



















Centre for Ene	Sector	Key mitigation technologies and practices currently commercially available.
Environmental	Energy Supply	Improved supply and distribution efficiency; fuel switching from coal
	[4.3, 4.4]	to gas; nuclear power; renewable heat and power (hydropower, solar,
Abatement		applications of CCS (e.g. storage of removed CO ₂ from natural gas)
antiona nou	Transport	More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles;
options now	[5.4]	biofuels; modal shifts from road transport to rail and public transport
(FAR WGIII, 2007)		systems; non-motorised transport (cycling, walking); land-use and transport planning
	Buildings [6.5]	Efficient lighting and daylighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves, improved insulation; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases
	Industry [7.5]	More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-CO ₂ gas emissions; and a wide array of process-specific technologies
	Agriculture [8.4]	Improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and manure management to reduce CH ₄ emissions; improved nitrogen fertilizer application techniques to reduce N ₂ O emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency
	Forestry/forests [9.4]	Afforestation; reforestation; forest management; reduced deforestation; harvested wood product management; use of forestry products for bioenergy to replace fossil fuel use
	Waste [10.4]	Landfill methane recovery; waste incineration with energy recovery; composting of organic waste; controlled waste water treatment; recycling and waste minimization





	C (
	Sector	Key mitigation technologies and practices projected to be
Centre for Energy	Energy Supply	Carbon Capture and Storage (CCS) for gas biomass and coal-fired
Environmental Ma	[4 3 4 4]	electricity generating facilities: advanced nuclear power: advanced
Possible	[10, 11]	renewable energy, including tidal and waves energy, concentrating solar, and solar PV.
abatement	Transport	Second generation biofuels; higher efficiency aircraft; advanced
options later	[3.4]	batteries
(FAR WGIII, 2007)	Buildings [6.5]	Integrated design of commercial buildings including technologies, such as intelligent meters that provide feedback and control; solar PV integrated in buildings
	Industry [7.5]	Advanced energy efficiency; CCS for cement, ammonia, and iron manufacture; inert electrodes for aluminium manufacture
	Agriculture [8.4]	Improvements of crops yields
	Forestry/forests [9.4]	Tree species improvement to increase biomass productivity and carbon sequestration. Improved remote sensing technologies for analysis of vegetation/ soil carbon sequestration potential and mapping land use change
	Waste [10.4]	Biocovers and biofilters to optimize CH4 oxidation

















Centre for Energy and Environmental Markets Market design choices (I)				
Range of options:	from	to		
Approach	Cap and trade	Baseline and credit		
Сар	Fixed	Relative (e.g. per capita or output)		
Coverage	All economy	partial		
Liable party	Down stream (emitting sources, e.g. industry)	Up stream (energy producers) mid stream (retailers)		
Traded unit	Temporary	Long term		
Flexibility	Banking/borrowing allowed	Banking /borrowing not allowed		





Centre for Energy and Environmental Markets		UNSM		
Market desig	gn choices (II)			
Range of options:	from	to		
Allocation of allowances	Free allocation	Auction		
Free allocation basis	Historic emissions	Benchmarks		
New entrants	Free allocation	Buy on market		
Shut downs	Give permits back	Keep permits		
Monitoring / verification	Emissions / Intern	Reductions / Extern (Third party)		
Penalty /enforcement	Deterrent ensure reductions	Fixed penalty which act as price cap		















Centre for Energy and Environmental Markets	NSW
Inclusion of Aviation	
 From 2012 onwards (around 150Mt CO2 about 7% of current EL ETS) 	J
 Coverage: All flights arriving at and departing from Community aerodromes 	
Liable entity: Aircraft operators since they have the most direct control	-
 Cap (set by 2nd of August 2009): 2012: 97% of average of 2004-2006 emissions 	
 2013 onwards 95% of 2004-2006 emissions (subject to review) 	
 Allowances allocated to aviation sector can only be used for compliance of aviation sector (therefore no full fungibility with EL 	JAs)
 Allocation: 2012: 15% auctioned, 85% for free 	
 2012 1070 dubitioned, 0078 for free 2013 onwards: 3% in special reserve (new entrants and more than 'growth), 15% auctioned (subject to review), 82% allocated for free Free allocation based on verified tonne-kilometre benchmark 	18%
 International Kyoto Units: 15% limit for CERs and ERUs for 2012 	2

Centr Enviro	e for Energy and onmental Markets					UNSW
	Table 1: Carbon	Market at a Gla	nce, Volumes	& Values in 2	2007-08	
		200	7	2	008	
		Volume (MtCO;e)	Value (MUSS)	Volume (MiCO;e)	Value (MUSS)	
0 0		Project-based	Transactions	i		
e t	Primary CDM	552	7,433	389	6,519	
ΓŽ	JI	41	499	20	294	
0 7	Voluntary market	43	263	54	397	
la ti	Sub total	636	8,195	463	7,210	
<u>3</u>						
0 c		Seconda	ry CDM			
	Sub total	240	5,451	1,072	26,277	
. <u>⊐ Q</u>		Allowances	Markets			
N N	EU ETS	2,060	49,065	3,093	91,910	
	New South Wales	25	224	31	183	
Шど	Chicago Climate Exchange	23	72	69	309	
L L	RGGI	na	na	65	246	
	AAUs	na	na	18	211	
ШО	Sub total	2,108	49,361	3,276	92,859	
	TOTAL	2,984	63,007	4,811	126,345	
Source	e: World Bank 2009					18





Centre for Energy and Environmental Markets	N
Evaluation criteria	
 Environmental Effectiveness: the extent to which the environmental objective is achieved. How well the scheme is actually mitigating the dangers of climate change by delivering long-term reductions in greenhouse gases (GHG). Efficiency: the extent to which the required objective is met at least cost. This includes dynamic efficiency (innovation incentives) Equity aspects: the extent to which any group is unfairly 	
disadvantaged or favoured.	19







Centre for Energy and Environmental Markets	
How effective is the EU ETS?	
 Target: Phase I: EUAs allocation exceeded 2005 emissions by around 100 Phase II: Based on Kyoto targets, around -13% compared to 2005 improved by EC decision in approval process of National Allocation Phase III Proposal: -21 % (1.74% p.a.) compard to 2005 for ETS s -20% scenario; based on 2005 will lead in 2020 to -21%), Member to borrow max. 5% under) Mio. tCO ₂ , substantially n Plans ector under the States are permitted
 Coverage: Phase I: Only CO₂ from process and combustion emissions. 	
 Phase II: Some MS cover N₂O emissions and from 2012 aviation Phase III: Inclusion of additional gases and sources e.g. N₂O from production and glyoxalic acid production 	adipic & ntiric acid
 Leakage: Phase I: Free and generous allocation to Industry Sector at Risk o Phase II : Free allocation to Industry Sector at Risk of Carbon leak Phase III: 100% free allocation based on Best Available Technolog 2005-2007 emissions, capped and declining annually Price Cap: No price cap: deterrend penalty (100€/tCO2e) and make good pro 	f Carbon leakage age yy and share in vision





















vistor	tions of		cation	n iviet	nods	5
Allowance allocation method	Impacts	More expension extending plan to new	More expenditure on extending plant life relative to new build		Increase plant operation	
	Distortions	Discourage plant closure	Distortion biased towards higher emitting plants	Shields output (and consumption) from average carbon cost	Distortion biased towards higher emitting plants	Reduce incentives for energy efficiency investments
Auction						
Bench-	capacity only	x				
marking	capacity by fuel/ plant type*	x	Х			
Updating	output only	Y		x		
from previous	output by fuel/ plant type*	x	x	x	x	
periods'	emissions	x	х	x	x	x









































