

COLOMBIA

INVESTMENT PLAN



Libertad y Orden
República de Colombia



DEPARTAMENTO NACIONAL DE PLANEACIÓN



Colombia's Climate Change Challenge

Accelerating Sustainable Transport Systems

The Opportunity in Energy Efficiency

CTF Funds Additionality and Impact

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Colombia

0.66%

of the World's population (45M)

0.57%

of the World's PPP GDP (US\$8,880 PPP per capita)

0.85%

of the World's surface area

10%

of the World's biodiversity



Colombia

1st place in birds

1,885 species (6% threatened)

2nd place in plants

41,000 species (1,5% threatened)

2nd place in amphibians

750 species (7% threatened)

3rd place in reptiles

524 species (5% threatened)

5th place in mammals

471 species (9% threatened)

2nd in South America in Freshwater Fishes

1,435 species (2,5% threatened)

50% of planet's Andean Tundra (páramos)

1.7% of Colombia's surface area



Colombia

A Growing Energy Powerhouse

- ▶ **Clean Generation Matrix:** Power generation capacity 69% (9.2 GW) hydro; production (last decade) **78% Hydro**; Hydro potential estimated at 93 GW
- ▶ **Growing Oil & Gas Producer:** 800K bpd → 1.5M bpd (2015)
- ▶ **Vast Coal Reserves:** World's **6th largest producer**, 4th largest exporter; reserves = 120 yrs current production
- ▶ **Biofuels Leader: 2nd producer** in LAC after Brazil; E10 (sugar cane)/B5-7 (oil palm) → E20/B20 by 2012
- ▶ **Untapped Solar and Wind potential:** 20 MW pilot wind project in operation, plans for significant expansion



Committed Global Citizen

Active in International Efforts

- ▶ Ratified UNFCCC - March 1995
- ▶ Ratified Kyoto Protocol - November 2001
- ▶ **First communication** - submitted December 2001
Second communication - to be submitted April 2010
- ▶ Supports **Copenhagen Accord**: proposed actions to be included in Appendix 2 (2H 2010)
- ▶ National Climate Change Policy (1H 2010);
National Climate Change System (1H 2010)
- ▶ 2010-2014 National Development Plan will be first to incorporate comprehensive carbon-intensity criteria



% Of Emissions Per Sector

Colombia's emissions represent

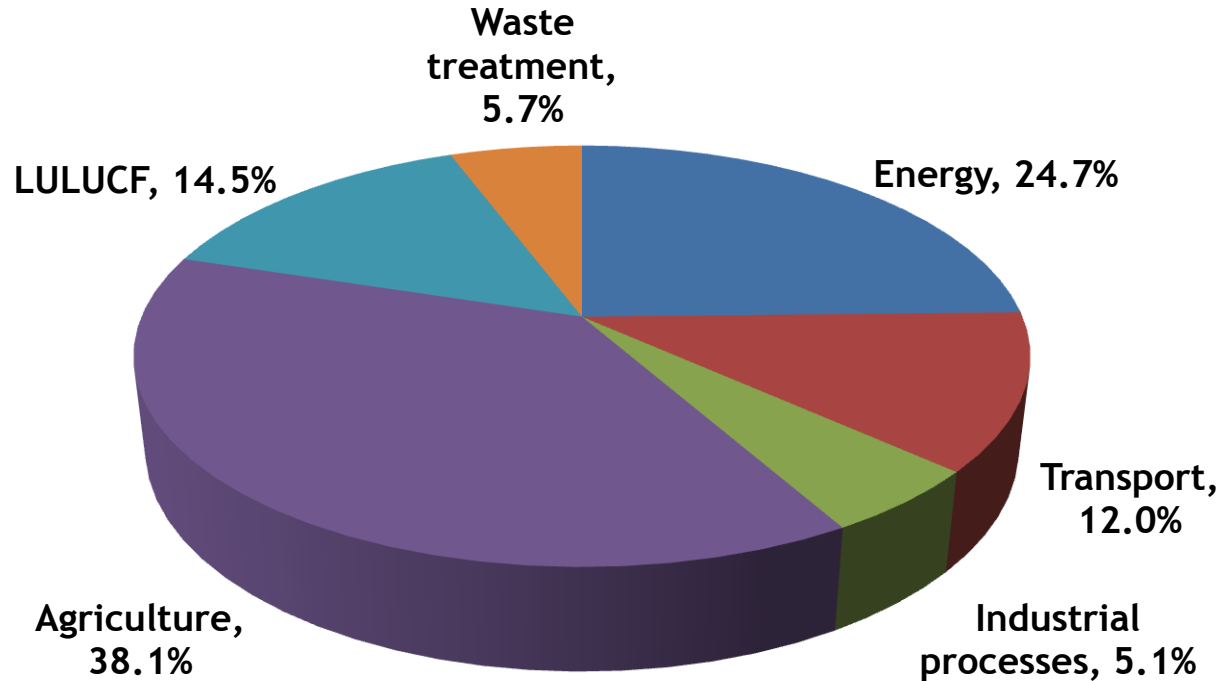
0.37%

of global emissions

Colombia ranks

5th

in Latin America,
in terms of its energy
sector emissions



High Vulnerability to Climate Change

- ▶ By 2050-2060, sea level will rise **40 cm** in the Caribbean Sea and **60 cm** in the Pacific Ocean.
- ▶ By 2050, air temperatures will increase between **1 and 2 °C**
- ▶ Precipitation will vary **± 15%** of the current average annual value depending on the region
 - ▶ Floods
 - ▶ Droughts
 - ▶ Desertification

High Vulnerability to Climate Change

- **Human Settlements:** Permanent flooding of 4,900 km² of coastal areas and 17% of San Andres Island (1 meter above sea level); 51% of the Caribbean Coastline's urban areas and 63% of the Pacific Coastline's urban areas affected.
- **Drought:** Medium to high threat for 42% of the country's population and medium to very high for 79% of the country's municipalities.
- **Glacier Loss:** 78% of the country's Permanent Snow Peaks and 56% of Andean Tundra (Páramo), as well as other high mountain ecosystems, expected to disappear.
- **Disease:** Increased prevalence of tropical diseases such as dengue and malaria → Increased demand for health services.
- **Infrastructure Undermined:** 44% of road infrastructure in the Caribbean Coastline; majority of seaport infrastructure in the Pacific Coastline (Tumaco and Buenaventura); 75.3% of Barranquilla's manufacturing industry and 99% of Cartagena's industry, impacted by rising sea levels.

Source: First National Communication (2001) and studies for Second National Communication.

High Vulnerability to Climate Change

- ▶ **Threat to Energy Generation:** Fall of water levels during dry seasons and flooding during rainy season would put **70% of Colombia's energy generation at risk and induce greater use of fossil fuels**
 - ▶ Water scarcity due to **2009/2010 *El Niño*** pushed thermal generation to **60%** of total production over the last few months
- ▶ **Impact on Agriculture:** **10% of agricultural GDP of Pacific Region and 4.3% of agro GDP of Caribbean Region at risk** due to sea level rising one meter.
- ▶ **Desertification:** **3.6 M new hectares (3.2% of territory)** expected to be at risk of desertification in coming years; adding to a current total of **14.4 M hectares (12.6% of territory)**
 - ▶ **74%** of area dedicated to rice crops in Huila and Tolima departments vulnerable to desertification
 - ▶ **85%** of area dedicated to sugar cane in Valle del Cauca and Caribbean Region vulnerable to desertification or already in process of desertification

High Vulnerability to Climate Change

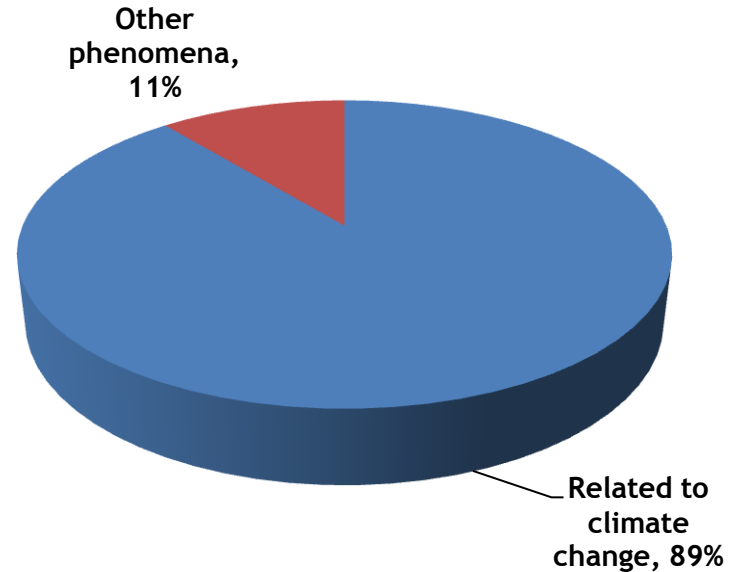
- Of **9,489** natural emergencies in 1998-2009, 89% were related to hydro-meteorological phenomena
- Climate change could mean more and more intense hydro-meteorological emergencies in the future, if current vulnerability conditions remain or become more intense.

According to DesInventar, Colombia has the largest number of emergencies due to natural disasters in Latin America.

89%

Avalanches, landslides, erosion, hail, frost, hurricanes, flooding, sea swells, thunderstorms, tornadoes, strong winds.

Disasters Emergencies in Colombia (1998-2009)



What Colombia is Doing to Address Climate Change: Public Policy

Background Framework

- ▶ **Colombia 2019 Vision** : Contemplated definition of institutional framework to supply necessary tools to address complexity of large, cross-sectoral challenge
- ▶ **National Development Plan 2006-2010**
 - ▶ Adoption of National Climate Change Policy (NCCP) by the National Economic and Social Policy Council (CONPES)
 - ▶ Development of Comprehensive Action Plan for Climate Change
- ▶ **Programs with multilateral banks (IDB and WB)**: Programmatic Credit, Technical Cooperations, Design and Implementation of the Economic Impacts of Climate Change Study (ECCS)



Other National Initiatives



- ▶ Creation of Internal Climate Change Committee at National Planning Department (June 2009) to structure Policy on CC and ECCS.
- ▶ 5 inter-ministry agendas with CC priorities (health, transportation, agriculture, education & defense)
- ▶ 4 CC strategies in the action plans of Regional Environmental Corporations.
- ▶ 15 CDM projects registered by the CDM Executive Board (4 in urban transport)
- ▶ 4 CDM validation methodologies (including for Bus Rapid Transit system in Bogotá)
- ▶ Designed National Program that promotes energy efficiency standards, creates incentives for increased use of renewable energy
- ▶ Identification of CC vulnerability in priority ecosystems (first country to obtain financial support from the GEF's Strategic Priority on Adaptation Fund)
- ▶ 3 ongoing adaptation projects in human health, ecosystems and coastal areas.
- ▶ Needs assessment of the Colombian hydro-meteorological network for CC scenario modeling and incorporation of hydro-meteorological information in energy sector planning (monthly cross-sectoral meetings)

National Climate Change Policy

Main Pillars

1. Objective

Mainstream climate change variables in public and private decisions to generate adaptation and mitigation measures, reduce vulnerability and take advantage of technological and financial opportunities

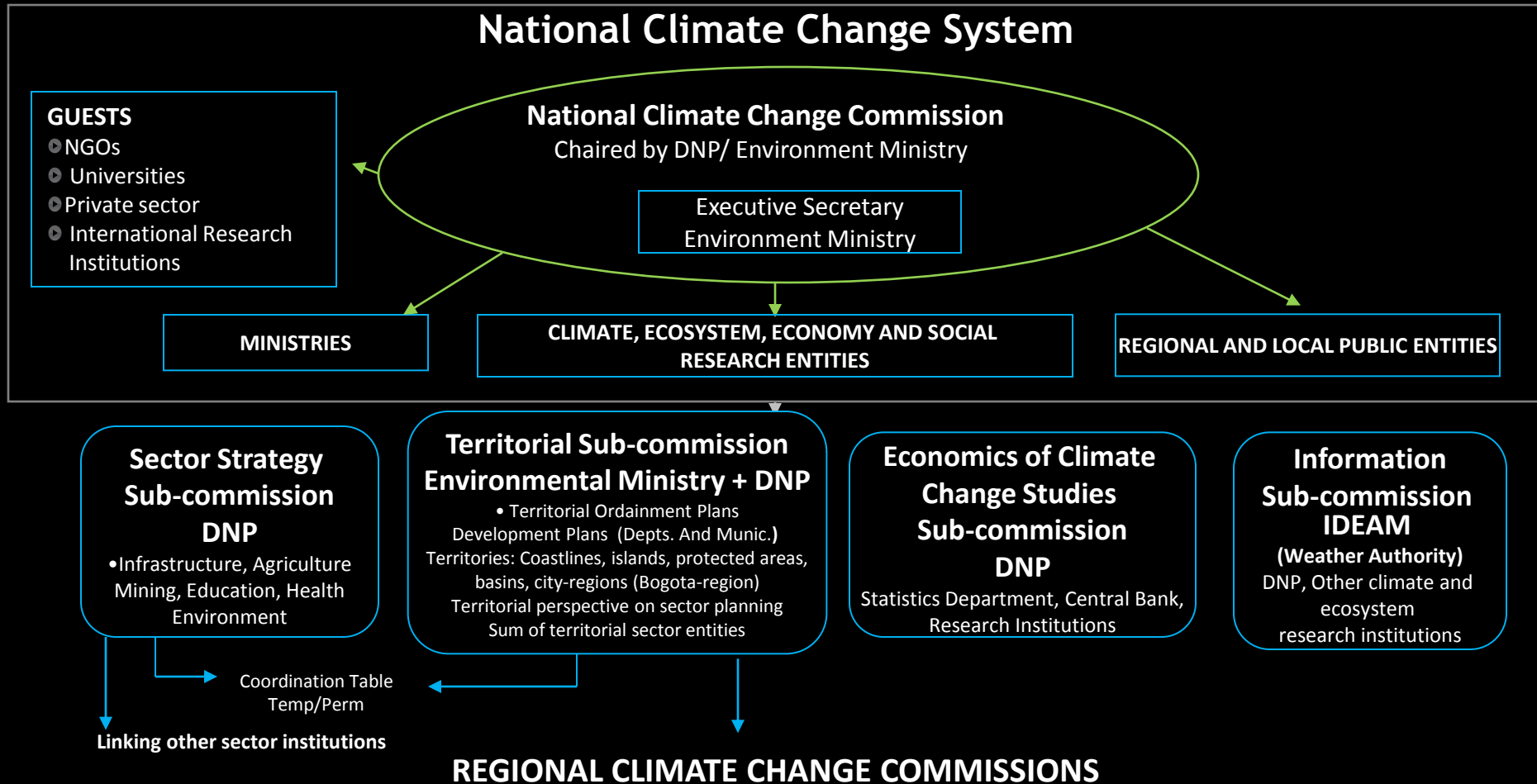
2. Establishes a conceptual framework to link information and analysis capabilities to decision-making regarding economic, population, ecosystems and climate variables

3. Outlines strategies for:

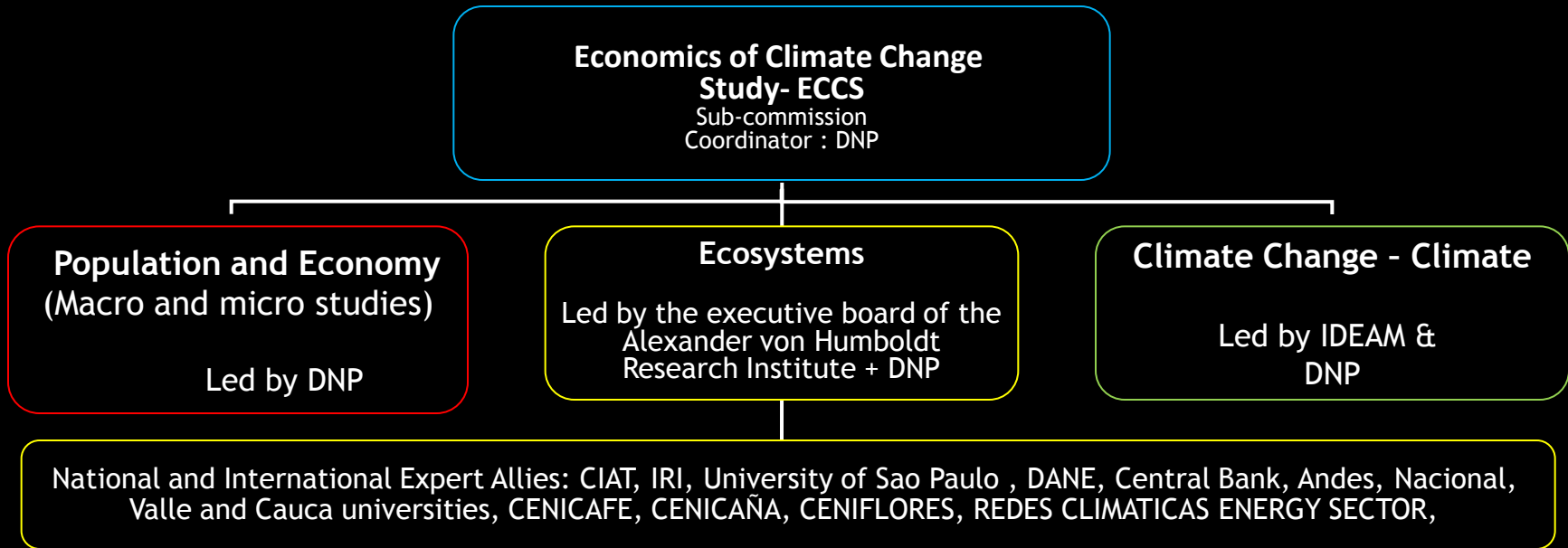
- **Sectors:** energy, mining, transport, agriculture, health, environment, risk management (natural disasters), poverty, international negotiations, urban, physical and social infrastructure
- **Territories:** strategic ecosystems, islands, coasts, cities, land use planning, regional and local development plans

- **Climate finance:** promotion of green and GHG markets, creation of a national adaptation and mitigation fund
- **International negotiations:** setting real and accountable voluntary mitigation goals
- **Institutional:** Establishes a **National Climate Change System** chaired by the National Planning Department and the Environment Ministry. Other members: Sector ministries; economic, ecosystemic and climate research institutions; regional and local public authorities; academia; the private sector
- Establishes an **action plan**, responsibilities, indicators and budget allocations for policy implementation.

Institutional Framework: Climate Change Public Policy



General Structure Economics of Climate Change Study



- Objectives, strategic plan and financial support will be adopted by a specific policy document during 2010.
- Several research and academic institutions, as well as international organizations, will be part of the study.

- Nature of the **ECCS** (permanent process)
- Selection of specific models and studies that support the decision making
- Results for Mainstreaming :
 - Policies and sector budgets
 - Policies and territorial budgets
 - Private decisions

Economics of Climate Change Study DNP (ECCS)

- Core Group study financed by DNP: US\$400,000/year
- Specific studies supported by IDB Technical Cooperation: US\$1M
- Other institutional strengthening support from IDB: US\$3M
- **Phase I:**
 - **General Equilibrium Model to assess the economic impacts of CC:** This model has been used to calculate climate change cost until 2100 if no measures are taken, to simulate a carbon tax and to analyze negotiations
 - **Micro-simulations to study the impact of CC on wealth by type of household:** According to preliminary results the most poor households will be more affected by CC.
 - **Impact of CC on ecosystems:** A model is used to analyze if ecosystems will contract, expand or remain the same as a consequence of CC.
 - **Impact of CC on value of environmental services:** Attached to the above model an effort has been made to analyze the impact of CC on the value of ecosystems.



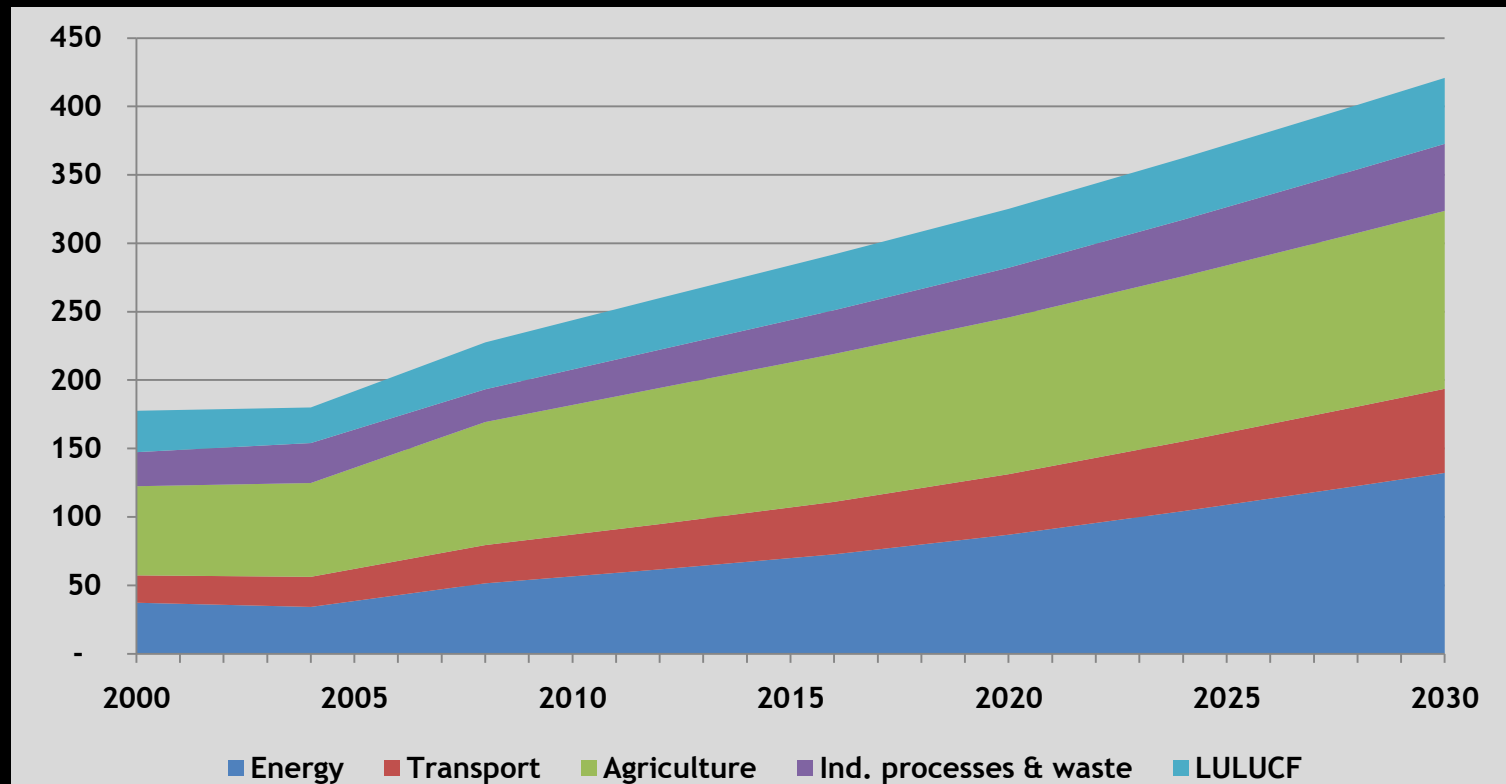
Economics of Climate Change Study DNP (ECCS)

- **Phase II: Technical Cooperation with IDB**
- **ECCS perspectives:**
 - **Regionalization of the General Equilibrium Model**
 - **Construction of a Ricardian Model to analyze economic impacts of land use change**
 - **Water supply and demand projections and their impact on sector productivity**
 - **Construction of a model to analyze the impact of CC on ecosystems vulnerability**
 - **Construction of a model to analyze the impact of CC on biodiversity**
 - **Prioritization of potential areas for REDD mechanisms**



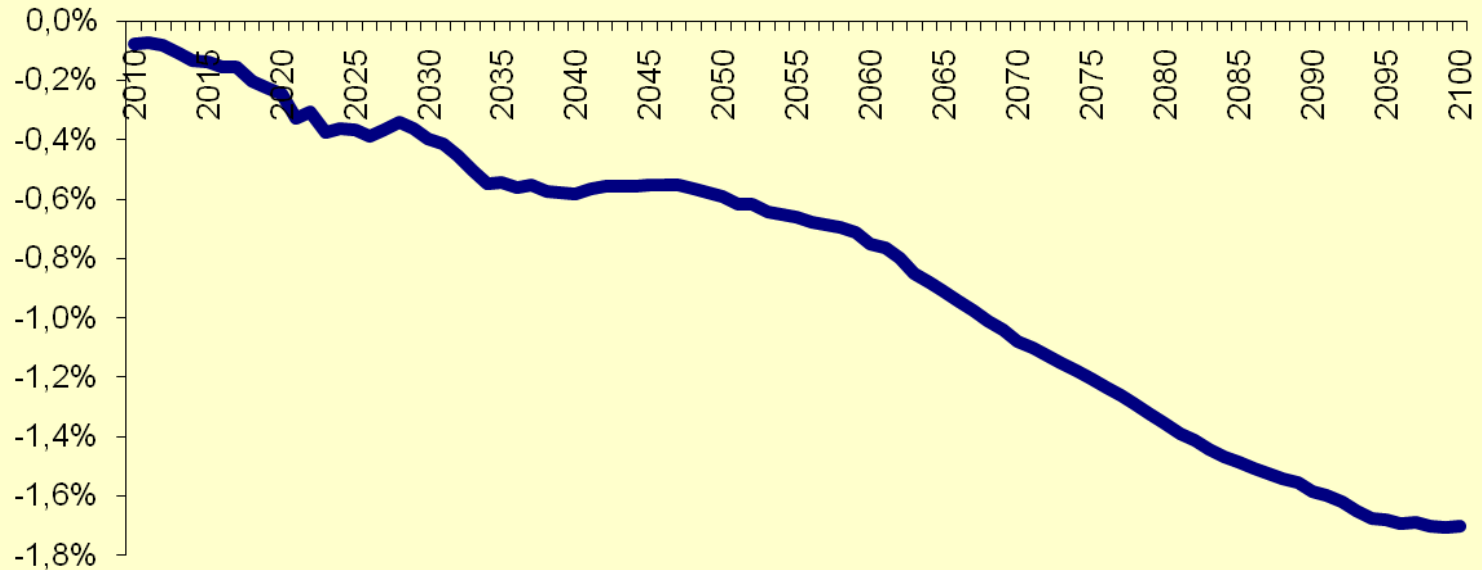
Results Phase I: Emissions By Sector

Mt CO₂e / year

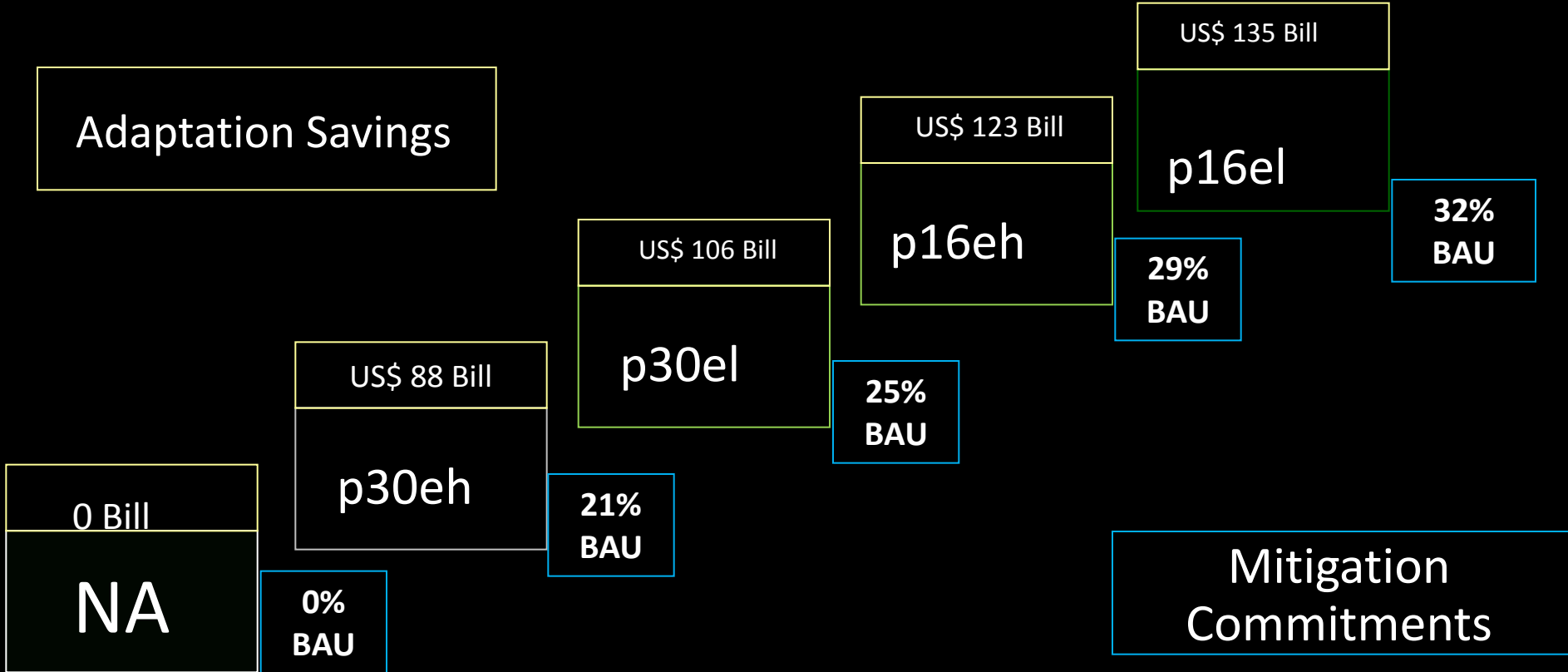


GDP Lost Because of CC

Scenario Compared to Non-Climature Change Scenario

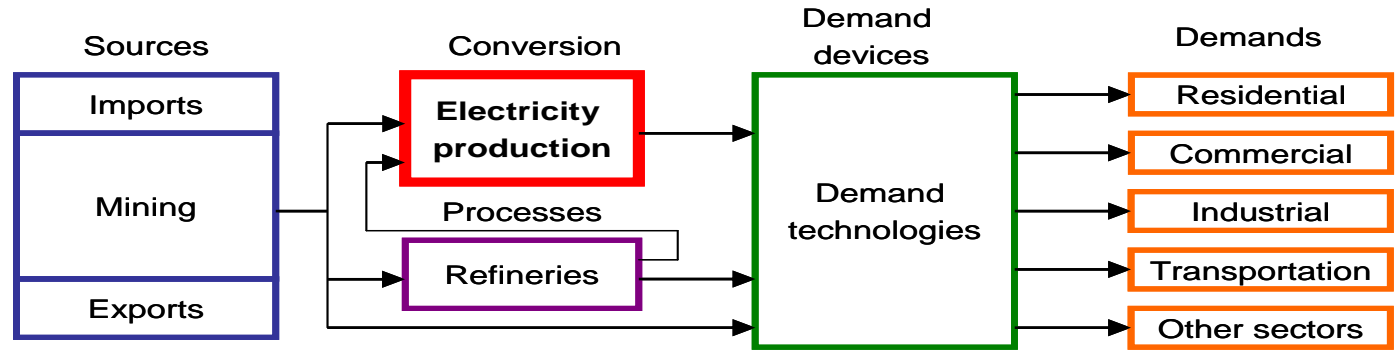


Negotiation Position (Example)



MARKAL Model

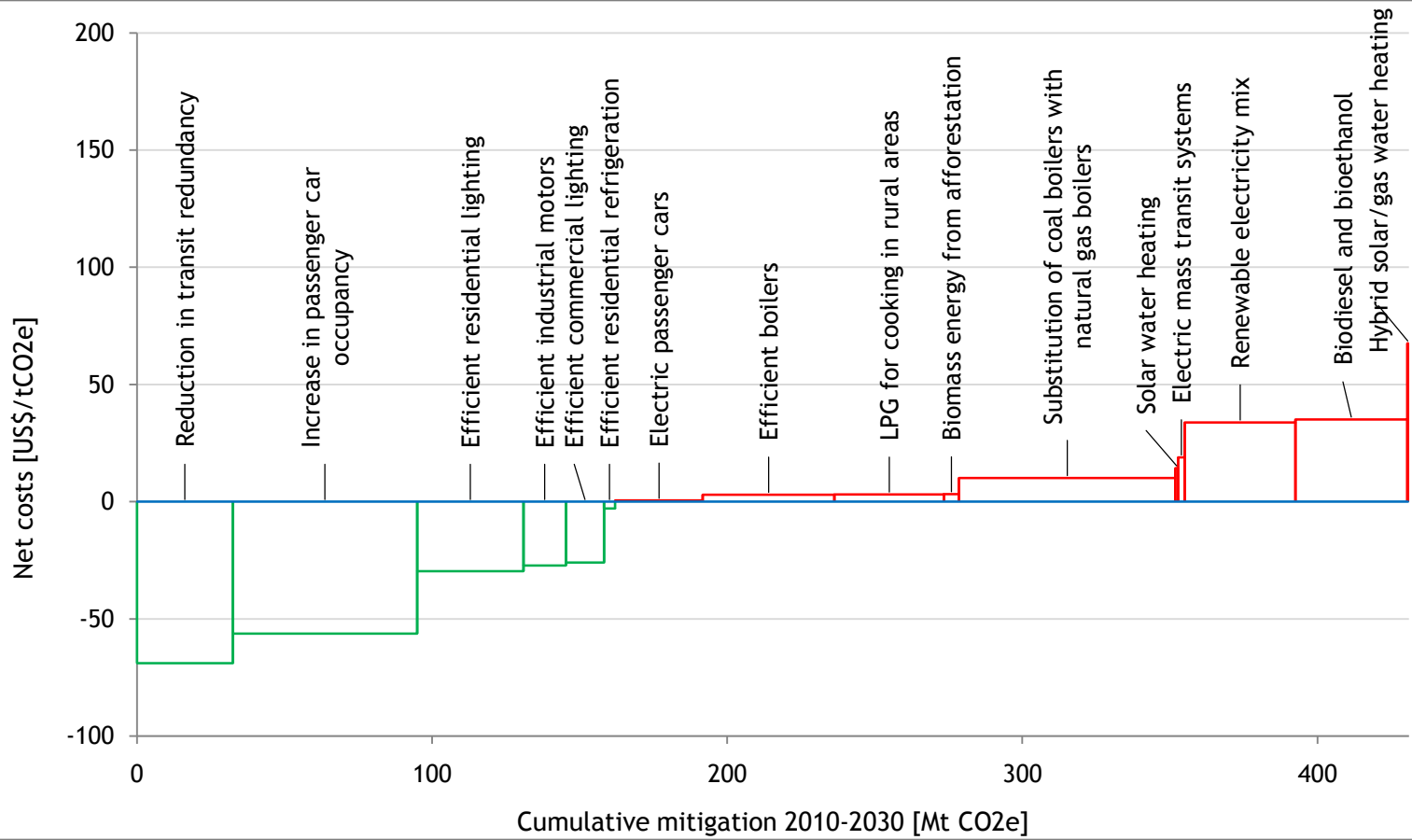
- ▶ MARKAL (MARKet Allocation) is a multi-period linear programming model that uses an exogenous demand function
- ▶ “A number of final use technologies compete to satisfy a particular demand and a number of production technologies compete to produce the same form of energy”, subject to an objective and some restrictions



Reference Energy System (RES)

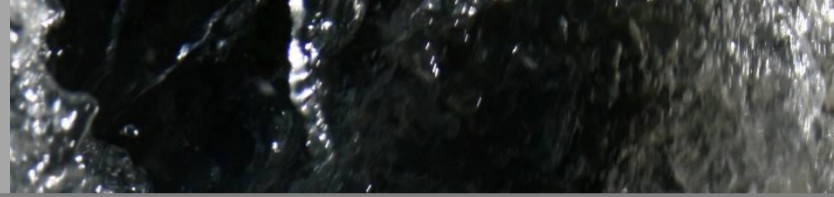
Source: Cadena et. al., 2009 (Uniandes study)

Abatement Cost Curve Using MARKAL



Source:
Cadena et. al., 2009
(Uniandes study)

Rationale for Selected Sectors for CTF Financing



- **Transport and Energy Efficiency**
 - Show **highest carbon abatement cost-effectiveness**, sector readiness, implementation potential & eligibility
 - Offer **significant leverage potential** (substantial commitments from national and local governments, MDBs, etc)
 - Greatest potential for **transformational impact** on sector and **shift to low-carbon path** of future sector investment
- **Transport**
 - **Fastest growing source of emissions** contributes 12% of country total
 - According to MARKAL analysis: **lowest costs, highest mitigation potential**
 - **Successful track record** in Colombia and high replicability
- **Energy Efficiency**
 - **Most cost-effective** way to meet growing electricity demand
 - Clean electricity matrix, but **high marginal emission factor** (fossil)
 - **Higher carbon growth path risk** associated with CC and recurring drought

Colombia's Climate Change Challenge

Accelerating Sustainable Transport Systems

The Opportunity in Energy Efficiency

CTF Funds Additionality and Impact

Transport

As A Priority Sector

- ▶ Fastest-growing sector in terms of energy consumption and corresponding emissions
 - ▶ Vehicles 2009 = **3 X** vehicles 1994
- ▶ Represents **12%** of the country's total CO₂e emissions (33% of energy sector emissions)
- ▶ Potential for emissions reductions: **95 Mt CO₂e** in a 20-year period (Uniandes study)



Transport

As a Priority Sector

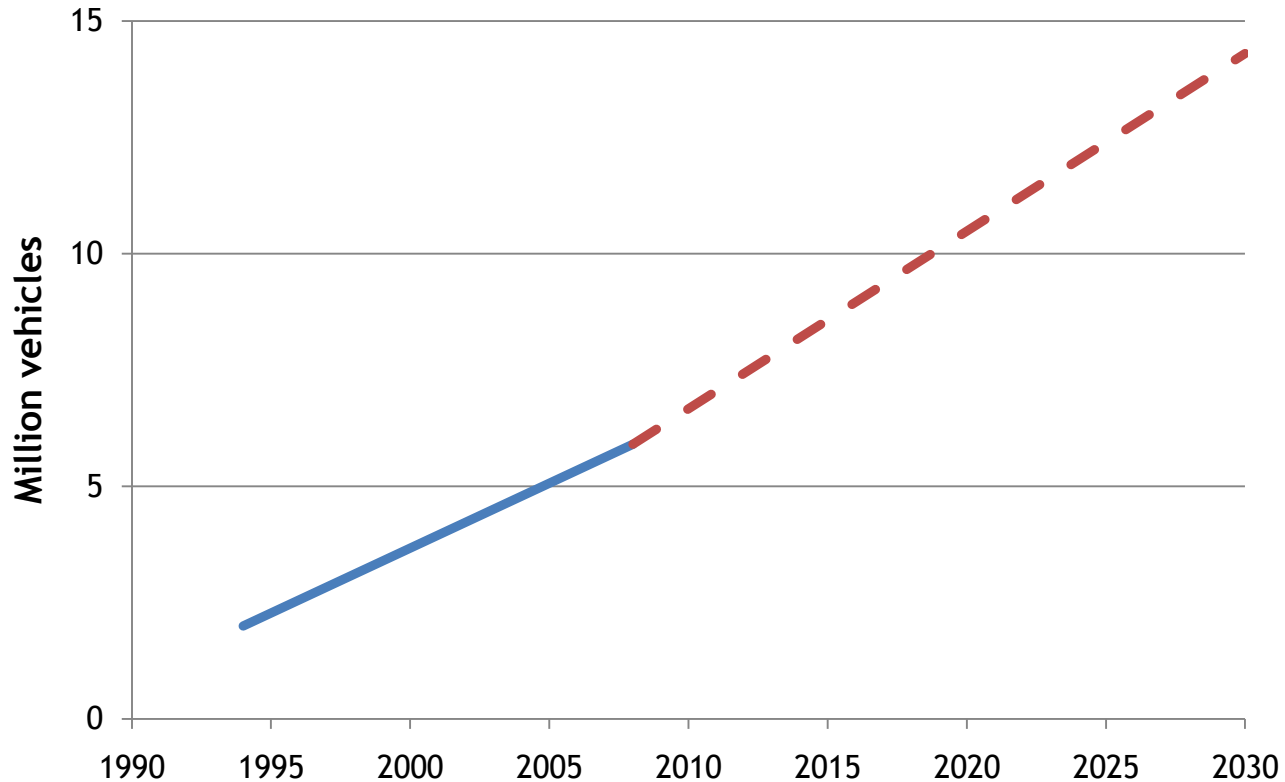
Main growth drivers

Growth in urban population

- ▶ 36 million in 2010
- ▶ 48 million in 2030

Accelerated motorization, following worldwide trend

- ▶ 1994 = 2 M vehicles
- ▶ 2009 = 5.9 M
- ▶ 2030 = 14.3 M ?



National Urban Transport Policy (2002)

Government Commitment

- ▶ Support implementation of transport systems in large (>600K pop) and medium-sized (250K-600K pop) cities: **provide competitive, efficient, affordable and safe mobility options**
- ▶ **GoC provides financial support** (up to 70% of infrastructure investment costs) and institutional capacity building incentives for municipalities: CONPES documents + earmarked fiscal transfers
- ▶ **GoC invested US\$1 B since 2000** (aprox. US\$1 B more from cities, private sector); **US\$ 1.7+ B expected from GoC alone through 2016**
- ▶ **Goal:**
 - ▶ **8 SITMs** (large cities) and **12 SETPs** (medium-sized cities)
 - ▶ **50%- 90% of total trips in public transit** (maintaining or increasing mode share of public transit)



Integrated Mass Transport Systems (Large Cities) - SITMs

Strategic Public Transit Systems (Medium Cities) - SETPs



Population in urban areas:

- ▶ 50% of World population live in cities
- ▶ 78.5% of Colombian population live in cities
- ▶ 44% of Colombia's population live in large cities (8)
- ▶ 19.7 million people
- ▶ 9% of Colombia's population live in medium-sized cities (12)
- ▶ 4.1 million people
- ▶ 75+% of Colombia's GDP in 20 main urban areas

SITM

Barranquilla (1H '10) * Cartagena ('11) * Bucaramanga (Active) * Valle de Aburrá (2H '10) * Pereira-Dosquebradas (Active) * Cali (Active) * Bogotá (Active) - Soacha ('11) * Cúcuta ('12)

SETP

Armenia * Pasto * Manizales * Popayán * Santa Marta * Neiva * Valledupar * Montería * Villavicencio * Buenaventura * Ibagué * Sincelejo

Rationale



CTF Funding would Enable/Accelerate “Greening” of Urban Transport

- Availability of CTF financing would facilitate integration of low-carbon technologies within SITPs and SETPs
 - **Additionality:** to date, reduction of GHG emissions has been ancillary benefit, not strategic priority, of NUTP
- Acting now will enable a scaling-up of sustainable transport systems to enhance the existing high modal share of public and non-motorized transport
- **CTF will cover additional upfront capital costs** of incorporating low-carbon technologies and scrapping programs
- Current **CDM can play a limited role** as price of CERs low, transaction costs high and difficulties related to CDM transport methodologies
- **Key: avoid reducing affordability** of transport systems, particularly for the poor, and making public transit far less attractive. **Additional costs cannot be transferred to the users**

Transformational potential



The urban transport vision:

To scale-up investment in low carbon urban transport systems that are competitive, efficient and equitable and provide city inhabitants with safe, clean and affordable mobility solutions.



Enhance existing urban transport plans for Bogotá & 7 medium cities

- ▶ **Accelerate investments in infrastructure to facilitate physical integration** between different low-carbon modes of transport
 - ▶ MDB loans and TA will include **design and implementation of adequate policy and regulatory measures** in the cities (comprehensive design of TDM strategies)
- ▶ **Factor in low-carbon technologies and measures** into investment plans from the outset
- ▶ **Support for scrapping displaced vehicles** (which otherwise would just be moved to other urban areas)
- ▶ **Pilot introduction of new low-carbon bus technologies**



Expected Results of CTF Transport Program

- ▶ **Emission reductions**
 - ▶ 2.5-2.8 Mt CO₂e per year from CTF Transport Program (56 Mt CO₂e cumulative by 2030)
 - ▶ 1.5 Mt CO₂e per year from replication and scale-up in SITMs (7 cities) and SETPs (12 cities)
- ▶ **Development impacts and co-benefits:** reduced traffic congestion, improvements in public health (air pollution, noise, accidents, sedentarism and stress), social inclusion (pro-poor), urban renewal and export potential
- ▶ **Accelerate the adoption of sustainable, low-carbon investments** in the sector in order to maximize modal shift toward public and non-motorized transport (proposed investments are outside the scope of existing budgeted costs for SITP and SETPs programs)

Expected Results of CTF Transport Program

The implementation of the systems at the proposed scale can stimulate a second generation of urban transport systems in Colombia, regionally in LAC and internationally

- Bogota's experience will be replicated in other large cities in Colombia and, potentially, beyond as has already occurred with BRTs
- Successful integration of low-carbon measures into the initial implementation of SETPs will encourage replication into all urban transport investment plans in the future
- Costs of alternative technologies will be reduced by providing incentives for manufacturers to produce and accelerate the introduction of clean and energy efficient transport technologies

Colombia's Climate Change Challenge

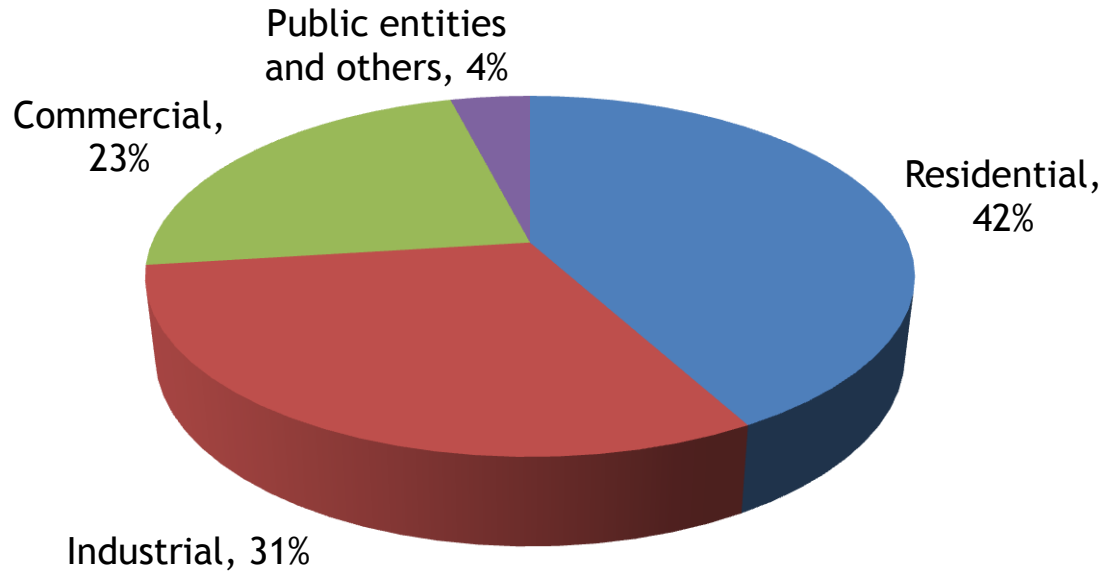
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This demand is used by:

Energy



Colombia consumed
55,986* GWh of
electricity in 2009

*including transmission
and distribution losses

Energy Efficiency is a Priority Sector

- ▶ 19% of national emissions from combustion of fossil fuels to generate electricity or heat
- ▶ Abatement potential of EE: **228 MtCO₂e** in a 20-year period (Uniandes study)
- ▶ Main drivers for emission growth in fuel combustion for electricity and heat are **economic growth, climate change, substantial fossil fuel availability**

Government Commitment to Energy Efficiency

Policy and regulatory measures are helping to set the stage for energy efficiency investments throughout the economy:

- Legal framework for efficiency and standard-setting mechanisms (**Law 697 of 2001**)
- Intersectoral commission for energy efficiency (**CIURE May 2004**)
- Energy guides and other technical specifications (**RETIE - RETILAP**)
- National plan for energy efficiency (**PROURE 2007**)

Continued commitment to promote scaled-up energy efficiency investments is demonstrated through government plans to:

- Study options for aligning regulatory structures towards efficiency, including for power distribution companies
- Establish a fund for residential energy efficiency investments





Rationale for Sector

The tremendous potential for emission reductions faces significant barriers due to market failures. Market participants are unable to adequately address these problems under current conditions:

- ◆ **Financial sector** lacks experience: difficulty in assessing and structuring investments; inflated risk perception
- ◆ **End users** lack information about the benefits and technical aspects of efficiency, and access to coordinated programs and technicians with sufficient EE training
- ◆ **Regulations** do not incentivize utilities to reduce power sales

Concessionary CTF finance provides the necessary catalyst to systematically address barriers to establishing a sustainable efficiency market in Colombia



Rationale for Sector

Once market players develop experience in the sector, efficiency savings can propel the sector forward

Market Conditions

Sustainable Market

Best Practices

Knowledge Programs
Regulatory Incentives



Attractive EE Investment
Climate

Develop Finance

Reduce Financial Risks
Increase Experience



Available Finance
At Market Rates

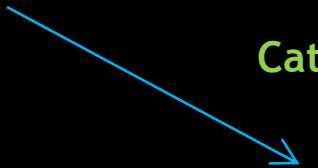
Catalyze Demand

Demonstrate EE Benefits
Train Technicians



Robust Demand
Implementation Capacity

Concessional
Finance



Energy Efficiency Program



Campaña
Uso
Racional
Energía

Strategically deploy CTF financing through a series of private and public sector interventions, using TA, investment financing and performance-based incentives to systematically reduce barriers

Policy Reform. Enhance the regulatory environment for EE

Financial Sector. Work with financial institutions to develop EE financing options, leveraging MDB and other financing. Training, financial tools, transaction support, financing support

End Users. Programs to foster demand for EE in industrial, commercial and residential sectors. Technical assistance, audits, technician training, performance-based incentive program

Expected Results

of Energy Efficiency Program

Climate (Based on expected mitigation costs plus program costs):

- 31.9 Mt CO₂e saved over 20 years
- \$670 million total program cost, leveraging \$50 million of CTF funding
- \$21.0/tCO₂e total abatement cost

National benefits:

- Higher economic efficiency as a result of better technologies
- Increased energy security, lower exposure to fuel price volatility and weather phenomena, deferred investment in energy infrastructure
- Reduced energy demand yields local environmental benefits
- Fiscal benefits for government (potential for subsidy reduction)

End user benefits:

- Financial savings, increased competitiveness for firms
- Low-income development impact, pro-poor



Expected Results of Energy Efficiency Program

Transformation. CTF finance would transform the efficiency sector in Colombia by creating:

- Stronger institutions, regulations and programs
- Capacity amongst financiers, end users and service providers
- Availability of efficiency finance

Scaling-up:

- Pilot efficiency programs exist and can be improved, coordinated and scaled up. Market actors ready to participate in scaling-up EE market
- Demonstration through key financial institutions and end users creates domino effect throughout market
- Use of concessional finance to address risk perceptions and internal capacity constraints will mobilize local financial resources

The Energy Efficiency program will result in a functioning market that encourages wholesale adoption of EE technologies throughout the economy, leading to ongoing emission reductions in the energy sector



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Key Indicators



	Cumulative emission reductions to 2030	Cost effectiveness	Cost effectiveness for CTF resources
	Mt CO ₂ e	US\$/t CO ₂ e	US\$/t CO ₂ e
Transport	56	41.5	1.8
Energy efficiency	32	21.0	1.6

Indicative Financial Plan (US\$ million)

Financing Source	Sustainable transport systems	Energy efficiency	TOTAL
CTF executed by IDB	60.0	32.5	92.5
CTF executed by IBRD	40.0	--	40.0
CTF executed by IFC	--	17.5	17.5
CTF total	100.0	50.0	150.0
IDB loans	400.0	130.0	530.0
IBRD loans	100.0	--	100.0
IFC loans	--	90.0	90.0
IDB grants	5.8	--	5.8
KfW	--	70.0	70.0
Carbon finance	30.0	--	30.0
GoC	340.0	40.0	380.0
Bogotá	150.0	--	150.0
Municipalities	240.0	--	240.0
Private sector	960.0	290.0	1250.0
TOTAL	2425.8	720.0	3145.8

Catalyzing a Low-Carbon Future

CTF Funds Additionality & Impact

- ▶ Colombia is committed to addressing its climate change challenge and contributing to global burden-sharing
- ▶ Sustainable Transport Systems and Energy Efficiency offer most cost-effective, actionable mitigation strategies
- ▶ CTF Funds will have transformational impact on these sectors:
 - ▶ Put **GHG emissions reduction** at center of sector agendas
 - ▶ Catalyze transition to **lower-carbon growth paths**
 - ▶ **Leverage** domestic public & private, MDB, bilateral, FDI and non-profit funds
 - ▶ **High replicability/scalability** in Colombia, LAC and beyond (see Bogotá Transmilenio experience)
- ▶ Colombia stands ready to put CTF Funds to immediate use generating **significant sustainability and developmental impact**



Thank you

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