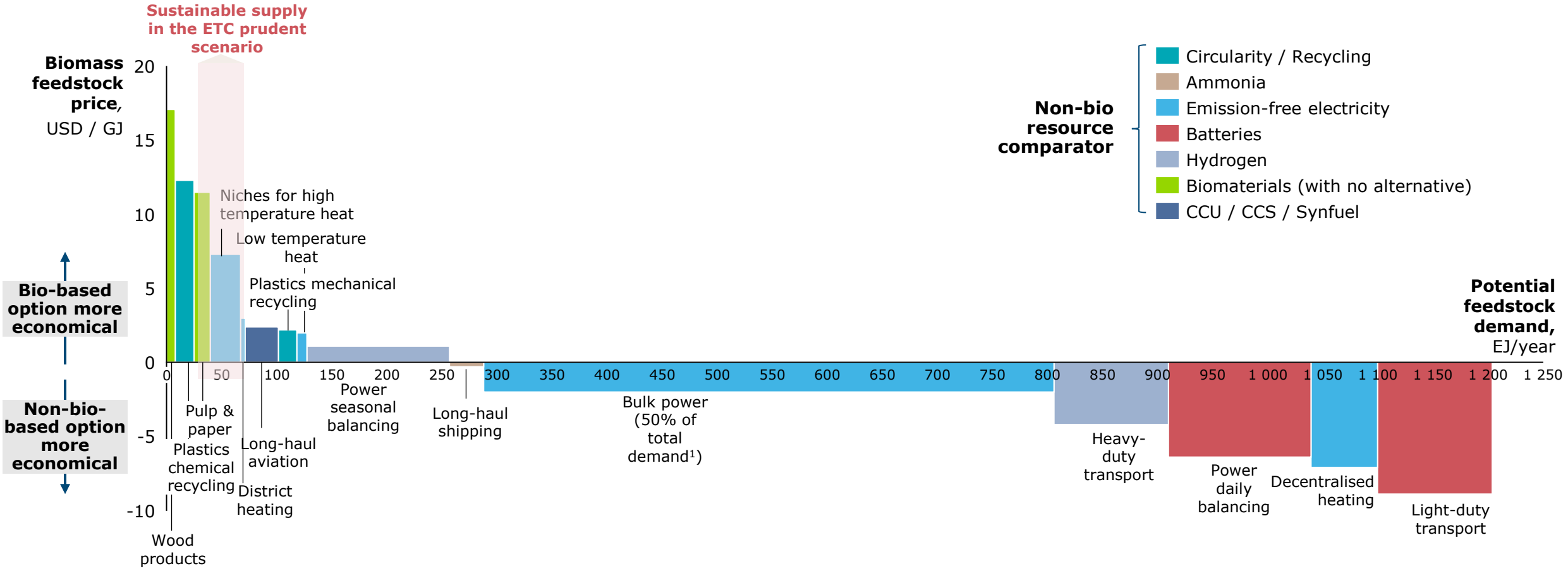


Notes: Ranges for cost numbers show that costs are likely to vary by location with lower bound being most favourable locations, and upper bounds representing a global average.
Sources: SYSTEMIQ analysis for the ETC, based on ETC (2020) *Making Mission Possible* and Material Economics (2021) *EU Biomass Use in a Net-Zero Economy - A Course Correction for EU biomass*.

Use of biomass in all sectors could far outstrip supply

Cost-parity curve – Breakeven biomass cost vs. alternative leading non-biogenic solution; global (2050 outlook)

"At what biomass feedstock price is the bio option cost effective?"

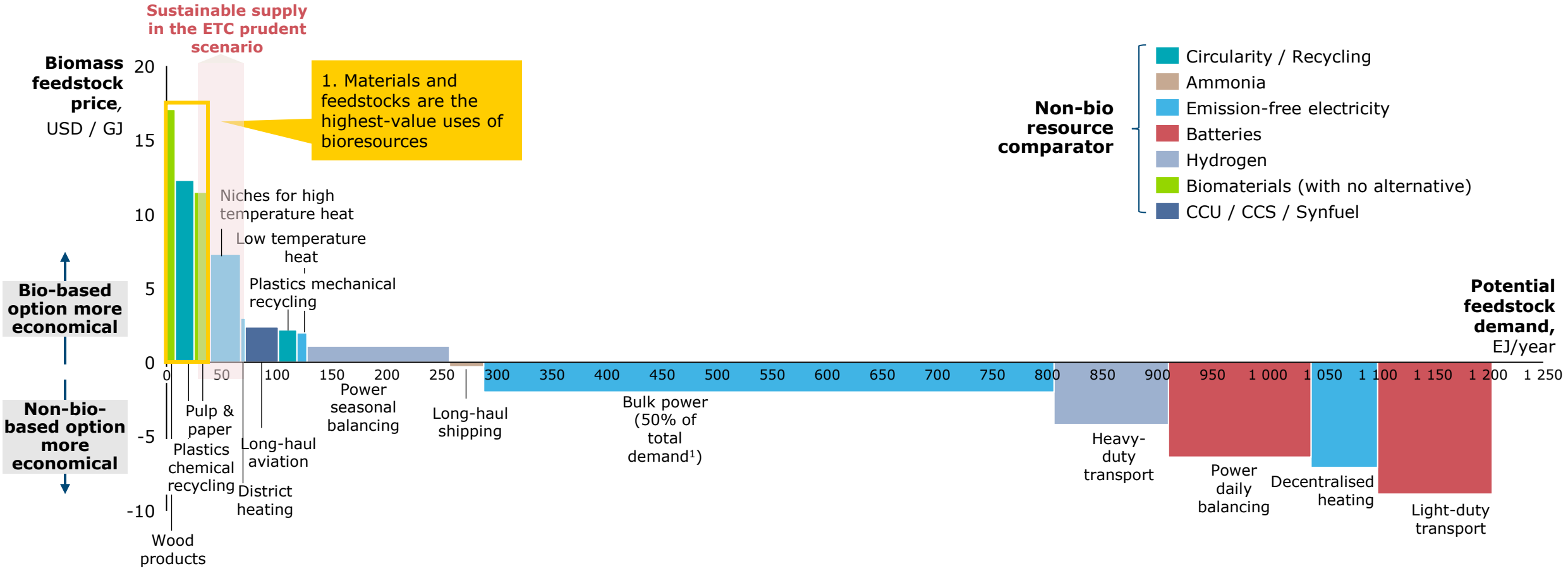


Note: Currently excludes carbon removal applications. 1. We limit the potential demand for biomass for bulk power to 50% of the demand of the segment in order to make the graph readable.
Source: Material Economics and ETC analysis (2021)

Materials and feedstocks are highest priority uses of bio

Cost-parity curve – Breakeven biomass cost vs. alternative leading non-biogenic solution; global (2050 outlook)

"At what biomass feedstock price is the bio option cost effective?"

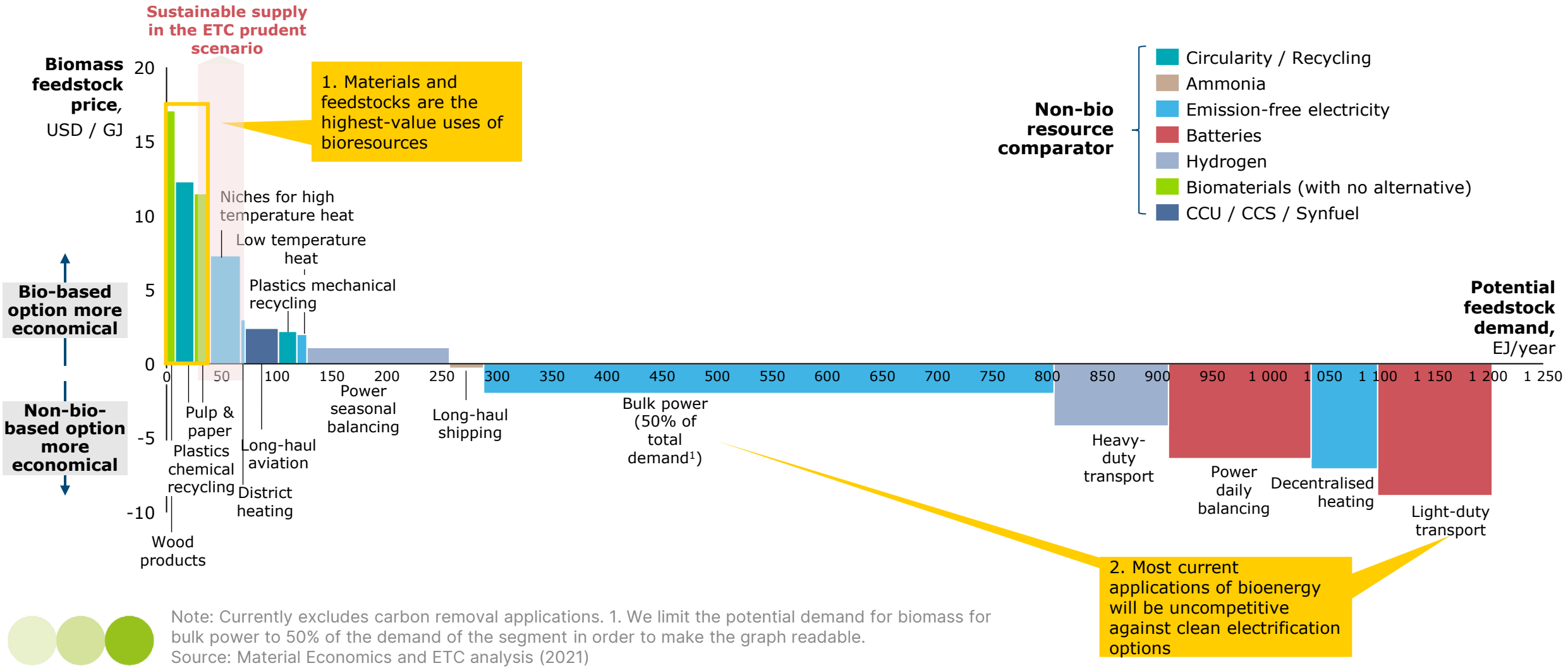


Note: Currently excludes carbon removal applications. 1. We limit the potential demand for biomass for bulk power to 50% of the demand of the segment in order to make the graph readable.
Source: Material Economics and ETC analysis (2021)

Current uses such as power and transportation can use non-bio-based alternatives

Cost-parity curve – Breakeven biomass cost vs. alternative leading non-biogenic solution; global (2050 outlook)

"At what biomass feedstock price is the bio option cost effective?"

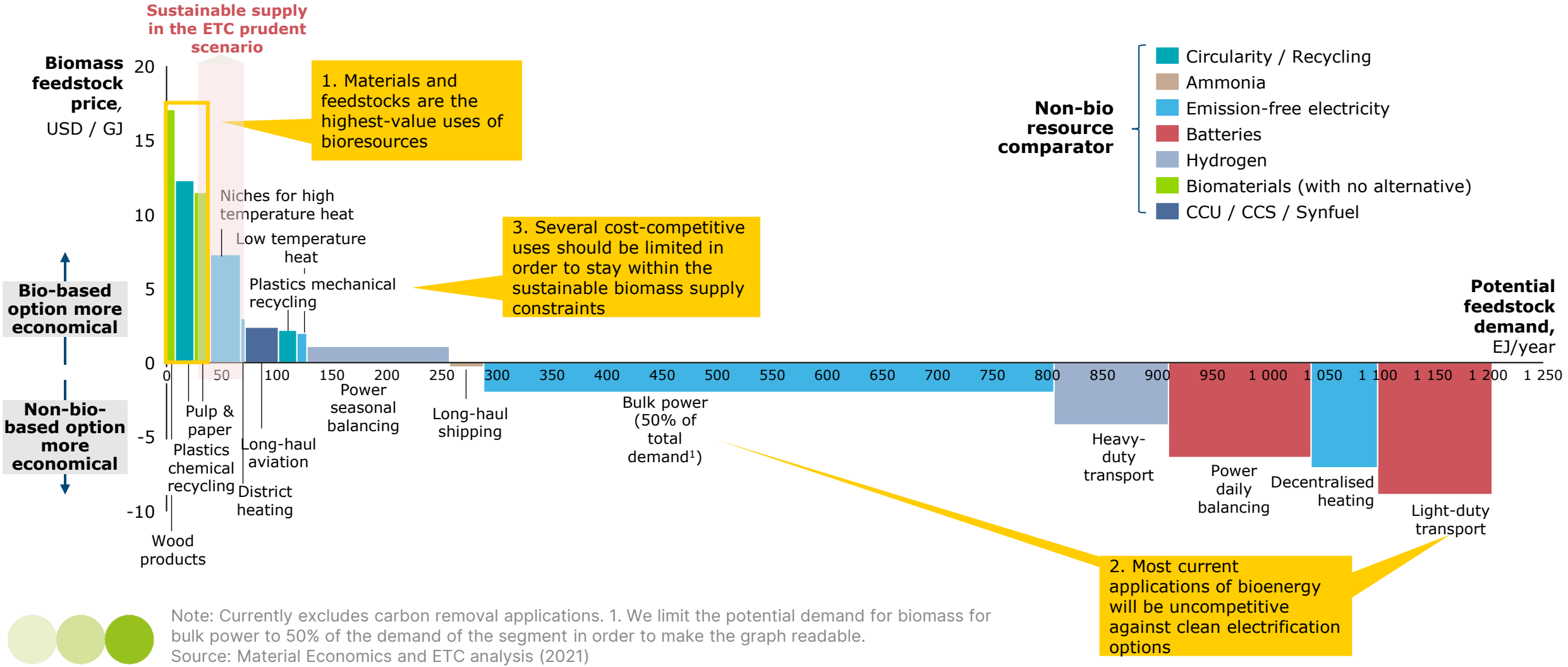


Note: Currently excludes carbon removal applications. 1. We limit the potential demand for biomass for bulk power to 50% of the demand of the segment in order to make the graph readable.
Source: Material Economics and ETC analysis (2021)

Not all cost-competitive uses will be able to use bioresources given limited supply

Cost-parity curve – Breakeven biomass cost vs. alternative leading non-biogenic solution; global (2050 outlook)

"At what biomass feedstock price is the bio option cost effective?"

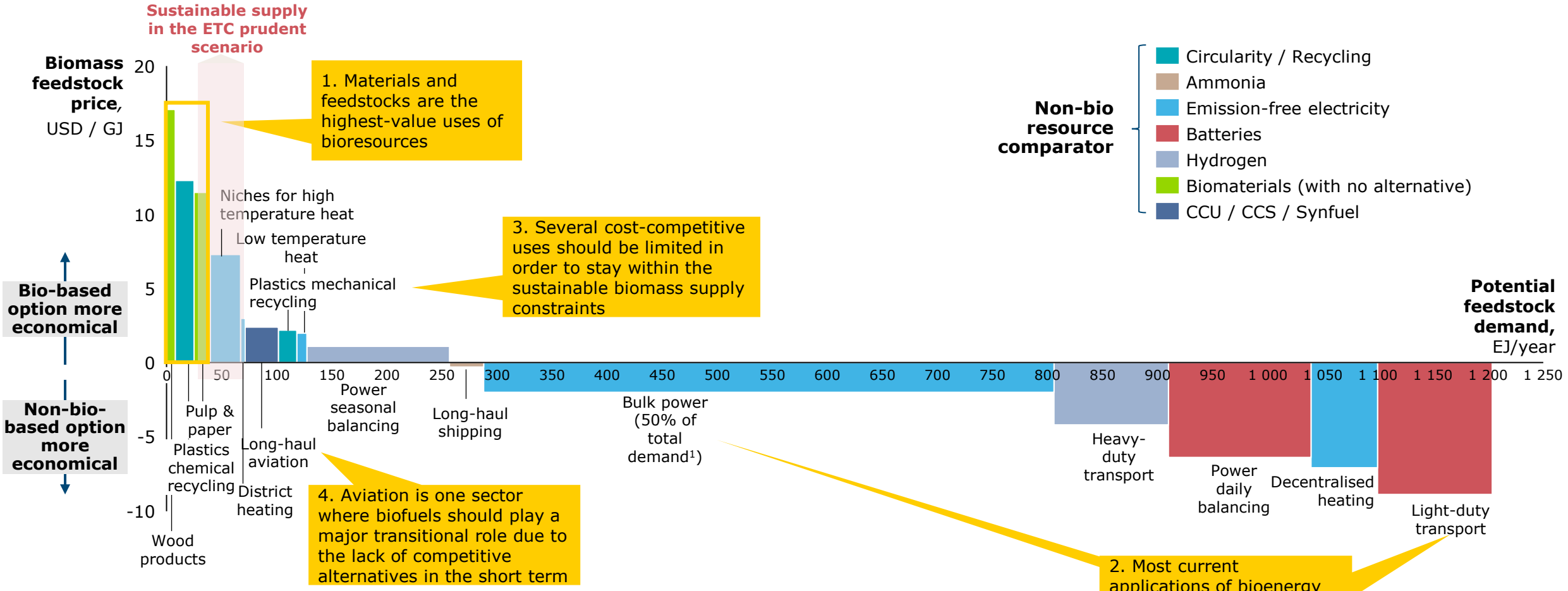


Note: Currently excludes carbon removal applications. 1. We limit the potential demand for biomass for bulk power to 50% of the demand of the segment in order to make the graph readable.
Source: Material Economics and ETC analysis (2021)

Aviation biofuels are a priority use given current lack of alternatives

Cost-parity curve – Breakeven biomass cost vs. alternative leading non-biogenic solution; global (2050 outlook)

"At what biomass feedstock price is the bio option cost effective?"

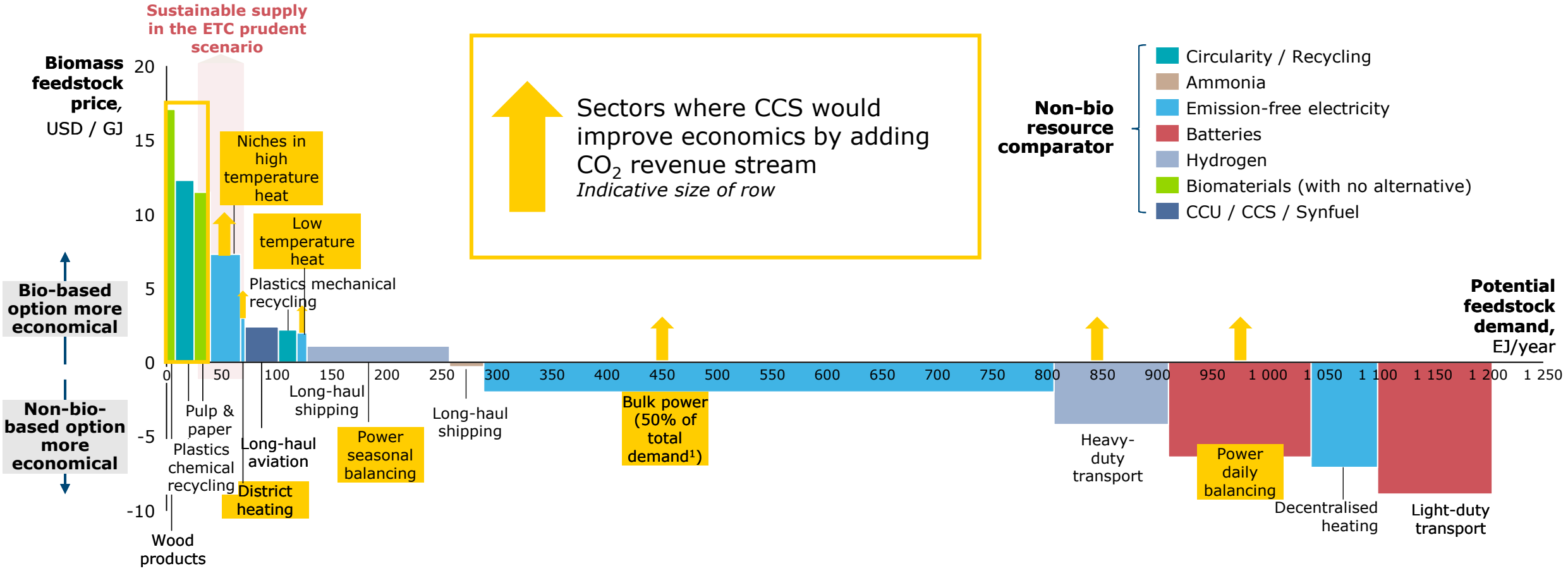


Note: Currently excludes carbon removal applications. 1. We limit the potential demand for biomass for bulk power to 50% of the demand of the segment in order to make the graph readable.
Source: Material Economics and ETC analysis (2021)

Potential revenues from CO_2 capture and storage can affect the prioritisation

Cost-parity curve – Breakeven biomass cost vs. alternative leading non-biogenic solution; global (2050 outlook)

"At what biomass feedstock price is the bio option cost effective?"



Note: 1. We limit the potential demand for biomass for bulk power to 50% of the demand of the segment in order to make the graph readable.
Source: Material Economics and ETC analysis (2021)

To balance limited supply with growing demand, we must ensure sustainable sourcing, increase supply, prioritise uses, and scale non-bio-based options