

• ENERGY EFFICIENCY AND CLIMATE CHANGE: OPPORTUNITIES FOR LATIN AMERICA AND THE CARIBBEAN



Alicia Bárcena
Executive Secretary
ECLAC, Santiago, Chile.

• CONTENT

- **Borderline conditions faced by the regional energy sector in the period 2012 – 2030 and lags persisting after the reforms in the 1990s**
- **LAC in the global energy balance**
- **Energy efficiency in the global climate change mitigation effort.**
- **LAC participation in the mitigation scenario**
 - **Cost-effective opportunities for LAC**
 - **Opportunities aligned with our own agenda of regional energy policy**
- **Conclusion: Opportunities for an integrated policy for the period 2010-2030**

• **THE REGION WILL FACE TWO NEW BORDERLINE CONDITIONS IN THE NEXT DECADE:**

- **The period 2012 – 2030 will see the strengthening of the international approach towards climate change** (at least in OECD countries)
 - Oriented to achieving the stabilization goals proposed by the European Union (20% by 2020)
 - There are political pressures on LAC to contribute to a certain extent to the mitigation scenario.
- **The sustained economic growth of Asian countries will continue pushing the global energy demand**
 - International Energy Agency (IEA-OECD) plans the balance price to be between 60-70 USD/crude barrel in the medium term.
 - There is a greater priority for LAC to have energy diversification and security policies
 - increased efficiency in the use of energy.

• **CURRENT POLITICAL PRIORITIES**

- **Investment in energy infrastructure,**
- **Supply security,**
- **Managing demand growth, source diversification,**
- **Improving access**

- **BUT THERE ARE LAGS AFTER THE REFORMS IN THE 1990s**

- **Infrastructure investment lagging behind**
 - First generation of reforms did not manage to induce the investment dynamics required by the regional energy sector
 - Institutional and regulatory failures, and macroeconomic barriers hindered the full achievement of the reforms goals in the energy sector in the 1990s.
- **Lagging behind in providing access to quality energy for non-covered sectors**
- **Insufficient institutional capacity for goals related to renewable and non conventional sources (including nuclear)**
- **Insufficient institutional capacity for energy efficiency**

- **CURRENT SITUATION**

- **Most countries have postponed the effective application of energy efficiency, security and energy diversification policies**
- **Priority of these policies increased due to record oil prices reached during 2007-2008,**
- **In view of this scenario, the regional energy sector should identify opportunities to move forward simultaneously in:**
 - **Its own energy policy agenda, and**
 - **Finding cost-effective options to participate in the international climate change regime**

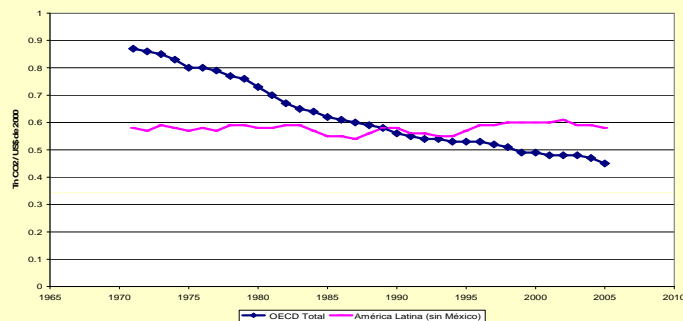
● CONTENT

1. Borderline conditions faced by the regional energy sector in the period 2012 - 2030 and lags persisting after the reforms in the 1990s.
2. **LAC in the global energy balance**
3. Importance of the energy efficiency in the global climate change mitigation effort
4. LAC participation in the mitigation scenario.
Cost-effective opportunities for LAC
Opportunities aligned with our own agenda of regional energy policy
5. Conclusion: Opportunities for an integrated energy policy for the period 2010-2030

● ENERGY EFFICIENCY IN LAC 1970 - 2005 EVOLUTION CO2 PER PRODUCT UNIT (KG CO₂ PER USD 2000 PPP)

Evolution of CO₂ emissions per product unit

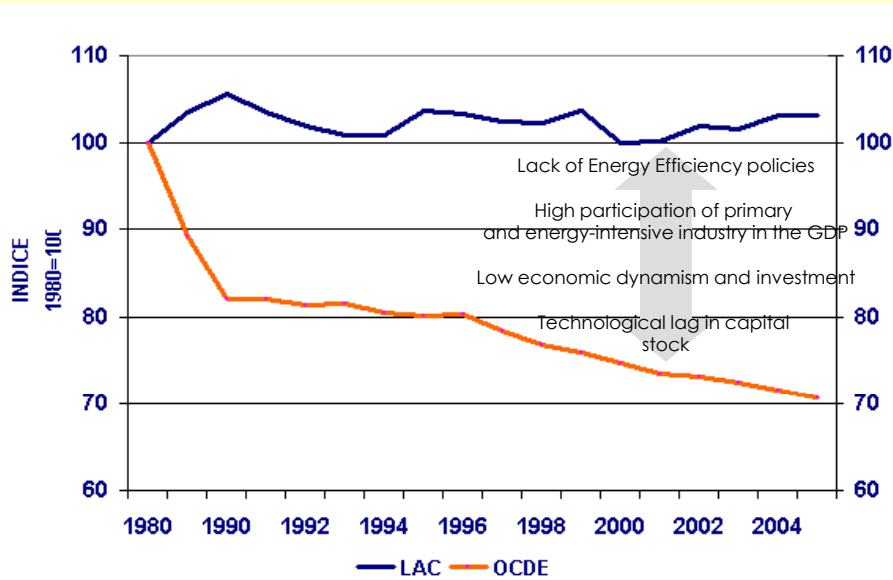
(Carbon Intensity) 1970-2005
Emisiones por Unidad de Producto



Source: International Energy Agency. CO₂ Emissions from Fuel Combustion. CO₂ Indicator Vol 2007 release 01.

GLOBAL ENERGY ETHICS IN LAC

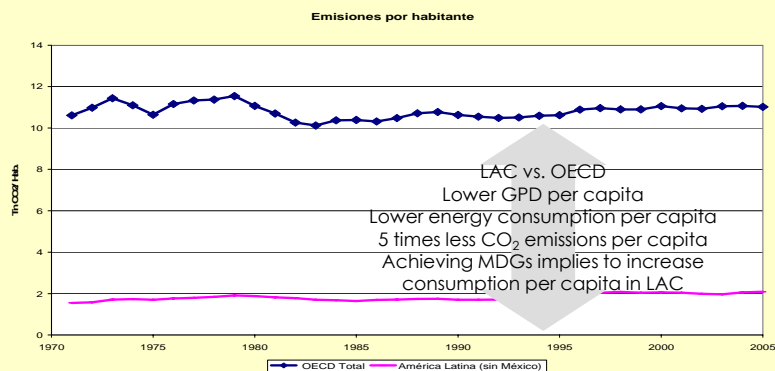
ENERGY INTENSITY (BEP/1000 US\$ AT 2'000 prices)



Source: Hugo Altomonte et al. América y el Caribe frente a la coyuntura energética internacional, ECLAC, 2008.

CO₂ PER CAPITA (TON CO₂ PER CAPITA) 1970 - 2005 EVOLUTION

Evolution of CO₂ emissions per capita 1971-2005

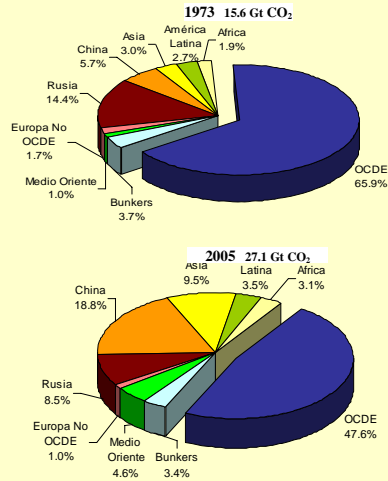


Source: International Energy Agency. CO₂ Emissions from Fuel Combustion. CO₂ Indicator Vol 2007 release 01.

• **LAC 3.5% OF GLOBAL CO₂ EMISSIONS GLOBAL IN 2005**

associated with fossil fuel combustion in the energy sector.

Graph 16
Regional share of global CO₂ emissions 1973-2005



Fuente: IEA, CO₂ emissions from fuel combustion 1971-2005.

• **2030 BAU PROSPECT: LAC WILL CONTRIBUTE 3.9% OF GLOBAL CO₂ EMISSIONS**

(Fossil fuel combustion in the energy sector.)

Cuadro 6

Participación regional en emisiones CO₂, oferta y consumo de energía mundial al 2005

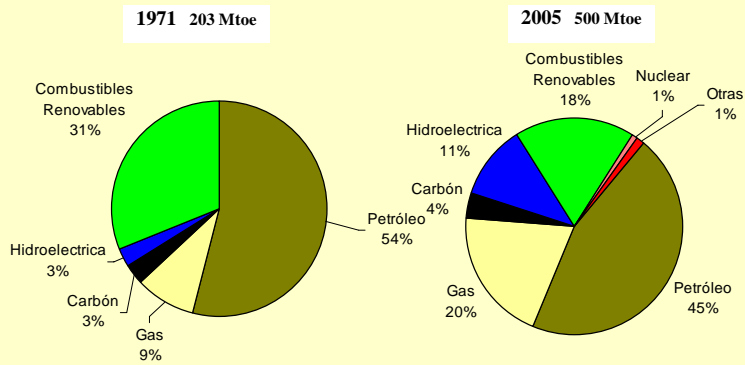
a) REGIONES	b) Oferta de Energía Primaria 2005 11,435 Mtoe % por región	c) Consumo Energía Final 2005 7,912 Mtoe % por región	d) Emisiones de CO ₂ 2005 27.1 Gt CO ₂ % por región	e) Emisiones de CO ₂ proyectada: 2030 41.9 Gt CO ₂ % por región
f) Países en Desarrollo	g) 40,5	h) 55,8	i) 39,0	j) 55
k) América Latina	l) 4,4	m) 5,0	n) 3,5	o) 3,9
p) Medio Oriente	q) 4,4	r) 4,2	s) 4,6	t)
u) Africa	v) 5,3	w) 5,6	x) 3,1	y)
z) Asia	aa) 26,5	bb) 25,6	cc) 28,0	dd) 42,0
ee) China	ff) 15,2	gg) 14,2	hh) 19,0	ii) 27,3
jj) India	kk) 4,6	ll) 4,5	mm) 4,3	nn) 7,9
oo)	pp)	qq)	rr)	ss)
tt) OCDE	uu) 48,5	vv) 49,0	ww) 48,0	xx) 36,0
yy) EEUU	zz) 20,4	aaa) 20,6	bbb) 18,2	ccc) 16,4
ddd) Unión Europea	eee) 15,8	fff) 16,8	ggg) 14,5	hhh) 10
iii) Mundial	jjj) 100	kkk) 100	lll) 100	mmm) 100

Fuente: Elaboración propia. Fuente estadística: IEA-OECD WEO 2007.

Mtoe = Millones de toneladas de petróleo equivalente. Gt = Giga toneladas de CO₂.

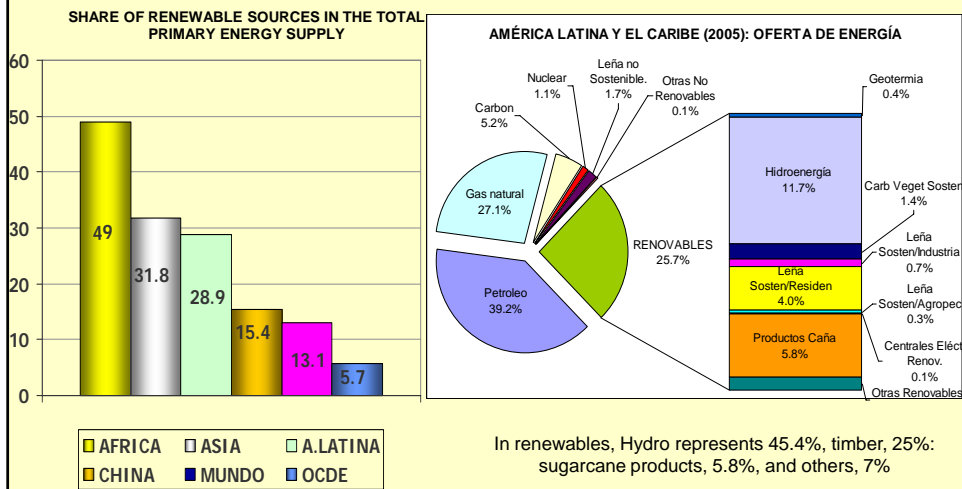
COMPOSITION OF ENERGY SUPPLY IN LAC

gráfico 15
Composición de la oferta de energía primaria en ALC 1971-2005



Fuente: Energy Balances of non-OECD Countries 2004-2005. IEA-OECD (2007). Mtoe = Millones de toneladas de petróleo equivalentes.

The share of renewables in the total primary energy supply in Latin America is in an intermediate position as compared to other regions in the world, with a net predominance of biomass and great hydro.



In renewables, Hydro represents 45.4%, timber, 25%: sugarcane products, 5.8%, and others, 7%

Source: Developed by IEA with own data, Renewables in Global Energy Supply. January 2007 and OLADE Economic Energy Information System. May 2007

• STYLIZED FACTS: LAC IN THE GLOBAL ENERGY BALANCE

- ◆ LAC has a low relative contribution to global CO₂ emissions (3.5%, 2005) and (3.9%, projected by 2030) on the (*business as usual*) assumption.
- ◆ LAC is among the regions with lower CO₂ emissions per product unit (Kg CO₂/USD 2000 ppp) and CO₂ emission per inhabitant.
- ◆ However, CO₂ emissions per product unit for LAC have remains stagnant in the period 1970-2005, as compared to OECD countries which have achieved reductions of almost 50% for this indicator during the same period.
- ◆ Stagnation of this indicator in LAC would be accounted for:
 - ◆ the high participation of primary and energy-intensive industries in the regional GDP (as compared to a higher weight of the service sector in OECD countries)
 - ◆ little progress in energy efficiency policies in countries
 - ◆ Low economic growth in the period 1980-2000 (approx. 3% average interannual, close to the energy supply growth rate) which would tend to stabilize the CO₂emissions/GDP rate.
- ◆ The non-energy emissions produced in the region (as a result of deforestation, changes in the use of soil, etc) have a much greater relative weight at global level than the CO₂ emissions of its energy sector.

• CONTENT

1. Borderline conditions faced by the regional energy sector in the period 2012 - 2030 and lags persisting after the reforms in the 1990s.
2. LAC in the global energy balance
3. **Importance of energy efficiency in the global climate change mitigation effort**
4. LAC participation in the mitigation scenario.

Cost-effective opportunities for LAC
Opportunities aligned with our own agenda of regional energy policy
5. Conclusion: Opportunities for an integrated energy policy for the period 2010-2030

• **MEASURES IDENTIFIED FOR EMISSION REDUCTION IN 2005 – 2030 SCENARIOS**

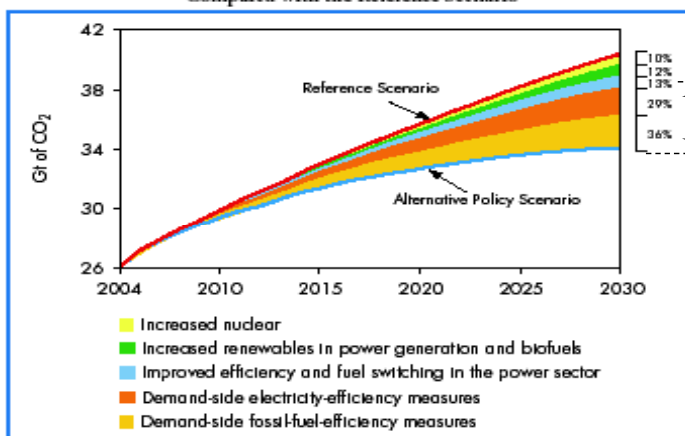
(INCREASE IN EFFICIENCY AND TECHNOLOGICAL PROSPECT IEA-OECD WORLD ENERGY OUTLOOK 2007 Y 2008)

- Efficiency increase in electric generation.
- Management of electricity demand and efficiency in use
- Greater efficiency in the industrial sector and transportation.
- Generation from renewable sources.
- Generation increase from nuclear energy.
- Introduction of carbon capture and sequestration technologies
- Forest management

EFFICIENCY IMPROVEMENTS IN ENERGY DEMAND REPRESENT 75% OF EMISSION REDUCTION IN THE ALTERNATIVE IEA-OECD SCENARIO BY 2030

(the scenario implies that countries effectively apply all mitigation policies that they had announced until 2007 in the period 2005-2030)

Figure 7.14: Global Savings in CO₂ Emissions in the Alternative Policy Scenario Compared with the Reference Scenario

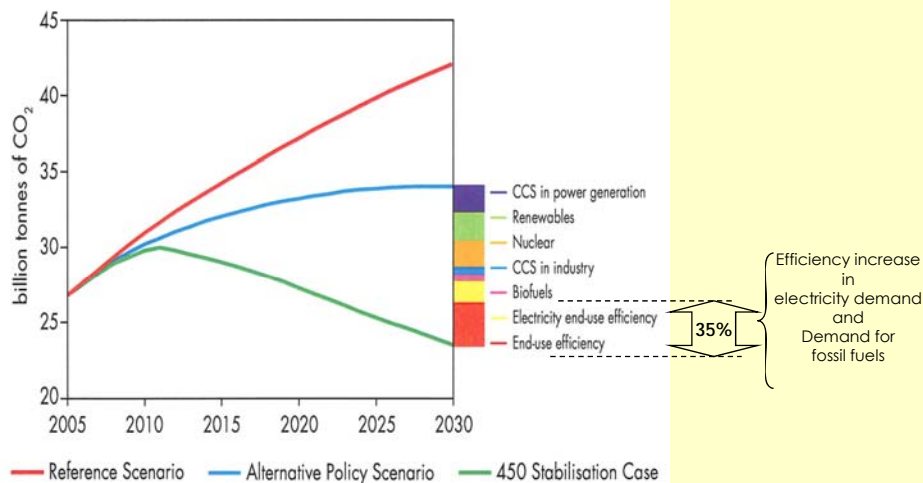


Efficiency increase in electricity demand and Demand for fossil fuels

Source: IEA-OECD World Energy Outlook 2006 and 2007

IN ADDITION, ENERGY EFFICIENCY WOULD REPRESENT 35% OF ADDITIONAL EMISSION REDUCTION REQUIRED TO ATTAIN THE MITIGATION SCENARIO BY 2030

(THE MITIGATION SCENARIO IMPLIES ADDITIONAL REDUCTIONS FOR THE STABILIZATION AT 450-550 PPM, THE GOAL PROPOSED BY THE EUROPEAN UNION)

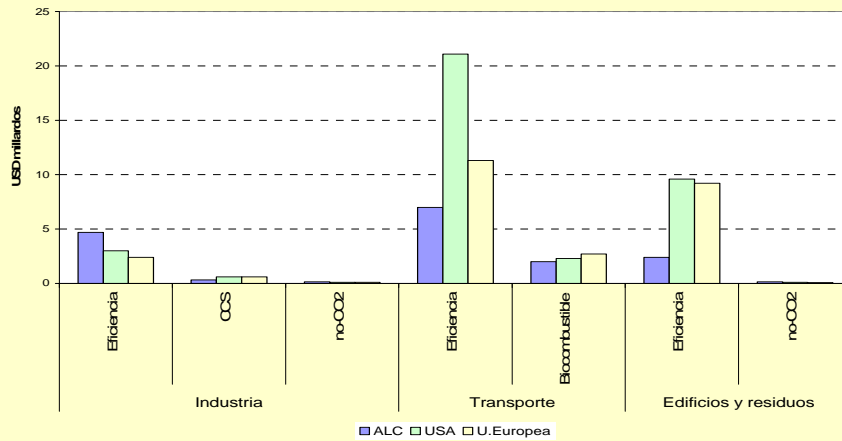


● CONTENTS

1. Borderline conditions faced by the regional energy sector in the period 2012 - 2030 and lags persisting after the reforms in the 1990s.
2. LAC in the global energy balance
3. Importance of energy efficiency in the global climate change mitigation effort
4. **LAC participation in the mitigation scenario.**
Cost-effective opportunities for LAC
Opportunities aligned with our own agenda of regional energy policy
5. Conclusion: Opportunities for an integrated energy policy for the period 2010-2030

• MITIGATION SCENARIO 2030

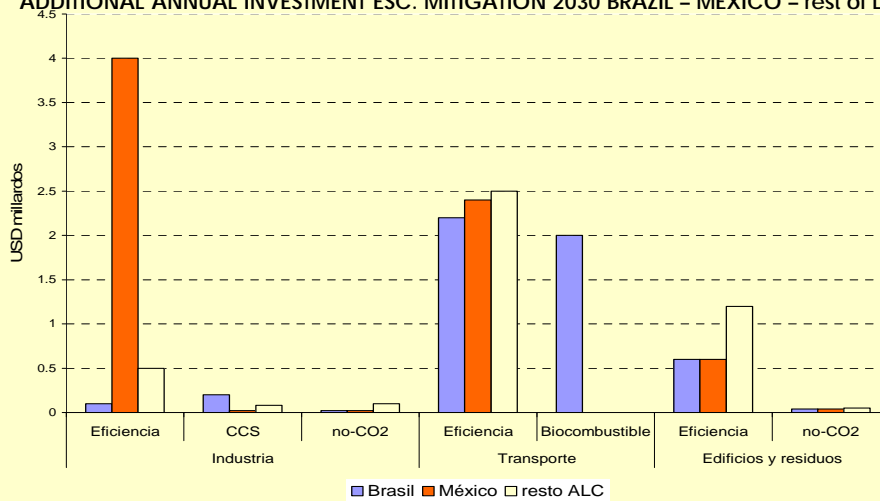
ADDITIONAL ANNUAL INVESTMENT ESC. MITIGATION 2030 LAC – USA - UE



Source: In house. Statistical source: UNFCCC (2007).

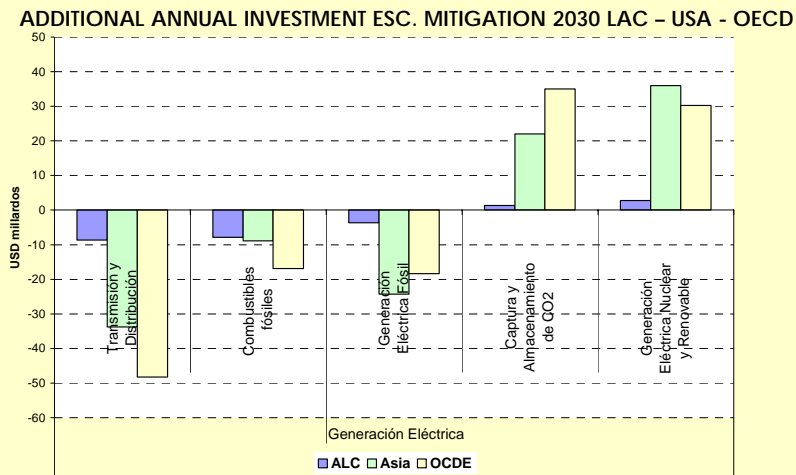
• LAC participation in the mitigation scenario to the interior of the region: opportunities are also focused on improved efficiency in Industry, Transportation and Buildings.

ADDITIONAL ANNUAL INVESTMENT ESC. MITIGATION 2030 BRAZIL – MEXICO – rest of LAC



Source: In house. Statistical source: UNFCCC (2007).

- LAC participation in the mitigation scenario



Source: In house. Statistical source: UNFCCC (2007).

- LAC participation in the mitigation scenario: main findings (I)

- Opportunities to contribute to the mitigation scenario are focused on efficiency gains in the use of energy in all sectors (electricity generation, transportation, buildings, etc.)
- It is a set of policies of interest to countries in the region regardless of the international agenda on climate change.
- LAC could save resources since, in net terms, investments saved in expanding the energy supply would be higher than the additional investments required to increase the energy efficiency on the demand side.
- According to estimates published by the Secretariat of UNFCCC, resources saved as a result of these efficiency measures could amount to 5,700 million USD per year in 2030 as compared to an scenario without policies..

Source: UNFCCC (2007) *Investment and Financial Flows to address climate change*, estimate based on the OECD-Env Linkages Model in cooperation with the IEA.

- **LAC participation in the mitigation scenario as compared to other regions**

PARTICIPACIÓN REGIONAL EN LAS EMISIONES CO₂ GLOBALES EN 2005-2030, Y EN LA INVERSIÓN ADICIONAL REQUERIDA EN EL ESCENARIO DE MITIGACIÓN

REGIONES	Emisiones CO ₂ 2005 ACTUAL 27 Gt CO ₂ Participación regional %	Emisiones CO ₂ 2030 Esc. REFERENCIA 42 Gt CO ₂ Participación regional %	Inversión adicional en 2030 Esc. MITIGACION - 15 Gt CO ₂ Reducción necesaria vs. Esc. Referencia Millones USD (dólar 2006)
América Latina	3,5 %	3,9 %	\$ -5 670
Brasil			\$ -1 220
Otros ALC			\$ -4 350
México			\$ 6 470
Asia	28,0 %	41,6 %	\$ 41 300
China	19,0	27,3	\$ 33 500
India	4,3	7,9	\$ 7 600
Países en Desarrollo	39,0 %	55 %	\$ 38 700
OECD	48,0 %	36,0 %	\$ 66 900
EEUU	18,2	16,4	\$ 51 800
Unión Europea	14,5	10	\$ 6 800
Mundial	100	100	\$ 109 000

Fuente: Elaboración propia con base en estadísticas: IEA WEO 2007, UNFCCC 2007

- **LAS participation in the mitigation scenario: main findings (II)**

- It is about the same energy efficiency, security and diversification policies that have long been identified as opportunities to prioritize in the energy policy agenda of countries from a national perspective.
- LAC is not in a position to absorb the first generation of investments in the new technologies of Clean Carbon, CAC, etc. vs. Asia and OECD countries where these technologies will play a much more significant role.
- It is anticipated that penetration and dissemination of transportation technologies of low or zero emissions (hybrid vehicles, fuel cells, etc) will occur first in those countries with higher per capita income than in our region.

● CONTENTS

1. Borderline conditions faced by the regional energy sector in the period 2012 – 2030 and lags persisting after the reforms in the 1990s.
2. Importance of energy efficiency in the global climate change mitigation effort
3. LAC participation in the mitigation scenario.
Cost-effective opportunities for LAC
Opportunities aligned with our own agenda of regional energy policy
4. **Conclusion: Opportunities for an integrated energy policy for the period 2010-2030**

● OPPORTUNITIES FOR THE PERIOD 2010-2030

- LAC participation in the mitigation scenario implies an additional effort to manage the energy demand growth in the period 2010-2030 applying effective energy efficiency policies to meet the development goals (MDGs) with 20% less emissions with respect to a scenario lacking policies.
- A strong political will and overcoming institutional and regulatory failures, and macroeconomic barriers which hampered the progress of the reforms in the energy sector in the 1990s are required.
- Building capacity to develop and successfully apply policies to increase the efficiency in the use and production of energy, and to increase the renewability of the energy supply is required. So far, efforts in both fields have been insufficient.

• OPPORTUNITIES FOR THE PERIOD 2010-2030

➤ PENDING AGENDA:

- Development of base lines, statistics, indicators, and institutional and technical capacity to apply energy efficiency and source diversification policies, and monitor their progress in the countries.
- Mobilization of the necessary investment and creation of institutional, technical and regulatory capacity to attain these policy goals.
- In order to meet the Millennium Development Goals (MDGs), LAC countries should necessarily converge to higher levels of per capita income and, therefore, higher per capita energy consumption.
- Expanding quality energy coverage and consumption to sectors that still have no access to it.
- Meeting these goals with greater energy efficiency is a challenge for the regional energy policy.

• CONCLUSIONS

- Positioning as proactive region in the international scene to combat climate change has low relative costs due to LAC's potential to manage its growth through improved efficiency in the use of energy and diversification of energy sources as compared to other regions.
- This positioning enables the region to capture additional technological and financial flows associated with this participation in the international agenda.
- These flows may be channeled to aspects that have been left behind in the regional energy agenda and that expect to be addressed independently from the international agenda on climate change.
- This strategy would allow countries to move their internal priorities forward simultaneously and take a proactive role before the international approach to climate change according to their own development priorities.

-
- Thank you



Executive Secretariat, ECLAC
Santiago, Chile

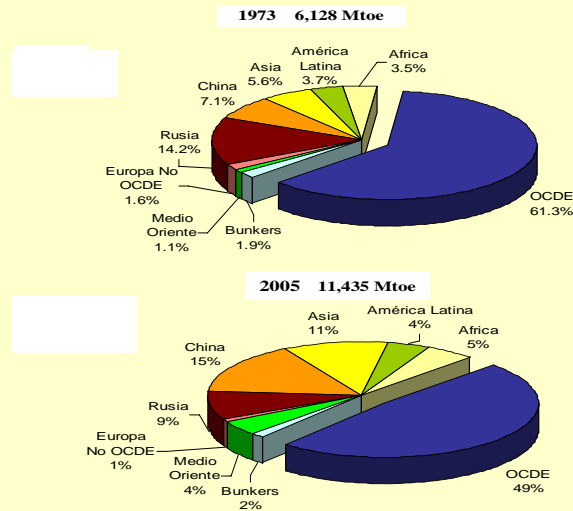
- **CONTENT**

ANNEX:

Latin America in the global energy
balance

- LAC 4% of global energy supply in 2005

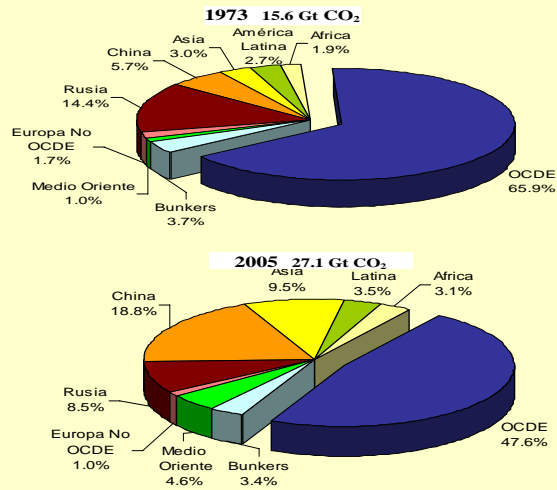
GRÁFICO 14 PARTICIPACIÓN REGIONAL EN OFERTA DE ENERGÍA PRIMARIA 1973-2005



Key World Energy Statistics, 2007 Edition. IEA-OECD 2007. Mtoe = Millones de toneladas de petróleo equivalentes. Bunkers = Combustibles marinos en aguas internacionales.

- LAC 3.5% of global CO2 emissions in 2005 associated to fossil fuel combustion in the energy sector.

GRÁFICO 16 PARTICIPACIÓN REGIONAL EN LAS EMISIONES DE CO2 GLOBALES 1973-2005



Fuente: IEA, CO2 emissions from fuel combustion 1971-2005.

• **2030 BAU Prospect: LAC will contribute 3.9% of global CO2 emissions (fossil fuel combustion in the energy sector.)**

Cuadro 6

Participación regional en emisiones CO₂, oferta y consumo de energía mundial al 2005

a) REGIONES	b) Oferta de Energía Primaria 2005 11,435 Mtoe % por región	c) Consumo Energía Final 2005 7,912 Mtoe % por región	d) Emisiones de CO2 2005 27.1 Gt CO2 % por región	e) Emisiones de CO2 proyectadas 2030 41.9 Gt CO2 % por región
f) Países en Desarrollo	g) 40,5	h) 55,8	i) 39,0	j) 55
k) América Latina	l) 4,4	m) 5,0	n) 3,5	o) 3,9
p) Medio Oriente	q) 4,4	r) 4,2	s) 4,6	t) 4,6
u) África	v) 5,3	w) 5,6	x) 3,1	y) 3,1
z) Asia	aa) 26,5	bb) 25,6	cc) 28,0	dd) 42,0
ee) China	ff) 15,2	gg) 14,2	hh) 19,0	ii) 27,3
jj) India	kk) 4,6	ll) 4,5	mm) 4,3	nn) 7,9
oo) OCDE	pp) 48,5	qq) 49,0	rr) 48,0	ss) 36,0
yy) EEUU	zz) 20,4	aaa) 20,6	bbb) 18,2	ccc) 16,4
ddd) Unión Europea	eee) 15,8	fff) 16,8	ggg) 14,5	hhh) 10
iii) Mundial	jjj) 100	kkk) 100	lll) 100	mmm) 100

Fuente: Elaboración propia. Fuente estadística: IEA-OECD WEO 2007.

Mtoe = Millones de toneladas de petróleo equivalente. Gt = Giga toneladas de CO₂.

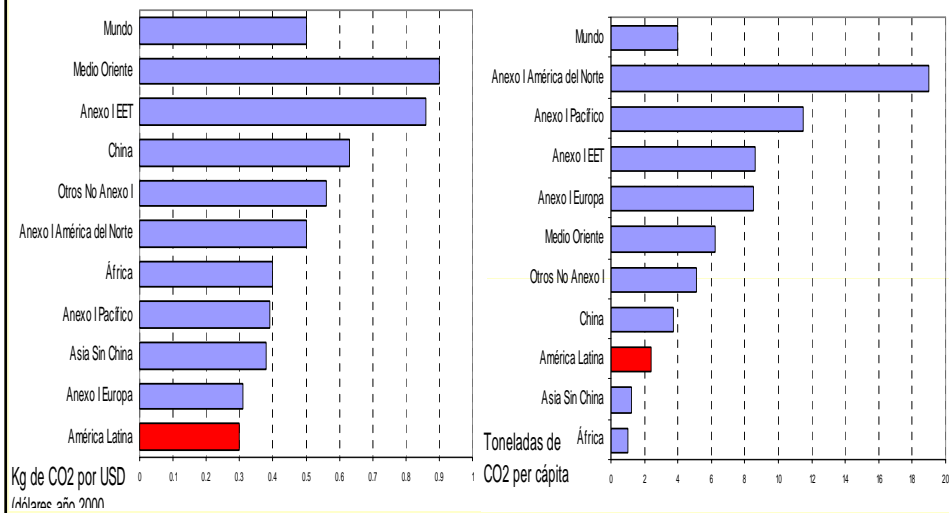
• **CO2 per product unit (Kg CO2 per USD 2000 ppp)**

similar to EUROPE, 40% lower than Annex I

CO2 per capita (CO2 ton per capita)

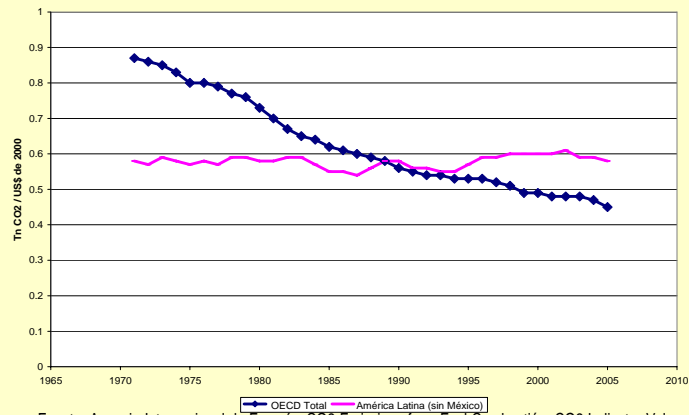
3 times lower than EUROPE, a magnitude order lower than the

U.S.



- **CO₂ per product unit (Kg CO₂ per USD 2000 ppp)**
Evolution 1970 – 2005

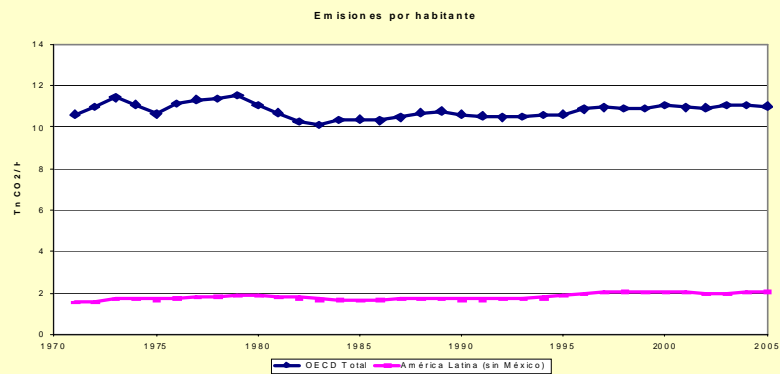
EVOLUCIÓN DE EMISIONES CO₂ POR UNIDAD DE PRODUCTO
(Intensidad de carbono) 1970-2005
Emisiones por Unidad de Producto



Fuente: Agencia Internacional de Energía. CO₂ Emissions from Fuel Combustión. CO₂ Indicator Vol 2007 release 01.

- **CO₂ per capita (CO₂ ton per capita)**
Evolution 1970 – 2005

Evolution of CO₂ emissions per capita 1971-2005



Source: International Energy Agency. CO₂ Emissions from Fuel Combustión. CO₂ Indicator Vol 2007 release 01.

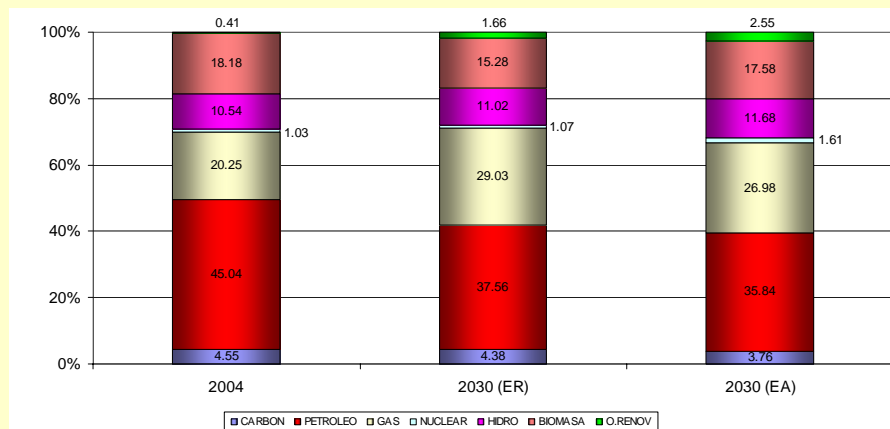
• Stylized facts: LAC in the global energy balance

- LAC has a low relative contribution to global CO₂ emissions (3.5%, 2005) and (3.9%, projected by 2030) on the (*business as usual*) assumption.
- LAC is among the regions with lower CO₂ emissions per product unit (Kg CO₂/USD 2000 ppp) and CO₂ emission per inhabitant.
- However, CO₂ emissions per product unit for LAC have remains stagnant in the period 1970-2005, as compared to OECD countries which have achieved reductions of almost 50% for this indicator during the same period.
- Stagnation of this indicator in LAC would be accounted for:
 - the high participation of primary and energy-intensive industries in the regional GDP (as compared to a higher weight of the service sector in OECD countries)
 - little progress in energy efficiency policies in countries
 - Low economic growth in the period 1980-2000 (approx. 3% average interannual, close to the energy supply growth rate) which would tend to stabilize the CO₂ emissions/GDP rate.
- The non-energy emissions produced in the region (as a result of deforestation, changes in the use of soil, etc) have a much greater relative weight at global level than the CO₂ emissions of its energy sector.

• Pending additional challenges in LAC's energy policy agenda

- To correct distortions of current prices which act against the sustainable management of energy demand growth (subsidies in Argentina (gas), Venezuela (gasoline), among other general price distortions in the region;
- To promote renewable sources and hydroelectricity in the regional energy supply more effectively;
- To achieve significant efficiency increase in the use of energy in all sectors;
- To develop policies to manage energy demand growth in accordance with sustainability criteria;
- To develop investment and technology policies to incorporate greater efficiency in infrastructure, capital goods and consumption;
- To develop urban infrastructure and land use policies to manage the accelerated growth of the demand for individual transportation in the region which bring about a growing consumption of liquid fossil fuels and byproducts (oil, diesel and gasoline).

• Latin America and the Caribbean: Composition of the total energy supply projected to 2030. Reference and alternative scenarios



Source: ECLAC, based on the International Energy Agency. World Energy Outlook 2006. Annex A Pages 520-559

• Latin America represents less than 7% of total investments projected until 2030, and almost one third corresponds to Brazil

REFERENCE SCENARIO
(In billion 2005 US\$).

	TOTAL	OECD	PED	Other (1)	LATIN AMERICA	BRAZIL
Coal	563	156	330	77	12	1
Oil	4266	1149	2223	894	378	138
Gas	3925	1744	1516	665	265	48
Electricity	11276	4240	6446	590	719	252
TOTAL (2)	20192	7289	10515	2388	1374	439

1- Includes Russia and other countries of transition economies in Central Europe

2- Includes 162 billion biofuels not broken down by region

Source: International Energy Agency. World Energy Outlook 2006. Page 77.

INVESTMENTS REQUIRED IN LATIN AMERICA - PUBLIC-PRIVATE SECTORS
(accumulated until 2030, in billion dollars)

1. Oil

- Upstream 270; Refining 42; Heavy crude oils 66
Estimated investments for state-owned companies amount to approximately 282 billion dollars. In the upstream (216) and in heavy crude oils (66). The private sector should focus on refining rather than exploration and development

2. Natural Gas

- Upstream 148; Transportation 54; LNG 22; Distribution 41
The private sector should find opportunities in transportation and in part in the LNG chain

3. Electricity

- Generation 324; Transmission 124; Distribution 271
Changes should favor a greater dynamism of the private sector. Uncertainties in some countries

• ENERGY EFFICIENCY AND CLIMATE CHANGE: OPPORTUNITIES FOR LATIN AMERICA AND THE CARIBBEAN



Alicia Bárcena
Executive Secretary
ECLAC, Santiago, Chile