Wildfire carbon accounting:

The Australian experience

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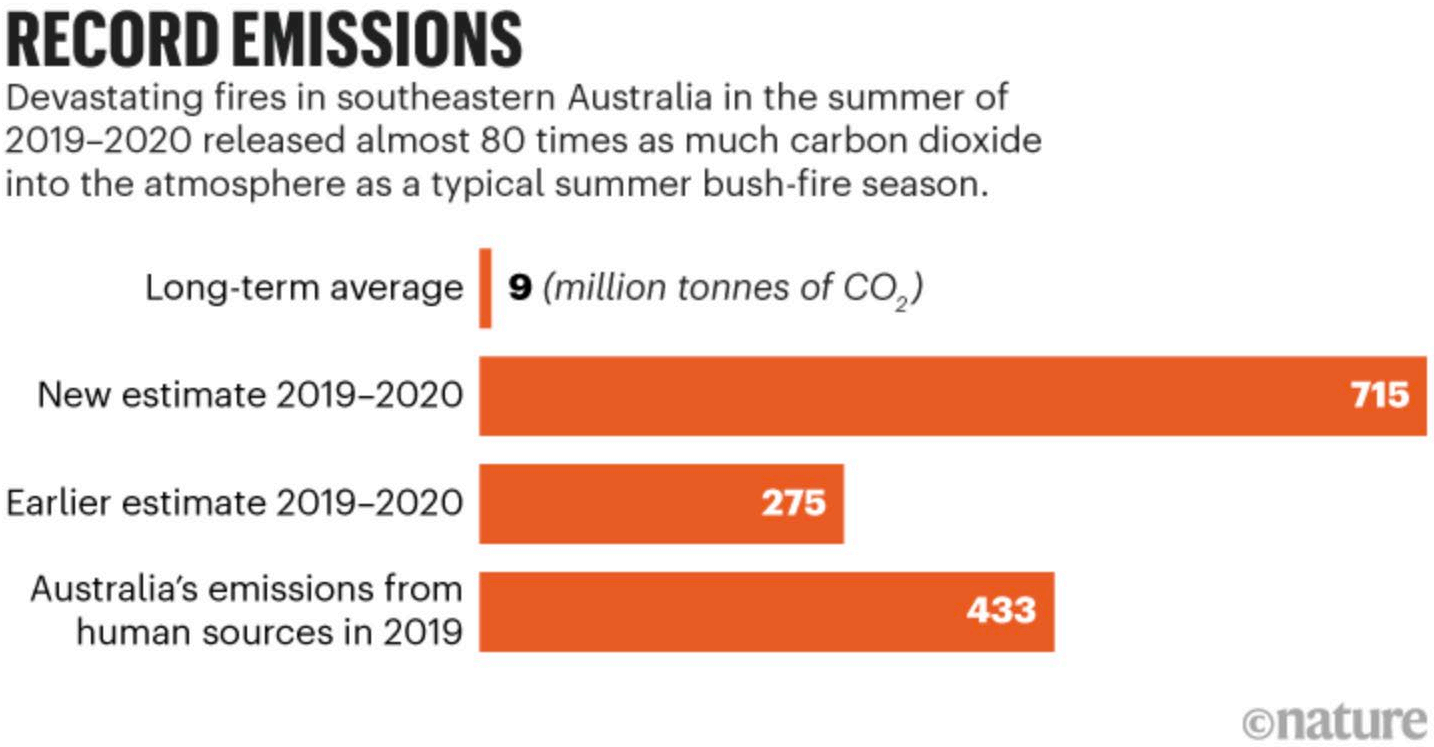
Carbon emissions

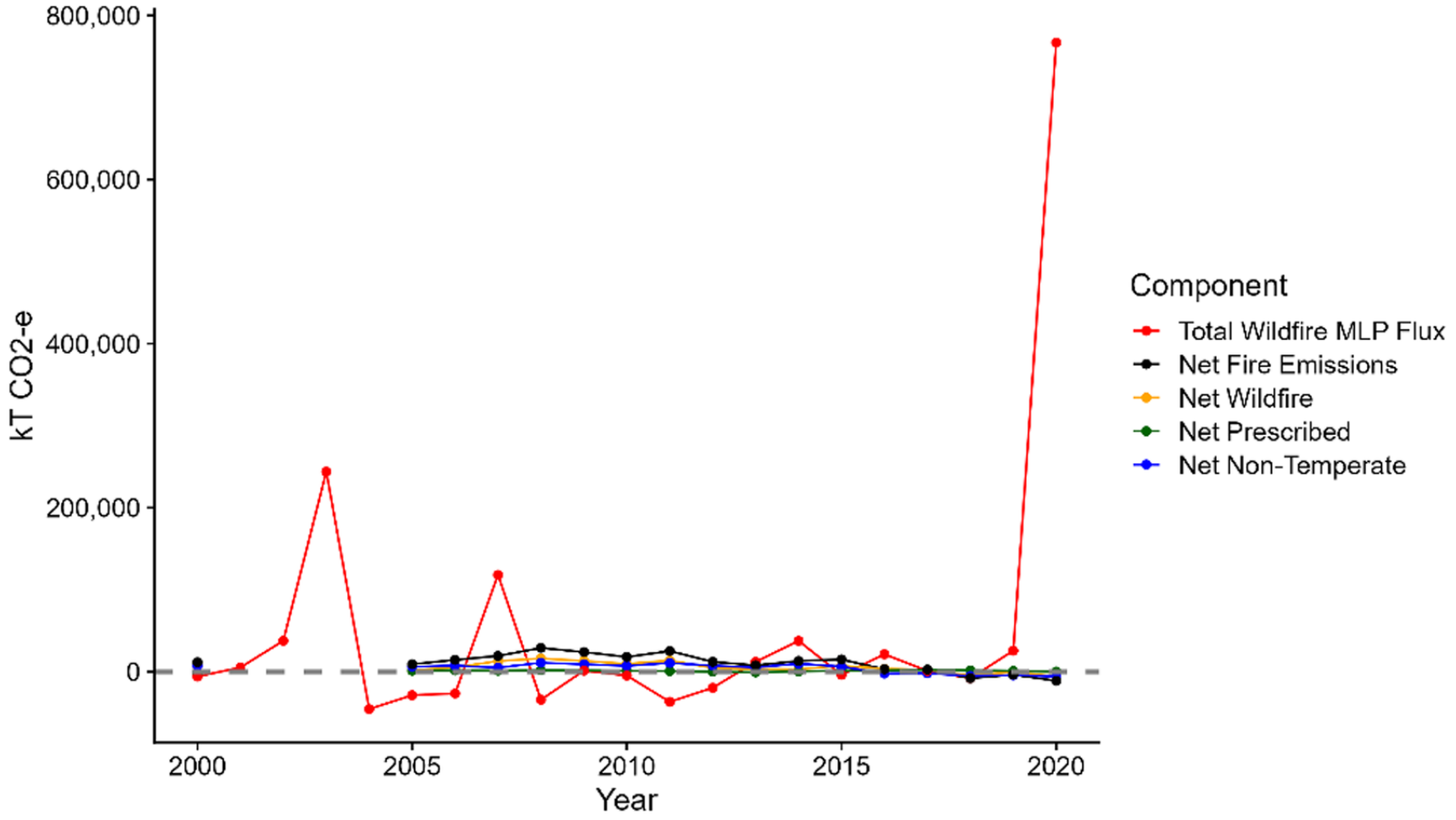


Source: Ref. 1/M. Crippa *et al*. 'Fossil CO2 emissions of all world countries: 2020 report' (European Commission Joint Research Centre, 2020).

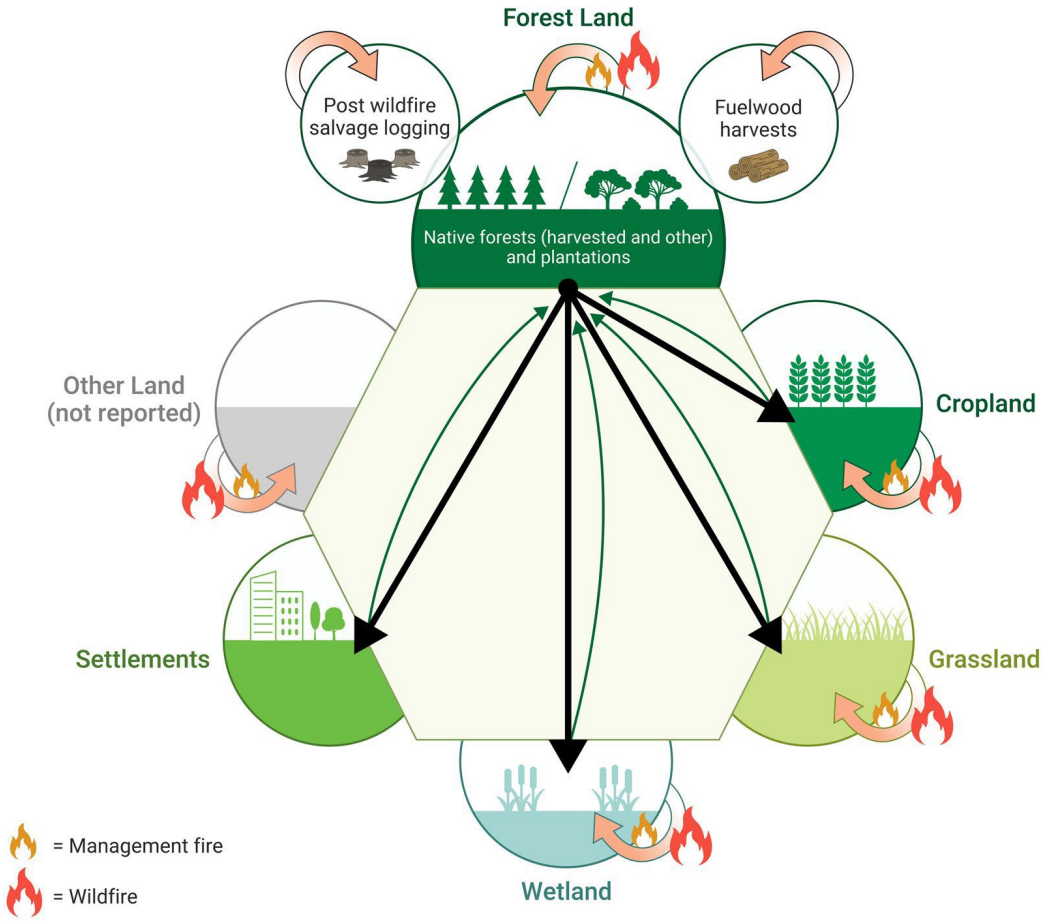
Emissions estimated to be 1.65 (715 vs. 433 Tg CO_2) times the total national anthropogenic CO_2 emissions for all economic sectors in 2019

Mallapaty (2021) *Nature,* 597, 459-460

Gross vs. net GHG emissions



Wildfire and United Nations Framework Convention on Climate Change (UNFCCC) reporting for Land Use, land Use Change and forestry (LULUCF)



Australian carbon accounting

Australia carbon accounts uses internationally agreed guidelines

Assumptions:

- fire disturbance is considered transient effect on GHG emissions (ecological equilibrium)
- carbon stocks the pre-fire level relatively quickly
- managed landscape fires are assumed to be less severe and patchier than unmanaged landscape fires
- historically and geographically anomalous wildfires in forests are excluded from national anthropogenic emission estimates because they are beyond human control

Fire National Greenhouse Gas Inventory (NGGI)

- National greenhouse gas inventories are designed to reflect human-induced emissions
- GHG emission calculations vary by vegetation type and whether managed or unmanaged
  - forests > 2 m height, > 20% canopy > 0.2 ha area
  - temperate forests (excludes tropical savanna)
- Major unmanaged landscape fires are disaggregated from Australia's national totals and reported separately
  - 'Natural disturbance provision'

‘Natural disturbance provision’ and wildfire #1

Method

- Baseline of annual **gross national emissions** from fires 2000 - 2012
- Emissions > 2 σ = anomalous season
- For anomalous fire season emissions: is **area burned** in each state and territory exceeds by 1 σ average area burned in 2000–2012 baseline?
- If this threshold is exceeded, then ***all*** fire related GHG emissions (excluding prescribed fires) from that state or territory are classified as unmanaged (‘natural’) fires

‘Natural disturbance provision’ and wildfire #2

- Assumed burned areas will recovery and reabsorb emitted carbon
- Climate change challenges recovery assumption
  - If forest does not recovery this is captured in future NGGI as land cover type conversion

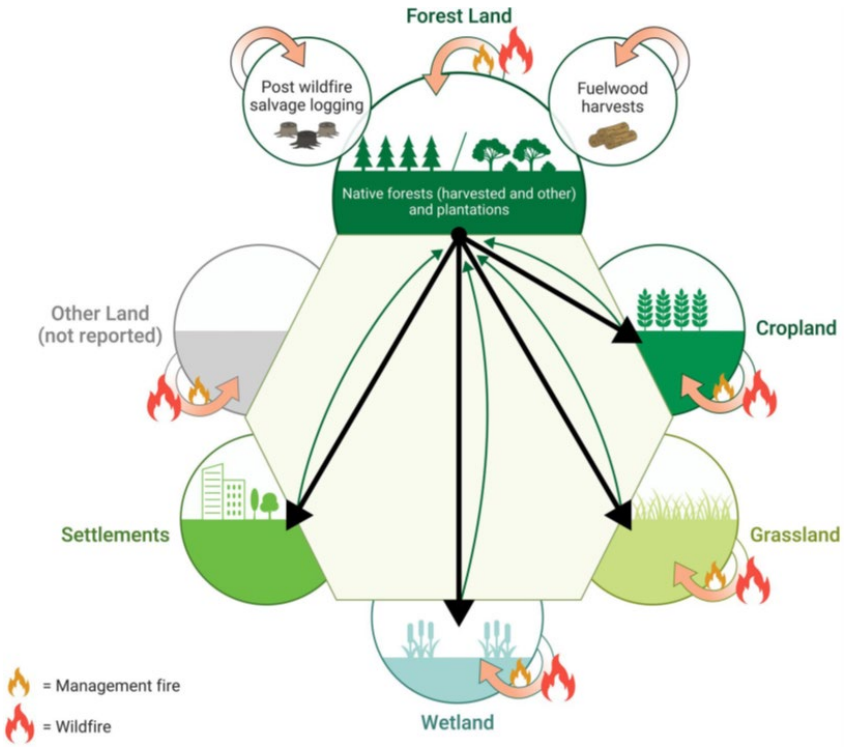
Improved wildfire national greenhouse gas accounting #1

More detailed reporting of different vegetation fires including:

- detailed mapping of vegetation and fire severity patterns
- more specific emission factors
- better models of post-fire growth and recovery
- understanding how fires severities affects carbon stocks
- analysis of the ignition types (lightning vs. anthropogenic)
- investigating fire-weather conditions associated with managed and unmanaged fires

Improved wildfire national greenhouse gas accounting #2

- Build on the precedent of Australian savanna burning program
  - that generates carbon credits reduced emissions of CH_4, NO_x
  - based on assumption that reduction in severity and emissions is associated with early dry season burning
- Current wildfire accountings contrasts with detailed carbon accounting associated with forestry
  - including regeneration burning in logging debris
  - uses process model *Fullcam*



LULUCF***F***

Land Use, Land Use Change, Forestry and ***Fire***

- accurate accounting of all managed and unmanaged landscape fires motivates investment in fire management

Incentivizing fire management

- Motivating fire management in savannas
- Fatalism - large uncontrolled fires
- Tracking carbon stocks in forestry

Bowman *et al.*
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Carbon Balance and Management

COMMENT Open Access

Wildfire national carbon accounting: how natural and anthropogenic landscape fires emissions are treated in the 2020 Australian government greenhouse gas accounts report to the UNFCCC

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