



Center for
Clean Air Policy

Sector-Based Approach for “Post-2012”: Electricity Sector and Major Industries

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Presentation Outline

- Sector-based approach
 - » What is it?
- Overview of sector GHG emissions and projections
 - » Global, Non-Annex I
- Overall structural options
 - » Sector-wide & Country-based sectoral
- “Straw” sector proposal
 - » Covered sectors and countries
 - » Establishing the “No Lose” Target
 - » Technology Finance Package
 - » Application to Developed Countries, Emissions Trading/CDM
- Sectoral Program’s potential to maintain 450ppm path
 - » Three Global Scenarios & Preliminary Results

About the Center for Clean Air Policy

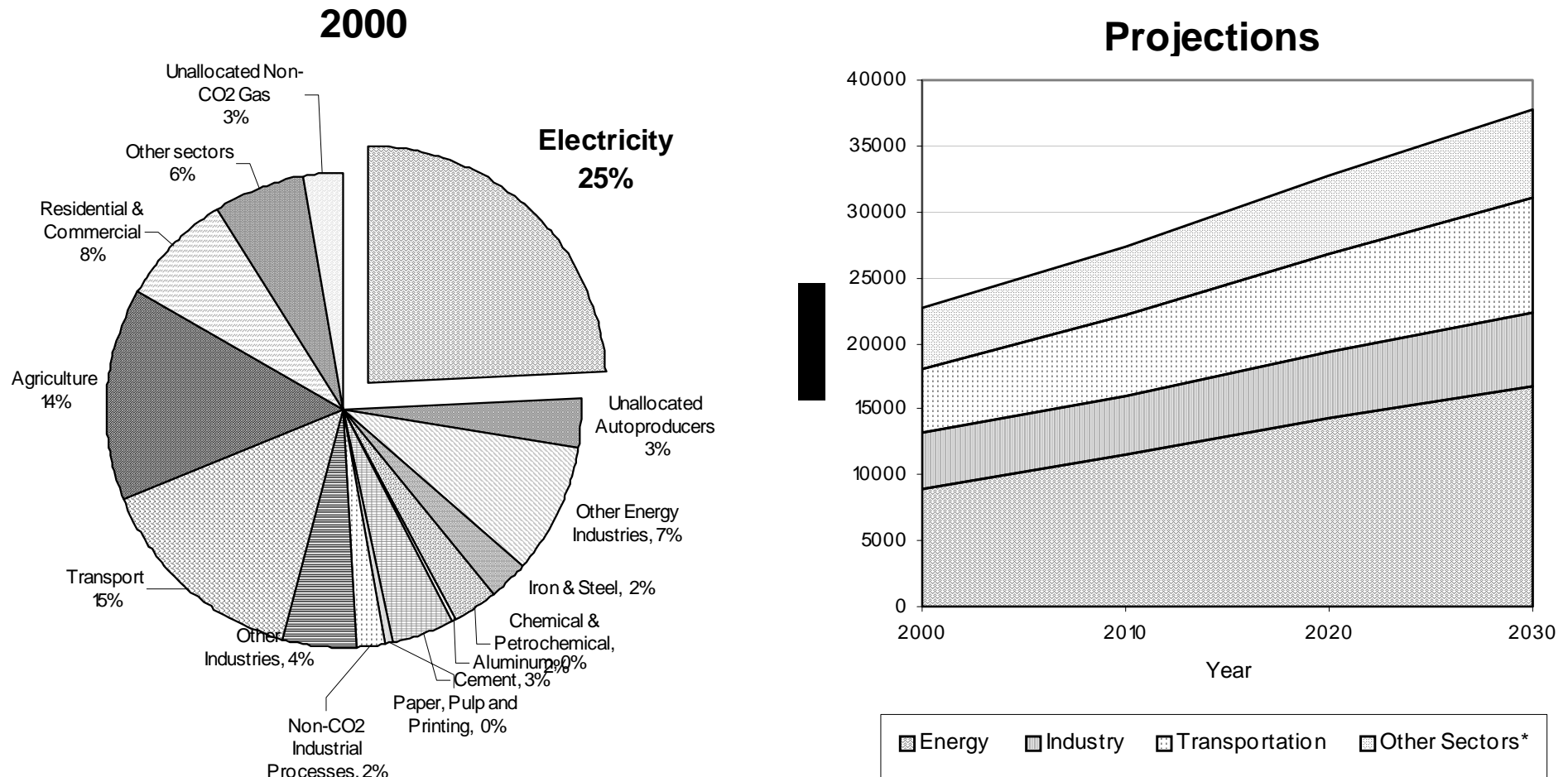
- Non-profit Washington, DC, Prague, and Brussels based environmental think-tank committed to advancing pragmatic and cost-effective air quality and climate policy through analysis, dialogue, and education
- Leader in several international climate initiatives on international emissions trading, the CDM, and post-2012 options
 - » Dialogue on Future International Actions to Address Global Climate Change (the FAD) brings together senior climate negotiators from 30 countries to discuss options for post-2012 climate regime
- Involved in a number of capacity building and analytical projects in developing countries, including China, India, Brazil, Mexico, and the Caribbean
- Lead analyst on project to help design the EU CO₂ emissions trading system and MRV program.



What is a Sectoral Approach to Post-2012 GHG Reductions?

- Bottom-up method for encouraging developing country sectoral (e.g. steel, cement, electricity) pledges and for deriving Annex I country targets
- Based on analysis of what is technologically feasible and economically cost-effective in each industrial sector both globally and in each country
- For developing countries, goal is no-lose target – pledge to reach intensity level in given sector, rewarded if achieved, no penalty if not achieved
- For A1, creates building block for next national target

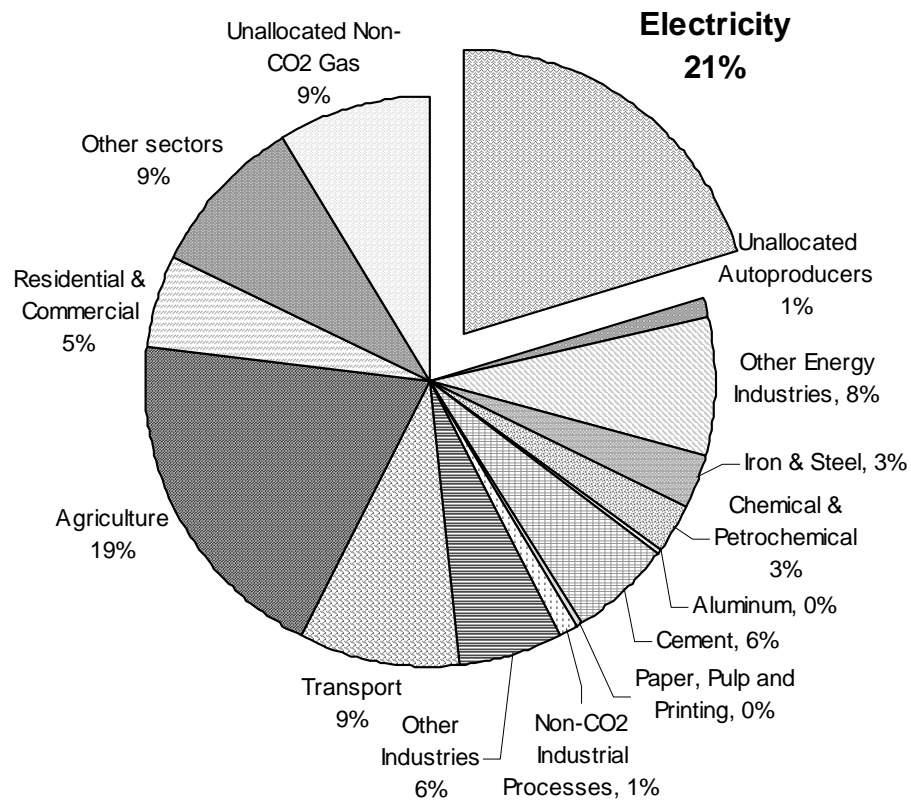
Global Sector GHG Emissions (without LUCF) & Sectoral CO₂ Projection



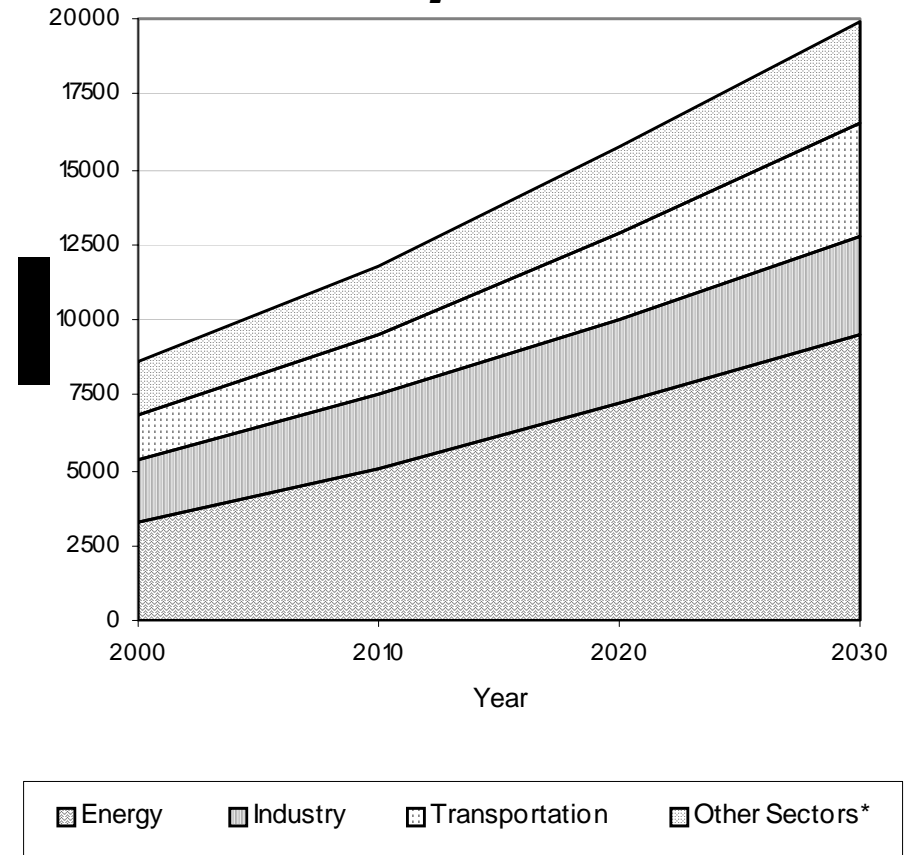
Source: Author's calculation, see Schmidt et al., 2006

Non-Annex I Sector GHG Emissions (w/o LUCF) & Sectoral CO₂ Projection

2000



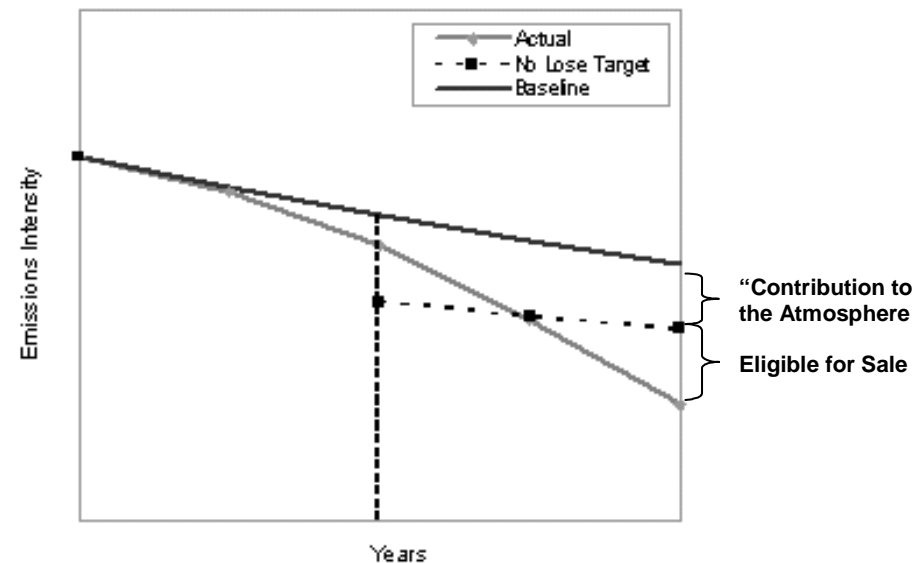
Projections



Source: Author's calculation, see Schmidt et al., 2006

Establishing the “No-Lose” Sector Target

- A voluntary “no lose” intensity target (e.g., CO₂ / ton of steel) is established
 - » No penalty for not meeting the pledge
- Emissions reductions beyond the “voluntary pledge” are eligible for sale
 - » As emissions reductions credits (ERCs) for sale to developed countries
 - » Voluntary intensity target effectively becomes the country’s crediting (“CDM”) baseline



“Technology Financing and Assistance Package”

- Industrialized countries, international financial institutions (IFIs), and export credit agencies (ECAs) provide a package of technology finance and assistance incentives to **help participating non-Annex I countries establish and meet more aggressive “no lose” targets**
- Designed to make these new technologies available to firms in developing countries while providing reasonable profits and property rights protections for the industrialized-country entities that provide the technologies.
- Scope of amount based upon bottom-up assessment in targeted sectors
 - » Designed to leverage private sector finance
 - » Differing financing tools (e.g., “soft” loans, grants, etc.) would be utilized as appropriate
 - » Financing will decline (and end) over time as these technologies become commercially viable due to economies of scale (e.g., German wind costs)
- Package could include:
 - » commitments to demonstration and pilot projects
 - » a pool of concessionary financing with WB, ECAs, loans, grants, & securitization
 - » support for development of small- and medium-sized enterprises
 - » Capacity building
 - » Etc.

Negotiation Process

Negotiation of the program could proceed as follows:

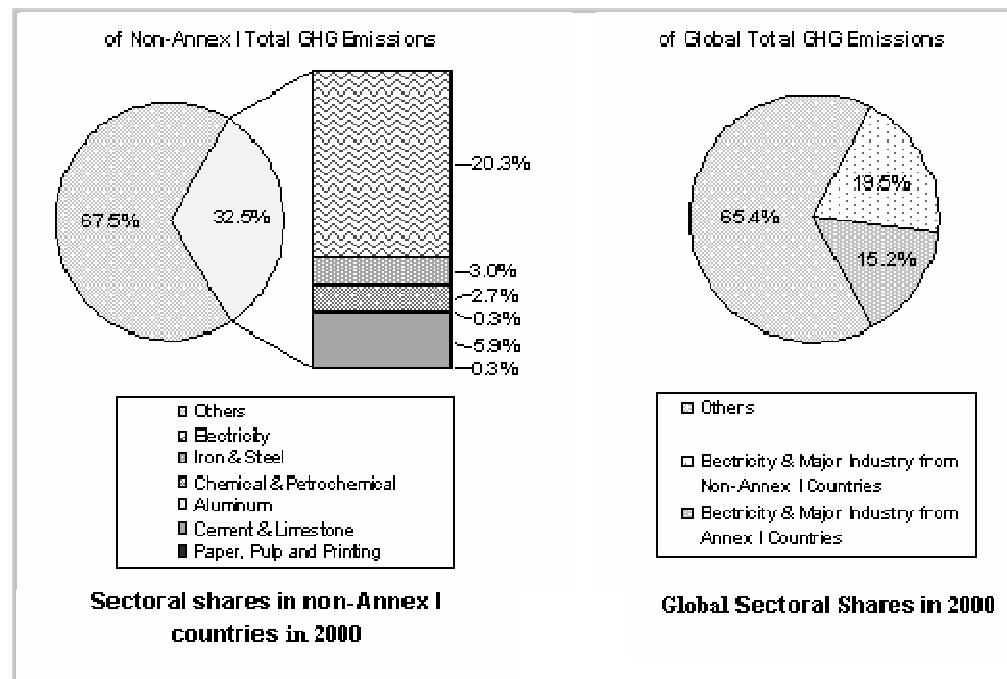
- 1) Agree on which countries will participate – minimum global coverage needed in each sector
- 2) Independent agency defines energy intensity benchmark for a given sector as starting point for negotiations – a la Triptych EU process
- 3) Negotiate a GHG intensity using such factors as the energy intensity BAT, fuel mix, and cost – one for new facilities and one for existing in each sector
- 4) Link the program to a technology finance package – assistance from tech finance is incentive to stronger pledge levels
- 5) Link to Annex I target setting process
- 6) Agree on structure of trading, link to CDM

Key Operational Questions?

- What sectors?
- Country-based or Industry-based?
- Structure of the target?
- Creation of emissions reduction credits?
- What role for Annex I?
- Role and structure of a “technology financing and assistance package”?
- How does the sectoral pledge and financing package relate to the CDM?

Which Sectors Covered?

- Program could focus on the Energy and Major Industry Sectors
 - » electricity, iron & steel, aluminum, oil refining, cement & lime, paper, pulp & printing
 - » relatively small number of entities, easier data collection, relatively homogenous products (except oil refining and pulp & paper), and operate in international trade (except electricity)
 - » 33% of non-Annex I emissions (2000; w/o LUCF)
 - » 20% of global emissions (2000; w/o LUCF)
 - » Bottom-up definitions (e.g., electricity facilities >20 MW) used to define individual facilities involved in the system
 - » Only direct emissions (e.g., on-site fuel combustion) included for the sectors

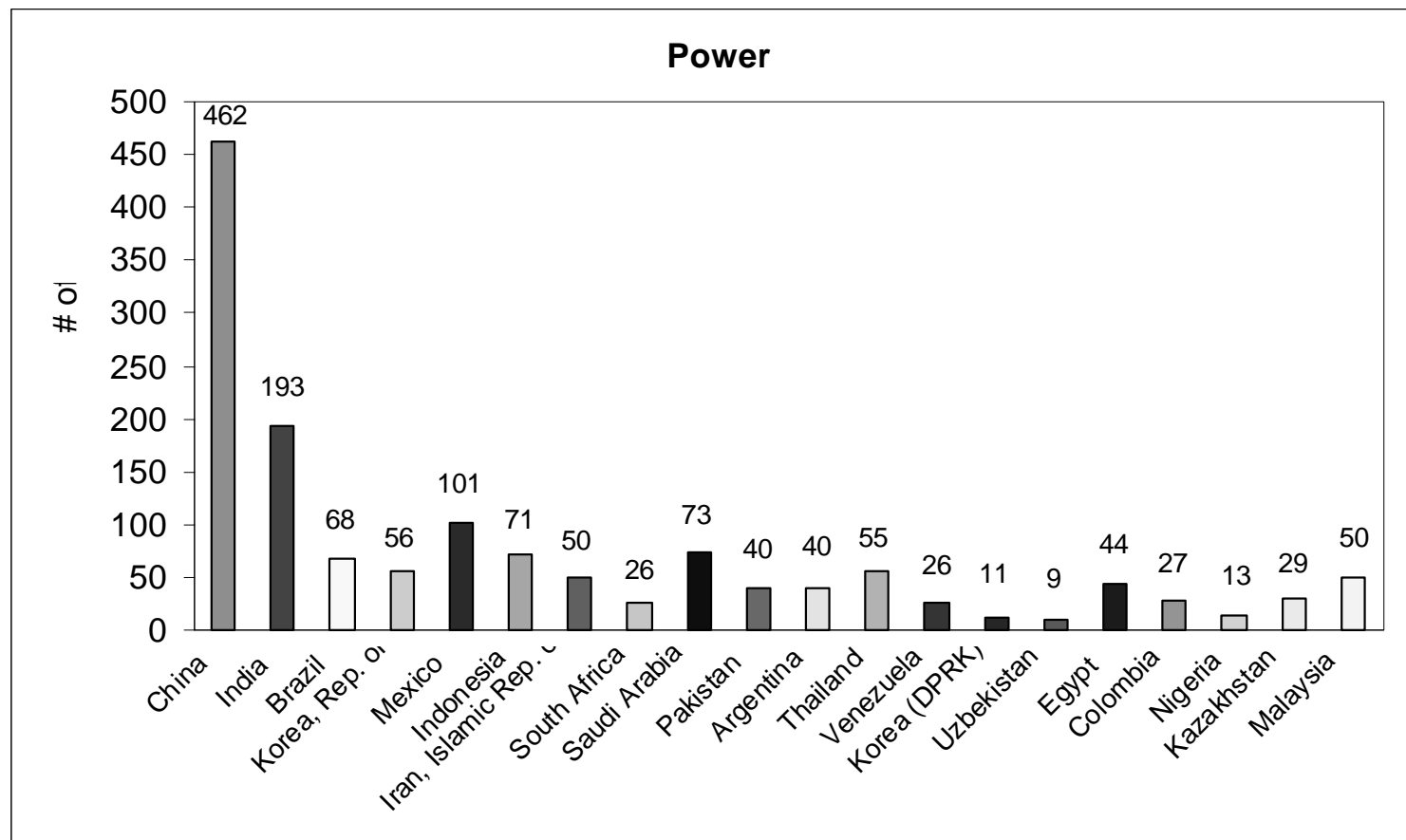


Source: Author's calculation, see Schmidt et al., 2006

Small # of Large Electricity Facilities

Number of Non-Annex I Facilities with Greater than 100 KT CO₂/year (“top 20”)

» 1140 facilities in the “top 10” countries; additional 304 facilities in the “top 20” countries

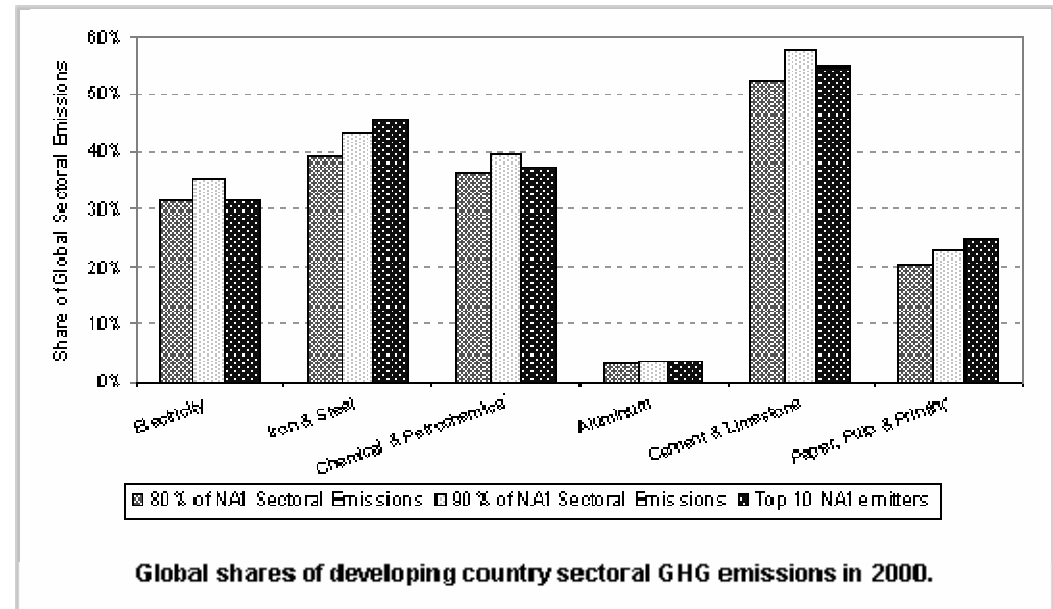
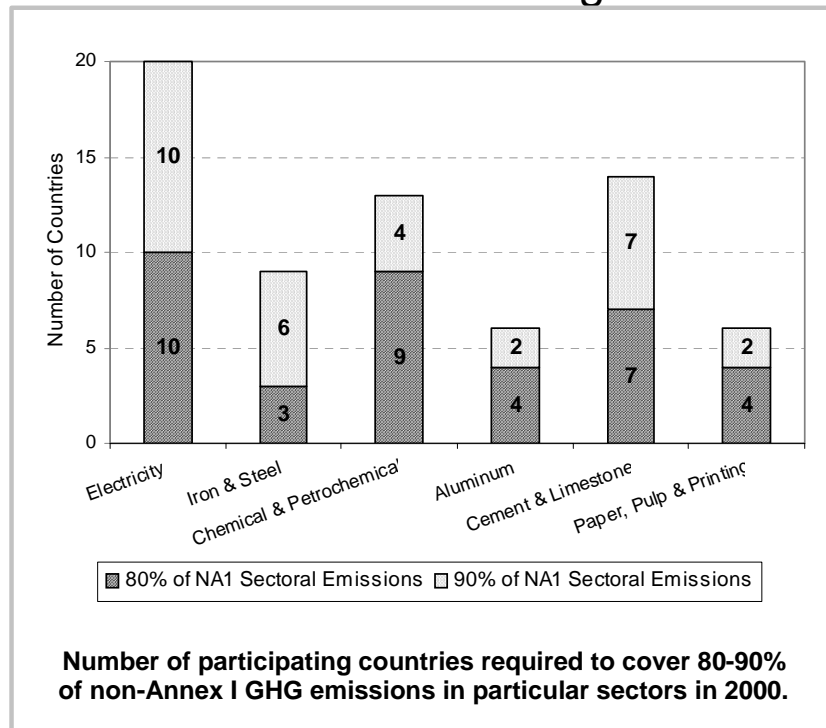


Country – based Structure

- Program will aim to include all major developing countries, but at least 80% of sector's emissions
 - » Country responsible for tracking and ensuring “no lose” targets met
- Variety of approaches could be used:
 - » Ten developing countries w/ the highest emissions in each sector
 - » Sufficient countries to cover 80% of sector's DC emissions
- Key is to cover enough of the sector to address leakage concerns
- Select internationally competitive industry sectors - for many sectors, small number of countries account for a large share of emissions

Possible Thresholds: “Top 10”

- Small number of non-Annex I countries account for sizeable share of non-Annex I and global emissions for these sectors



Source: Author's calculation; see Schmidt et al., 2006

Note: non-metallic minerals is cement and limestone; non-ferrous metals is mostly aluminum

Note: See appendix for list of countries implied by this threshold

Alternative Structure: Global Industry-based

- Covers all or major actors in the global sector to address concerns of:
 - » Leakage: e.g., firms moving operations from covered to non-covered countries
 - » Competitiveness: e.g., one firm is covered, but its competitor are not
- We suggest that a sectoral approach be country-based since:
 - » A small number of countries generally responsible for the vast majority of the GHG emissions in each sector
 - thus competition concerns addressed through participation of small number of countries
 - » Countries have much clearer legal authority to ensure that firms operating within their borders comply with program requirements
 - establishing a new legal institution to enforce sector-wide targets would likely require lengthy and contentious international negotiations.

How is the Target Established?

- Experts assess and define *energy-intensity* benchmarks in each sector to use as a starting point for discussions.
 - » Defined as energy intensity of commercially available technology
 - Separate benchmarks could be established one based upon technological potential and the other reflecting cost
 - Separate benchmarks for new and existing facilities
 - » Reflects a limited number of the major processes within the sector
 - » Updated regularly to reflect changes in technology
 - Non-annex I countries pledge a carbon-intensity level that they can meet without assistance.
 - » based upon the benchmark, fuel mix, impact on competitiveness of their products, and other factors (e.g., energy security, air quality, and sustainable development)
 - Annex I countries negotiate with developing countries on specific financial and other support—through a *Technology Finance and Assistance Package*—to encourage non-Annex I countries to ultimately commit to stricter “no-lose” emissions intensity levels.
- ⇒ Likely negotiation will produce different “no lose” targets for each country, but will begin from the same starting point—the benchmark

Emissions Trading

- Emissions Reduction Credits (ERCs)
 - » Earned sector-wide; managed by individual participating countries
 - » Need to be converted from rate-based to a fixed quantity of reductions
- Ex-post conversion conducted every two years
 - » ERCs equal difference b/t “no lose” target and actual intensity target multiplied by actual operations in previous two years
 - » Therefore ERCs calculated two years into the five year target period and at the end
- ERCs eligible into other trading systems (e.g., EU ETS)

Developed Countries

- Retain “hard economy-wide targets” (e.g., 30% below 1990 levels)—use Benchmarks as building block similar to the EU Triptych approach
 - » Bottom-up development of the sectors AAUs (e.g., national allocation plans) using the energy-intensity benchmark
 - » Other sector’s targets would be developed and added to the electricity and major industry AAUs to come up w/ the nat’l target
- Helps “Levels the playing field” since the covered sector in both developing and developed countries start w/ the same basis for their target setting
 - » Some differentiation is likely, but moves the int’l process forward in “leveling the playing field”
- Trading allowed to provide covered sectors flexibility to improve cost-effectiveness, helps to offset disadvantage that DCs have sectoral intensity targets rather than hard targets
- Further, for some sectors developing countries are as or more efficient than their developed country counterparts

Emissions Implications of the Sectoral Program

- “Top-down” analysis conducted by ECOFYS
 - » Evaluated implications of sector-based proposal on emissions level in key countries & global CO₂ stabilization trajectories
- Data, Sectors, & Countries used in the analysis
 - » Data: physical production, energy use, and GHG emissions
 - » Sectors: electricity, iron & steel, cement
 - 91% of emissions covered in this proposal
 - » Countries:
 - Annex I: EU-15, USA, Japan, Canada, Russia
 - Non-Annex I: Brazil, China, India, Mexico, South Africa, South Korea
 - 72% of total global emissions; 79% of three sectors’ global emissions
- Three Global Scenarios
 - » “Mild,” “Strong,” and “Sectoral Only”

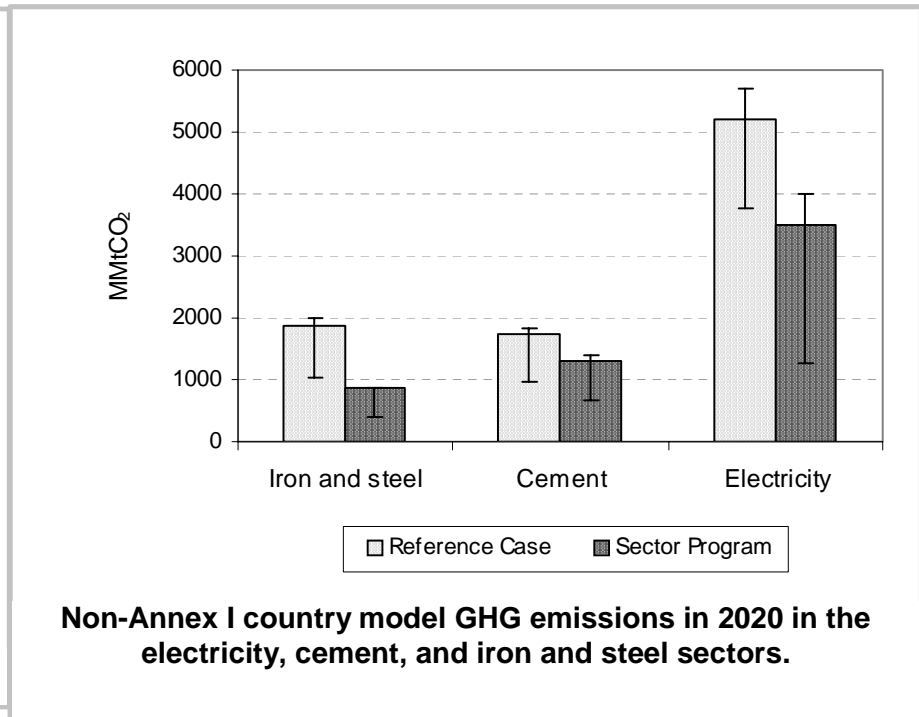
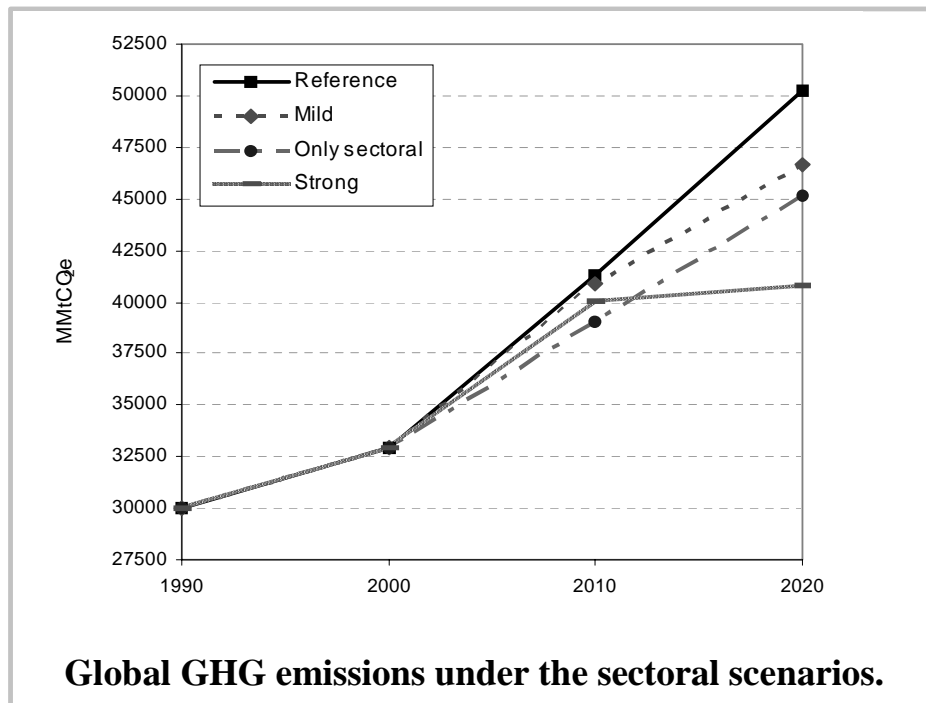
Three Global Scenarios

Scenario	Condition	
“Mild”	Annex I excl. USA	-15% below 1990 level in 2020
	USA	+10% above 1990 level in 2020
	Non-Annex I	Reference
“Strong”	Annex I excl. USA	-30% below 1990 level in 2020
	USA	+0% at 1990 level in 2020
	Non-Annex I	“Sectoral” for electricity, iron & steel and cement
“Sector only”	All countries	“Sectoral” for electricity, iron & steel and cement

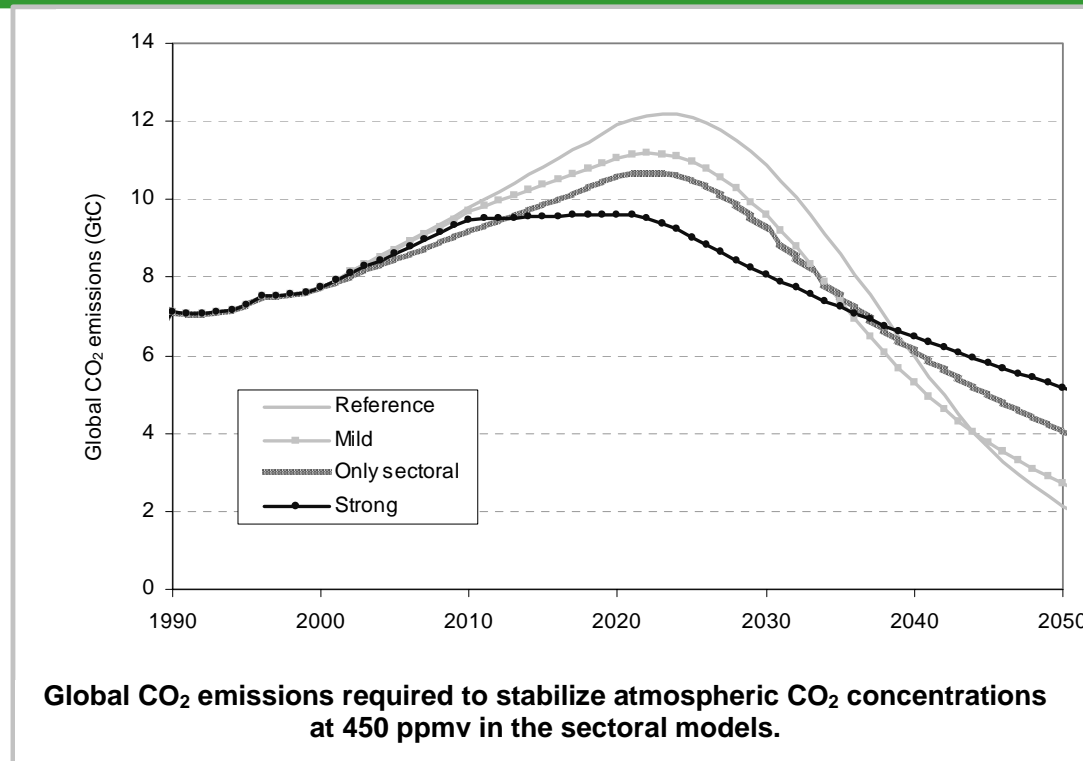
Electricity	Reduce carbon intensity of production (C/kWh) by 3% per year; growth in electricity production reduced by 0.5% for EE improvements
Iron & Steel	Convergence in CO ₂ /t steel by 2025 to 0.80 (today's avg. 1.63)
Cement	Convergence in CO ₂ /tcement by 2020 to 0.60 (today's avg. 0.78)

- Annex I countries' economy-wide emissions are limited to fixed quantities
 - » NOT implied that emissions reductions must be achieved
 - » Domestic emissions could exceed these levels if additional ERCs were purchased
 - ➔ Annex I countries can purchase ERCs from both covered sectors w/ “No Lose” target or other sectors (e.g., transportation through sectoral CDM)

Preliminary Results: Through 2020



Implications for Emissions Stabilization Levels: Preliminary Results



- Required reductions for global CO₂ stabilization levels after 2020:
 - » 450ppm—Strong: 2.2% per year; Mild: 6.5% per year
 - » 550ppm—Strong: 0.6% per year; Mild: 0.9% per year

Conclusions

- Sectoral No-Lose target approach can maintain needed progress in 2020 to stay on course for 450 ppm CO₂ concentration goal provided A1 countries take strong targets for 2020
- No-lose target has political and cost-effectiveness attractions – simplifies current CDM issues
- “No lose” sectoral targets have garnered significant interest among developing countries and other Parties
 - » Mentioned in several interventions to the UNFCCC Dialogue (e.g., Mexico and South Africa) and garnered quiet interest among other countries in CCAP FAD
- Begins to move int’l process forward by:
 - » Recognizing and encouraging “unilateral actions” by developing countries (e.g., China’s vehicle efficiency standard)
 - » Addressing leakage and competition since all the major players in a given sector participate and starting point for target setting is same energy intensity benchmark
 - » Covering all facilities in a given sector (not just the ones reducing emissions as in the CDM)
 - » Encouraging developing country “contributions to the atmosphere”
 - » Providing specific and targeted technology finance for advanced and more expensive technologies
- Potentially viable for other sectors as well, e.g.:
 - » Vehicle efficiency
 - » Appliance and lighting efficiency

References

For more information, visit our website: www.ccap.org/international/future.htm

Paper on proposal:

- Schmidt, J., N. Helme, J. Lee. (2006). Sector-based Approach to the Post-2012 Climate Change Policy Architecture. Future Actions Dialogue Working Paper. August. Available at: <http://www.ccap.org/international/Sector%20Straw%20Proposal%20-%20FINAL%20for%20FAD%20Working%20Paper%20%7E%208%2025%2006.pdf>

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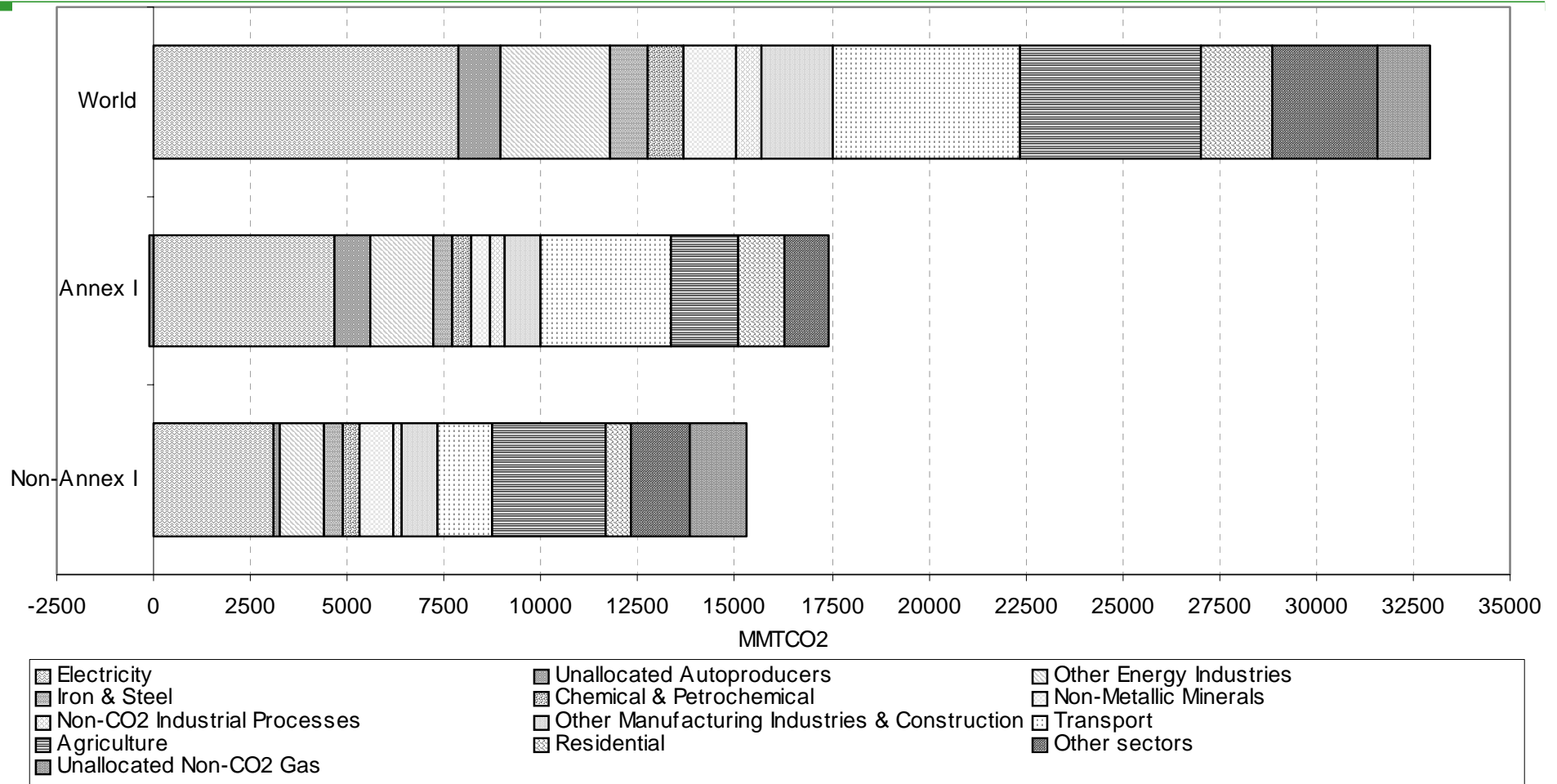


Dialogue on Future International Actions to Address Global Climate Change (the FAD)

- Brings together senior climate negotiators from approx. 15 developed and 15 developing countries
 - » Meets face-to-face biannually and through workgroups via conference call to develop specific ideas in b/t meetings.
- Informal, off-the-record forum to discuss mitigation and adaptation options for a possible post-2012 international framework for climate policy
- Funding for the project supported by governments of 15 countries.
- CCAP produces FAD working papers and will produce a compendium in 2006 on the project and options discussed.
- For all presentations and finalized working papers from the process, see: www.ccap.org/international/future.htm

Annex A: Global Sector Emissions in 2000

(without LUCF)



Source: Author's calculation, see Schmidt et al., 2005; IEA, 2002; Scheele and Kruger, 2004; Schaefer et al., 2004

Annex B: “Top 10” Non-Annex I Countries for Covered Sectors

Top Ten Developing Country GHG Emitters for the Electricity and Major Industrial Sectors

Electricity	Iron & Steel	Chemical & Petrochemical	Aluminum	Cement & Limestone	Paper, Pulp & Printing
China	China	China	China	China	China
India	India	India	Brazil	India	Brazil
South Africa	Brazil	U.A.E.	India	South Korea	South Korea
South Korea	South Africa	South Africa	Venezuela	Brazil	India
Mexico	Mexico	South Korea	Chile	Indonesia	Indonesia
Iran	South Korea	Brazil	Argentina	Mexico	Mexico
Saudi Arabia	Venezuela	Mexico	Bahrain	Thailand	Colombia
Kazakhstan	Indonesia	Iran	Kazakhstan	Pakistan	Thailand
Indonesia	Kazakhstan	Indonesia	South Korea	Egypt	Argentina
Thailand	Iran	Venezuela	Macedonia	Iran	Chile

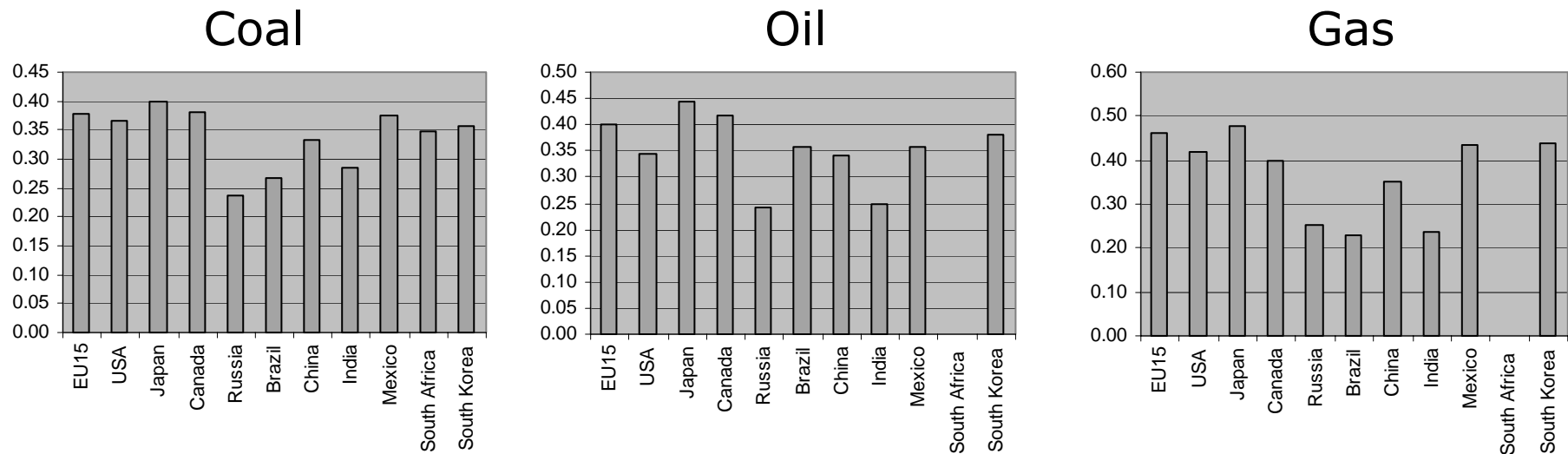
Source: Author's calculation, see Schmidt et al., 2006



Annex C: “No Lose” Target and CDM

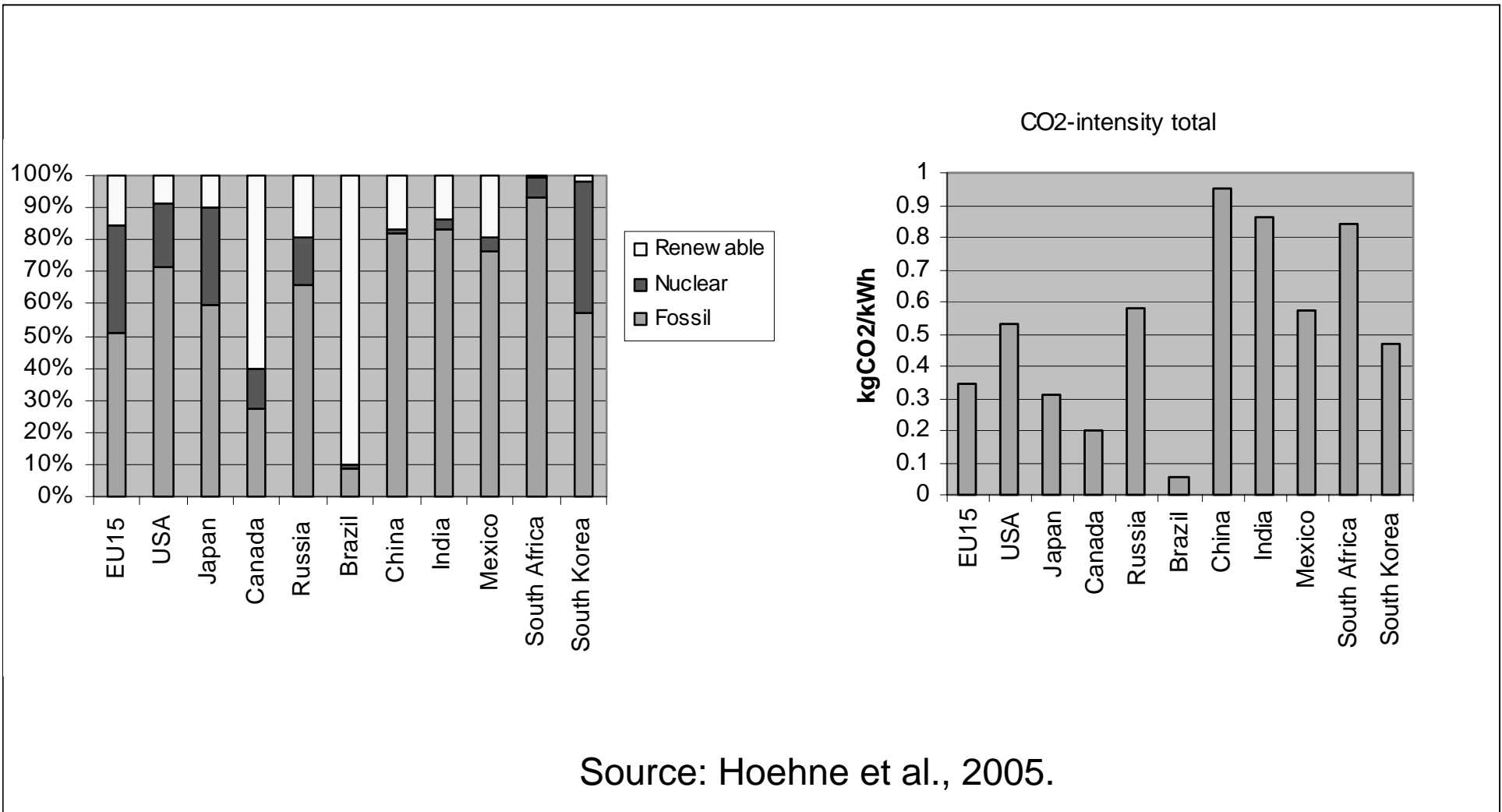
- New pledge process would replace CDM in the sectors and countries participating
 - » ERCs in these sectors generated by exceeding the sectoral intensity target
- For sectors not included in the proposal, CDM would proceed as in the past, but:
 - » Energy-intensity benchmark developed in pledge process would become minimum threshold for CDM baseline for new facilities
 - » CDM Meth process would continue to set precedents for the final CDM project baseline on a project, country, or regional basis as appropriate
 - » Sectoral pledge could create a new sectoral CDM process for these countries

Annex D.1: Electricity Generation Efficiency



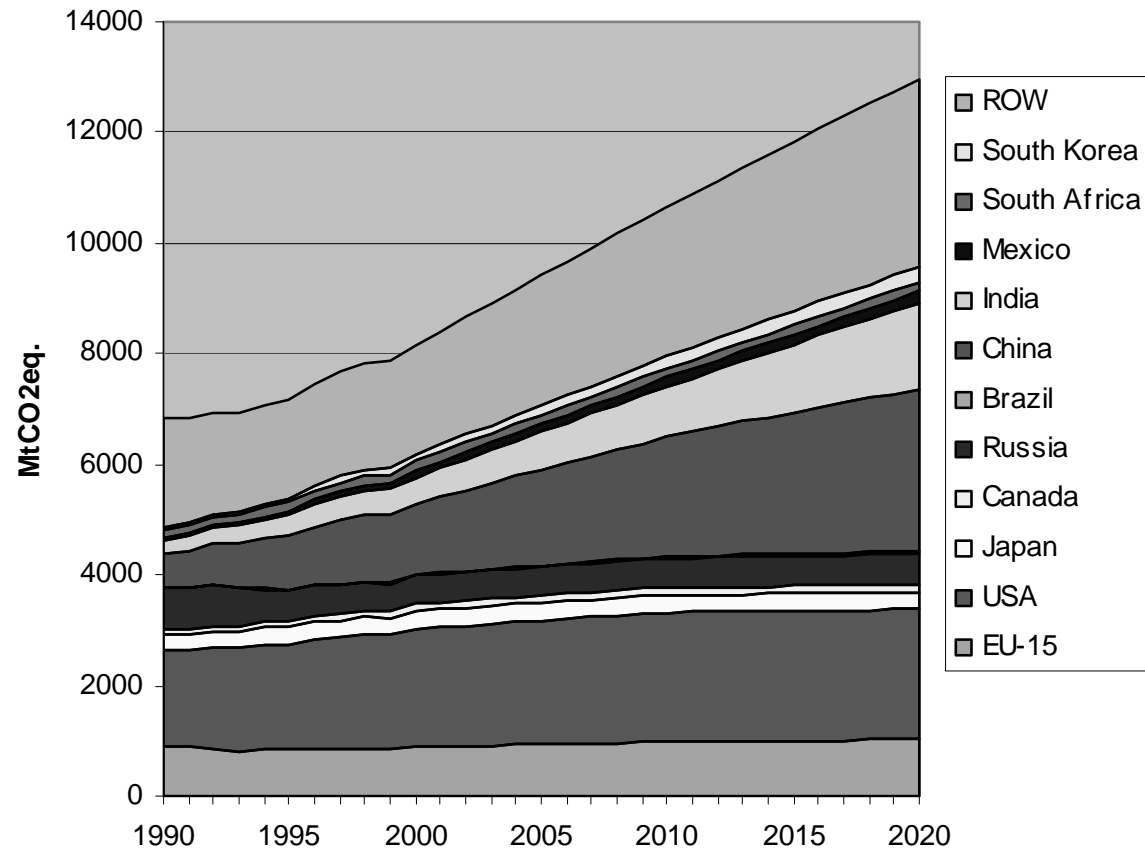
Source: Hoehne et al., 2005.

Annex D.2: Electricity GHG Intensity



Source: Hoehne et al., 2005.

Annex D.3: Electricity GHG Reference Case Emissions



Source: Hoehne et al., 2005.

Annex D.4: Electricity Scenarios Analyzed

Scenario	Condition			
		Aver.	Max	Converg.
Convergence in thermal efficiency				
	Coal	0.34	0.40	0.42
	Oil	0.35	0.44	0.45
	Gas	0.37	0.48	0.54
Convergence in CO ₂ /kWh per fuel		Aver.	Min	Converg.
	Coal	0.96	0.73	0.69
	Oil	0.68	0.39	0.4
	Gas	0.52	0.27	0.28
Convergence in CO ₂ /kWh		Aver.	Min	Converg.
		0.52	0.05	0.45
Reduction on CO ₂ intensity	Reduce by 3% per year			

Growth in electricity production from IMAGE implementation of SRES scenarios for regions applied to countries. Reduced by 0.5% for improvements in energy efficiency in appliances

Annex D.5: Sectoral Scenarios All Countries: Electricity

