A NEW CONCEPT FOR DETERMINING THE LONG-TERM STORAGE OF CARBON IN WOOD PRODUCTS

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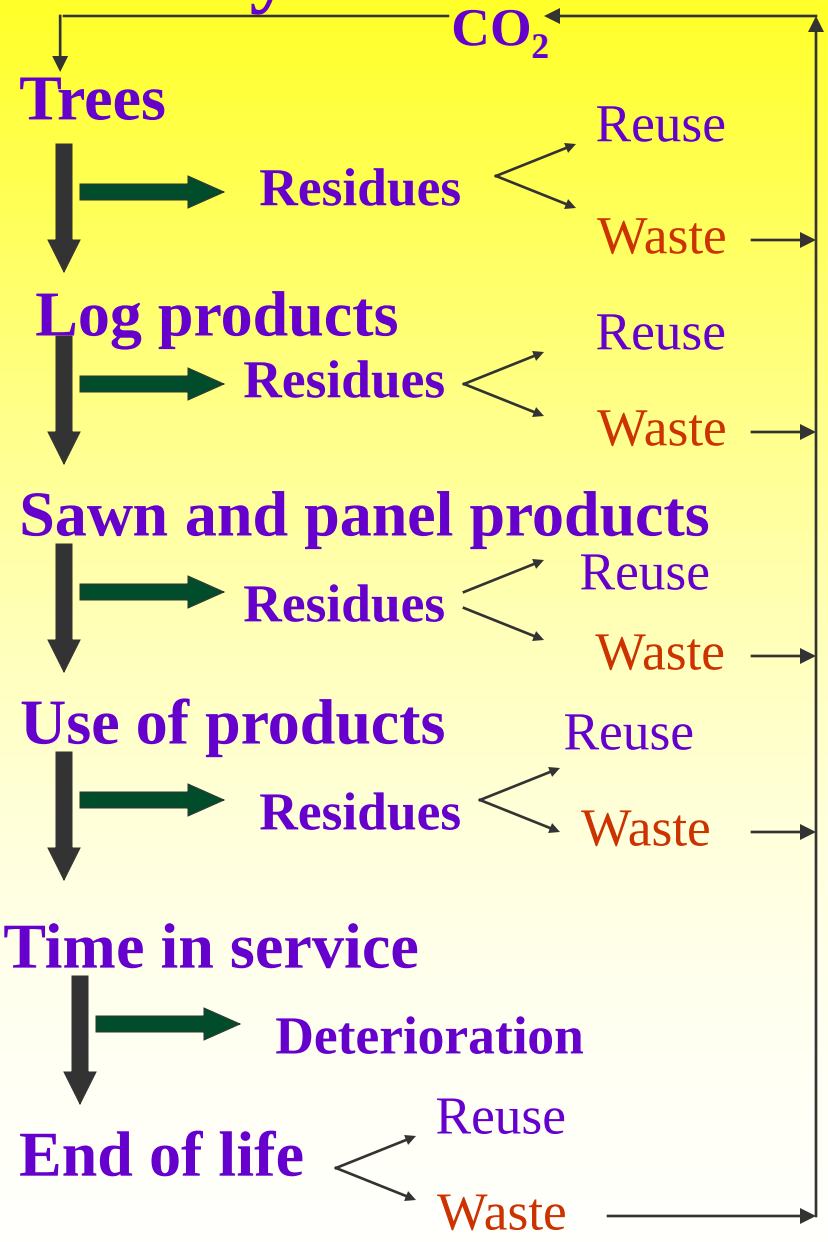
Menu

1. Briefly review CRCGA wood products research.
2. Review allocation of carbon in the production and use of wood products.
3. Review current assumptions for determining carbon storage in wood products.
4. Describe a new concept for determining carbon storage in wood products.
5. Consider the outcomes of adopting a new concept for determining carbon storage in wood products.
6. Future research.

Life Cycle



A3 Projects

- Harvesting studies
- Conversion studies
- Production database
- Density and carbon studies
- Waste audits
- Building waste audits
- Service life survey
- Landfill research

Harvesting studies

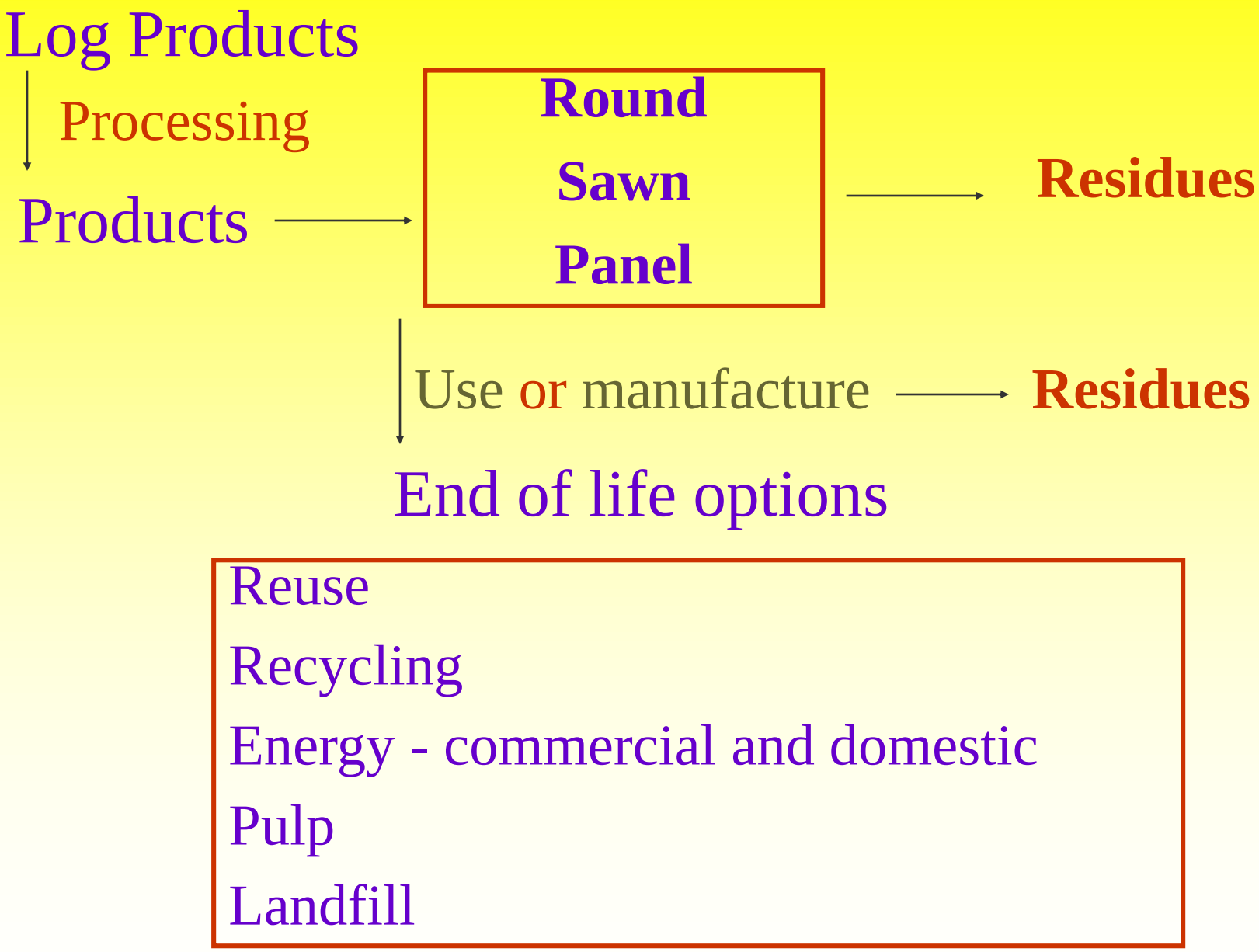
Conversion studies

Conversion studies

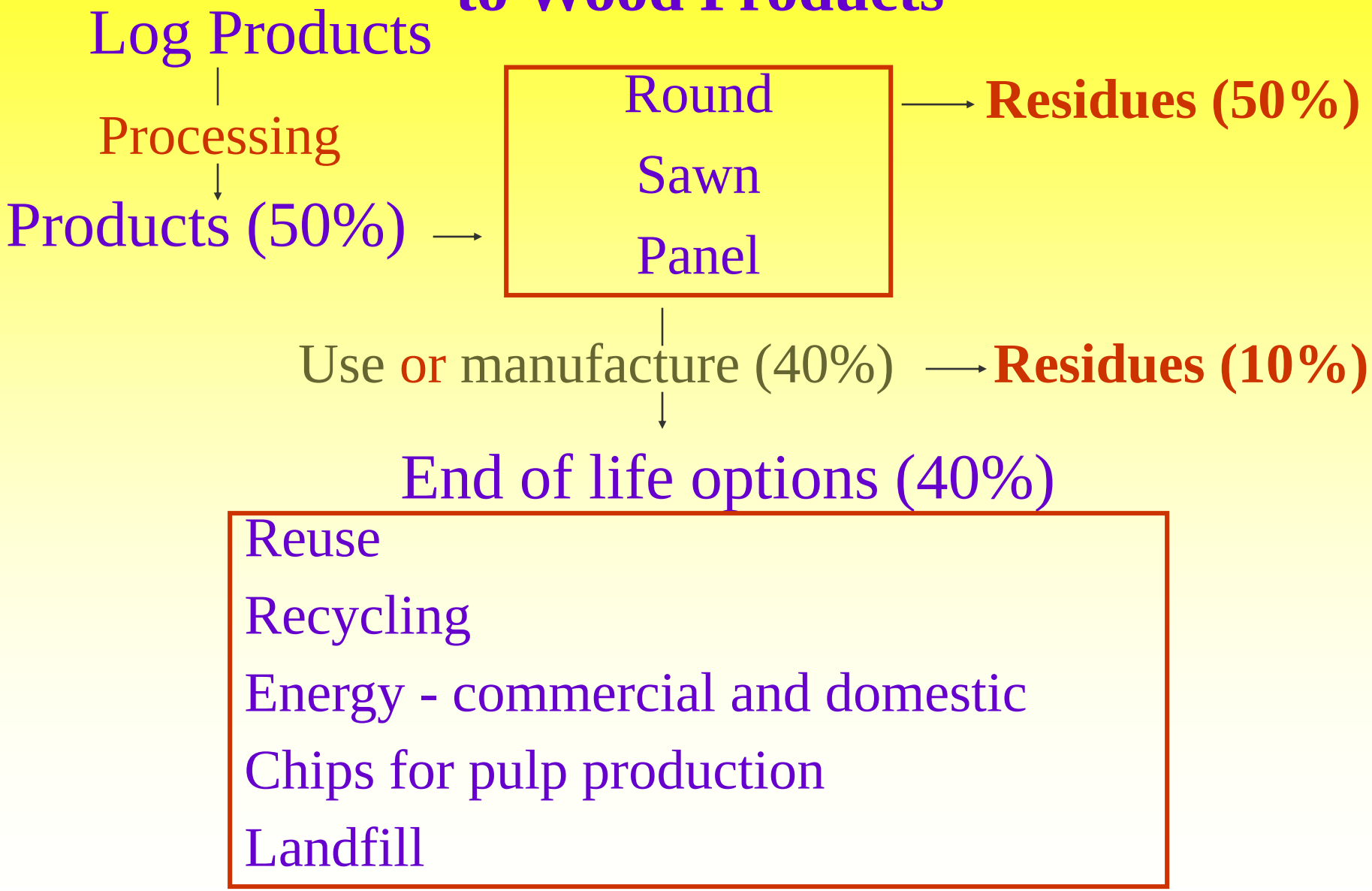
Waste audits

Landfill studies

Landfill studies


Log Products
Processing
Products
Round
Sawn
Panel
Residues
Use or manufacture
Residues
End of life options
Reuse
Recycling
Energy - commercial and domestic
Pulp
Landfill

Post-harvest Fate of Carbon in Logs Processed to Wood Products



Current Assumptions for Carbon Storage in Wood Products

Log Products

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Processing → Residues - oxidised (50%)

↓

Products (50%) → Oxidised in year of harvest or Oxidised over service life

↓

End of life options (0)

Basis for Current Assumptions for Carbon Storage in Wood Products

- Carbon storage in wood products is limited to their service life. This is presumably due to the assumed high rates of decomposition of carbon in wood products placed in landfill.

- Carbon storage in residues is not acknowledged.

Outcome from Current Assumptions

Carbon storage in wood products is

transient

and service life dependent

Wood products after 20 years in landfill

Paper after 20 years in landfill

Wood products after 46 years in landfill

Paper after 46 years in landfill

New Concept for Carbon Storage in Wood Products

- Some of the carbon in wood products is in long-term storage that is not service life dependent.

- Carbon storage in residues from processing and use should be determined and included in a system for acknowledging carbon storage in wood products.

- Equivalent credit for carbon storage should be given for avoided fossil fuel emissions when redundant wood products or residues are used as fuel for energy production.

Rationale for New Concept

Some of the carbon in wood products is in long-term storage that is not service life dependent

The assumed decomposition (30%) of carbon in wood products in landfill is much greater than actually occurs. Our research has demonstrated that approximately 3% of the carbon in wood products (not including paper products) is decomposed after up to 46 years in Australian landfills.

Wood products in landfill are a long-term carbon store.

Rationale for New Concept

Carbon storage in residues from processing and use of wood products should be determined and included in a system for acknowledging carbon storage in wood products

Residue uses include:

- Feedstock for panel product manufacture.
- Pulp for paper and paper product manufacture.
- Animal bedding and landscaping.
- Fuel for energy - either commercial or domestic.

Most residues go to a useful purpose or are placed in landfill. Very few residues are burnt to waste.

Rationale for New Concept

Equivalent credit for carbon storage should be given for avoided fossil fuel emissions when redundant wood products or residues are used as fuel for energy production

Redundant wood products and residues are being used as fuel for:

- On-site heating for timber drying.
- Fuel for commercial heating - brickworks, hospitals, etc.
- Co-fuel in coal-fired power stations.
- Domestic heating.

Residues used as fuel for these purposes avoid emissions from fossil fuels that would otherwise have been used.

Estimating Long-term Carbon Storage in Wood Products

Long-term storage in wood products is a function of:

- The quantity of wood products processed from log products.

- The quantity of residues generated from the processing and use of wood products and the quantity of those residues that go to long-term uses, are used as fuel for energy or are placed in landfill.

- The quantity of redundant wood products used as fuel for energy or placed in landfill.

Cont.

Estimating Long-term Carbon Storage in Wood Products Cont.

Long-term storage in wood products is a function of:

- The relative fuel efficiency when redundant wood products and residues are used to produce energy.

- The equivalent percentage of carbon in wood products and residues placed in landfill that is retained in long-term storage and not emitted as greenhouse gases.

Estimating Long-term Carbon Storage in Wood Products

The quantity of residues produced from the processing and use of wood products and the quantity of those residues that go to long-term uses, are used as fuel or are placed in landfill

- Processing residues have been estimated at 50% of log volume. This value is based on mill recovery studies for three hardwood and two softwood timber species.
- It has been estimated that 70% of residues from processing and use of wood products go to long-term uses, are used for energy or are placed in landfill.

Estimating long-term carbon storage in wood products

The quantity of redundant wood products used as fuel for energy or placed in landfill

It is estimated that 90% of redundant wood products are placed in landfill or are burnt for energy. In Australia the vast majority of redundant wood products are placed in landfill.

Estimating long-term carbon storage in wood products

The relative fuel efficiency of redundant wood products and residues when they are used to produce energy

A Displacement Factor of 0.8 has been selected. This is based on the assumption that most residues and redundant wood products used as fuels will be a) used for heating rather than electricity generation and b) some of the fuels used for domestic heating will displace heating from electricity generated from fossil fuels.

Estimating long-term carbon storage in wood products

The equivalent percentage of carbon in wood products placed in landfill that is retained in long-term storage and is not emitted as greenhouse gases

It is estimated that the equivalent of 90% of the carbon in wood products placed in landfill remains in long-term storage. This is based on the assumption that 3% of the carbon in the wood products will be decomposed in landfill and one half of that will be emitted as methane.

Estimating long-term carbon storage in wood products

Percentage of carbon in wood products that remains in long-term storage (CLST) is given by the following formula:

$$CLST = CR(F1xF2 + F3xF4) + CP(F5xF2 + F6xF4)$$

Where CR = percentage of carbon in residues
F1 = Fraction of residues used as fuel.
F2 = Displacement Factor for avoided fossil fuel emissions.
F3 = Fraction of residues placed in landfill or processed into long-term products.
. F4 = Factor for equivalent carbon storage in residues placed in landfill or processed into long-term products.

Cont.

Estimating long-term carbon storage in wood products Cont.

CP = percentage of carbon in wood products.

F5 = Fraction of wood products used as fuel.

F2 = Displacement Factor for avoided fossil fuel emissions.

F6 = Fraction of wood products placed in landfill or processed into long-term products.

F4 = Factor for equivalent carbon storage in wood products placed in landfill or processed into long-term products.

Estimate of Carbon in long-term storage in Round, Sawn and Panel Wood Products in Australia

$$CLST = CR(F1xF2 + F3xF4) + CP(F5xF2+F6xF4)$$
$$= 60(0.5x0.8 + 0.2x0.9) + 40(0.1x0.8 + 0.9x0.9)$$
$$= 34.8 + 35.6$$
$$= 70.4\%$$

Assumes:

- 50% of residues are used as fuel.
- 20% of residues are placed in landfill or used for long-term products.
- 10% of redundant wood products are used as fuel.
- 90% of redundant wood products are placed in landfill or used for long-term products.

Conclusions

Our research demonstrates that:

- Wood products provide long-term storage of carbon.

- Service life is not a realistic indicator of carbon storage in wood products.

We have proposed a new concept based on the “whole of life” contribution of wood products and residues to carbon storage and avoidance of fossil fuel emissions. Applying this concept, the equivalent of 70% of the carbon in log products processed to round, sawn or panel products in Australia is committed to long-term storage.

Outcomes of acceptance of concept of long-term carbon storage in wood products

Estimates for national greenhouse gas emissions will be reduced when the lower “real life” decomposition factors for carbon in wood products are used to estimate emissions from wood products in landfill. The reductions in landfill emissions will be significantly increased if long-term carbon storage in paper products is also proved and accepted.

Acceptance of long-term carbon storage in wood products will significantly increase estimates of the carbon storage in wood products.

Future Research

Work with the paper industry and landfill regulators and researchers to develop landfill decomposition data on paper products. These data will contribute to determining the long-term carbon storage potential of paper products.