Bio-Based Materials: Discussion and Definitions

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Contributors

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1. Introduction

The mission of the Bio-Based Materials Collective is to increase the use of regenerative, regional, bio-based materials in North America.

Technical definitions for words, such as “bio-based” exist and are reasonably consistent; however, through discussions amongst the Collective, it became clear that the technical definitions do not fully describe the qualitative and subjective, sometimes unquantifiable, characteristics we desire from our bio-based materials. In this brief document we present the commonly used technical definitions for “bio-based” and other relevant words, and explain through discussion topics how the technical definitions can fall short of describing the materials we want and need to use in our built environment.

2. Discussion

Through research and through discussion we kept returning to these questions, which we pose here to highlight the current limitations, contradictions and controversies of bio-based material definitions.

- How much biomass is needed before it is considered a bio-based product?
- What are the global warming impacts of fast vs slow growing plants?
- What is the impact of bio-based products made from primary-products vs waste?
- Are bio-based materials inherently good?

We hope that it raises awareness of these issues and, through an evolving conversation, informs changes to technical definitions in codes, standards and certifications.

2.1. How much biomass is needed before it is considered a bio-based product?

Many products are composites - they contain more than one material. All the materials in the product could be bio-based, but often they are not, such as hemp and lime (lime being a natural but not explicitly bio-based material) in hempcrete, or lumber and synthetic adhesive in mass timber. We think that most of us would consider hempcrete (~33-50% hemp by weight) and mass timber (~95-99% wood by weight) to be bio-based products, but at what ratio would we assume it to not be a bio-based product? And how is the ratio measured, by weight, by volume, by carbon atoms?

The USDA’s BioPreferred program attempts to answer these questions. The program has 139 designated categories, each of which has a minimum biobased content required to receive the BioPreferred Label. There is a minimum of 30% biobased content required for products that do not fit within any categories, but you can see from Table 1 that the minimum biobased content percentages vary enormously between product categories. It is not clear how these minimum biobased content percentages have been established.

Product Category	Minimum Biobased Content for the BioPreferred Label
Adhesives	24%
Lumber, Millwork, Underlayment, Engineered Wood Products	25%
Loose-Fill and Batt Insulation	25%
Floor Coverings (Non-Carpet)	91%
Carpets	7%

Table 1: Minimum biobased content of product categories for the BioPreferred label.[1]

Biobased content is measured in accordance with ASTM D6866, which measures the percentage of "new" organic carbon (from biobased sources) compared to "old" organic carbon (from petroleum-based sources). The test excludes water and inorganic carbon.

It is important to understand the testing methodology to understand how some products like fibreglass have BioPreferred Labels. As measured to ASTM D6866 this fiberglass insulation reports 98% biobased content. Fiberglass insulation is typically over 90% glass fibres by weight, which are made from melted minerals like soda ash, limestone and silica sand - none of which are organic carbon. The binder that holds the glass fibres in a batt form is typically less than 10% by weight. The ASTM D6866 test measures the ratio between “new” and “old” organic carbon, so the results for the fiberglass insulation can be accurately described as “Of the organic carbon within this product, 98% of it is from biobased sources”. There are hemp insulation based products in the BioPreferred catalog that have lower biobased content, as measured to ASTM D6866.

2.2. What are the global warming impacts of fast vs slow growing plants?

The rate at which plants grow affects how quickly they remove and store carbon dioxide from the atmosphere — and therefore influences global warming. However, the relationship between growth rate and climate impact is complex, depending on plant biology, land management, and how harvested biomass is used.

2.2.1. Growth and Harvest Cycles

Plants grow along an S-curve, with rapid growth early in their life followed by slower accumulation as they mature. Growth rates vary widely by species and environment. Hemp completes its growth

[1] USDA *https://www.biopreferred.gov/BioPreferred/faces/pages/ProductCategories.xhtml*

cycle in about four months and slow-growing fir species may take centuries to reach ecological maturity.

Harvest cycles are related to growth rates. Typically plants are harvested as soon as commercially viable but in some instances longer harvest cycles are used because there is longer-term financial gain, or an ecological benefit to doing so. This difference between biological maturity and economic maturity has significant implications for carbon storage.

2.2.2. The Carbon Cycle

Carbon exists in several interconnected pools: the atmosphere, above-ground biomass (trunks, stems, branches), below-ground biomass (roots), dead organic matter (litter, coarse woody debris), soil organic carbon, and products (e.g., lumber, hempcrete, engineered bamboo). From a global warming perspective, the goal is to move CO_2 from the atmosphere into these more stable stores.

The time value of carbon matters. Removing CO_2 today reduces global warming more effectively than removing the same quantity later, because near-term reductions lower peak global temperatures. Fast sequestration can therefore provide outsized climate benefits, even if total storage capacity is smaller.

2.2.3. Key Considerations

The carbon impact of fast vs. slow growth depends on multiple ecological and management factors:

- Selective harvesting removes above-ground carbon while often leaving soil carbon relatively intact, though machinery and erosion can disturb or oxidize it.
- Perennial species, such as bamboo, maintain living root systems that continue storing carbon and often enhance long-term soil carbon stability.
- Annual species, like hemp, decompose after harvest, returning some carbon to the atmosphere but also enriching soil organic matter.
- Land management practices strongly affect carbon outcomes. Intensive forestry operations that clear understory or disturb soil can release significant stored carbon. Conversely, no-till and low-impact harvesting methods help retain carbon in soil and below-ground biomass.
- Land use change from slow growing species to fast growing species, such as the Amazon rainforest conversion to soy plantations, releases enormous amounts of stored carbon.
- Allocation of impacts depends on the feedstock, as discussed further on.

2.2.4. Comparing Fast and Slow Growing Biomass

Fast-growing plants, such as bamboo and straw, sequester CO_2 rapidly, whereas slower-growing trees take longer but ultimately can store more carbon above and below ground when mature. According to BamCore's modelling (Figure 1) by the ninth year, all three species of bamboo have accumulated more than 100 tonnes of carbon per hecate (C/ha). In contrast, Loblolley, the fastest growing commercial species, doesn't accumulate 100 tonnes C/ha until year 18, which is twice as long as the slowest of the three bamboo species.

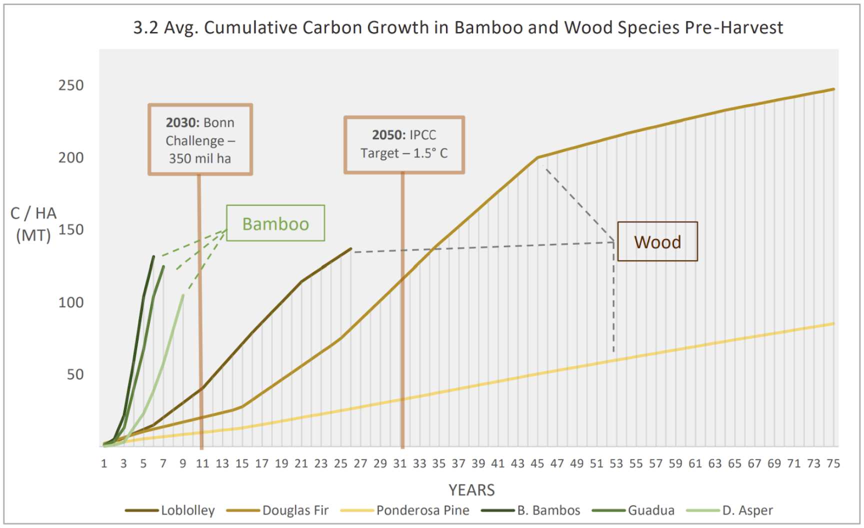

Figure 1: Average cumulative carbon growth in bamboo and wood species pre-harvest.[2]

Figure 1 shows that fast growing plants store more CO_2 in the short term than slower growing plants. Figure 2 shows how the speed of growth and the embodied carbon emissions associated with production influence global temperatures.

Figure 2 illustrates the global temperature change associated with 1kg of various bio-based materials. The initial production phase of these materials releases emissions, but, as the plants regrow, they sequester CO_2 according to their normal regrowth curve, which contributes to climate cooling.

In this study the age at which the plants are harvested varies: trees used for sawn wood are harvested at 90 years, trees for glulam are harvested at 40 years, bamboo is harvested at five years, and straw is harvested in one year. Due to their rapid regeneration, straw and bamboo lead to a net climate cooling within 10 years. Conversely, the slower regeneration of trees and higher production emissions from glulam manufacturing mean it takes over 20 years for a net cooling effect to be observed.

This data highlights that fast-growing bio-based materials offer quicker climate cooling compared to slower-growing ones. In contrast, non-bio-based materials would never demonstrate a cooling effect. It's important to note that direct comparisons between these materials are limited because they are unlikely to be functionally equivalent. For instance, while straw cools the climate faster than glulam, they serve different purposes in construction.

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[2] *BamCore, 2019*
https://www.bamcore.com/_files/ugd/77318d_c0ddbbf622e7495d8ccc697990044cf6.pdf

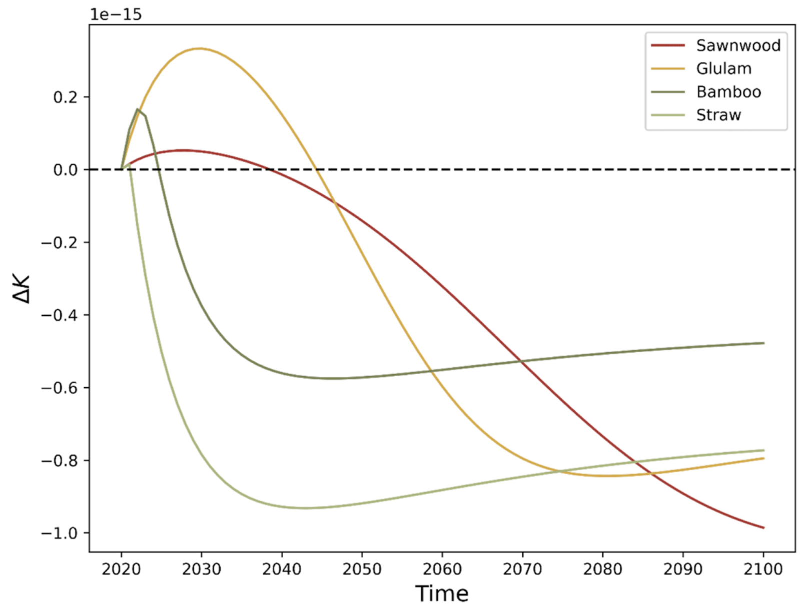

Figure 2: Global temperature change (GTP) of different biobased construction materials considering the production (cradle-to-gate) emission and subsequent biogenic carbon sequestration from replanting of 1 kg of each. [3]

Fast growing plants have been a preference all over the world to replace deforested ecosystems and to provide wood products for a variety of purposes. Monocultures of fast growing eucalyptus and pine trees can be found far outside of their native habitats, where they are known to degrade biodiversity, water cycles, and soil health. So harvesting and storing carbon in our buildings from faster growing plants can lead to quicker global cooling but we need to ensure these plants are sourced from land that supports biodiversity, cleans water and builds soil health. We must prevent scenarios where plants are grown solely as "carbon pumps," a problem observed in biomass energy and biofuel production.

2.2.5. Discussion Summary

Fast-growing plants support near-term climate cooling by rapidly cycling carbon out of the atmosphere but these plants are much more complex than a single attribute like carbon. They are part of complex ecosystems performing functions like cleaning water, stabilising soil, creating habitat, feeding people, etc. Carbon accounting has its merits, because it is clearly an important factor in the future of humanity and other living species, however it is limited. When we have narrow boundary goals, like reducing CO_2 in the atmosphere, we can so often create a problem because we did not holistically consider the impacts. This problem has been apparent with biomass energy and biofuel. The choice of plants for bio-based building materials should not only be based on its ability to cool the planet. We should ask how growing and harvesting that plant

[3] *Göswein, V., Arehart, J., Phan-huy, C., Pomponi, F. and Habert, G. (2022) 'Barriers and opportunities of fast-growing biobased material use in buildings', Buildings and Cities, 3(1), p. 745–755.* https://journal-buildingscities.org/articles/10.5334/bc.254

impacts the integrity of the ecosystem? Similarly, we should ask how using this bio-based material perpetuates degenerative or regenerative land practices?

2.3. What is the impact of bio-based products made from primary-products vs waste?

Determining the impacts of bio-based products depends heavily on their feedstock source - whether they are made from primary-products or waste. Examples of primary-products are logs from silviculture trees, or fibre from hemp plants. Typical examples of waste are straw from rice plants, or small branches from trees. As highlighted in the Definitions section, primary products are the purpose for the plant being grown, and waste is generated from the production of the primary product.

Purpose-grown plants, like hemp and flax, are cultivated for use in bio-based products. While these products offer potential environmental benefits such as carbon storage and soil building, their cultivation practices can also lead to harms. These harms include water stress, chemical pollution, and notably, land use change. If not carefully managed, cultivating crops for materials can displace land used for food production or habitat, contributing to deforestation or biodiversity loss. This displacement can occur directly, such as when monoculture forests replace natural ecosystems, or indirectly, when farms for building materials replace food farms, which then leads to food farms replacing natural ecosystems.

In contrast, bio-based products made from waste utilize residues or waste streams from other processes—such as agricultural straw, forestry residues, sawdust, or food-processing waste. The environmental impacts, to the extent they exist, are associated with the primary product, not the by-product.

Therefore, when allocating impact, it is preferable to use waste products.

2.4. Are bio-based materials inherently good?

In short, no. In our current age of overconsumption and pressure on land, even advocates of bio-based materials would first advocate for using less material, so before reaching for bio-based materials as a solution, prioritise:

1. Don’t build - Propose non-material approaches to solving the problem
2. Use less - Design more highly utilised buildings and systems within buildings
3. Reuse - Adapt existing buildings and salvaged materials

Bio-based building materials can offer climate, health, ecological, social, and circular economy benefits. They store carbon through photosynthesis and have reduced embodied emissions with lower impacts than extracted alternatives. Many are naturally low-VOC, require fewer harmful additives, and help regulate humidity for healthier indoor environments. Their production can support regenerative land management, reduce reliance on mining and drilling, and make productive use of agricultural byproducts. Bio-based supply chains often strengthen rural economies, offer more transparent and equitable labor practices, and enable community-scale manufacturing. Because many of these materials are repairable or biodegradable, they support a shift towards circular material flows.

As mentioned, these benefits are not a given.

2.4.1. Growing and Harvesting Methods

The impact of bio-based materials depends heavily on how raw materials are grown and harvested, especially within the context of global supply chains where forests and agricultural landscapes may be thousands of miles from final manufacturing and construction sites. Conventional monoculture practices can strip soil carbon, reduce biodiversity, and depend on pesticides and synthetic fertilizers, while regenerative agriculture approaches - such as cover cropping, reduced tillage, and agroforestry - can improve ecosystem health and increase long-term carbon sequestration. Certification programs help distinguish responsible practices, but not all are equally rigorous: for example, the Forest Stewardship Council (FSC) is generally considered stronger and more ecologically protective than other forestry certifications. Regenerative farming certifications, such as Regenerative Organic Certification, attempt to measure real ecological outcomes rather than simply management practices, helping verify that the material's source contributes to soil health and climate resilience.

2.4.2. Bioregional Sourcing and Global Supply Chains

Long-distance, cross-continental supply chains increase the upfront emissions of bio-based materials before they ever reach a building. The transportation of wood pellets, bamboo, agricultural fibers, and other materials between continents adds fuel use and carbon outputs while disconnecting material use from the ecosystems that produced them. By comparison, bioregional sourcing - using materials grown, processed, and reused within the same ecological region - supports rural economies, strengthens local manufacturing, and makes circular resource loops more feasible. It also ensures that materials are better suited to regional climates and ecosystems, reinforcing ecological resilience and transparency in a way that large global systems often cannot. Local sourcing better connects consumers to their impacts, both positive and negative.

2.4.3. Toxicity Risks in Bio-Plastics

Although plant-based plastics are often marketed as safer alternatives, research[4] shows that bio-plastics can contain the same types of concerning additives and breakdown products found in petrochemical plastics. Studies of polylactic acid (PLA) have shown that as it degrades, it can release micro- and nano-particles that trigger cellular stress and inflammation in biological systems, raising concerns about safety for humans and ecosystems. Polyhydroxyalkanoates (PHAs), another major class of bio-plastics, are sometimes blended with toxic additives such as phthalates, which influence degradation, persist in the environment, and pose known health risks.

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[4] Lisa Zimmermann, Andrea Dombrowski, Carolin Völker, Martin Wagner, Are bioplastics and plant-based materials safer than conventional plastics? In vitro toxicity and chemical composition, Environment International, Volume 145, 2020, https://doi.org/10.1016/j.envint.2020.106066

Mass spectrometry analyses of commercially available bio-plastics have identified large numbers of volatile and semi-volatile compounds - including plasticizers and unexpected contaminants - demonstrating that "bio-based" does not automatically mean non-toxic and that deeper chemical-safety design is needed.

2.4.4. Biomass Energy and Net-Zero Policy

Biomass energy can be environmentally damaging when climate policies treat it as automatically carbon-neutral, even when significant ecosystem losses occur upstream. The United Kingdom's Drax power station provides a key example: the plant burns millions of tonnes of wood pellets imported from North American forests under net-zero incentives, yet independent analysis indicates that cutting mature forests creates a carbon debt that will take decades to repay. Despite Drax receiving billions in public subsidies, investigations have shown that emissions accounting and supply-chain monitoring have been insufficient to ensure real climate benefit[5]. It is not just the UK, the US EPA has deemed forest biomass for energy production to be carbon-neutral[6]. Policies that prioritize narrow emissions accounting at the smokestack while overlooking deforestation, habitat loss, and transport emissions embedded in the global biomass trade. These carbon-neutral claims are being reviewed and addressed in many jurisdictions.

2.4.5. Biofuel Expansion and Ecosystem Destruction

Biofuel production has also contributed to widespread ecological damage when demand leads to the conversion of biodiverse ecosystems into industrial fuel plantations. In Southeast Asia, large areas of rainforest and peatlands have been cleared for oil palm biodiesel production, causing massive biodiversity loss, releasing stored soil carbon, and fragmenting habitats for endangered species[7]. These developments emerged from economic incentives and climate policies that counted biofuels as low-carbon without fully including land-use impacts in emissions accounting. These case studies illustrate how poorly designed net-zero policies can unintentionally accelerate environmental degradation when they focus only on emissions at the point of combustion rather than the full lifecycle impacts of material production.

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5 https://www.theguardian.com/business/2024/jan/24/questions-22bn-uk-billpayer-cash-wood-burning-electricity-firms-biomass-subsidy

6 https://www.epa.gov/sites/default/files/2018-04/documents/biomass_policy_statement_2018_04_23.pdf

7 https://www.ucs.org/sites/default/files/legacy/assets/documents/global_warming/palm-oil-and-global-warming.pdf

3. Definitions

Unless otherwise noted the exact text has been copied from the reference.

3.1. Bio-based

Biobased: Containing renewable plant, marine, and forestry-based resources not derived from petroleum.	BioPreferred, About Page Link
Bio-based: derived from biomass Note 1 to entry: Biomass can have undergone physical, chemical or biological treatment(s).	EN 16575:2014
Biobased Content: A ratio of a product's new organic carbon to total organic carbon, as measured by a standard test method (ASTM D6866). Biobased content is expressed as a percentage. New organic carbon is derived from plants and other renewable agricultural materials. Total organic carbon consists of new organic carbon and old organic carbon (which originates from petroleum).	BioPreferred, About Page Link ASTM D6866 Link
Bio-based content: fraction of a product that is derived from biomass Note 1 to entry: Normally expressed as a percentage of the total mass of the product	EN 16575:2014
Bio-based content: Biobased content refers to materials that are derived in whole or in part from biomass resources.	UL 9798 Link
Biobased product: product wholly or partly derived from biomass Note 1 to entry: The biobased product is normally characterized by the biobased carbon content or the biobased content.	ISO 16559:2014
Bio-based Products: Commercial or industrial products (other than food or feed) that utilize biological products or renewable, domestic, agricultural (e.g., plant, animal and marine), or forestry materials.	EPA Greener Products Link
Bio-based product: Bio-based products are made from renewable, biological raw materials such as plants and trees.	Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - A lead market initiative for Europe {SEC(2007) 1729} {SEC(2007) 1730} Link

Bio-based Plastics: While conventional plastics are made from fossil resources (oil and natural gas), biobased plastics are made from biomass. The biomass currently originates mainly from plants grown specifically to be used as feedstock to substitute fossil resources, such as sugarcane, cereal crops, oil crops or non-food sources like wood. Other sources are organic waste and by-products, such as used cooking oil, bagasse and tall oil. Plastics can be fully or partially made from biobased feedstock.	European Commission COM(2022) 682 final Link
Bio-based plastics are made out of polymers derived from non-petroleum, biological sources. They include plant and microbial-based polymers and can be engineered to be either biodegradable or non-biodegradable.	FAO. 2021. Assessment of agricultural plastics and their sustainability. A call for action. Rome. Link
Bioplastics: The term "bioplastics" should ideally be avoided. It is preferable to use bio-based plastic if it is a plastic derived from biomass or biodegradable plastic if it biodegrades. Both categories overlap but there also are bio-based plastics that are not biodegradable as well as biodegradable plastics that are not bio-based.	Nova-Institute, 2014, 'Annex V' in Study on "Methodology framework for the bioeconomy observatory"' - BISO Project - January 2014

3.2. Biomass

Biomass: material of biological origin excluding material embedded in geological formation or transformed to fossil	ISO 13833:2013 Whole life carbon assessment for the built environment 2nd edition, RICS, 2023 Link
Biomass: material of biological origin, excluding material embedded in geological formations and material transformed to fossilized material Note 1 to entry: Biomass includes organic material (both living and dead), e.g. trees, crops, grasses, tree litter, algae, animals, manure and waste of biological origin. Note 2 to entry: In this document, biomass excludes peat.	ISO 14067:2018 ISO 14021:2016
Biomass: material of biological origin excluding material embedded in geological formations and/or fossilized EXAMPLES (whole or parts of) plants, trees, algae, marine organisms, micro-organisms, animals, etc.	EN 16575:2014
Biomass: material of biological origin excluding material embedded in geological formations and material transformed to fossilized material,	Level(s) indicator 1.2: Life cycle Global

excluding peat	Warming Potential (GWP), 2020 Link
Biomass: material of biological origin excluding material embedded in geological formations and/or fossilised	ISO 16620-1:2015 FAO, Energy, Definitions Link
Biomass: Organic material excluding the material that is fossilised or embedded in geological formations.	IPCC AR6 WGIII Appendix I, Link
Biomass means non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms. This shall also include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.	Clarifications on Definition of Biomass and Consideration of Changes in Carbon Pools due to CDM Project Activity, UNFCCC Link

3.3. Biogenic Materials

Biogenic materials are produced in natural processes by living organisms but are not fossilized or derived from fossil resources. These include such materials as trees, crops, grasses, tree litter, algae, animals, and waste of biological origin (e.g., manure).	ISO 21930:2017
Short Cycle Biogenic Materials are biogenic materials from agricultural or forestry crops with a natural growing life-cycle of 10 years or less, as well as biogenic materials from waste streams, salvage, or forestry residues.	City of Vancouver Addendum (v1.0) to the National wbLCA Practitioner's Guide, City of Vancouver, 2025 Link
Biogenic: produced in natural processes by living organisms but not fossilized or derived from fossil resources.	ISO 13833:2013

3.4. Biogenic Carbon

Biogenic carbon refers to carbon that is sequestered from the atmosphere during biomass growth. This carbon is found in a variety of natural materials, such as trees, plants, and other forms of biomass, and accumulates in pools such as soil organic carbon.	Biogenic Carbon Project, Life Cycle Initiative, UN Environmental Program, 2024 Link
Biogenic carbon: Carbon removals associated with carbon sequestration into biomass, as well as any emissions associated with this sequestered carbon. Biogenic carbon must be reported	Whole life carbon assessment for the built environment 2nd

separately if reporting only upfront carbon, but should be included in the total if reporting embodied carbon or whole life carbon.	edition, RICS, 2023 Link
Biogenic carbon: carbon derived from biomass	EN 16575:2014 ISO 14067:2018 Level(s) indicator 1.2: Life cycle Global Warming Potential (GWP), 2020 Link
Bio-based carbon content: fraction of carbon derived from biomass in a product Note 1 to entry: There are several approaches to express the bio-based carbon content. These include as a percentage of: the mass; the total carbon content, or the total organic carbon content of the sample.	EN 16575:2014
Biobased carbon content: amount of carbon derived from biomass present in the product Note 1 to entry: The biobased carbon content is expressed by a fraction of the total carbon content, or as a fraction of the total organic carbon content.	ISO 16620-1:2015

3.5. Primary-Product, By-Product, Waste

By-product: A secondary or incidental product of a manufacturing process (e.g., scrap or emissions).	EPA, Glossary of Sustainable Manufacturing Terms, 2020 Link
By-product: An incidental product deriving from a manufacturing process or chemical reaction, and not the primary product or service being produced. A by-product can be useful and marketable, or it can have negative ecological consequences.	EPA, Life Cycle Assessment: Principles and Practice, 2006 Link
By-product: A secondary product which is made incidentally during the production of something else. Example: Sawdust when sawing timber.	ISO 16559:2014 Link
By-product: A secondary product; a substance of more or less value obtained in the course of a specific process, though not its primary object.	Oxford English Dictionary Link
By-products: co-product (3.4.6) from a process (ISO 14040:2006,	ISO 21930:2017

3.11) that is incidental or not intentionally produced and which cannot be avoided Note 1 to entry: Wastes (3.3.11) are not by-products.	
Co-product: any of one or more products (ISO 14050:2009, 3.2) from the same unit process (3.4.1), but which is not the object of the assessment	ISO 14040:2006
Agricultural By-Product: Materials that come from the leftovers of existing agricultural processes -- like wheat straw, corn stover, or rice husks. These are residues that would otherwise be discarded, burned, or left to decompose, releasing CO_2 into the atmosphere.	BfCA Bio-Based & Circular Materials Database Link
Purpose-Grown Plants: Materials made from crops cultivated specifically for use in construction -- such as industrial hemp, bamboo, cork, trees, or perennial grasses. These are not waste products but are grown with intention, often for their regenerative properties and potential to store carbon.	BfCA Bio-Based & Circular Materials Database Link
Liability Biomass: Naturally occurring, often-overlooked materials -- such as grasses, reeds, invasive plants, urban trees, or even seaweed. These are abundant, underutilized resources that can be harnessed to create lower-impact building products.	BfCA Bio-Based & Circular Materials Database Link
Waste/Recycling: Materials sourced from post-consumer or post-industrial waste streams -- like recycled textiles, plastic, municipal waste, paper, cardboard, glass, or demolition debris. These products help keep valuable resources in use and divert waste from landfill.	BfCA Bio-Based & Circular Materials Database Link
Forestry Residue: By-products of logging or timber milling operations, such as thinnings, wood chips, sawdust, bark, or needles. These residues are not purpose-grown and don't require additional harvesting, making them a lower-impact wood source.	BfCA Bio-Based & Circular Materials Database Link

3.6. Other definitions

Carbon Sequestration: The process by which CO2 is removed from the atmosphere and stored within a material, for example by being stored in biomass as biogenic carbon by plants.	Whole life carbon assessment for the built environment 2nd edition, RICS, 2023 Link
Fossil Carbon: carbon that is contained in fossilized material Note 1 to entry: Examples of fossilized material are coal, oil and natural gas and peat.	ISO 14067:2018
Renewable Material: material that is composed of biomass and that can be continually replenished	EN 16575:2014

Waste: substances or objects which the holder intends or is required to dispose of	ISO 14040:2006