Grassland degradation – a global perspective

The case of greenhouse gas mitigation

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and
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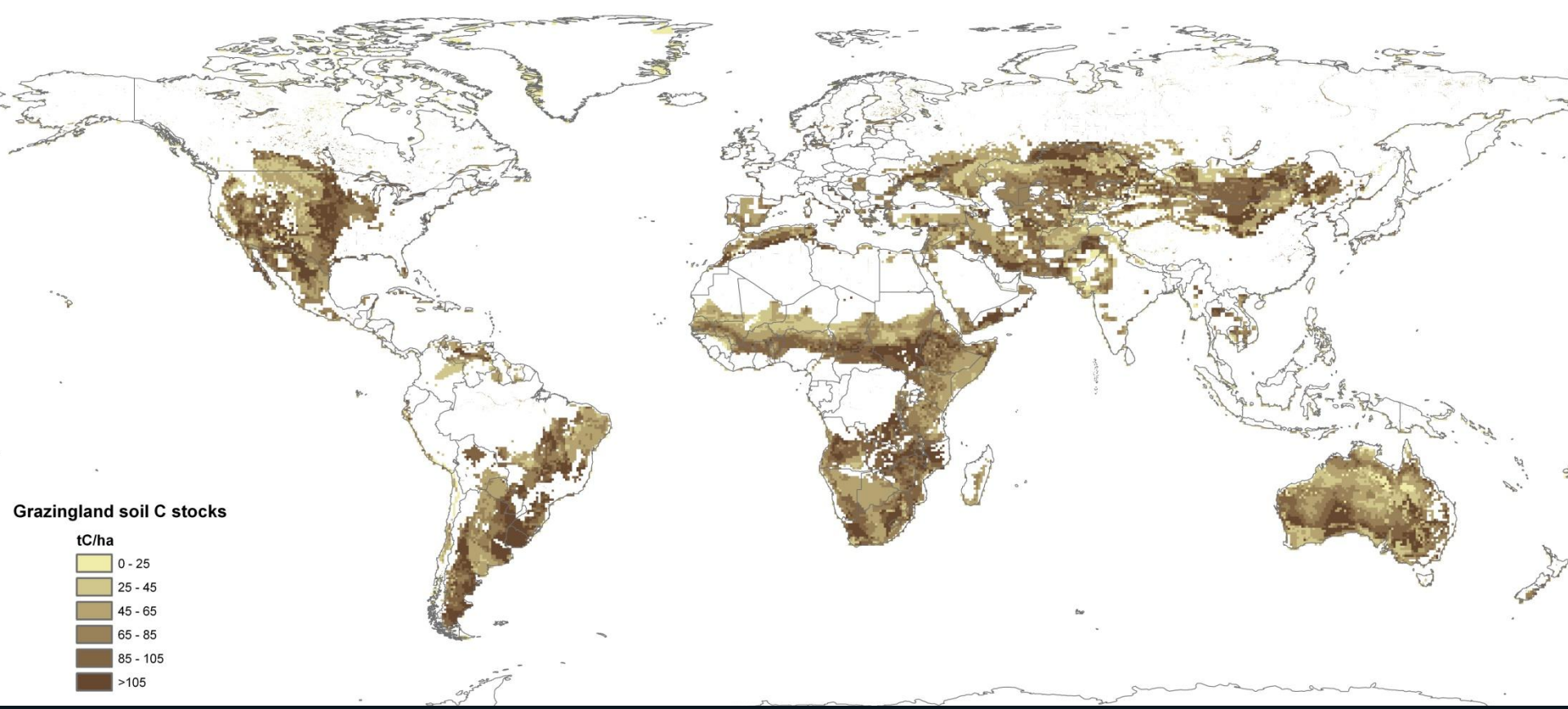
Carbon flow in grassland ecosystems



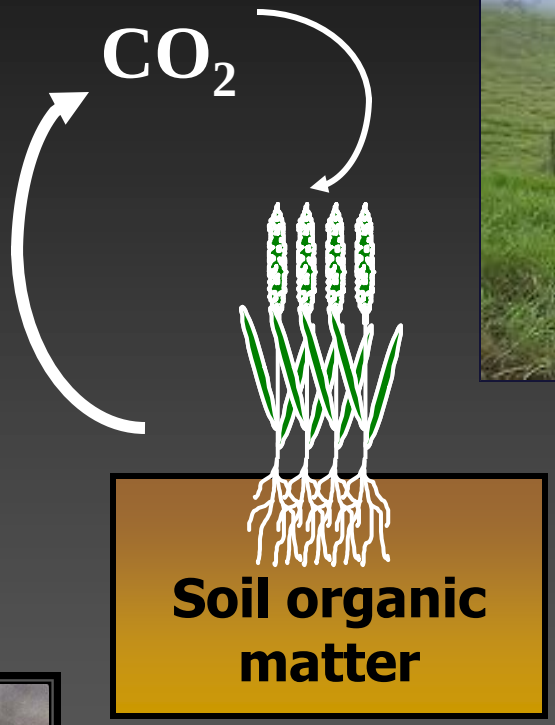
Carbon stocks in grassland ecosystems

1. Grassland soil C stocks are substantial.

Poor grassland management practices

Overgrazing

Low fertility

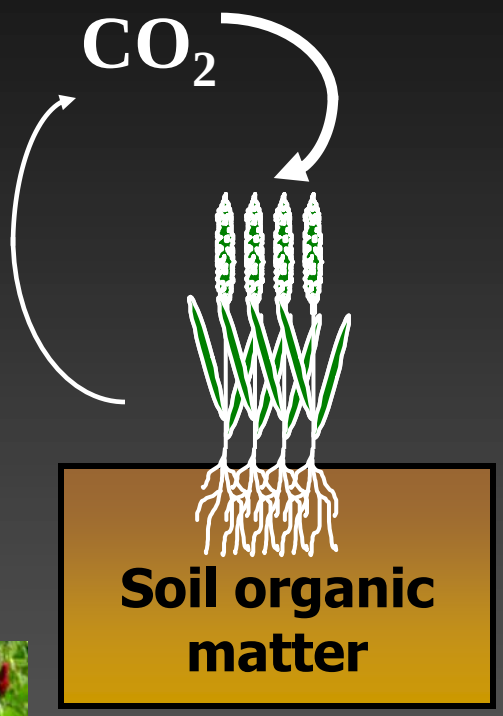


Inefficient forage use

Erosion

Improved management practices

Reverse overgrazing



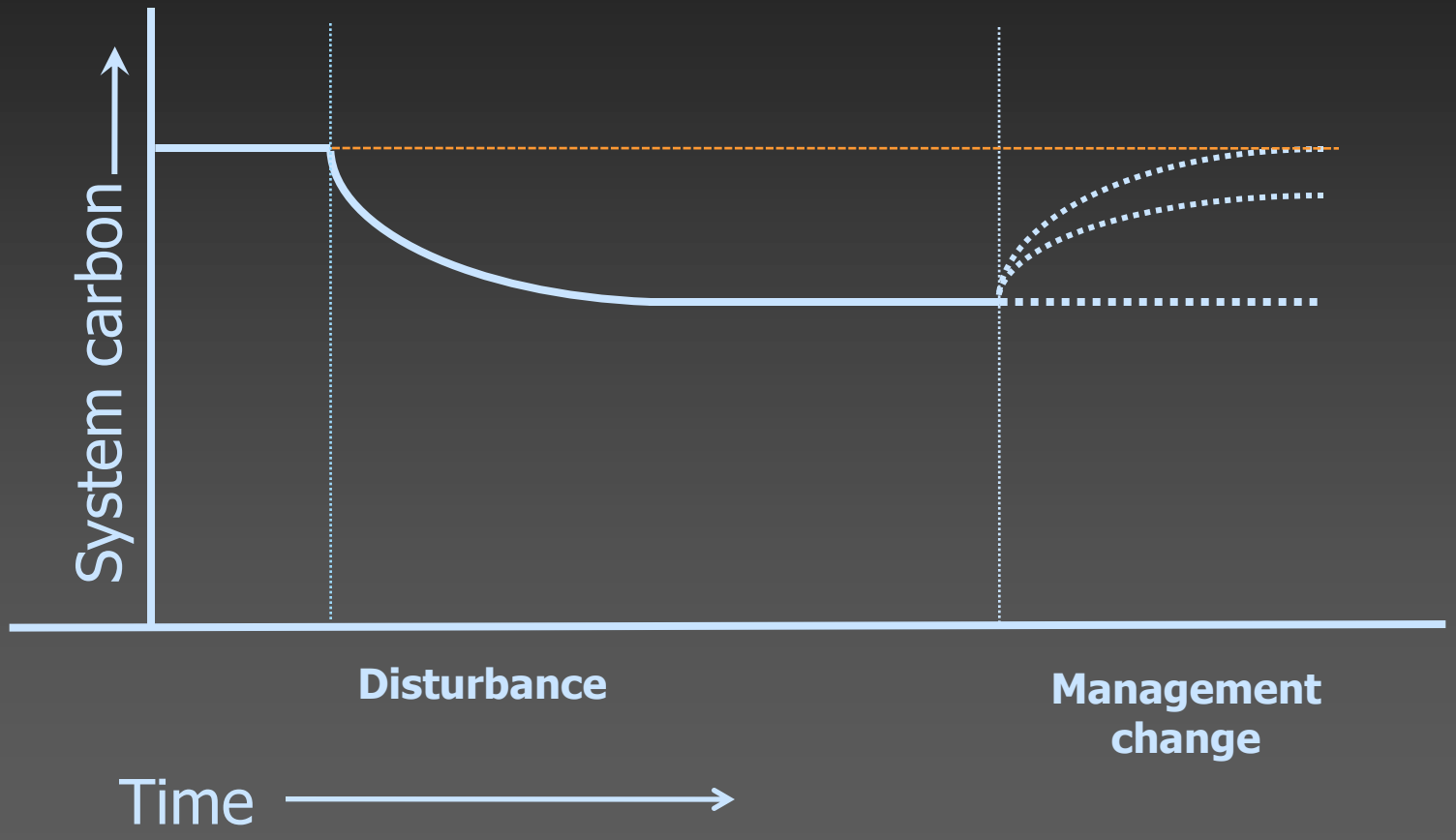
Irrigation

Sowing legumes/ improved species

Fertilization

Carbon stocks in grassland ecosystems

– conceptual framework



Carbon stocks in grassland ecosystems

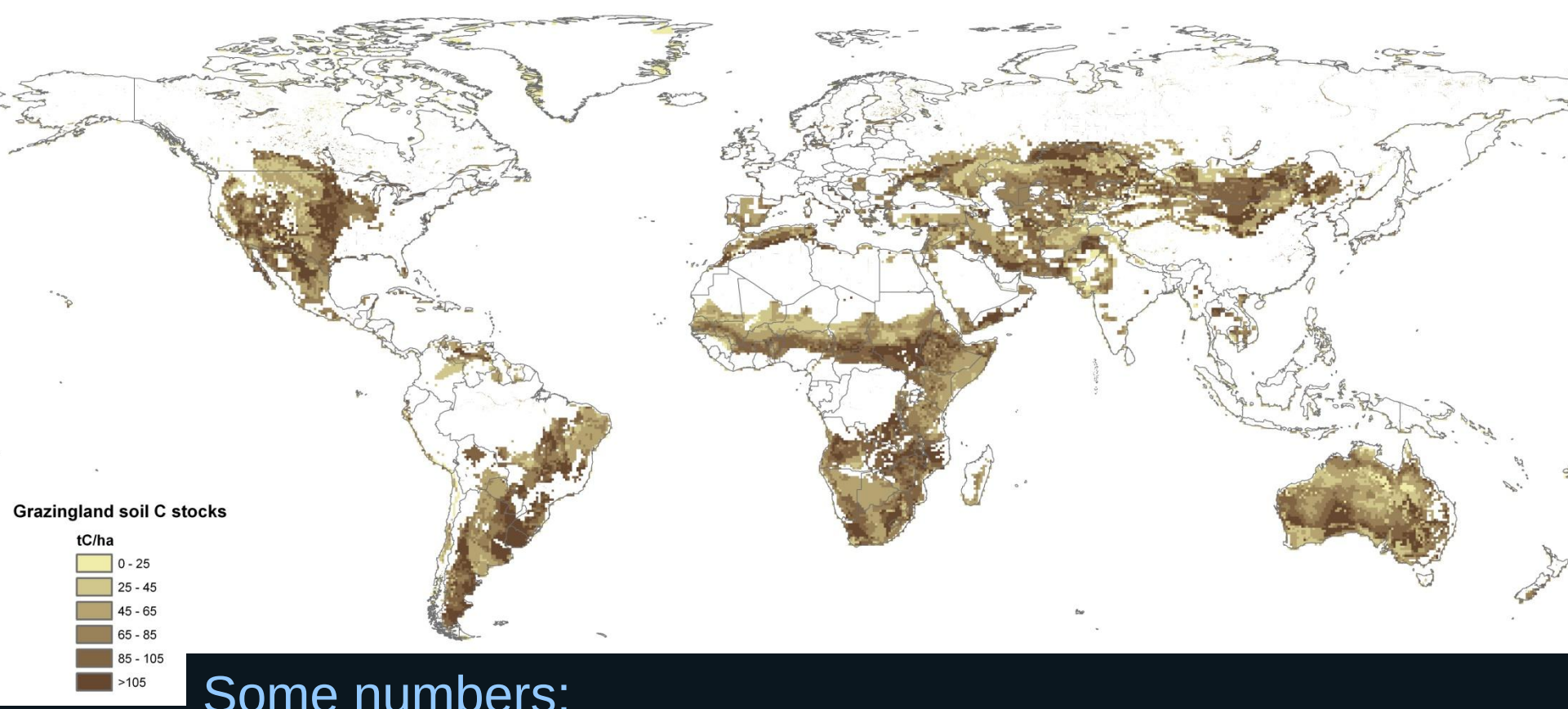
1. Grassland soil C stocks are substantial.

2. Management impacts carbon stocks – C stocks are susceptible to loss

3. Carbon lost from grassland systems can be re-gained through changes in management

4. Improved management practices can increase soil carbon stocks

Carbon flow in grassland ecosystems



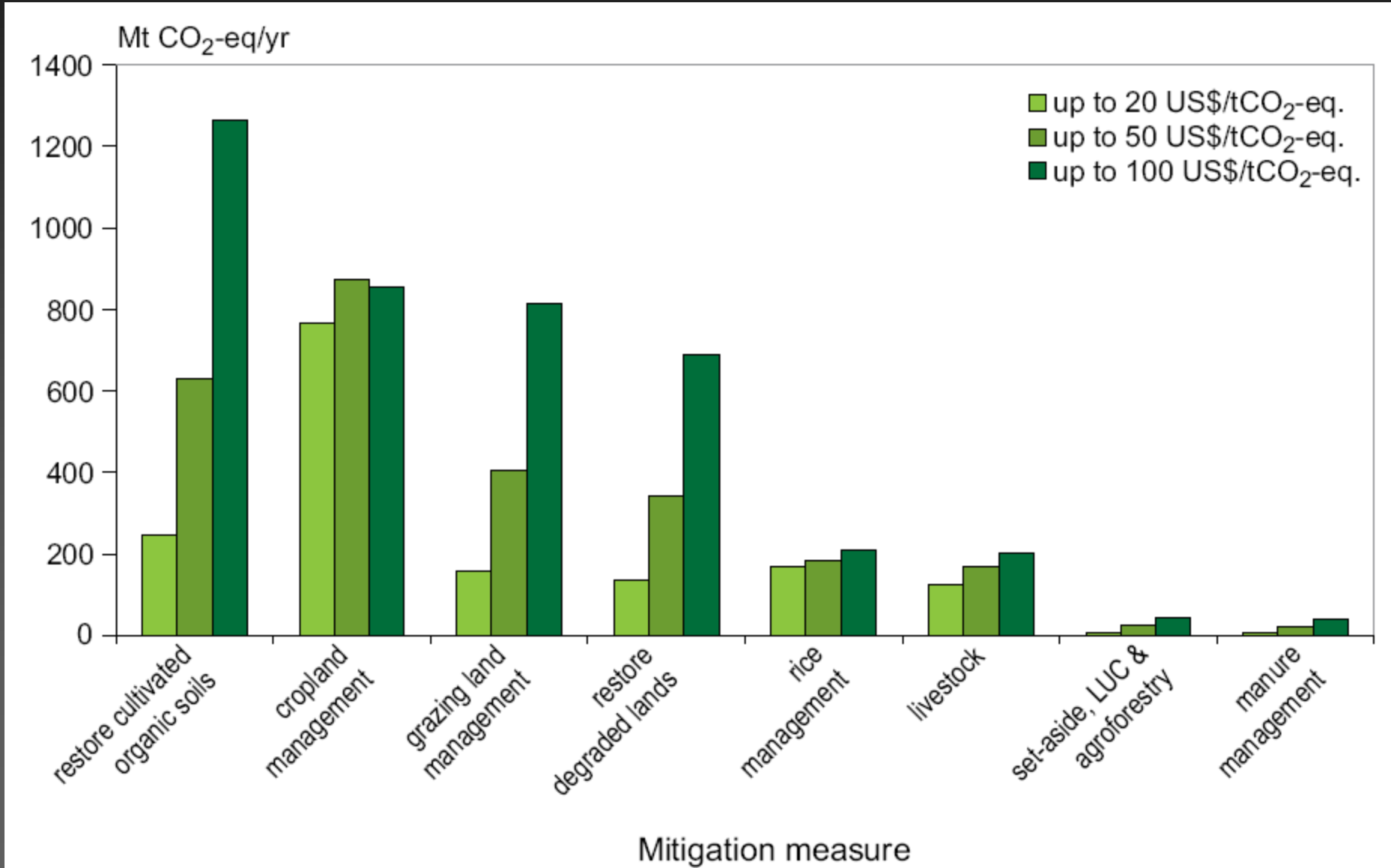
Some numbers:

5.1Bha → 730Mha converted to cropland

~415Pg C (in top 20cm) → ~at least 30 PgC lost due to conversion to cropland

Carbon stocks in grassland ecosystems

– *technical potential for sequestration is large*



Carbon stocks in grassland ecosystems

What do we know?

1. Grassland soil C stocks are substantial.

2. Management impacts carbon stocks – C stocks are susceptible to loss

3. Carbon lost from grassland systems can be re-gained through changes in management

4. Improved management practices can increase soil carbon stocks

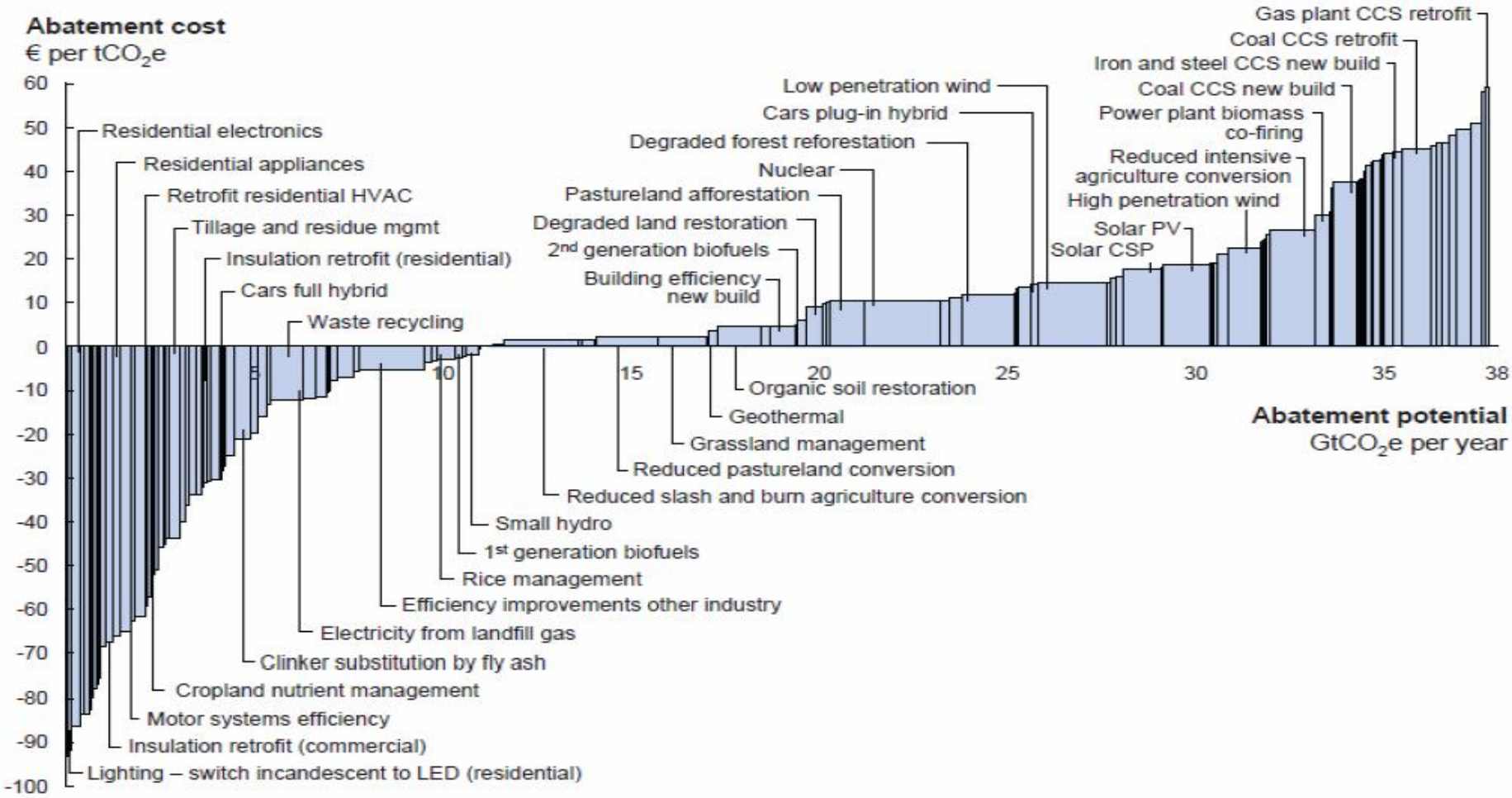
5. Technical potential for sequestration in grasslands is large

Carbon stocks in grassland ecosystems

– *limited knowledge about costs/benefits*

Exhibit 1

Global GHG abatement cost curve beyond business-as-usual – 2030

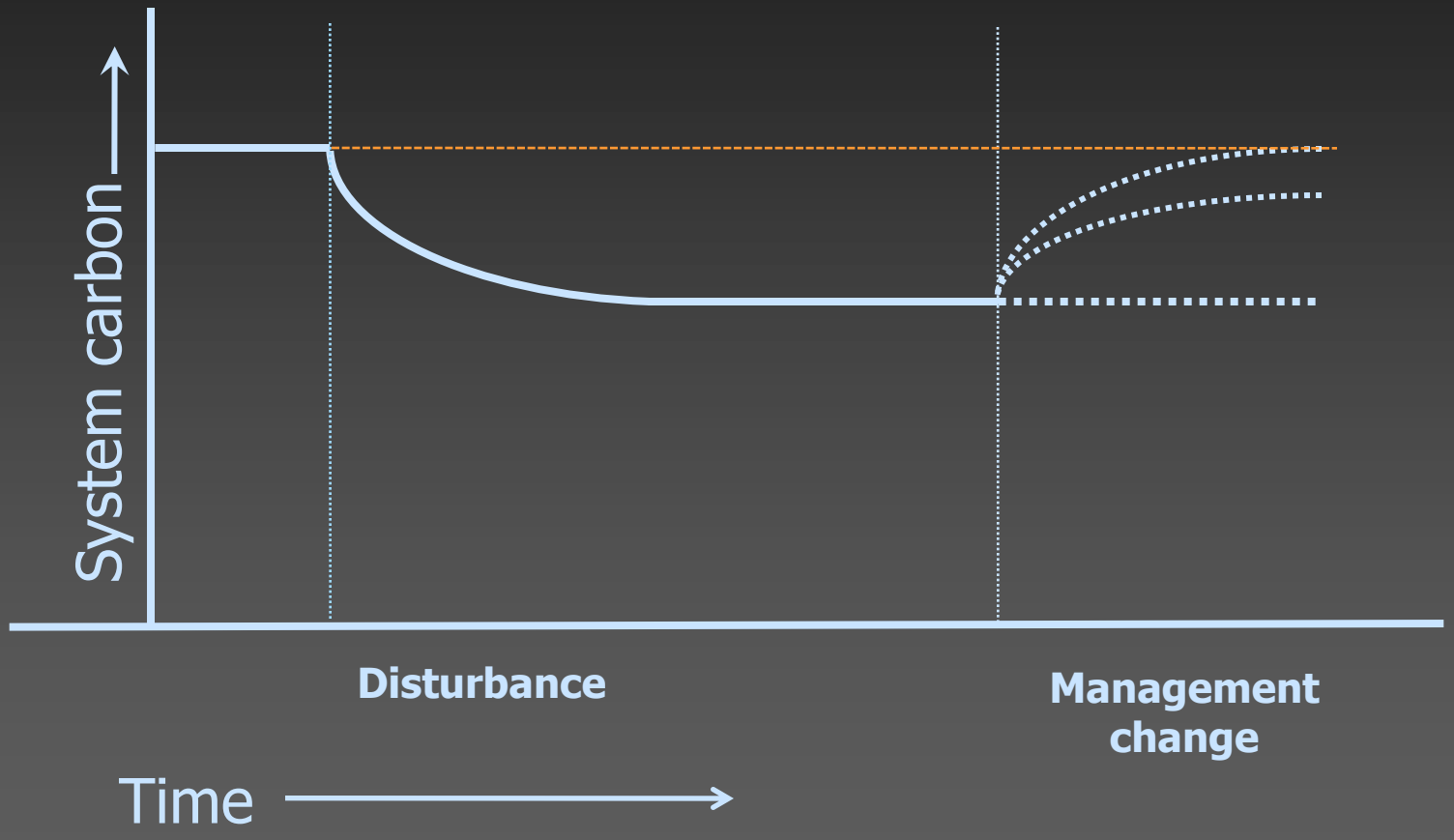


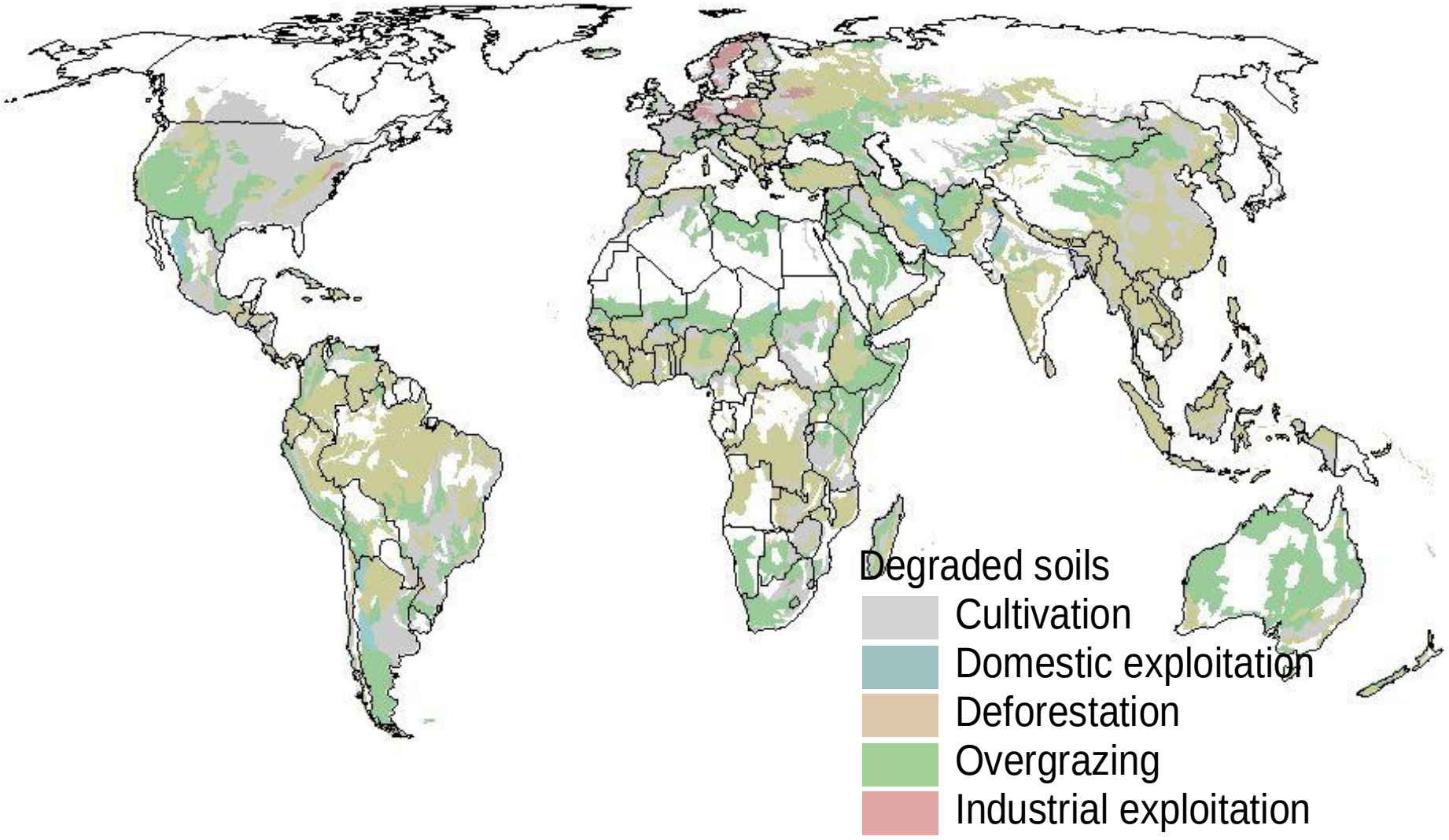
Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

Source: Global GHG Abatement Cost Curve v2.0

Carbon stocks in grassland ecosystems

– how to assess global potential?





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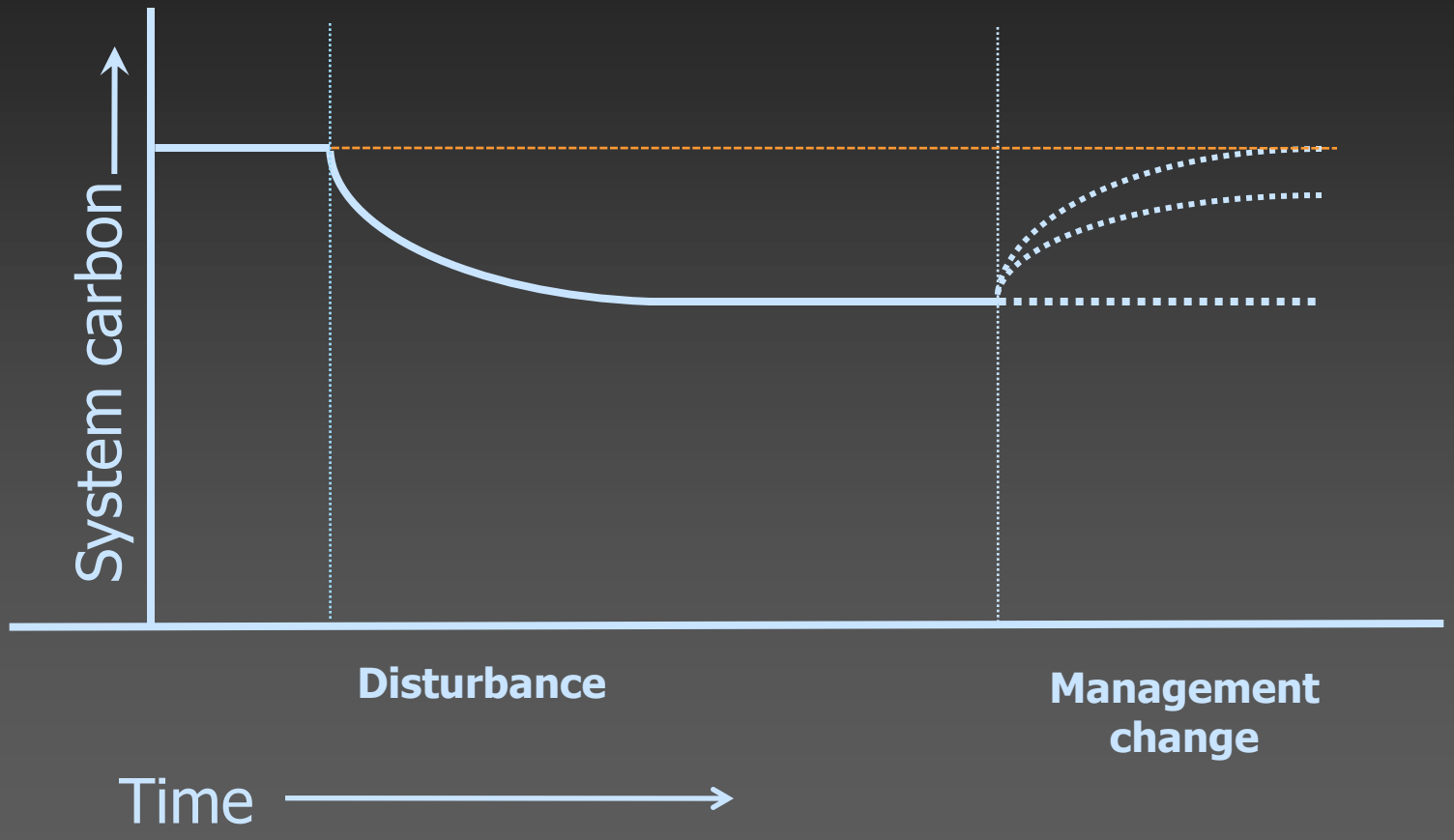
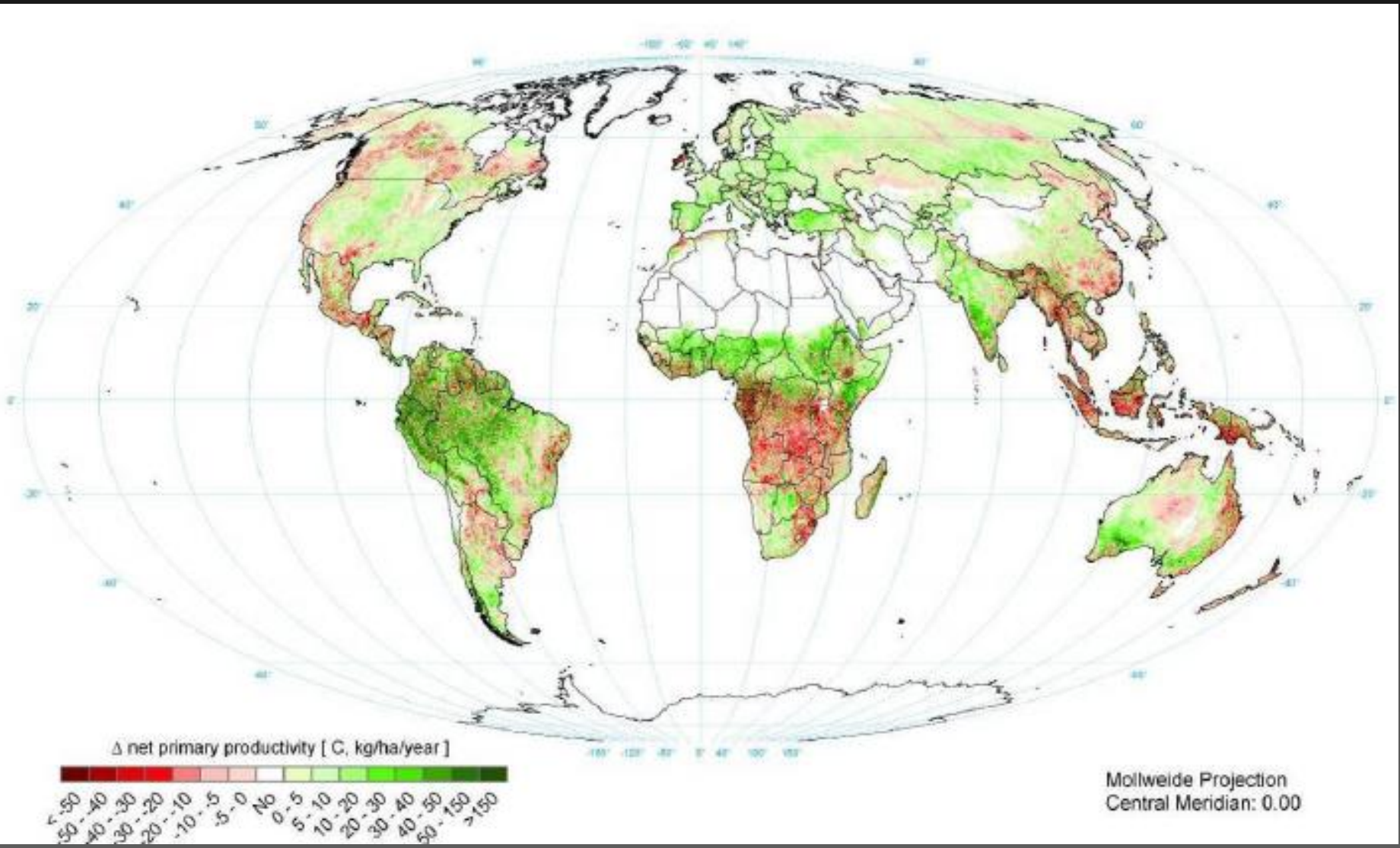
Carbon stocks in grassland ecosystems

– how to assess global potential?





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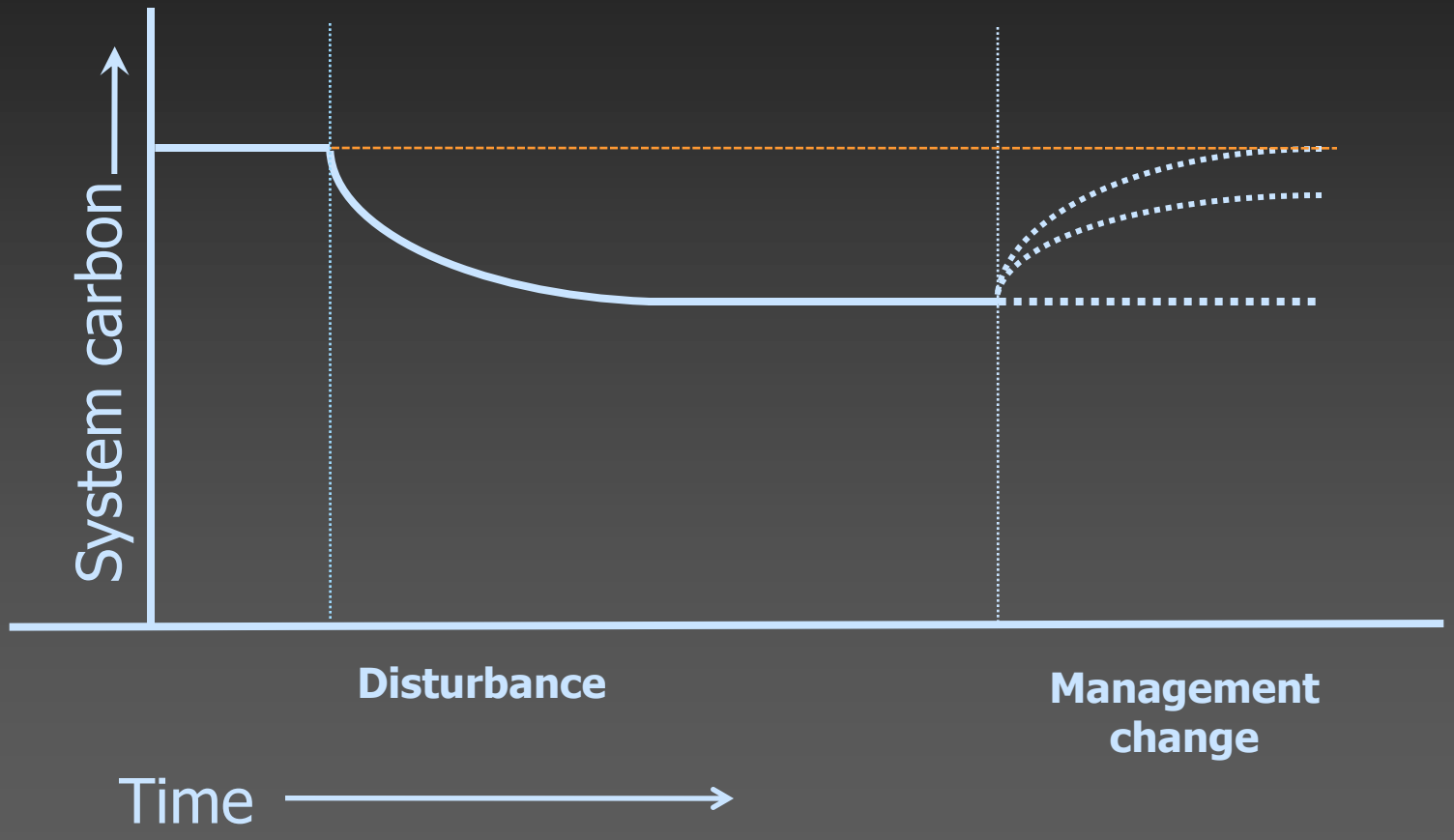
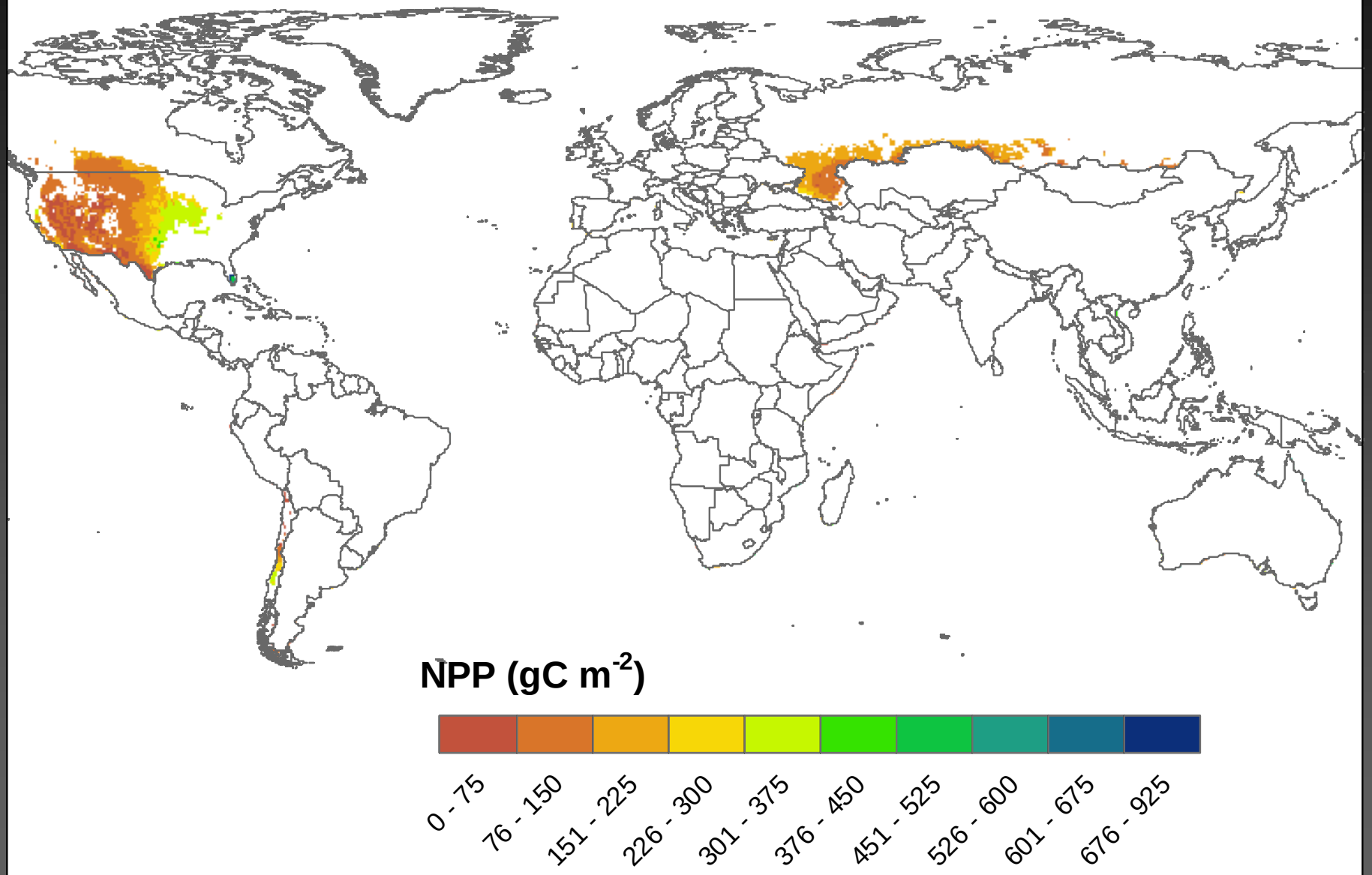
Carbon stocks in grassland ecosystems

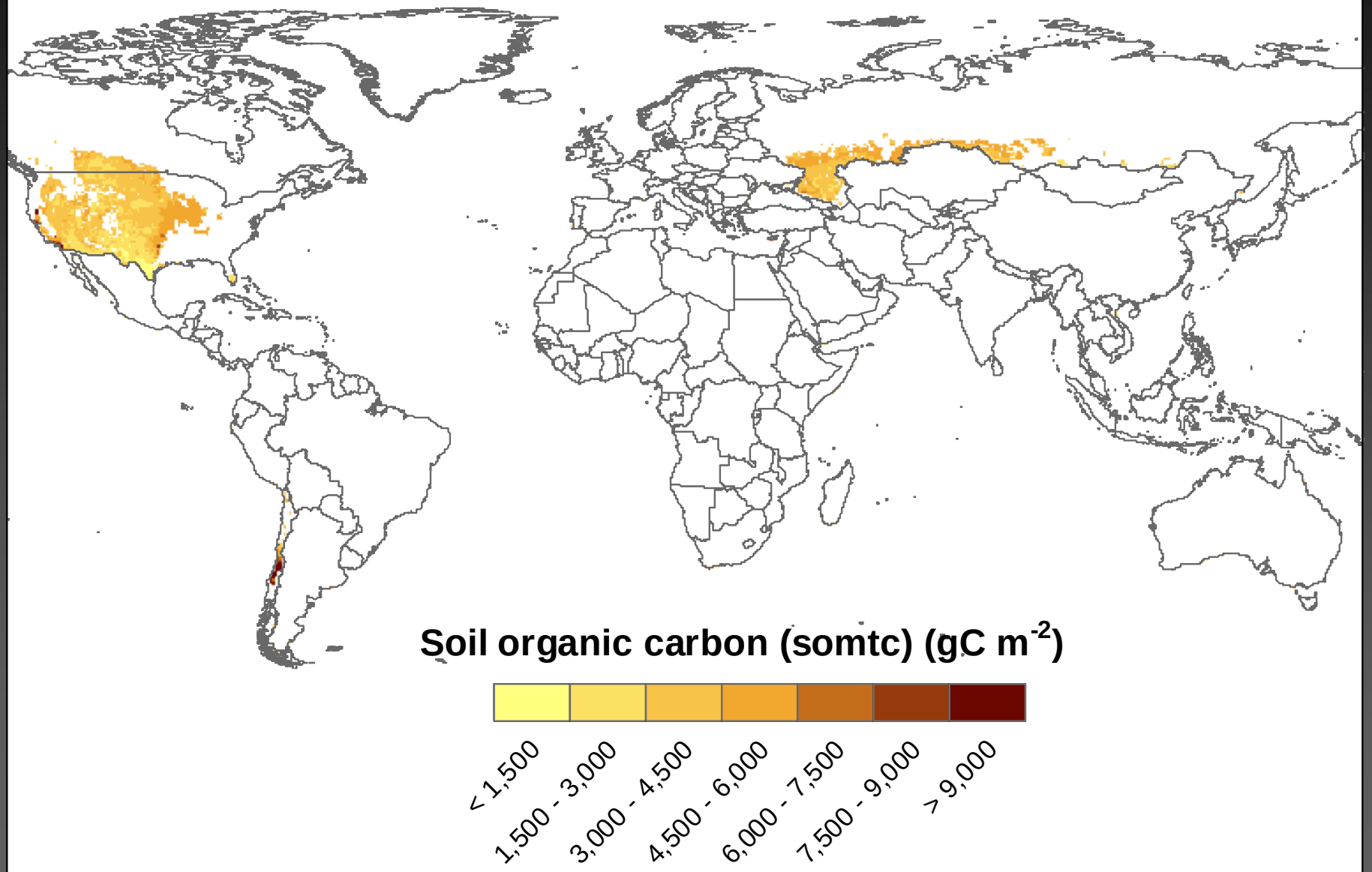
– how to assess global potential?



NPP_{sim} at grazing level that best matched LADA NPP

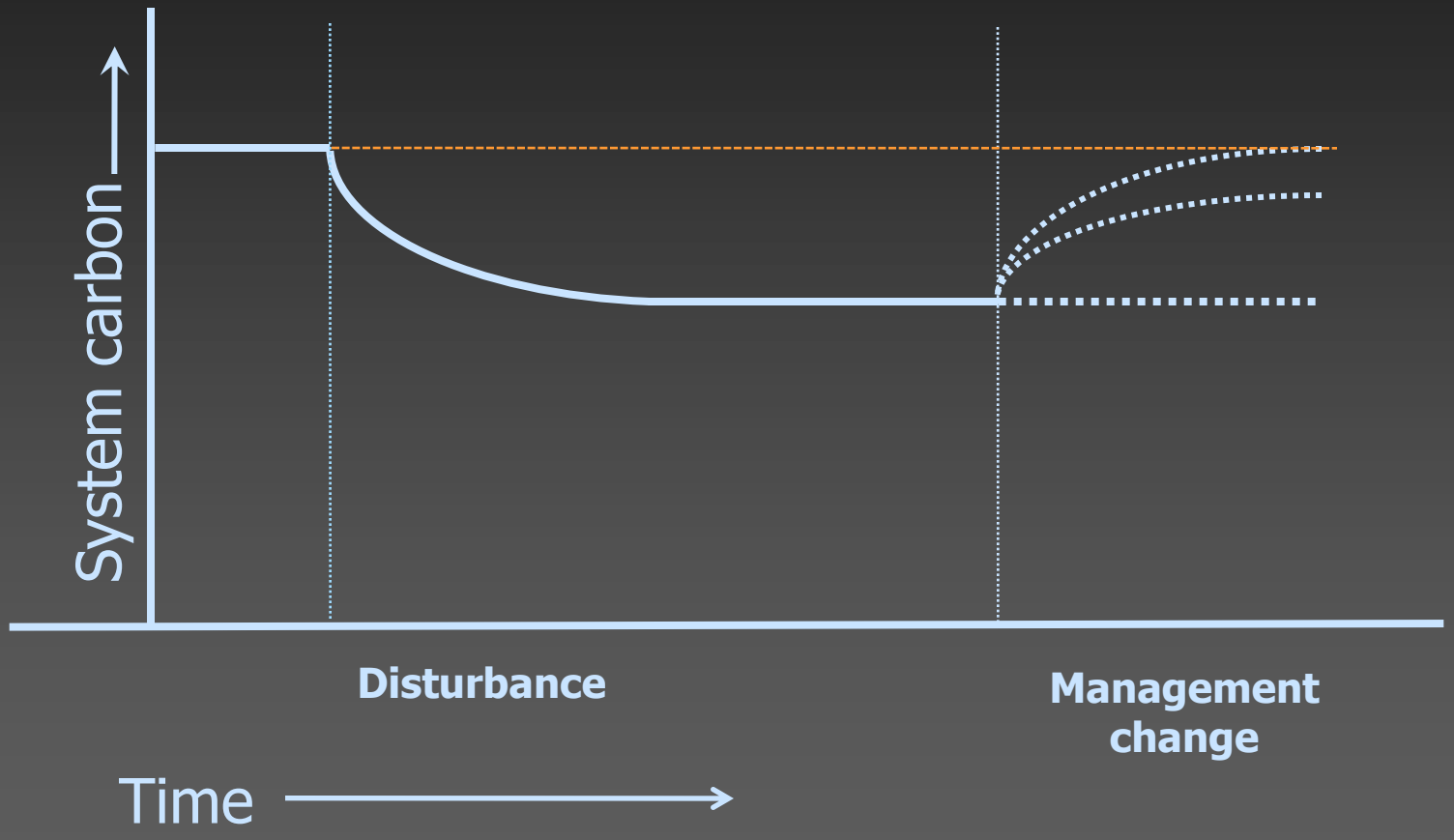


Soil organic carbon (somtc) at grazing level that best matched LADA NPP

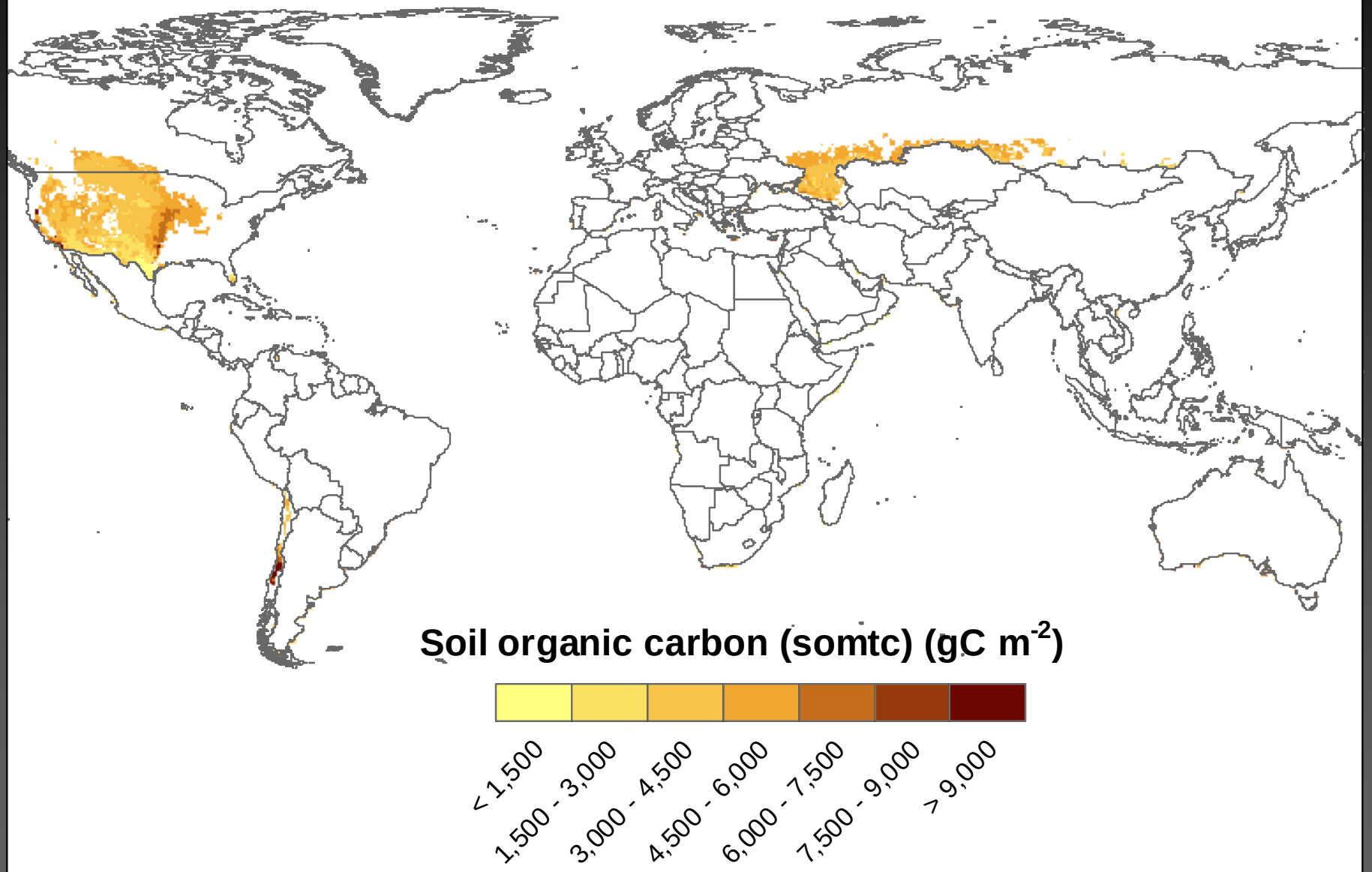


Carbon stocks in grassland ecosystems

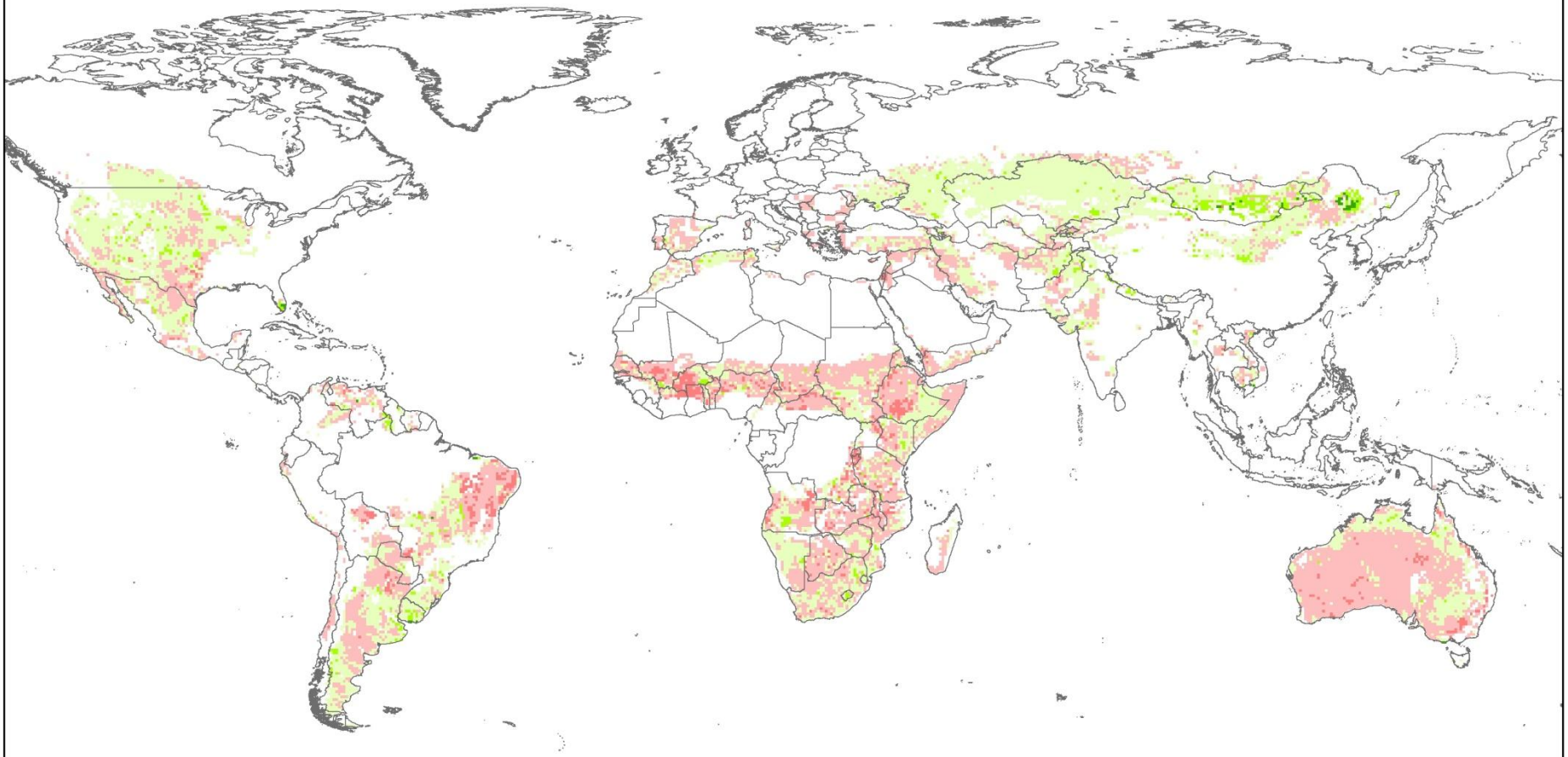
– how to assess global potential?



Soil organic carbon (somtc) at grazing level with maximum NPP



Soil organic carbon difference
Transition from LADA baseline to max NPP
(1986 – 2006)



Carbon stocks in grassland ecosystems

Net C stocks don't always decline

Restoring value to grasslands

– quantifying benefits

1. The potential for carbon sequestration driven by restoration of degraded grasslands is substantial

2. Opportunities vary as a function of type and severity of degradation.

3. Restoration seems likely to be very challenging in some rangeland – carbon benefits may be small (even negative), costly, and slow to realize.