Centre for Energy and Environmental Markets

UNSW THE UNIVERSITY OF NEW SOUTH WALES SYDNEY • AUSTRALIA

Environmental Markets, Carbon Markets and Australian Experiences

Ecological Conservation in Forestry
ACEDP Brainstorming Workshop
Beijing, 2-4 December 2008

Dr Iain MacGill, Joint Director - CEEM

CEEM established …

- *to provide a formal interdisciplinary framework* for joint work between UNSW researchers in Engineering, Business, Social Sciences, Environmental Sciences…
- *through UNSW Centre* providing Australian research leadership in interdisciplinary design, analysis + performance monitoring of energy + environmental markets, associated policy frameworks
- *in the areas* of
  - Energy markets
  - Energy related environmental markets
    - National Emissions Trading, Renewable Energy Targets, Energy Efficiency, Renewable energy support…
  - Broader policy frameworks and instruments to achieve desired societal energy and environmental outcomes

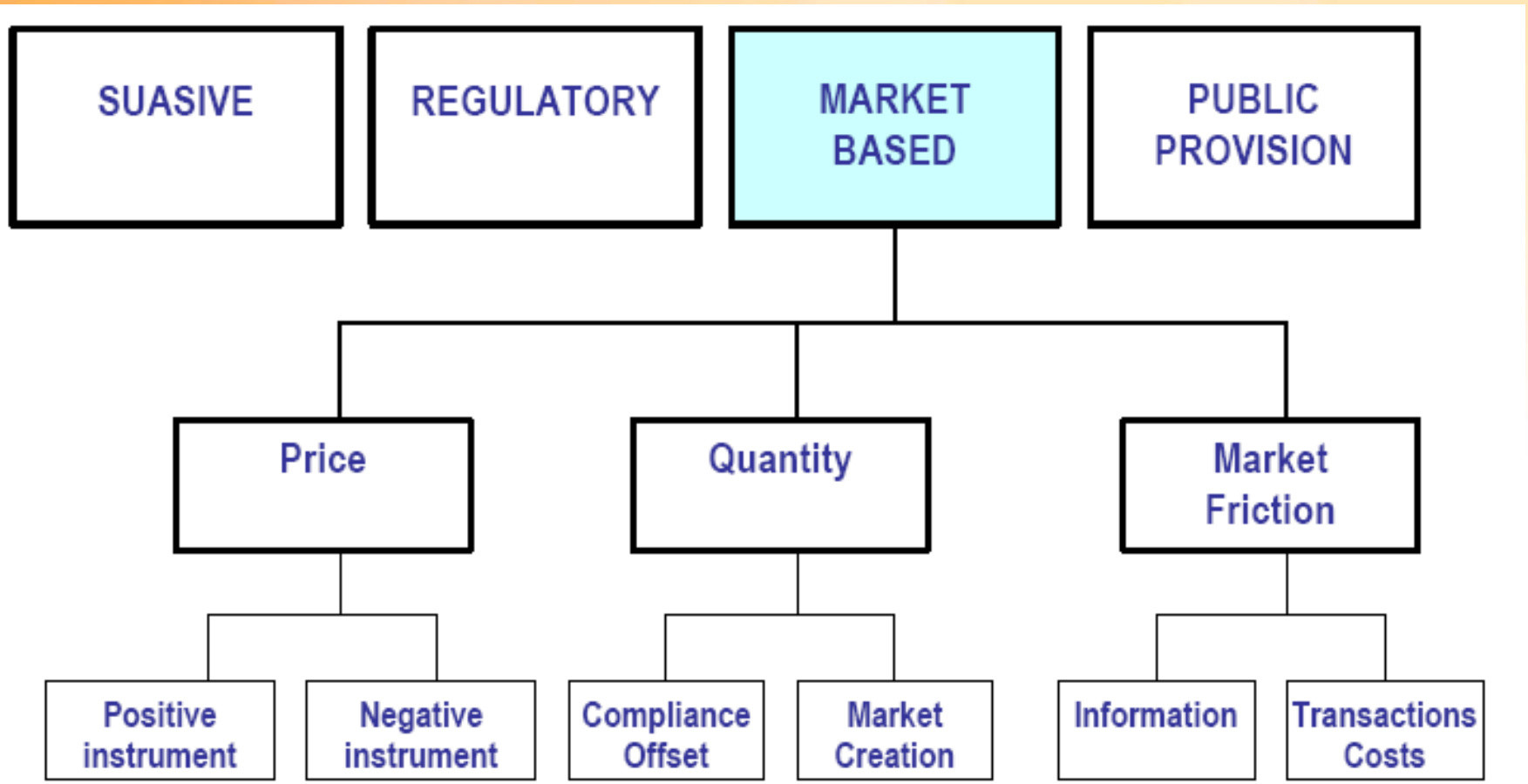
Ecosystem services

- "*…ecosystem services are the benefits people obtain from ecosystems*" *(Millennium Ecosystem Assessment)*

	Forests	Cultivated / Agricultural Lands
Environmental Goods	• Food • Fresh water • Fuel • Fiber	• Food • Fuel • Fiber
Regulating Services	• Climate regulation • Flood regulation • Disease regulation • Water purification	• Climate regulation • Water purification
Supporting Services	• Nutrient cycling • Soil formation	• Nutrient cycling • Soil formation
Cultural Services	• Aesthetic • Spiritual • Educational • Recreational	• Aesthetic • Educational

(UNEP, Payments for Ecosystem Services: Getting Started, 2008)

Policies for Natural Resource Management



(BDA, Market-based instrument decision support tool, 2008)

Possible strengths of Market-Based Instruments

- *Suasive approaches* : provision of information
  - Limits to what Codes of Practices, guidelines, R&D can achieve alone
- *Public provision* of services: public goods difficult or uneconomic to manage by private sector
  - Limits given the important role of private sector in most economic sectors
- *Regulatory approaches:* penalise non-compliance with standards, licensing
  - can promote inefficiency, inhibit innovation because usually imposes uniform requirements while land managers have different capabilities, costs & benefits
- *Market-based instruments* : incentivise change via mkt signals
  - Price; Subsidies, grants taxes, tax concessions, stewardship payments
  - Quantity; market creation, offsets schemes
  - Market Friction; accreditation, labelling
  - *Encourage those who can most cost effectively supply natural resource or environmental improvements to do so.*

(Adapted from BDA, 2008)

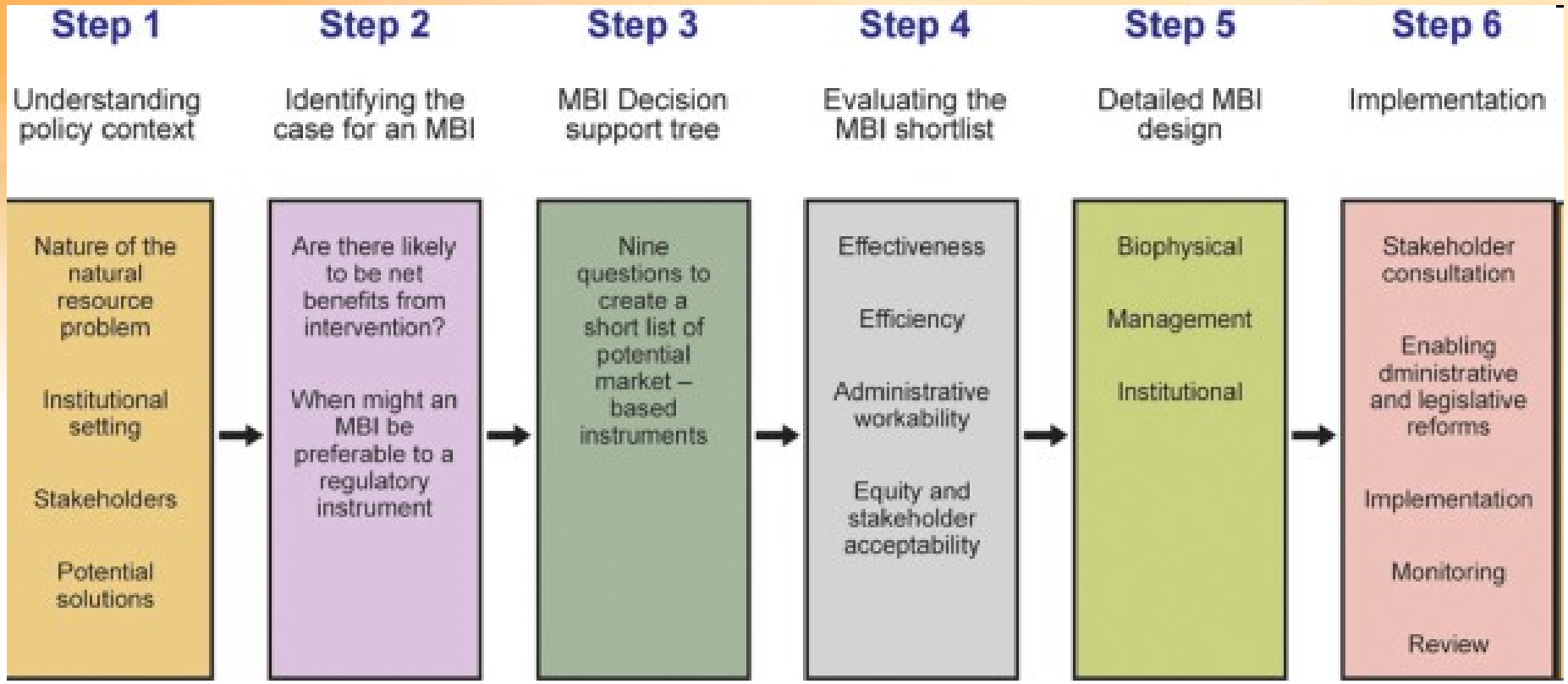
Designing tradeable Market-Based Instruments

- Markets require
  - Tradeable fungible commodity
    - permits, allowances (cap and trade); certificates, credits (baseline and credit) of commodity (eg. tCO2-e)
  - Buyers
    - Government (eg. tenders), mandated parties (eg. emissions trading), voluntary (eg. green consumers)
  - Sellers
    - Voluntary participants motivated by profitable opportunities (‘baseline and credit’)
    - Governments (eg. permit auctions) or obliged buyers with excess

Challenges for MBI Design

- Novel ‘Designer’ markets
  - abstractions & design choices have major impact on scheme effectiveness, efficiency
- Appropriate baselines
  - required in ‘baseline and credit’ schemes to ensure additionality
- Broad reach of market-based tools
  - increases potential for adverse interactions with other policy objectives
- ‘market for lemons’ risks
  - where measurement, verification and additionality difficulties; ‘poor quality’ low-cost projects crowd out ‘high quality’ activities
- Creating transparent, liquid markets
  - that allow efficient price discovery and risk management by participants
- *Particularly challenging for*
  - *Baseline and credit schemes*
  - *NRM and Climate Services*

Possible design process for MBI in NRM



(BDA, 2008)

Australian examples of MBIs in NRM

- Price
  - assign price to environmental impacts within existing markets through positive (e.g. competitive grants via tenders) or negative (e.g. charges)
  - Generally understood costs but uncertain environmental outcomes
  - *Examples: Victorian Government BushTender, EcoTender*
- Quantity
  - restrict total level of activity, allocate rights to undertake then allow trade (eg. Offsets, Carbon markets)
  - Achieve desired environmental outcome but uncertain costs
  - *Examples: NSW Greenhouse Gas Reduction Scheme (GGAS), forthcoming National Carbon Pollution Reduction Scheme (CPRS), NSW Bio-banking, Victorian BushBroker*
- Market Friction
  - Help existing markets work better through information, accreditation.. *Examples: Greening Australia Pilot Land Innovation Fund, Federal Govt accredited voluntary Greenhouse Friendly program*

(Adapted from BDA, 2008)

Price MBI – Victorian EcoTender

- Targets multiple environmental outcomes
  - habitat for native animals, protection of ecosystems, biodiversity, water quality, salinity, carbon sequestration
- Design challenge
  - estimate quality & quantity of multiple environmental outcomes that result from individual landholder actions
  - reveal landholders who can provide low cost high quality env. outcomes
  - Ensure landholders undertake agreed land management actions despite difficulty monitoring individual actions
  - ensure any negative environmental impacts are accounted for
- Tools
  - Victorian habitat hectare methodology to estimate biodiversity impacts
  - Catchment Modelling Framework (CMF) to estimate water quantity and quality impacts, carbon and saline land.

=> determine Environmental Benefit Index (EBI) for each bid
Carbon benefits kept separate

(Adapted from www.marketbasedinstruments.gov.au)

EcoTender methodology & outcomes to date

- Expressions of interest by land managers
- Site assessments by Field officers
- Development of management plans by landowners & field officers
- Submission of bids - management plans and bid price
- Bid assessment wrt highest EBI/$
- Management agreements. formal contracts
- Payments and reporting against agreement

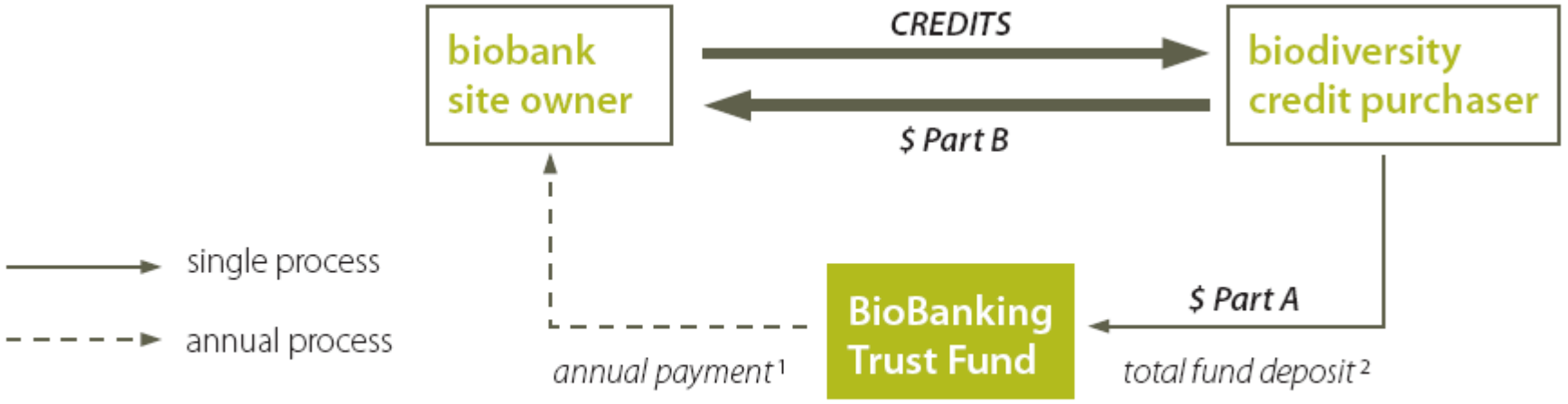
- Outcomes to date in Pilot
  - Requires significant scientific & modelling capability to inform process
  - Potential synergies in developing multiple-objective tenders.
  - Tender process incentivises landholders to reveal true costs of actions
  - 62% of bids successful, 97% of these had multiple env. outcomes
  - $ price for carbon offsets can reduce cost to govt. of achieving other environmental outcomes

VIC BushBroker / NSW BioBanking

- BushBroker
  - system to establish, register and trade native vegetation credits
- BioBank
  - system to rule-based, transparent market in biodiversity credits
  - use for conservation goals, offset adverse impacts of developments

BushBroker / BioBanking performance

- Only limited experience to date but promising opportunities
- Possible challenges
  - Fungibility of biodiversity, native vegetation across different sites
  - Certification and verification processes to ensure additionality
  - Ensuring longer-term maintenance of offsets
  - Perverse incentives? eg. allow proposed development sites to degrade?



1 Annual payment as per schedule in biobanking agreement
2 Based on present value of estimated management cost

(NSW DEC, 2008)

Carbon markets and Land-use

- Agriculture, Forestry and Other Land Use (AFOLU)
  - ~ 30% of global GHG emissions & cost effective reduction options
- Complex challenges and opportunities
  - Deforestation ~20% of emissions
  - Response of ecosystems to climate change
  - Potential renewable energy sources offsetting fossil-fuel use
  - Potential low-emission materials
  - Significant opportunities for carbon sequestration
  - Many related issues in land-use: water, biodiversity, livelihoods
- Key issues for MBI approaches – integrity and credibility
  - Verifiability: measurement, monitoring and enforcement
  - Project additionality: inevitably counter-factual
  - Leakage: of emissions via shifted projects, products via alternatives
  - Permanence: sequestration impacts by human or natural occurrence
  - Timing of sequestration

Adapted from (CRS, Report to Congress, 2008)

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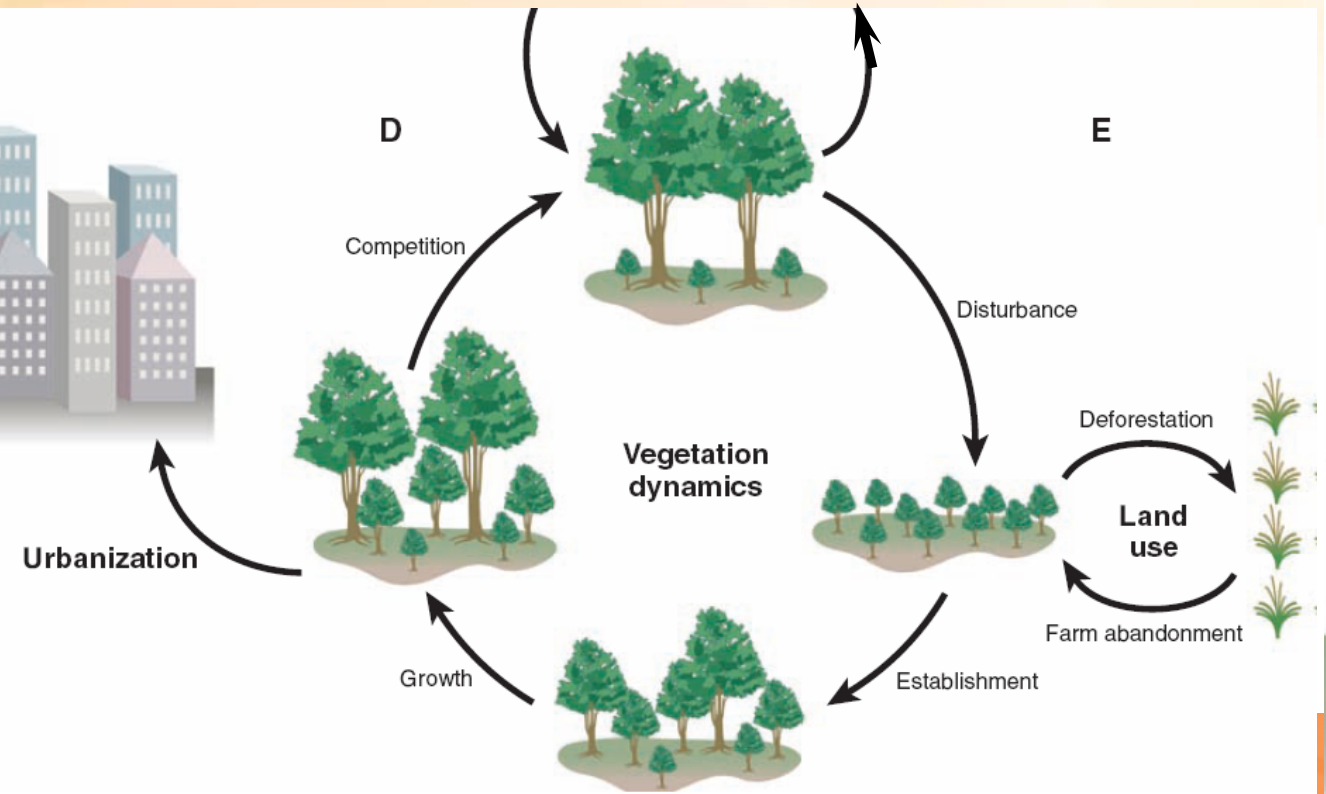
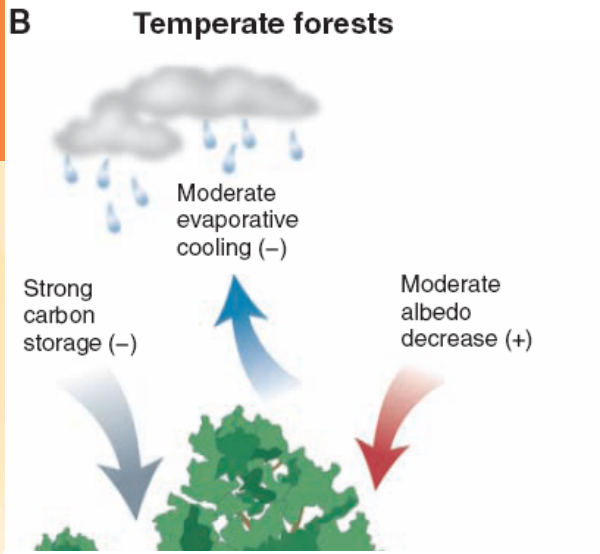
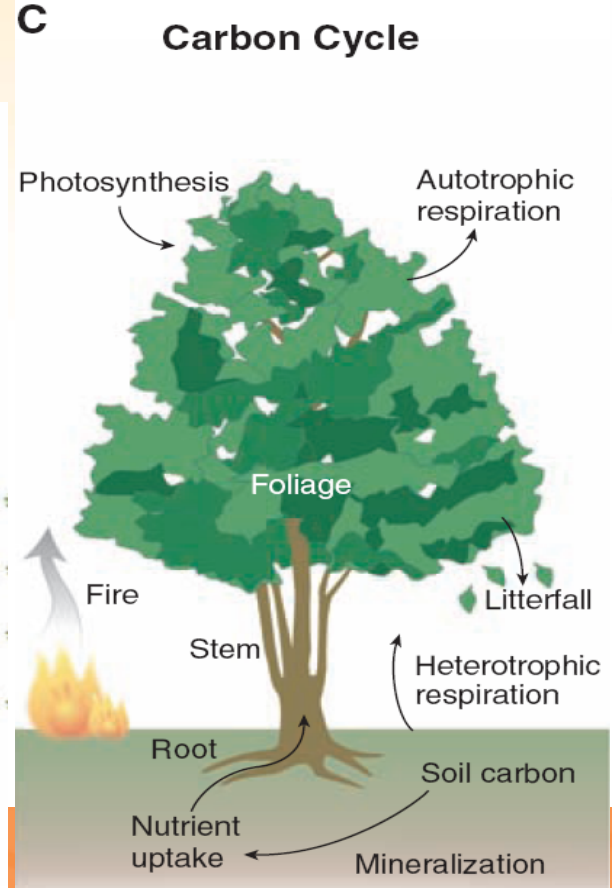
Forest and carbon complexities

- Wider climate services of forests
- Complex carbon cycle
- Complex human/natural dynamics

(Science, Future of Forests, 2008)







Forestry in some key carbon markets

- Regulatory
  - Kyoto Protocol
    - Developed countries required to include deforestation, reforestation and afforestation (Article 3.3), can include other changes in land-based carbon stocks (Article 3.4)
    - Flexibility mechanisms: CDM afforestation & reforestation
  - EU ETS
    - Domestic forestry outside cap, no international forestry credits
  - RGGI
    - Domestic forest conservation & reforestation
  - NSW Greenhouse Gas Reduction Scheme
    - Australian forest afforestation & reforestation
  - Forthcoming Australian National CPRS
- Voluntary
  - Chicago Climate Exchange (CCX)
  - Voluntary Retail Carbon Markets eg. Voluntary Carbon Standard (VCS)

NSW Scheme – a 'designer' market

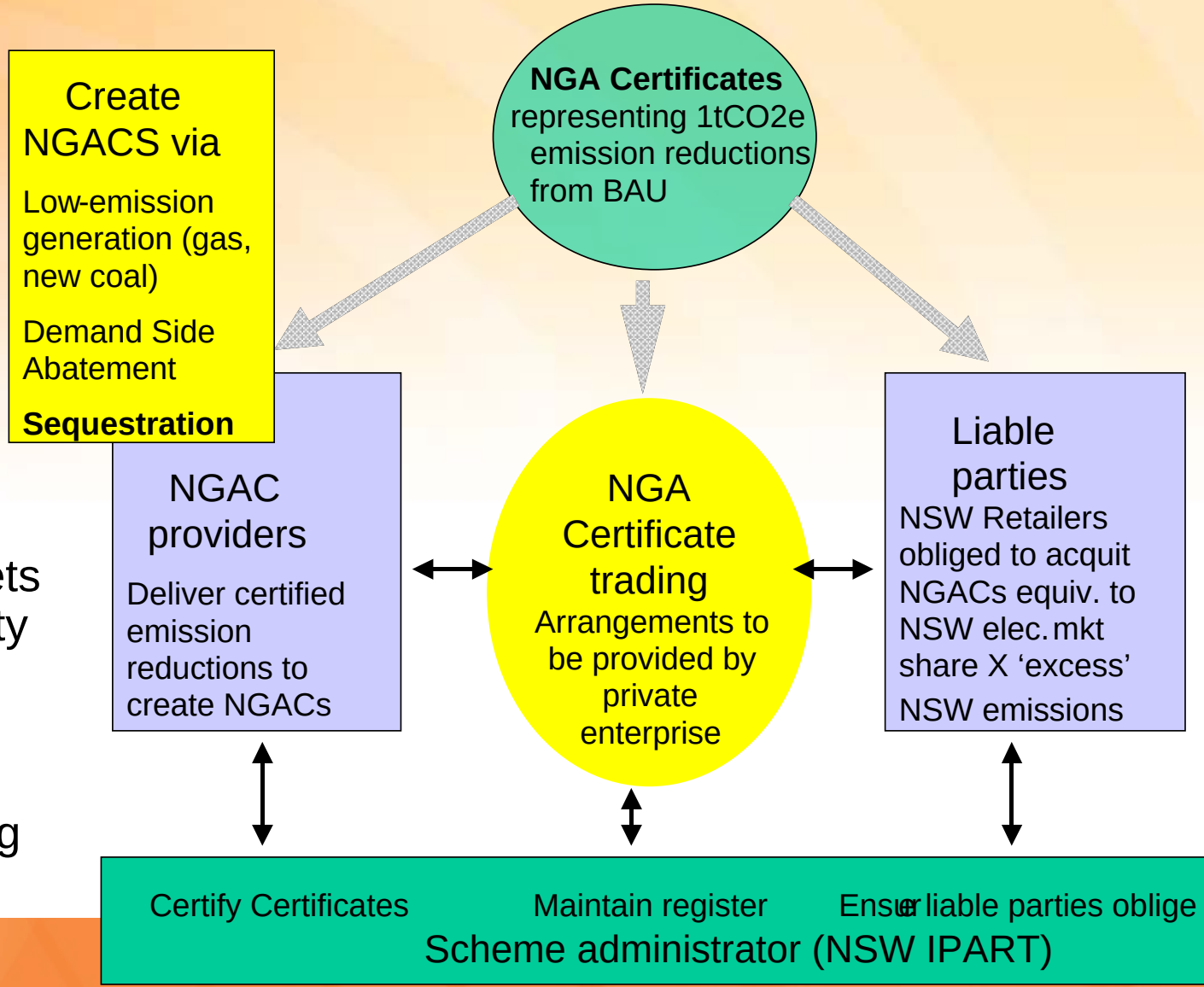
Policy intent

"reduce GHG emissions associated with the production and use of electricity..."

Implementation

State per-capita greenhouse targets for NSW Electricity Industry

Baseline+credit 'emissions reductions' trading



Forestry in NSW GGAS

- Eligibility criteria
  - capability of organisation to do carbon accounting & maintain long-term commitments involved
  - eligibility of forest (consistent with Kyoto Protocol)
  - ownership or control of registered carbon sequestration rights on land title
- Creation of certificates
  - only permitted once assessed for given period, no forward trading
- Activities
  - conservation-style forestry, commercial, rotational harvest forestry.
- Models
  - include National Carbon Accounting Toolbox (NCAT)
- Standards
  - Interim Australia Standard AS4978.1(Int.)2002 – *Carbon Accounting for Greenhouse Sinks Part 1:Afforestation & Reforestation*

Forestry GGAS Outcomes

- Challenges for participation due to documentation, legal requirements
  - 6 accredited providers
- Modest abatement to date c.f. other options

Table 6.1 Certificates created to date

Vintage	Generation	Demand Side Abatement	Carbon Sequestration	Large user	Total
2003	6,317,835	345,141	0	0	6,662,976
2004	6,744,232	742,233	166,005	0	7,652,470
2005	7,879,171	1,509,199	538,471	94,277	10,021,118
2006	9,548,179	8,934,236	587,853	790,460	19,860,728
2007	12,827,675	9,975,356	698,765	1,288,383	24,790,179
Total	43,317,092	21,506,165	1,991,094	2,173,120	68,987,471

Figure 4.1 Plant-grow-harvest carbon storage

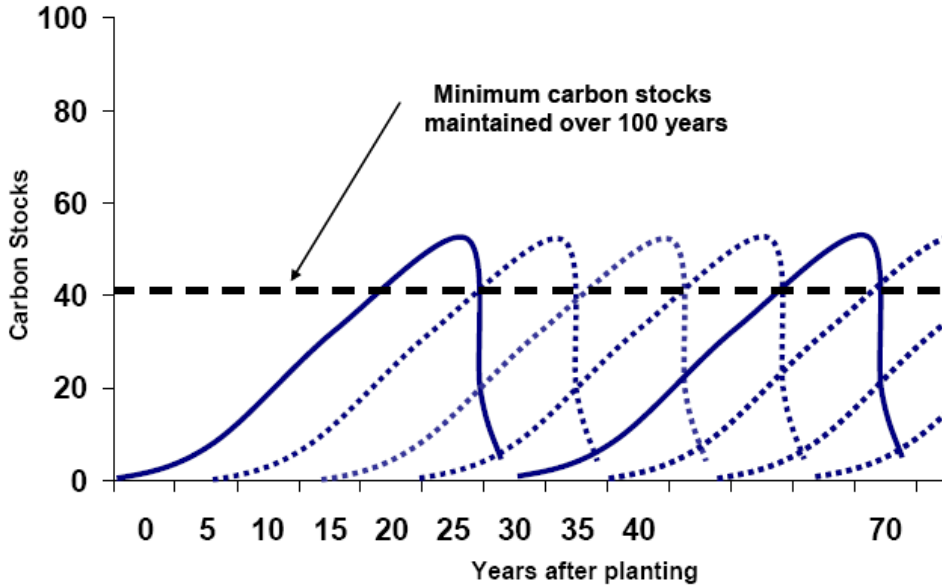
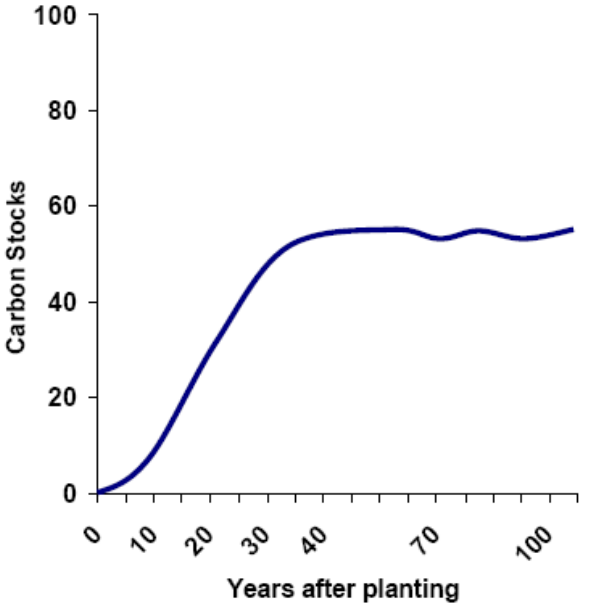
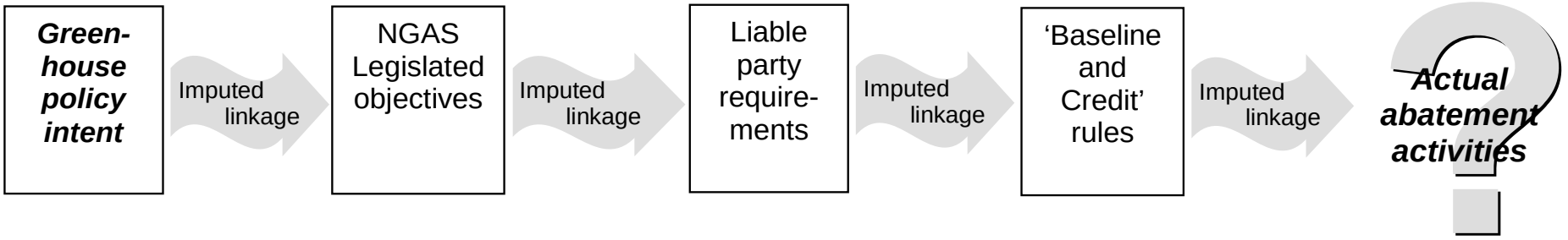


Figure 4.2 Permanent forest carbon storage



Broader challenges of GGAS design

- Highly abstracted design
  - major separation between policy objectives + commercial arrangements + physical outcomes
- Very wide scope
  - Adds complexity, dilutes accountability
  - Risks creating a 'market for lemons'
- Complicated transition to forthcoming national CPRS

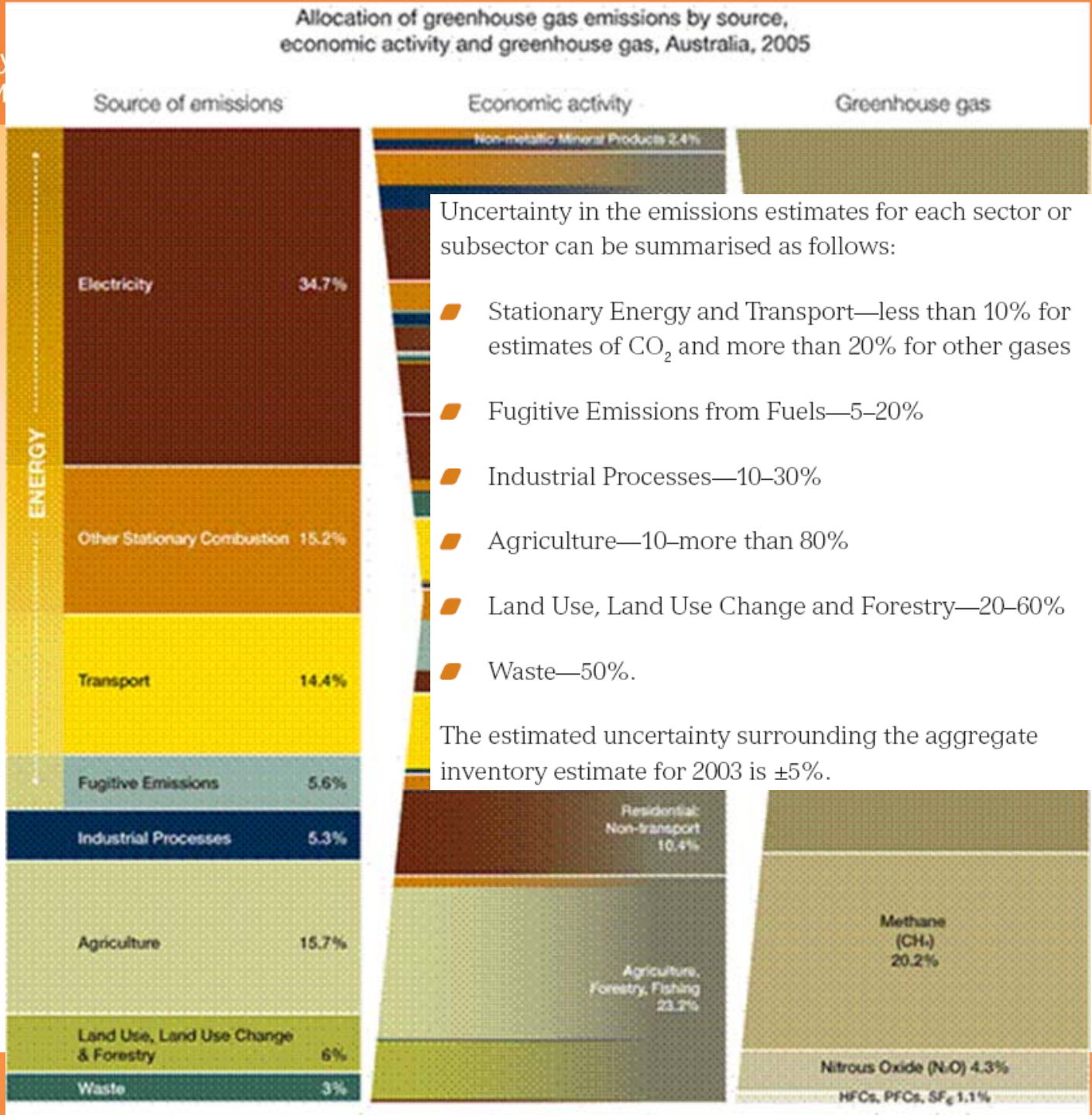


Australia's estimated greenhouse emissions

(PM Taskgroup, 2007)

Note emissions uncertainties for different sectors

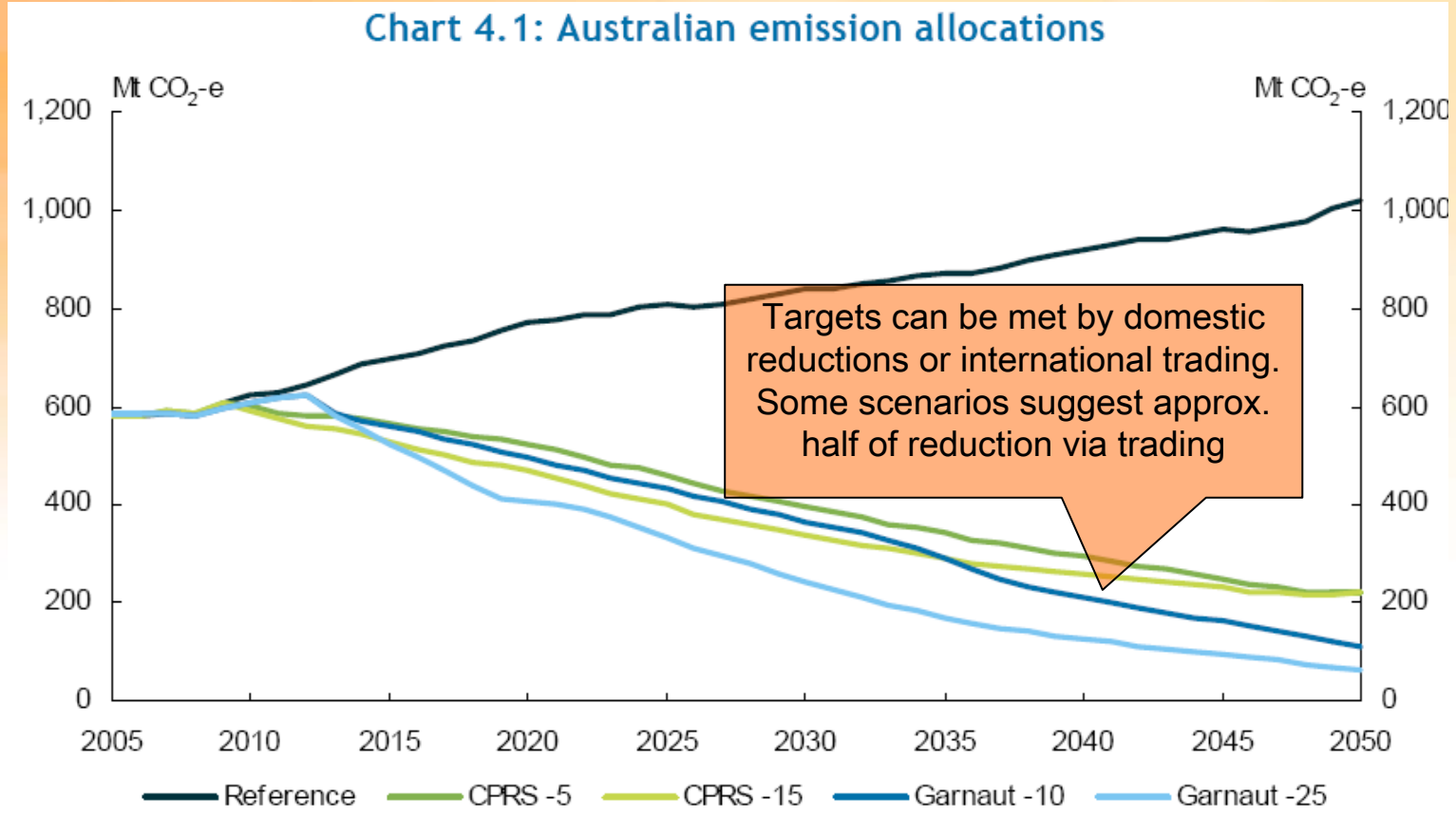
(Aust. Govt, 2005)



Carbon Pollution Reduction Scheme

- Proposed Coverage
  - 6 Kyoto gases, ~75% national emissions
  - ~1000 firms with mandatory obligations, otherwise upstream liability on fuel
  - Agriculture coverage not before 2015
  - Forestry opt-in 2010
    - Reforestation projects can opt-in to receive permits for sequestration, however, liabilities when harvesting
  - Limited scope for offsets
- International linking
  - Preference for open links over time
  - Allow use of Kyoto units for compliance
  - Some initial restrictions – no transfer of permits outside Australia
  - Provide five years certainty to market on types and quantities of international units allowed

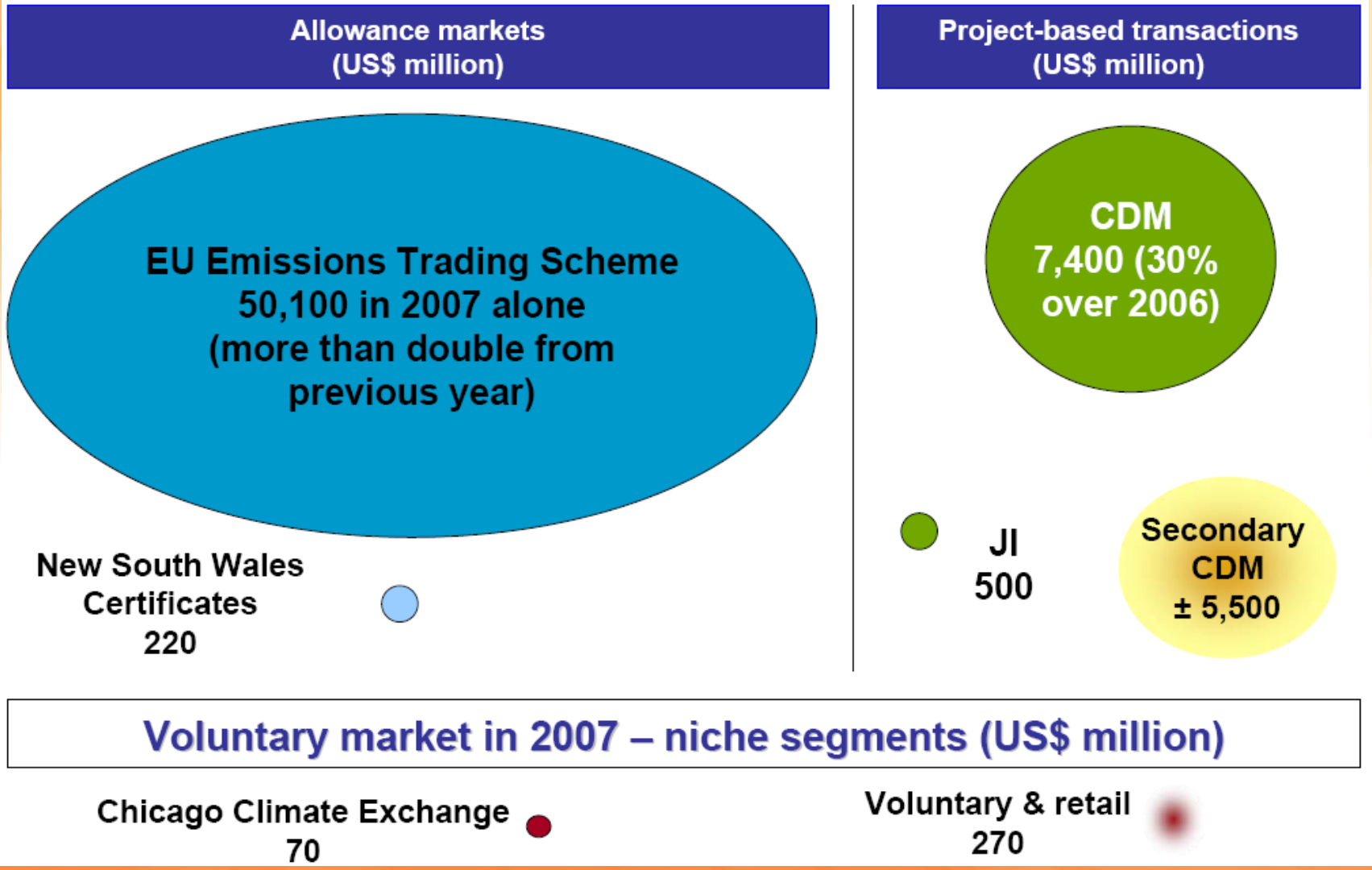
Australian Treasury scenarios for CPRS



Stabilisation goal (ppm)	550	510	550	450
Emissions change 2000 in 2020/2050 (%)	-5/-60	-15/-60	-10/-80	-25/-90

(Australian Treasury, *Australian Low Pollution Future*, 2008)

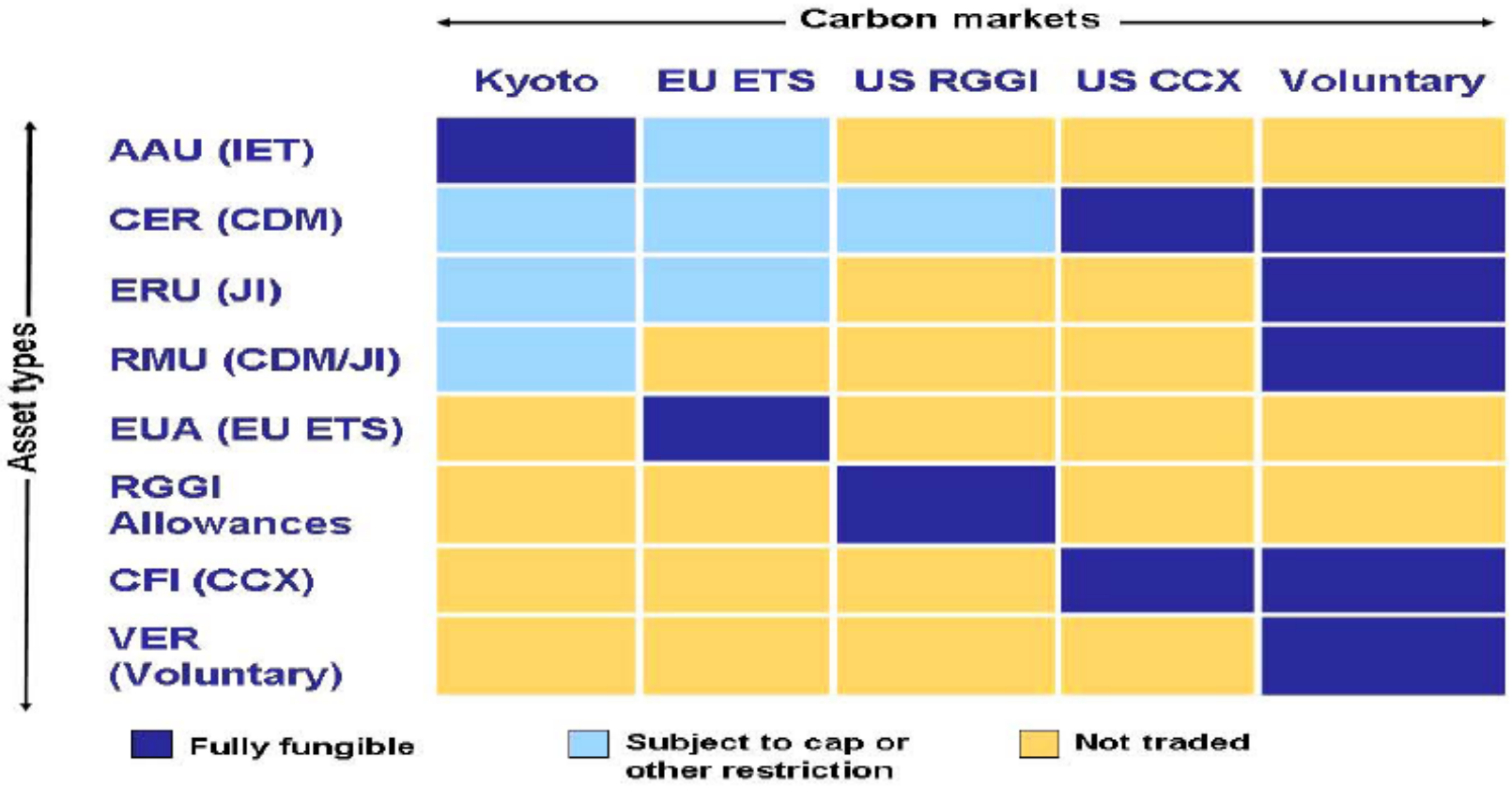
International carbon markets



(World Bank, Carbon Markets Report, 2008)

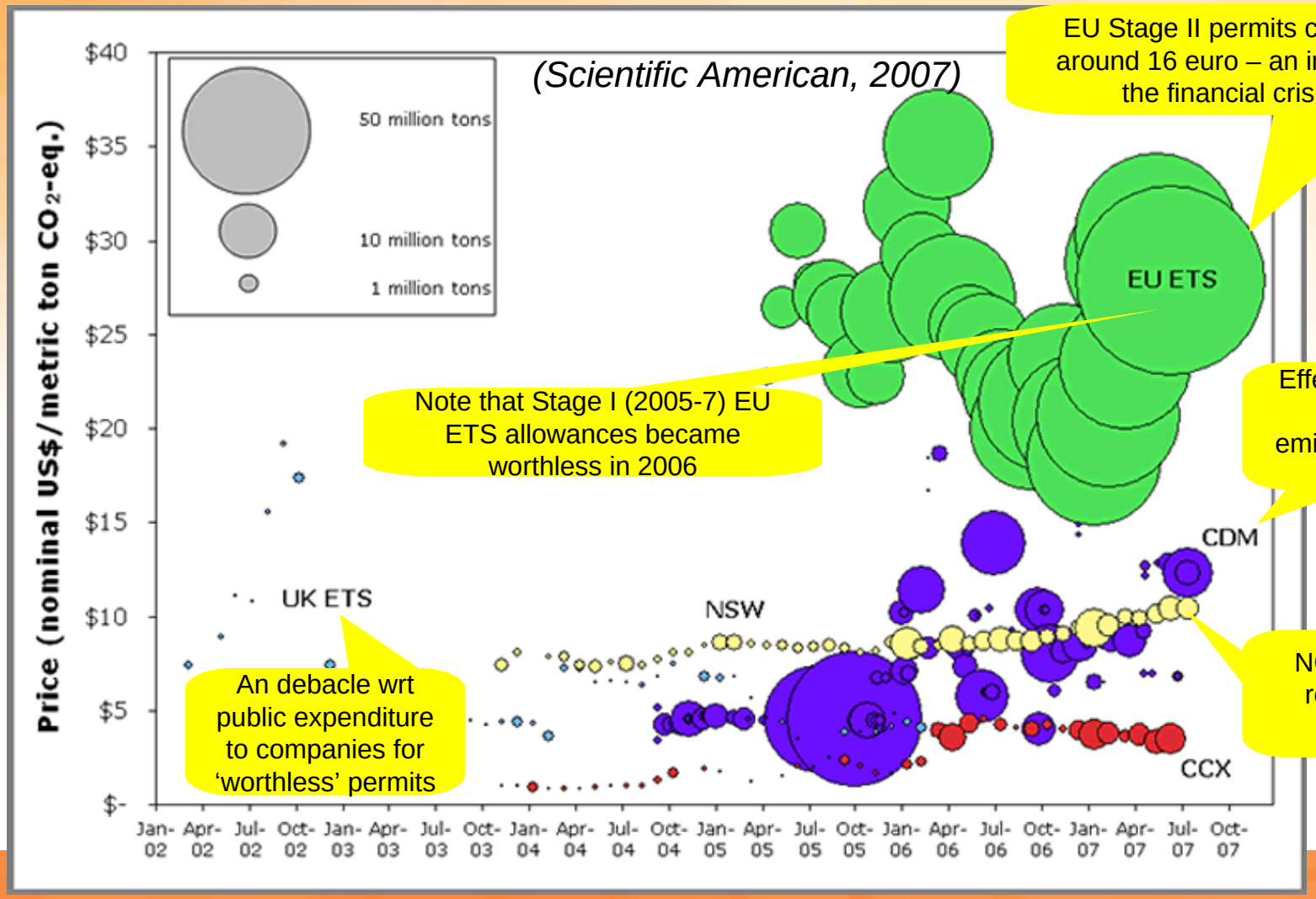
Complex mix of markets & instruments

8 carbon assets trading in at least 5 markets



(World Bank, Carbon Markets Report, 2008)

Market performance to date has been mixed



EU Stage II permits currently around 16 euro – an impact of the financial crisis?

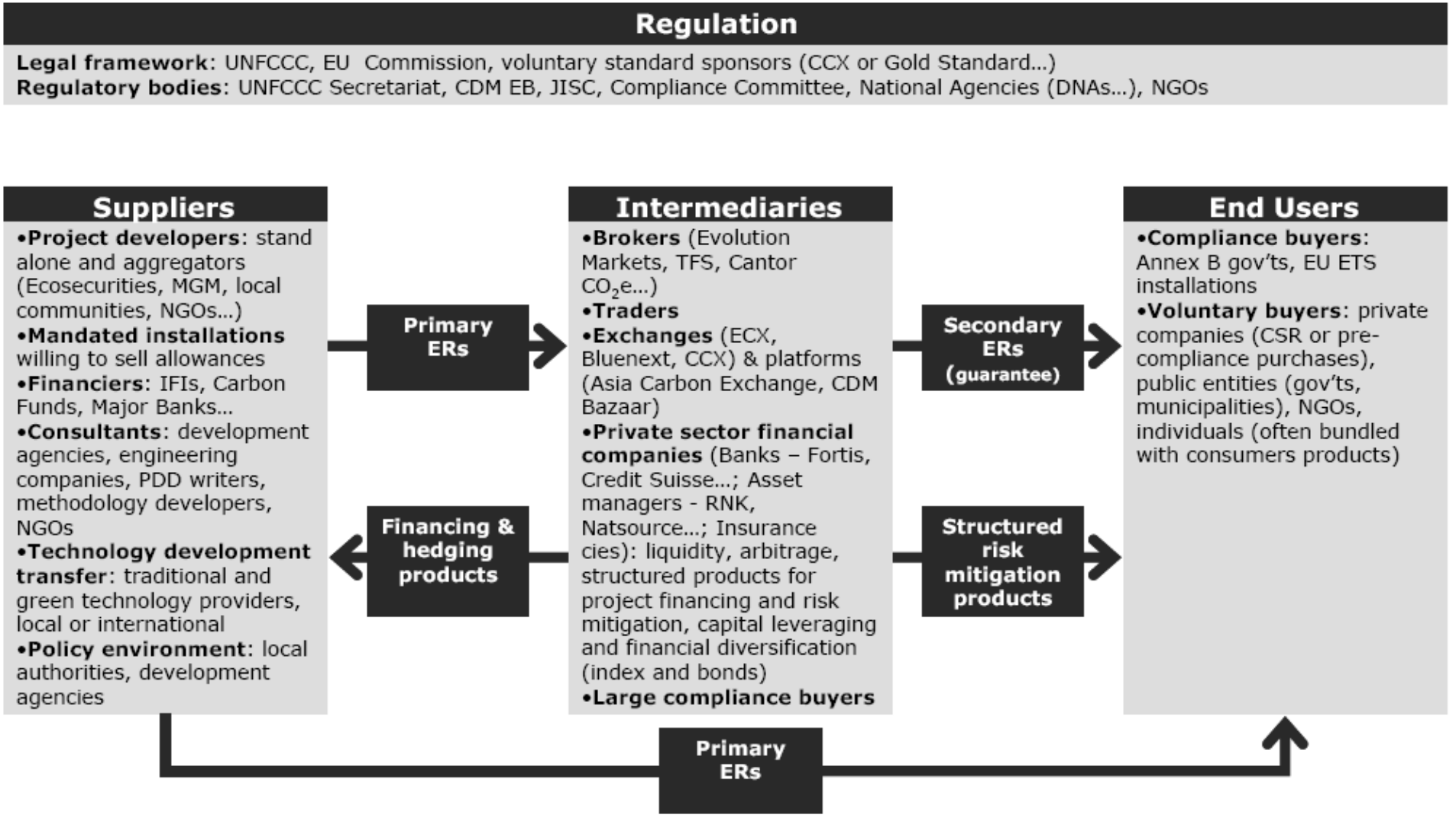
Note that Stage I (2005-7) EU ETS allowances became worthless in 2006

Effectiveness in reducing emissions under question

An debacle wrt public expenditure to companies for 'worthless' permits

NGAC prices recently fell 50+%

Clean Development Mechanism



Forestry in CDM

- Limited activity
  - 27 CDM afforestation/reforestation projects at various stages of development (10/08) out of 4000 total
  - No CERs yet issued, likely soon.
  - 1 A/R project registered with CDM EB (Pearl River venture in Guangxi, China, World Bank's BioCarbon Fund portfolio)
  - Expected <1% of CDM projects & CERs
- Reasons
  - Complexity of rules - only finalised in 2006 & project methodologies needed to address extra risks & verification requirements
  - A/R CERs not permanent, with complex set of rules surrounding crediting periods and re-verification
- *Post 2012?*

(China Sustainable Industrial Development Network, 2008-10-9)

Voluntary Carbon Markets eg. VCS

- Covered AFOLU activities
  - Afforestation, Reforestation and Revegetation (ARR)
  - Agricultural Land Management (ALM)
    - Improved cropland management
    - Improved grassland management
  - Improved Forest Management (IFM)
    - Conversion from conventional logging to reduced impact logging
    - Conversion of logged forests to protected forests
    - Extending rotation age of evenly aged managed forests
    - Conversion of low-productive forests to productive forests
  - Reducing Emissions from Deforestation (RED)
- Process
  - Verification
  - Validation of methodologies
  - Approval of Tools
  - Community and/or environmental impacts
  - *Non-permanence risk analysis & buffers*

(VCS, Guidance for AFOLU Projects, 2008)

Possible future directions

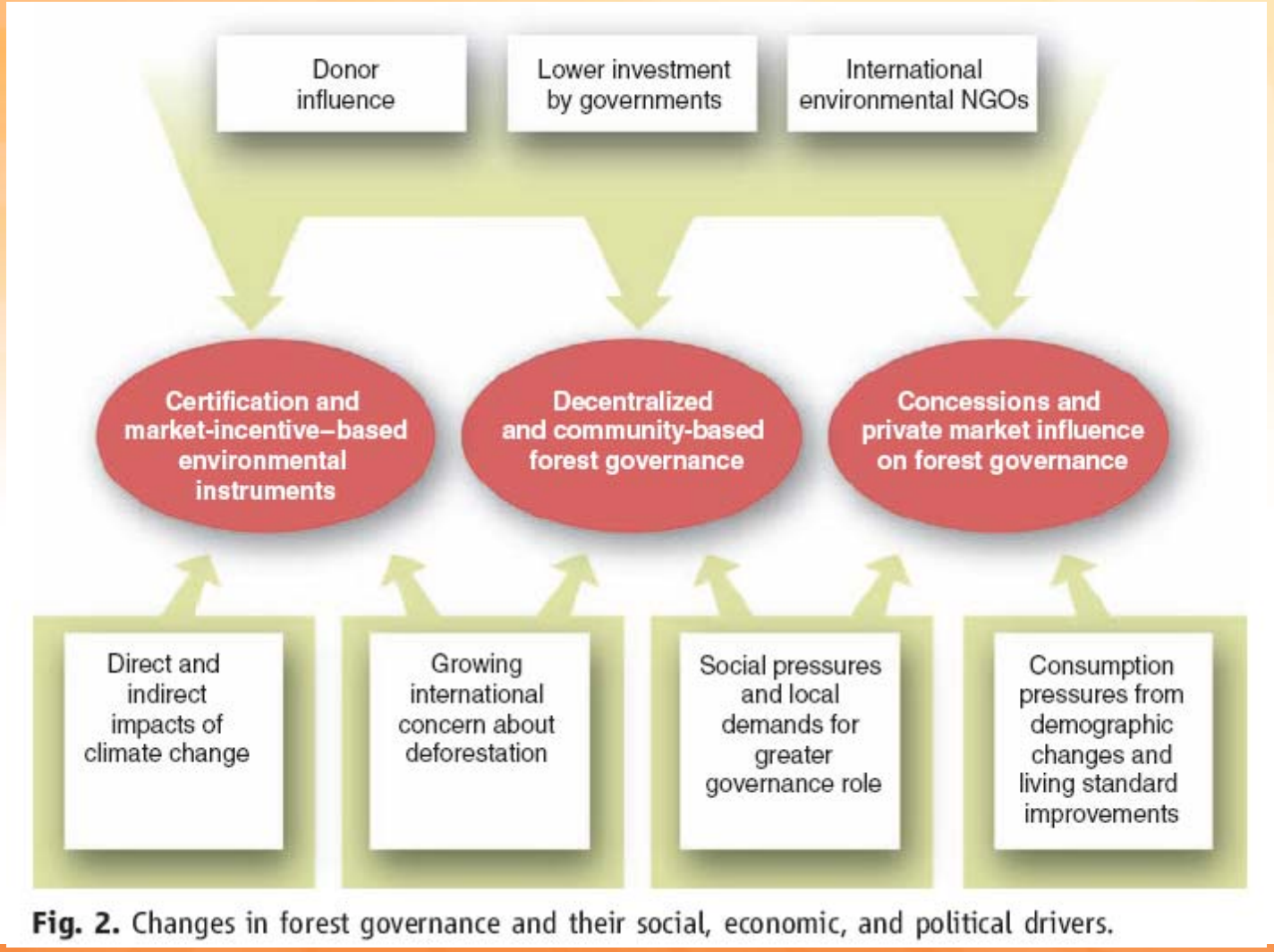


Fig. 2. Changes in forest governance and their social, economic, and political drivers.

(Agrawal et al, Science v320, 2008)

A role for AFOLU in international carbon markets

What is traded?	Units = tons of carbon dioxide (or equivalent) allocated as part of an emission cap or "reduced" by a project or program activity. These units are labeled based on the market segment in which they are traded : AAUs, CERs, ERUs, EUAs, VERs, etc.
What is the underlying principle?	Cost-effectiveness: a ton of CO_2 emitted anywhere in the world has exactly the same impact on climate change and should therefore be reduced/mitigated where the cost of doing so is lowest.
What are the benefits of the carbon market?	• Lowers compliance costs in countries with obligations to reduce emissions; • Catalyzes financial and technology flows to developing countries to facilitate low-carbon growth; • Creates a global and long-term price signal to lower carbon intensity.

- However,
  - Questionable fungibility between AFOLU & energy-sector emissions
  - Wider externalities of AFOLU activities
  - Very significant transaction (measurement, verification) costs for AFOLU inclusion in trading arrangements
- *And wider questions of post 2012 action … hence many challenges*

Diagram from (World Bank, Carbon Markets Report, 2008)

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Thank you… and *questions*

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