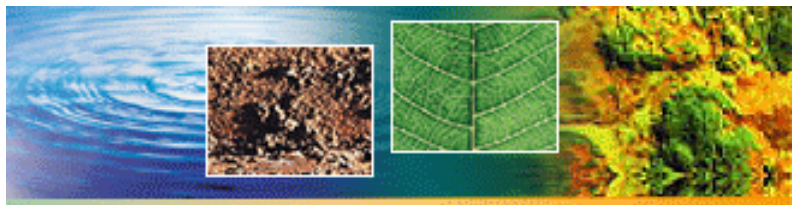


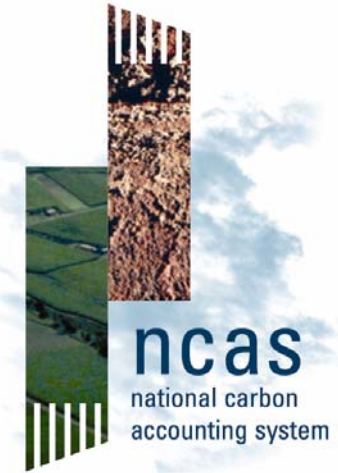
Cropland, Grazing Land Management and Revegetation

-

The experience of the National Carbon Accounting System of Australia



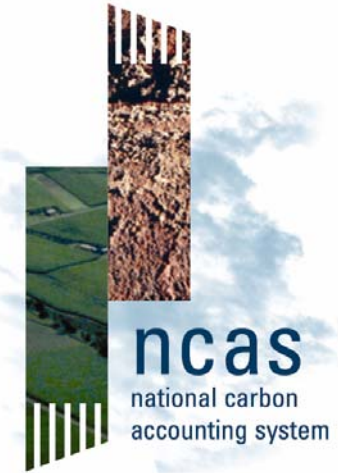
Where to start ...



- The definitions:
 - what are the activities and how will various processes, lands and gases be treated?
 - what is the spatial scale required?
 - what is the reporting period (temporal scale)?
 - treatment of indirect (eg time under cultivation) and natural effects?
 - identification of managed and unmanaged lands?



Policy and Practice



- The inclusion of LULUCF in the Kyoto Protocol demanded the development of specific methods
 - The manner of inclusion of Articles 3.3 and 3.4 was not consistent with the 1996 Guidelines framework for LUCF in UNFCCC NGGIs and overlaps with the Agriculture (Article 3.1) reporting



Marrakesh Accords (3.4)



- Set out key definitions
- Provided a basis for land identification (inclusion)
- Set out net-net accounting for all but Forest Management (gross but capped)
- Set net-net as 5x1990 against 2008-2012
- Set out the pools and gases to be reported
- Established principle of reporting all emissions once land enters framework



Good Practice Guidance

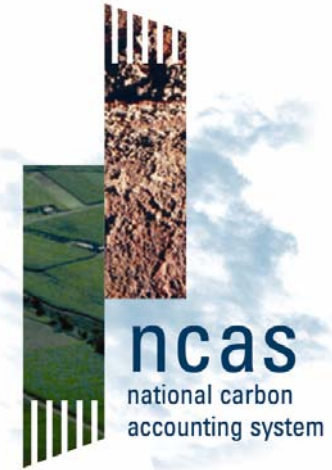
LUCF



- Recognised the separate and different frameworks for UNFCCC and Kyoto reporting
- UNFCCC
 - Changed to a land based structure
 - Delineated managed and unmanaged lands
 - More inclusive of pools, processes and land areas
 - Introduced Tier 3 accounting methods
- Kyoto
 - Elaborated on 1996 UNFCCC methods (as defined in GPG) where necessary to accommodate new accounting and reporting frameworks (Article 3.1 and 3.3 precedence)



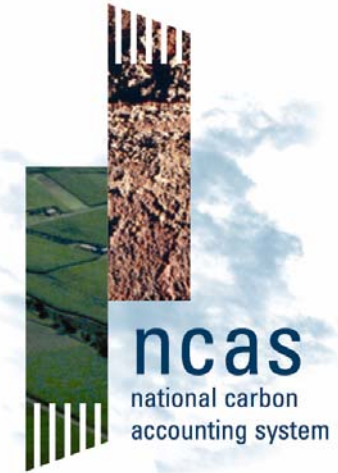
GPG – Chapter 4



- Provided implementation methods (eg how to deal with changing land use areas given net-net construction (nb only some conversions are 3.3))
- Interpreted meaning of geographically identifiable
- Homogenised landscapes (eg cropland can contain forest and be reported as cropland unless deforested)
- Flexibility in country choice of a land cover or land use based system (eg are forests in forest management or grazing land)
 - Nb- the land use activities under 3.4 are similar but not the same as UNFCCC
- Reconciliation with Article 3.1



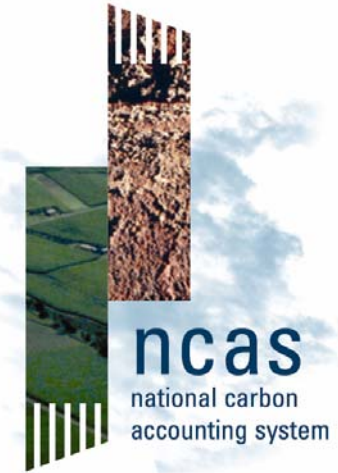
Agriculture Sector Coverage



- CH₄ from enteric fermentation
- CH₄ and N₂O from manure management
- CH₄ emissions from rice cultivation
- CH₄, N₂O, CO, NO_X from savannah burning
- N₂O from soils



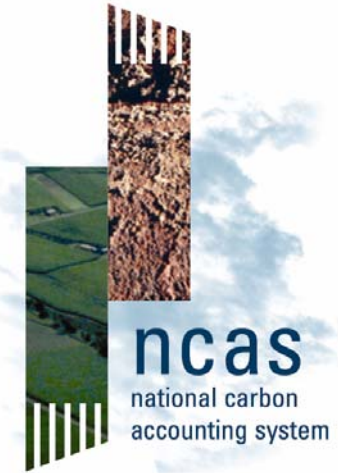
Processes Accounted



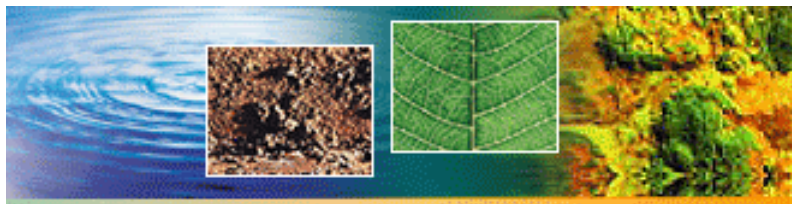
- All anthropogenic emissions on managed lands:
 - GPG doesn't directly state that only anthropogenic emissions are accounted
 - Does not provide methods to separate natural and anthropogenic sources
 - Managed v Unmanaged lands delineates anthropogenic



Accounting Steps



- Land use area identification
 - Finding and monitoring land areas from 1990 and separating from Article 3.3
- Land management
- Emissions estimation
- Reconciliation with other sectors
 - Lands reported elsewhere (eg Article 3.3 lands)
 - Gases reported elsewhere



Australia to date- Tier 3 & Approach 3

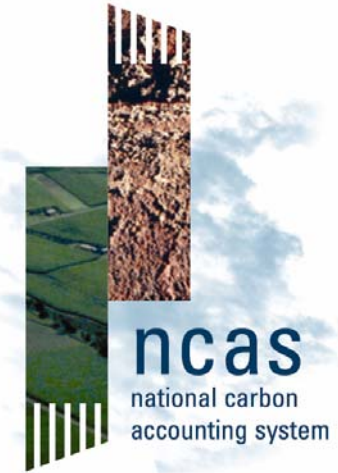


- Remote sensing of woody & forest cover - Landsat 30 year (14 national) time-series
- Remote sensing of land use – high frequency NDVI trace
- Surface interpolations for monthly climate
- Crop/grass yield data
- Modelled tree growth
- Modelled soil/litter C
- Modelled non-CO₂

integrated mass balance
C:N ratio with
boundary layer for N₂O
emissions estimation



Revegetation Issues



- Lands
 - 1990 and Commitment Period – units of land much like AR&D
- Pools and gases
 - All unless a proven sink (no products)
- Setting a 1990 account
 - A baseline (without activity 1990 account)
- Sinks and sources in 1990
 - Limited, but climate variable
- Relationship with other reporting sectors
 - Lands may come from cropland or grazing land



Identifying Lands for Revegetation

- Only feasible using remote sensing of non-woody/woody cover
 - Low signal of interest
 - Use of texture in addition to spectral content
 - Time-series probability network (14 over 32 years)
 - Neighbourhood (spatial pattern matching) not pixel-by-pixel
 - Landsat but using high resolution for 2-stage sample



Estimating sinks and sources



- Typically low productivity and therefore non-CO₂ of little consequence
- Modelled estimates of carbon stock and non-CO₂
- Biomass modelled by site productivity
- Soil carbon/litter decomposition modelled



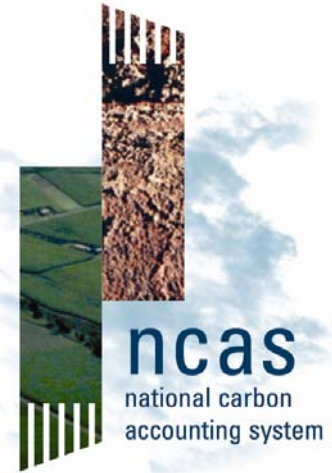
Grazing Land Management



- Lands
 - 1990 and Commitment Period (separate ID of savannahs)
- Pools and gases
 - all pools and gases unless shown to be a sink
- Setting a 1990 account
 - an identifiable year
- Sinks and sources in 1990
 - mostly grass and soil carbon stocks; non-CO₂ from non-savannah burning; heavily dependent on rainfall
- Relationship with other reporting sectors
 - excludes those under 3.1, non-CO₂ from savannah burning, soil
 - net of Article 3.3 deforestation



Identifying Lands



- By land use or land cover?
- If land use
 - grasslands identified by remote sensing
 - grazed woodlands/savannahs by traditional tenure mapping
- Use of NDVI trace and rainfall to identify pasture yield/quality
- Management practice by survey



Estimating sinks and sources

- Varying productivity – both CO₂ and non-CO₂ gases varying
- Modelled estimates of stocks and fluxes
C:N integrated model
- Monthly models; time-series consistent
1970 and forward



Cropland Management

- Lands
 - 1990 and Commitment Period
- Pools and gases
 - all pools and gases except those shown to be a sink
- Setting a 1990 account
 - an identifiable year
- Sinks and sources in 1990
 - crop and soil carbon; CO₂ and non-CO₂ from biomass burning
- Relationship with other reporting sectors
 - exclusive of 3.3 & 3.1; non-CO₂ from soil, rice cultivation



Identifying Lands

- Using remote sensing to identify crop areas and crop type
 - Use of high temporal frequency NDVI
- Management practice by survey



Estimating sinks and sources

- Integrated C:N model at monthly time-steps
- Currently by reported yields, moving to modelled crop/type yield estimation methods

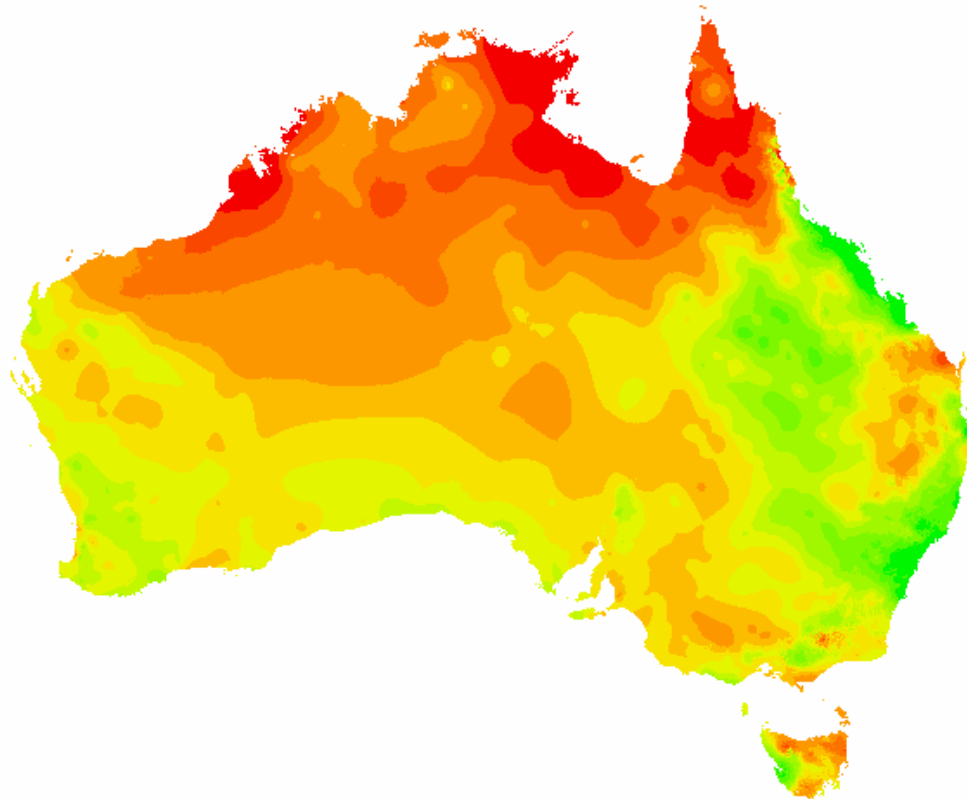
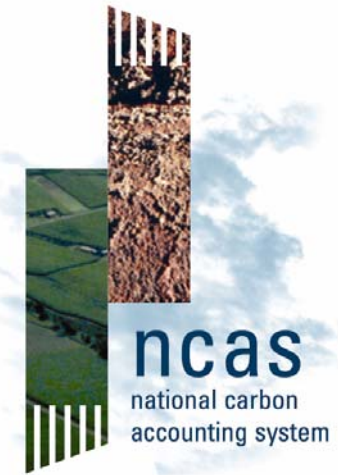


Understanding the base year

- Will be mostly about C-stocks as non-CO₂ largely under Article 3.1
- C-stocks fluctuate by rainfall



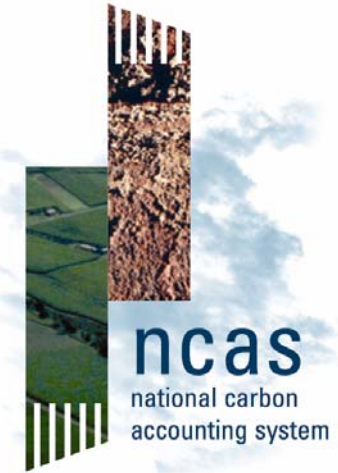
+/- 1990 rainfall to aver.



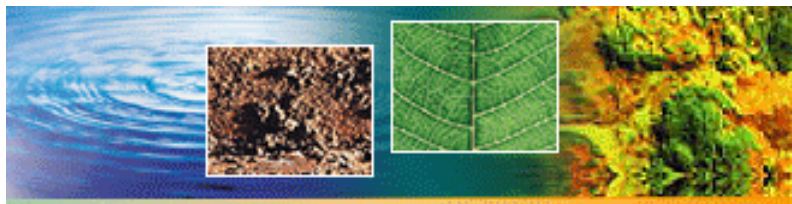
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-  0mm - 50mm
-  50mm - 100mm
-  101mm - 200mm
-  201mm - 300mm
-  301mm - 400mm
-  401mm - 500mm



Validation and NCAS Toolbox



- The publicly available NCAS as a point-based model:
 - web-based access to spatial data/databases
 - defaults reflect inputs to national model
 - publication series in searchable format



Information exchange

- NCAS Toolbox model calibrations can be saved at around 40kb – readily interchanged/exchanged for review





