Forest Products Technology for Sustainable Forest Management

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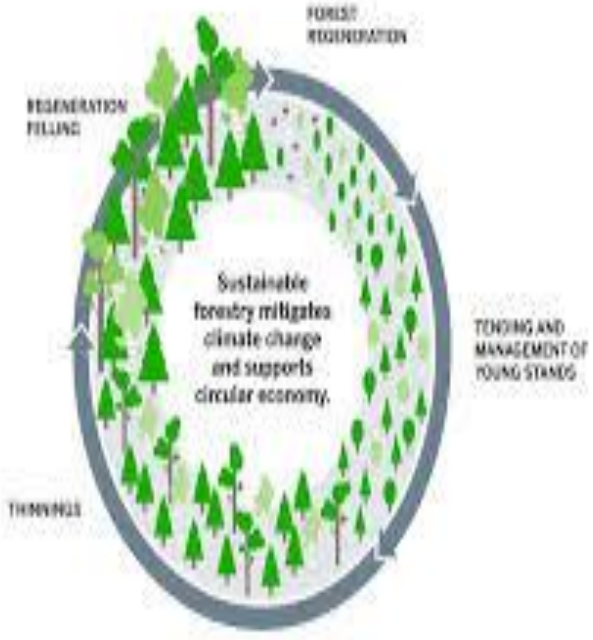
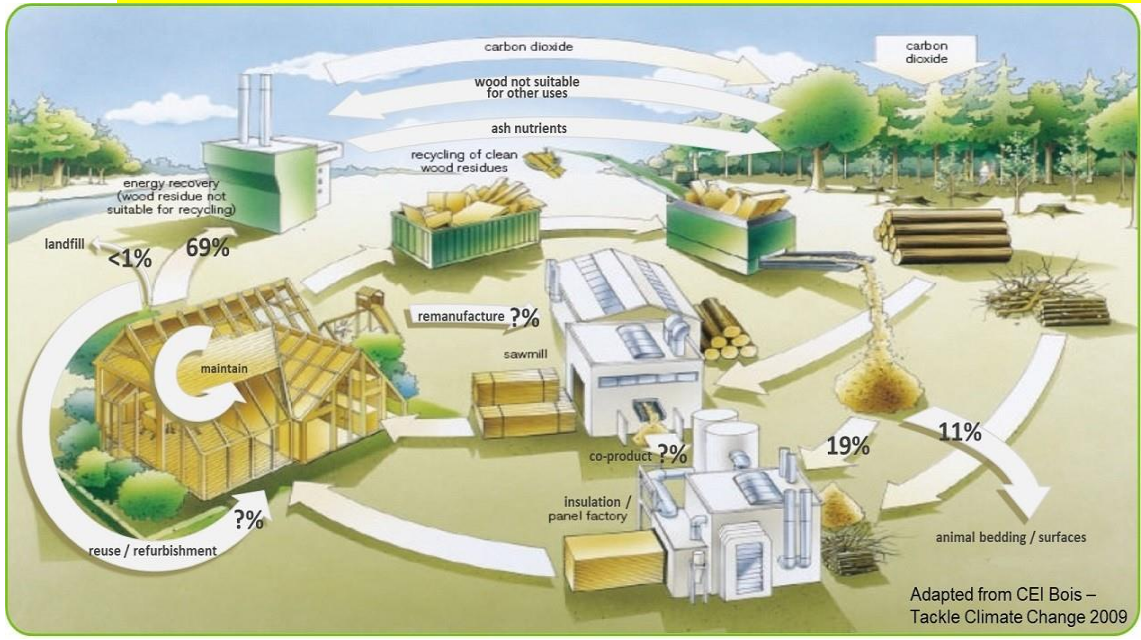
Forest Sustainability vs Forest Product Processing

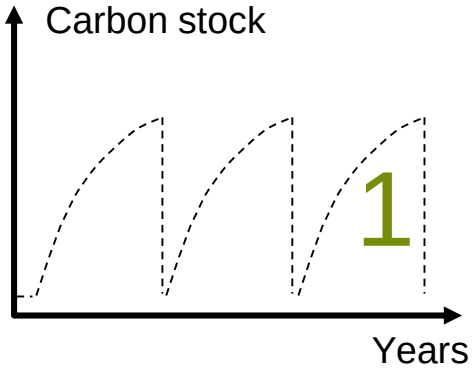
1. In Situ, Inside Farm
2. Function Classification
3. Sustain Parameters
4. Quality Standard

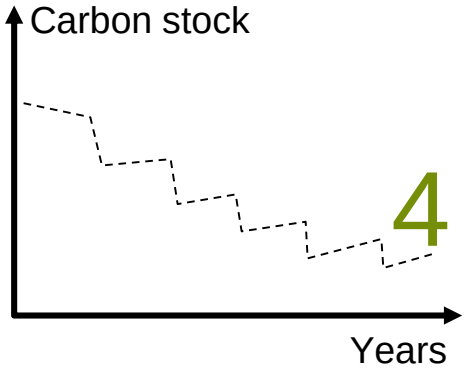
1. Ex Situ, Outside Farm
2. Suitability Processing Parameters
3. Service Parameters
4. Quality Standard

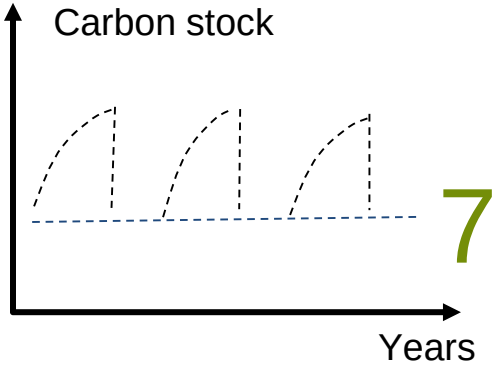


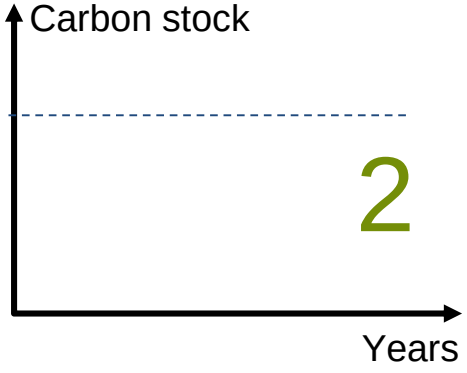


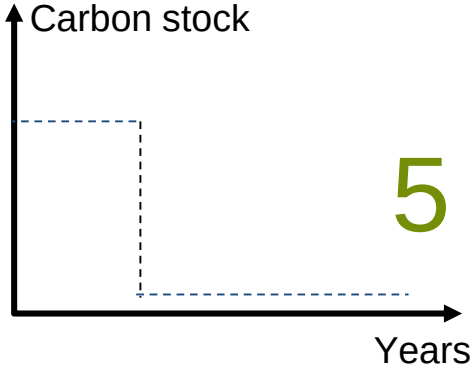
Typical CARBON STOCK of Forest Variation

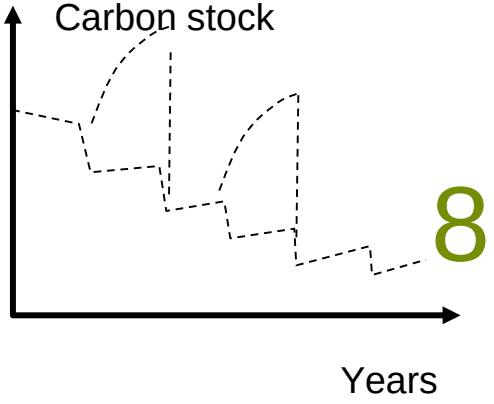


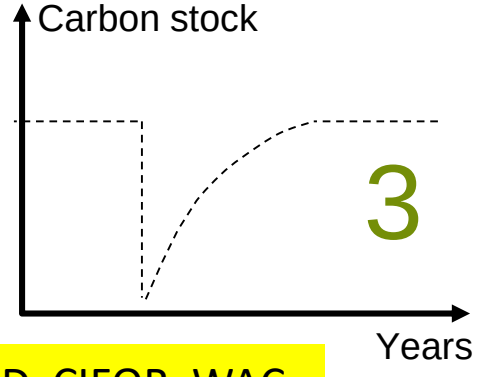


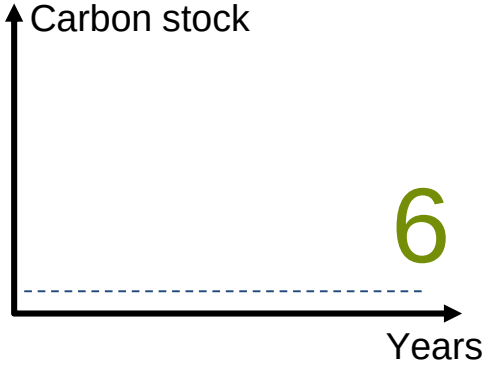












USAID, CIFOR, WAC

Produksi Kayu Bulat (BPS, 2022)

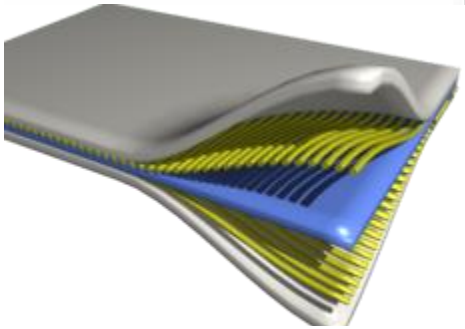
- Total : 64.65juta m3, (48.79% **akasia**)
- Rincian per pulau:
  - Sumatra 43,54juta m3: (64,35% **akasia**)
  - Kalimantan 11.04juta m3 (33.91% ***rimba campur***)
  - Jawa 8,18juta m3 (81,15% ***rimba campur***)
  - Maluku-Papua 1.64juta m3 (72,76% **meranti**)
  - Sulawesi 0,23juta m3 (70,57% ***rimba campur***)
  - Bali-NTT 0,03 juta m3 (74,66% ***rimba campur***)

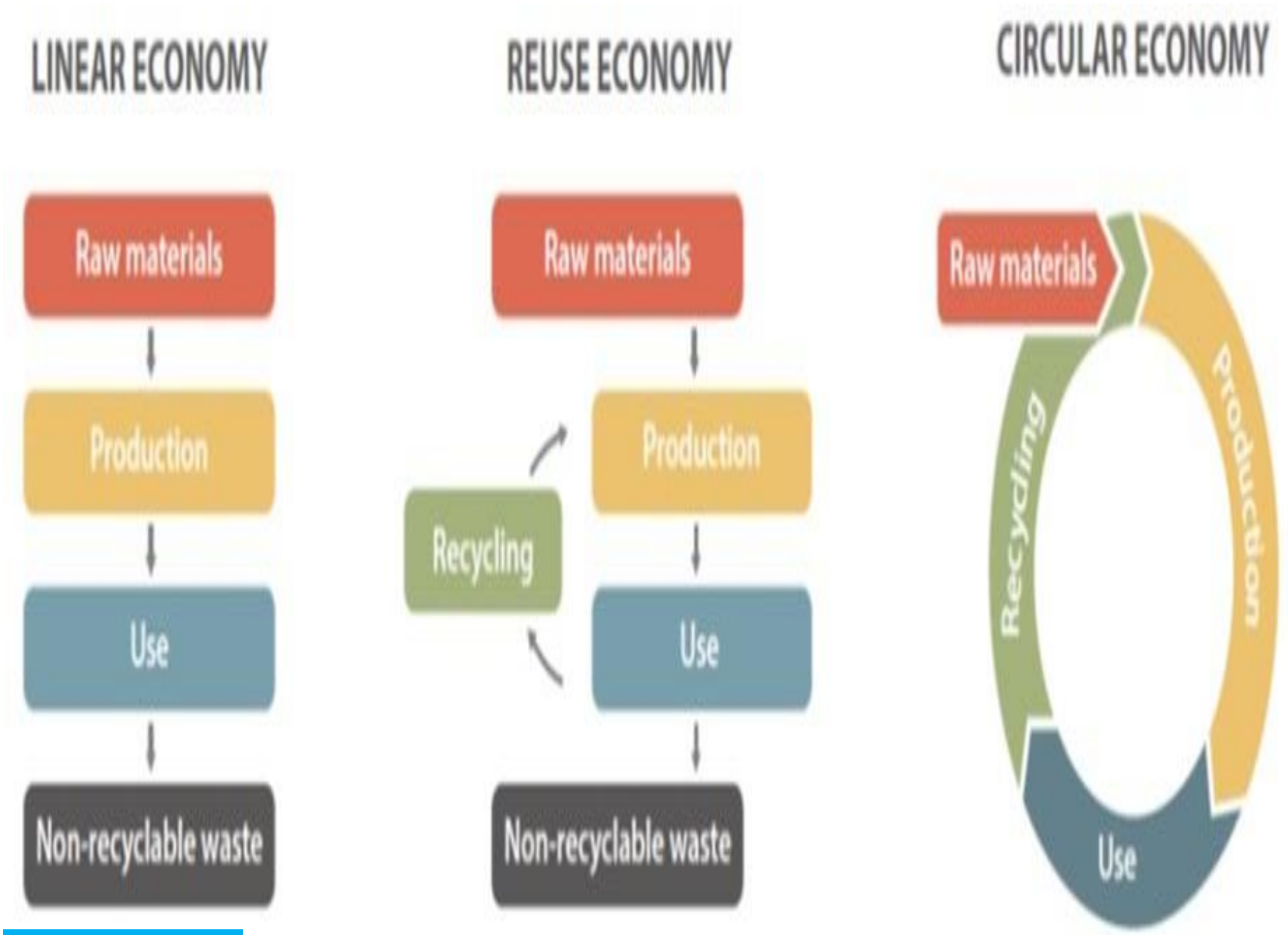
Forest Products Supply VS Forest Product Technology Demand

- Forest decreasing (RenstraKLHK-2020-2024)
  - Forest area (it shrinks to 107million ha, LKJ 2022)
  - Area covered by Forest (81,99million ha)
  - Variation of Forest Management (new trend forest management, Social Forestry)
  - Forest production (64,65million m3, mainly Acacia (48,79%) (BPS, 2022)
  - Indonesian wood processing history
- Forest product tech Dev: R3, R5, R7, R9, R… Circular economy; action taken by user, manufacturer, interactive user-producer

Forest Products Processing Development

- Mengolah hasil hutan sistem zero waste (maximisation)
- Mencampur bahan berkayu dan limbah lignoselulosa pada pengolahan kayu, perkebunan dan pertanian serta perkotaan (biokomposit)
- Memperpanjang masa layan produk: pengawetan, R3, R5,R7,R9, R…..
- Penerapan prinsip sirkular ekonomi secara keseluruhan




LINEAR ECONOMY
Raw materials
Production
Use
Non-recyclable waste
REUSE ECONOMY
Raw materials
Production
Recycling
Use
Non-recyclable waste
CIRCULAR ECONOMY
Raw materials
Production
Use
Recycling

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CIRCULAR ECONOMY

INCREASING CIRCULARITY

Smarter product use and manufacture

Extend the lifespan of a product and its parts

Useful application of materials

R0 Refuse

Make product redundant by abandoning its function or by offering the same function with a radically different product

R1 Rethink

Make product use more intensive (eg. by sharing product)

R2 Reduce

Increase efficiency in product manufacture or use by consuming fewer natural resources and materials

R3 Reuse

Reuse by another consumer of a discarded product which is still in good condition and fufils its original function

R4 Repair

Repair and maintenance of a defective product so it can be used with its original function

R5 Refurbish

Restore an old product and bring it up to date

R6 Remanufacture

Use parts of a discarded product in a new product with the same function

R7 Repurpose

Use a discarded product or its parts in a new product with a different function

R8 Recycle

Process materials to obtain the same (high grade) or lower (lower grade) quality product

R9 Recover

Incineration of material with energy production

LINEAR ECONOMY

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Who take action?

- User-user: reuse, reduce
- User-business: repair, refurbished, remanufacture
- Business to business: repurpose, recycle
- Innovators: rethink, refuse, recover,

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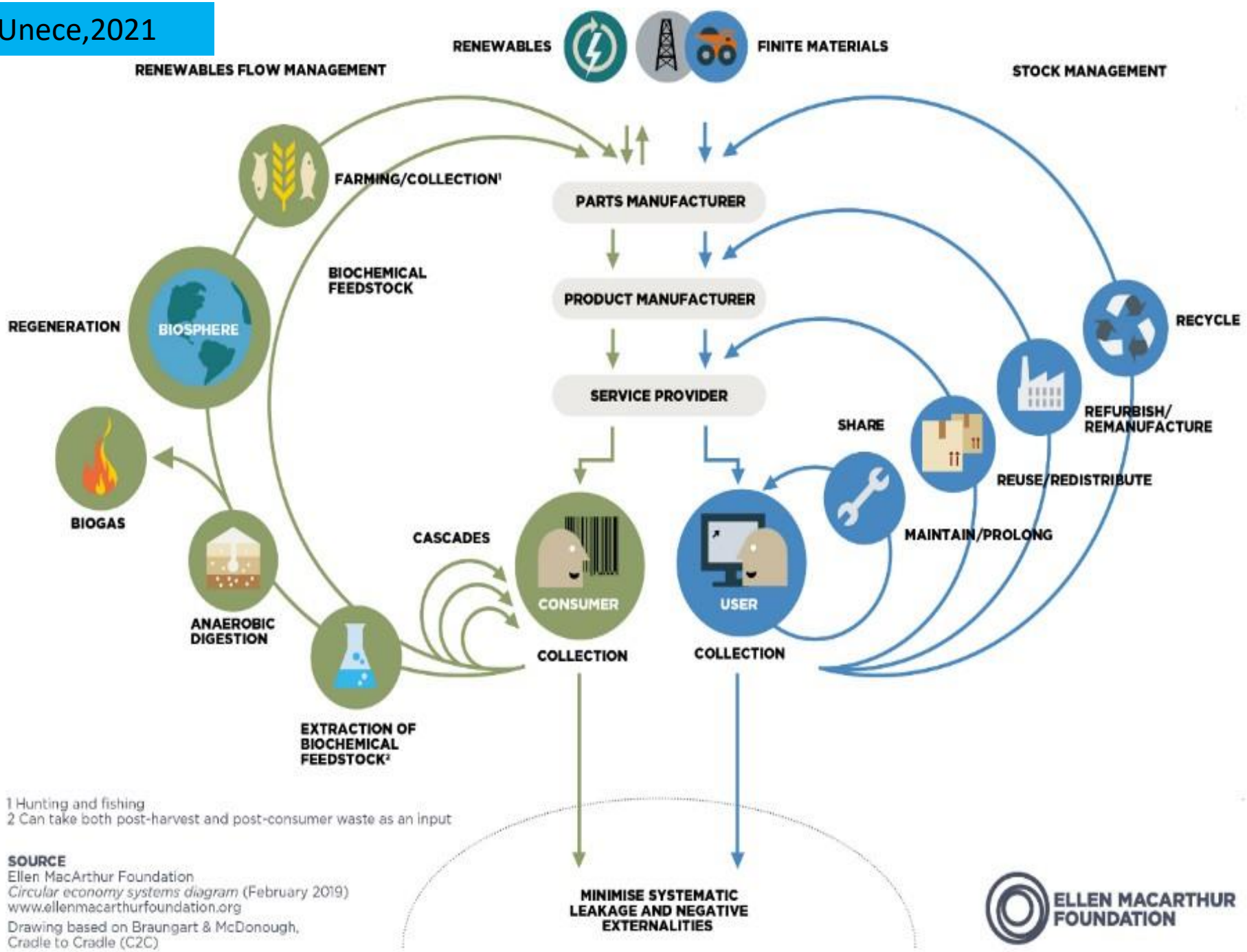

1 Hunting and fishing
2 Can take both post-harvest and post-consumer waste as an input

SOURCE
Ellen MacArthur Foundation
Circular economy systems diagram (February 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough, Cradle to Cradle (C2C)

ELLEN MACARTHUR FOUNDATION

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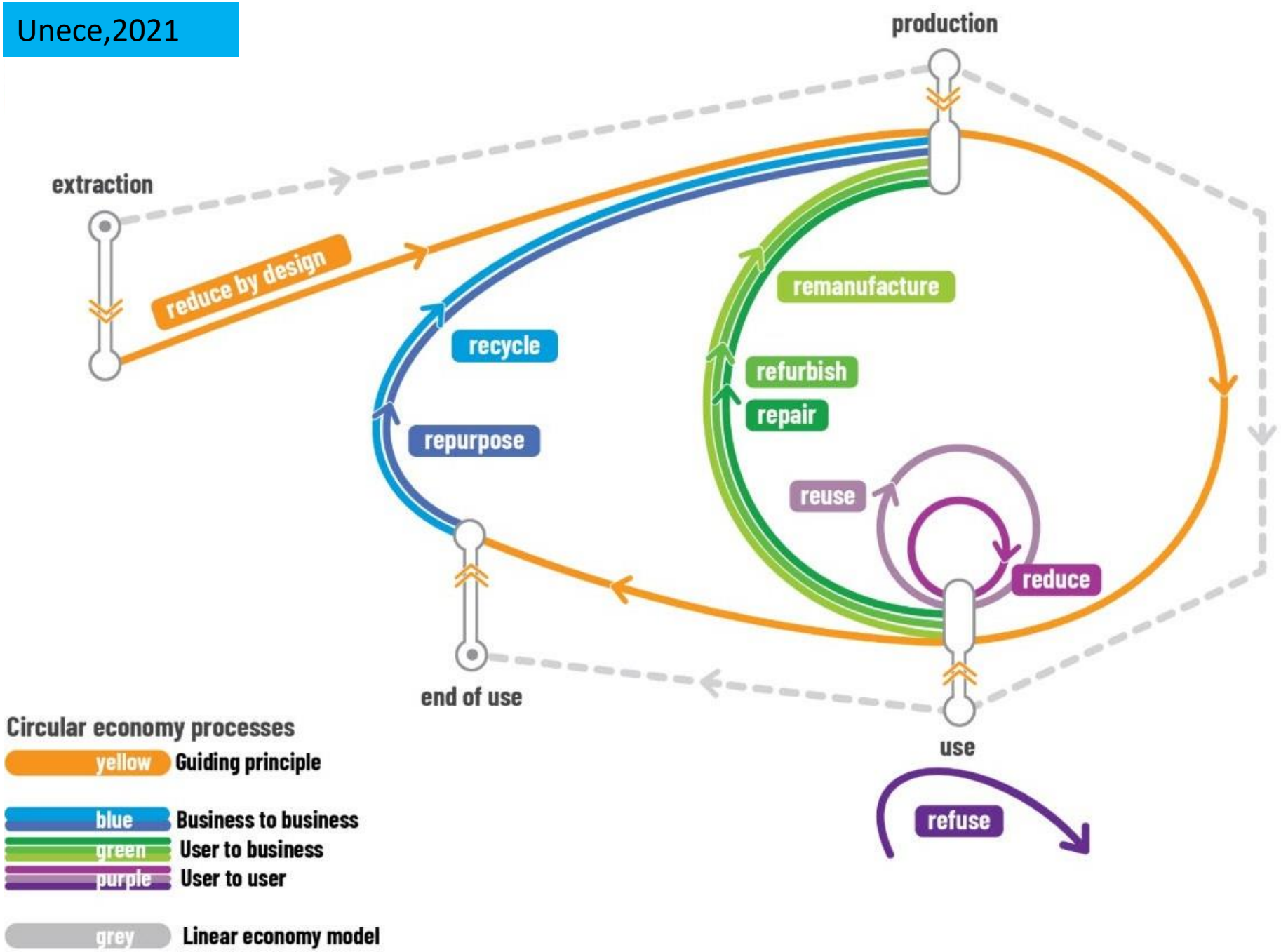
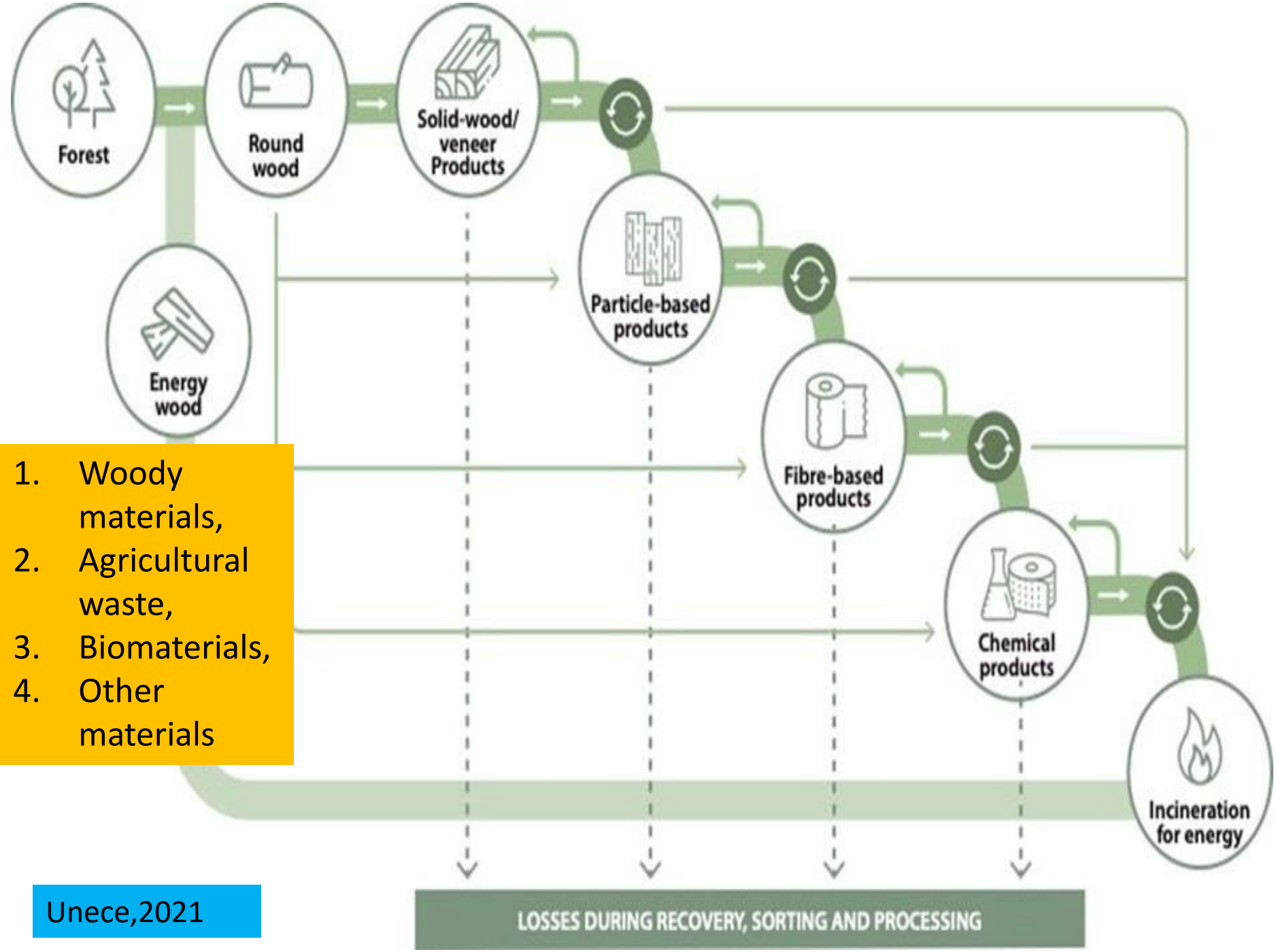

production
extraction
reduce by design
recycle
repurpose
remanufacture
refurbish
repair
reuse
reduce
end of use
use
refuse
Circular economy processes
yellow Guiding principle
blue Business to business
green User to business
purple User to user
grey Linear economy model



1. Woody materials,
2. Agricultural waste,
3. Biomaterials,
4. Other materials

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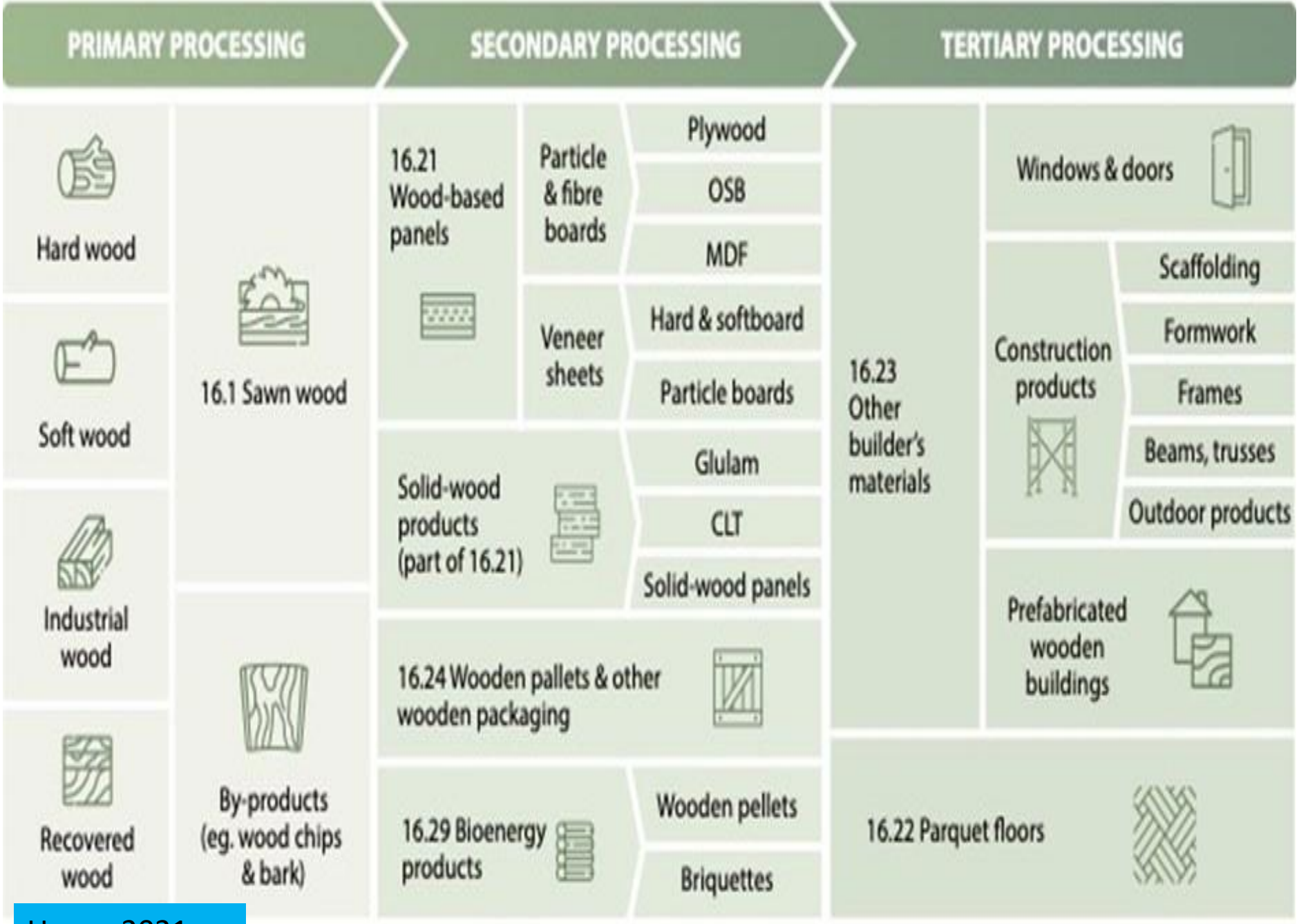
PRIMARY PROCESSING
SECONDARY PROCESSING
TERTIARY PROCESSING
Hard wood
Soft wood
Industrial wood
Recovered wood
16.1 Sawn wood
By-products (eg. wood chips & bark)
16.21 Wood-based panels
Particle & fibre boards
Plywood
OSB
MDF
Veneer sheets
Hard & softboard
Particle boards
Solid-wood products (part of 16.21)
Glulam
CLT
Solid-wood panels
16.24 Wooden pallets & other wooden packaging
16.29 Bioenergy products
Wooden pellets
Briquettes
16.23 Other builder's materials
Windows & doors
Construction products
Scaffolding
Formwork
Frames
Beams, trusses
Outdoor products
Prefabricated wooden buildings
16.22 Parquet floors

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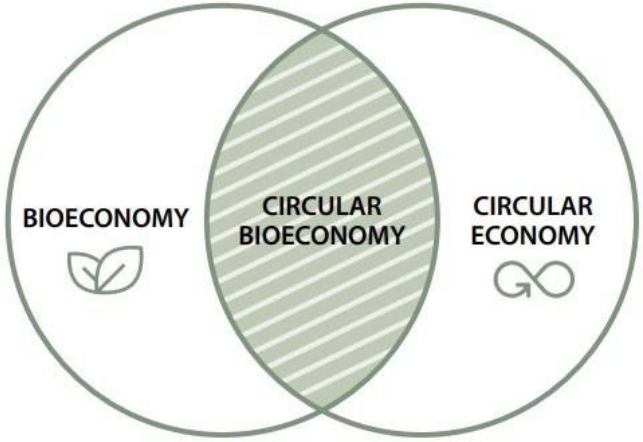
Maksimum Pengolahan Hasil Hutan (kayu, berkayu, limbah HHBK, agroforestri)



The European Commission Expert Group on the Bioeconomy (EC, 2017a, b) have indicated that a circular bioeconomy involves the following activities:

1. Use of organic side and waste streams from agriculture, forestry, fishery, aquaculture, food and feed to applications such as aquaculture feed.
2. Biodegradable products being returned to the organic and nutrient cycles.
3. Successful cascading of paper, other wood products and natural fiber textiles.
4. Innovations that enhance the recyclability of other materials, such as biodegradable oleo chemicals used to de-ink paper.
5. Linking different industrial sectors, such as forest-based industries and chemical industries.
6. Collection and recycling of bioplastics

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Forest Products Technology Challenges

1. Forest product processing SHALL be developed in **SUSTAINABILITY PARADIGM** (in terms of forest area, function and production).
2. **MAXIMIZING** COMBINATION forest products processing with other materials especially biomaterials waste from any types of ANY FOREST MANAGEMENT and other non renewable materials

ENVIRONMENTAL WIN

- Reduced virgin material and energy input
- Virgin inputs are predominantly/ to the extent possible renewable from productive ecosystems

ENVIRONMENTAL WIN

- Reduced waste and emissions
- Resources in production-consumption systems are used many times, not only once
- Renewable are CO_2 neutral fuels and their wastes are nutrients that can be used by nature

INPUT

OUTPUT

ECONOMIC WIN

- Reduced raw material and energy costs
- The value in resources is used many times, not only once
- The use of costly scarce resources is minimized
- Reduced costs that arise from environmental legislation, taxes and insurance
- Image, responsible and green market potential

SOCIAL WIN

- New employment opportunities through new uses of the value embedded in resources
- Increased sense of community, cooperation and participation through the sharing economy
- User groups share the function and service of the physical product instead of individuals owning and consuming the physical product

ECONOMIC WIN

- Value leaks and losses are reduced
- Reduced waste management costs
- Reduced emissions control costs
- Reduced costs from environmental legislation, taxation and insurance
- New markets are found for the value in resources
- New responsible business image attracts investment

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thank
you