

EIANZ Conference
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Soil Carbon for Productivity or Trading?

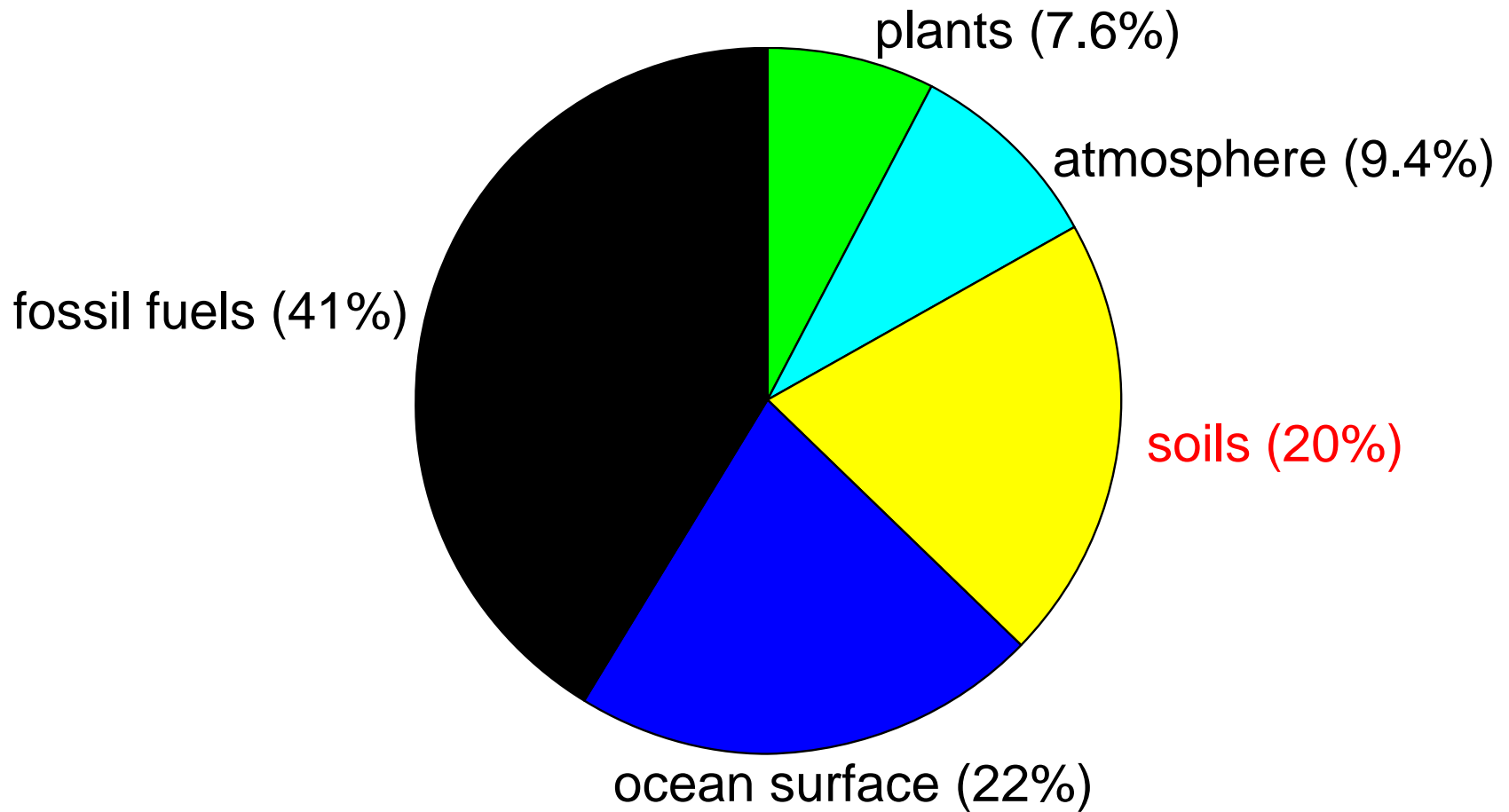
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Outline

- What is soil carbon?
- How does it affect productivity?
- What are the issues for trading in soil carbon?
- How do we weigh up the options?

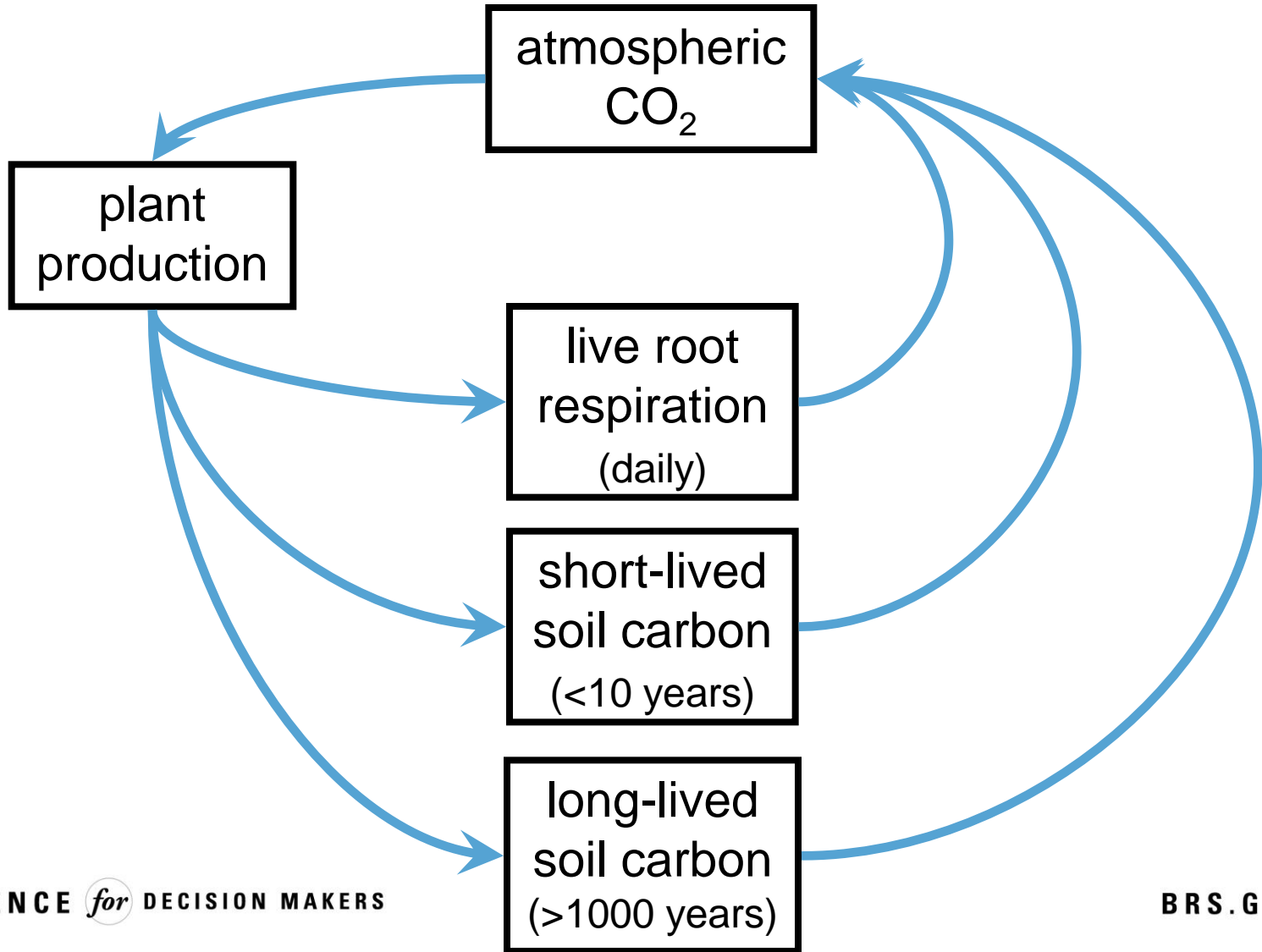
Where is the accessible carbon?



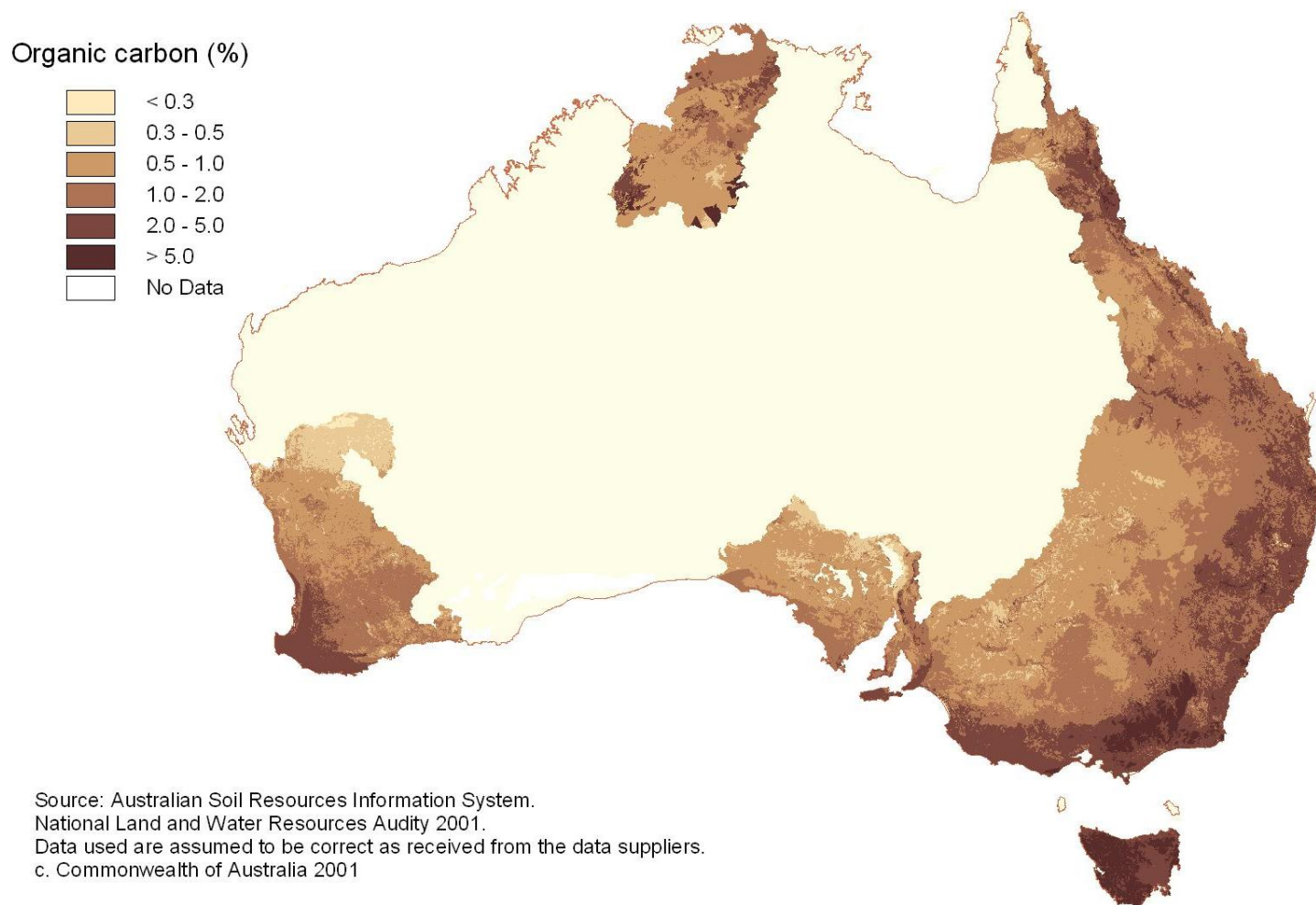
Components of soil carbon

- Living organisms
 - plants, animals, microbes
- Non-living materials
 - particulate, dissolved, humus, inert

The soil carbon cycle



Variation in soil carbon levels across Australia



Source: Australian Soil Resources Information System.
National Land and Water Resources Audit 2001.
Data used are assumed to be correct as received from the data suppliers.
c. Commonwealth of Australia 2001

Soil carbon accumulation depends on

- Rainfall
- Temperature
- Vegetation cover
- Soil nutrients
- Soil microbes

Increasing soil carbon enhances productivity by

- Improving soil moisture holding capacity
- Improving soil biodiversity and “health”
- Improving soil nutrient storage and supply
- Reducing soil erosion
- Increasing soil buffering capacity (pH, pesticides)

Soil carbon storage can be enhanced by

- Changes in land management practices
- Changes in land use
- Addition of external carbon sources

Changes in land management practices

- Minimum till or no till cropping
- Grazing management strategies
- Planting perennials

Changes in land use

| Original land use | Modified land use | Change in soil carbon (%) |
|-------------------|-------------------|---------------------------|
| pasture | plantation forest | -10 |
| native forest | plantation forest | -13 |
| pasture | crop | -42 |
| native forest | pasture | +8 |
| crop | pasture | +19 |
| crop | plantation forest | +18 |
| crop | native forest | +53 |

Addition of biochar as a carbon source

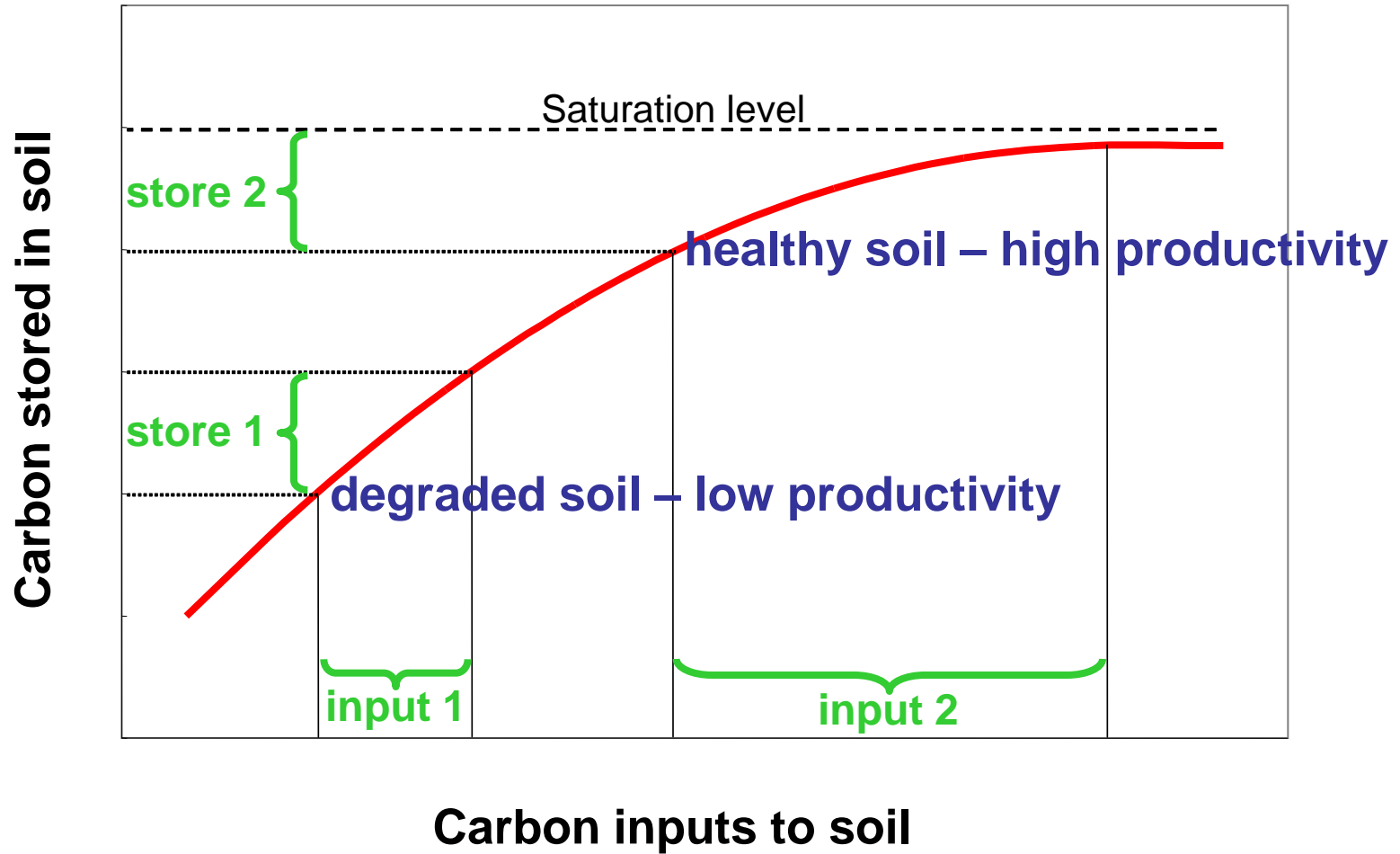
Charcoal produced from low oxygen burning

- Removes carbon from the atmosphere
- Can improve soil condition
- Different biochars have different values
- Uncertain cost of supply chain

Law of diminishing returns

- Degraded soils have the greatest potential to store carbon
- Healthy soils require greater inputs to achieve the same increase in carbon storage

Law of diminishing returns



Impacts of climate change on soil carbon

- Rainfall
 - low rainfall decreases plant growth and rates of decomposition
 - high rainfall increases plant growth and rates of decomposition
- Temperature
 - high temperatures increase rates of decomposition and CO₂ loss
- Vegetation cover
 - CO₂ fertilisation increase plant growth
 - bushfires reduce vegetation cover, reduce soil carbon and increase CO₂ loss

Trading in soil carbon will require

- Measurable changes in soil carbon
- Verification by an independent 3rd party
- On-going monitoring of carbon sinks
- Permanent storage with low risk of leakage
- Full life-cycle analysis of carbon gains & losses
- Clarification of market rules

Why is measuring soil carbon complex?

- Soil carbon levels can change across a paddock
- Soil carbon levels with depth
- Land management and land use affect carbon storage
- Climate change will affect carbon storage and leakage

Some trade-offs

- Short-term addition vs long-term release
 - added carbon can be lost in a future drought
- Nutrients for production and soil carbon
 - price of nutrients vs returns on soil carbon
- Harvesting carbon or storing it in the soil

The future for soil carbon

- Productivity gains can result from management practices that enhance soil carbon (win-win)
- Many issues still to be resolved around trading in soil carbon
- \$20m research program announced by Minister for Agriculture, Fisheries and Forestry
- Weigh up current production gains against potential future trading benefits

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