CAREC ESCC Meeting
Almaty, Kazakhstan
25-26 March 2010

Energy Statistics and Outlook for Asia and the Pacific

- Focusing CAREC Members

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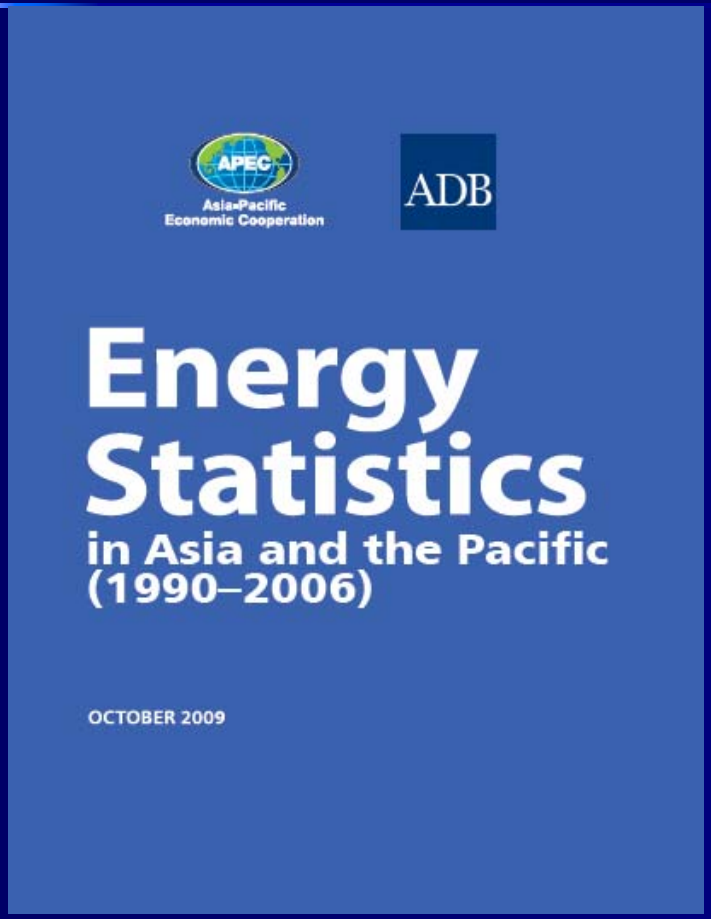
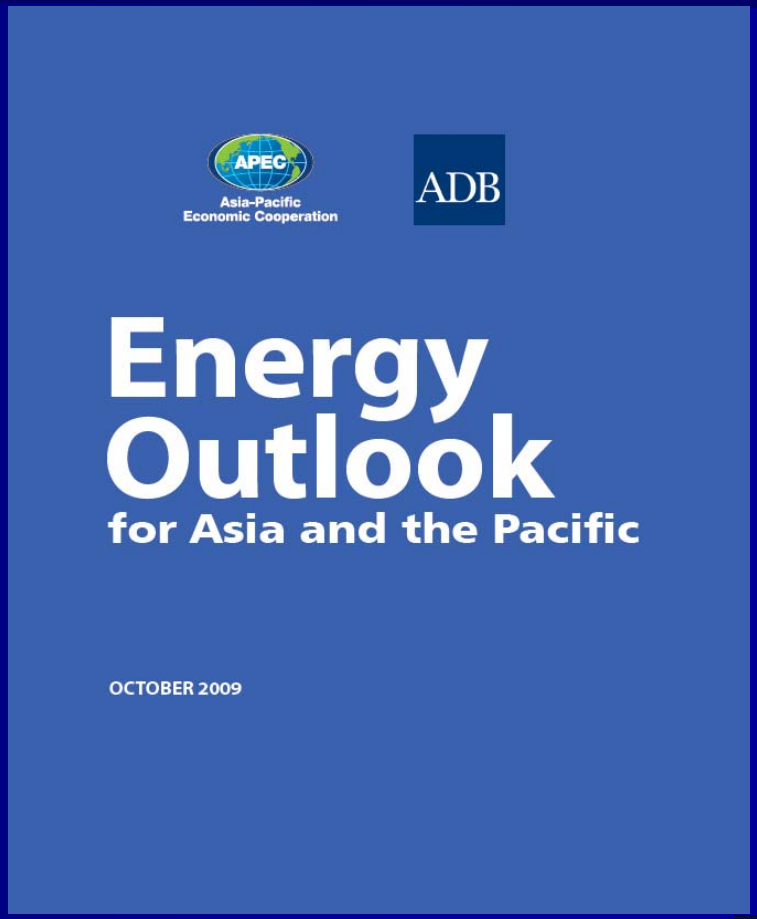
Historical Trends and Outlook of Energy in Asia and the Pacific





Outline

- Study Background
- Energy Outlook Results
  - Asia-Pacific
  - CAREC Members
- Moving Forward

Study Background

- Why this Study was initiated?
- What "Asia and the Pacific" means?
  - Central and West Asia (10): AFG, ARM, AZE, GEO, KAZ, KGZ, PAK, TAJ, TKM, UZB
  - East Asia (5): HKG, KOR, MON, PRC, TAP
  - The Pacific (14): COO, FIJ, KIR, RMI, FSM, NAU, PAL, PNG, SAM, SOL, TIM, TON, TUV, VAN
  - South Asia (6): BAN, BHU, IND, MLD, NEP, SRI
  - Southeast Asia (10): BRU, CAM, INO, LAO, MAL, MYA, PHI, SIN, THA, VIE
  - Developed Group (3): AUS, JPN, NZL
  - 48 Regional Members of ADB

Study Background (Conti.)

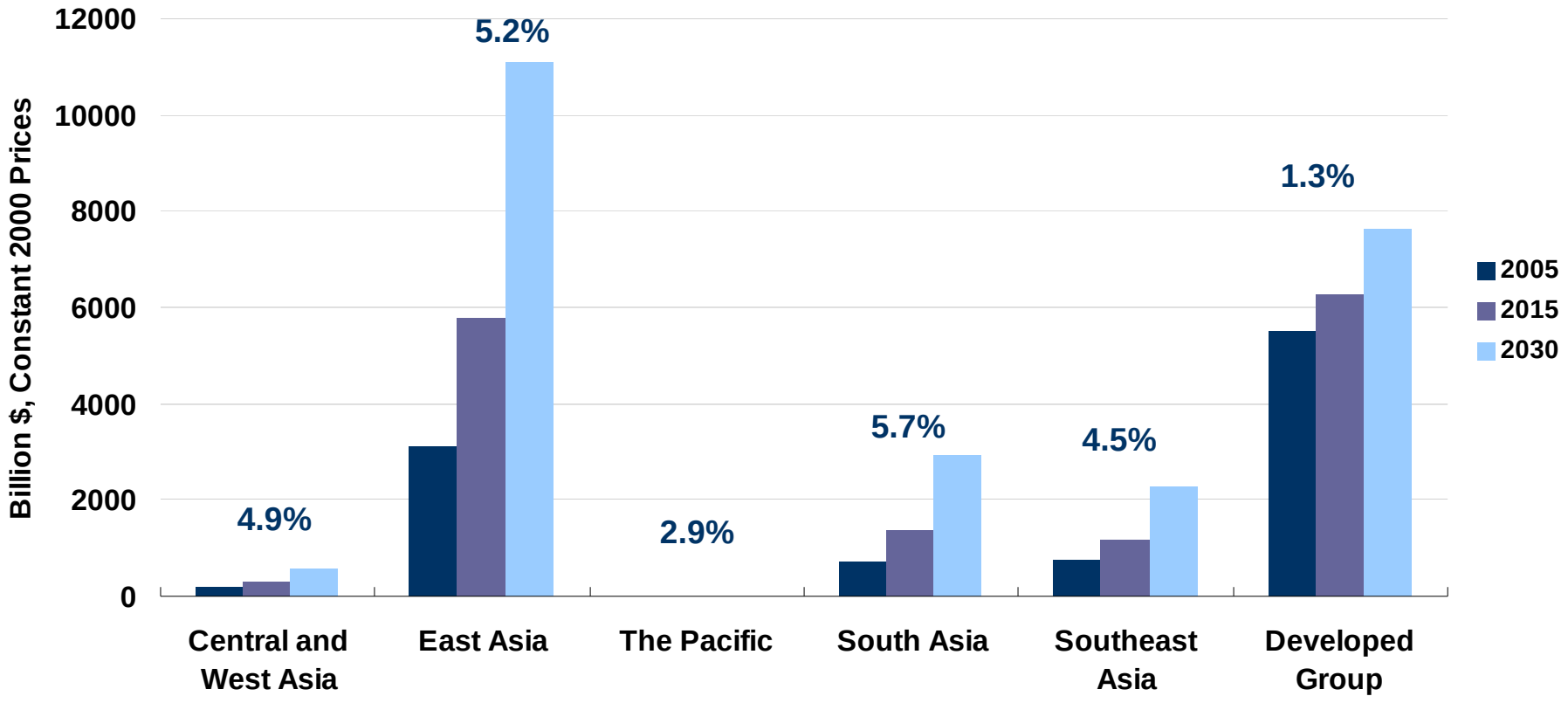
- **Sources of Energy Information?**
  - 15 APEC members: APEC Energy Database
  - Remaining 33 members:
    - √ IEA Energy Balances (16)
    - √ UNSD Energy Database (13)
    - √ Lao PDR (1): consultant's estimate
    - √ No available data (3):

      Federated States of Micronesia, Tuvalu, Marshall Islands,

Energy Outlook for Asia and the Pacific

GDP

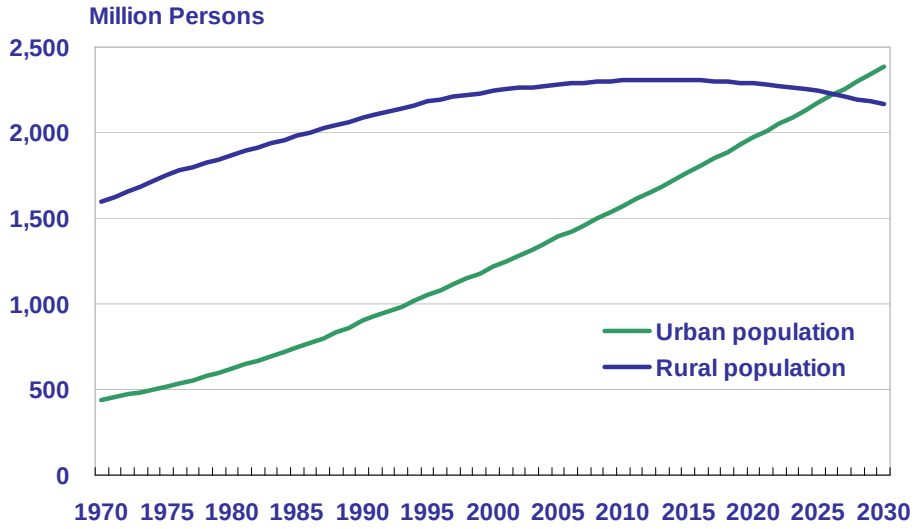
South Asia is expected to grow at the fastest annual rate, followed by East Asia, Central and West Asia.



Source: Asian Development Bank and Asia Pacific Energy Research Centre.

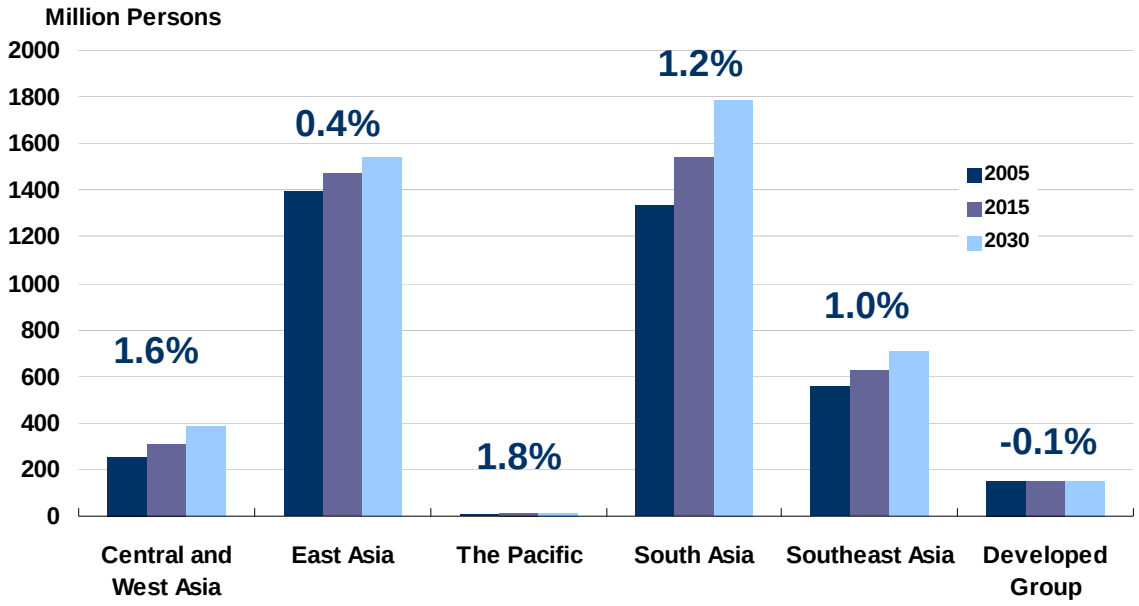
Population

Urban Population



Growing number of urban population may drive the growth in the use of commercial energy sources.

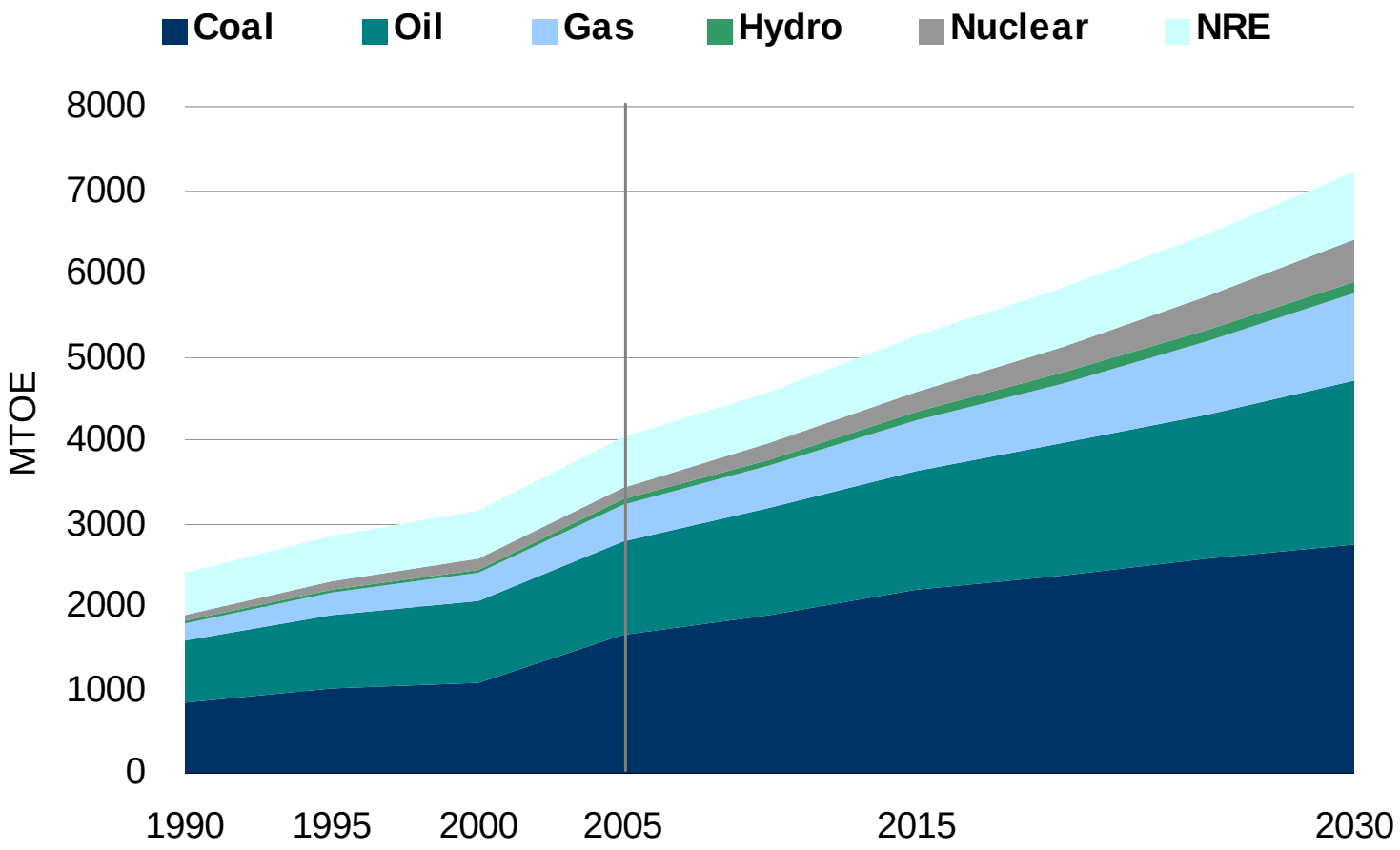
Total Population



Source: United Nations Population Prospects

Total Primary Energy Demand by Energy Type

Energy demand of Asia and the Pacific to grow at 2.4% per year - a faster rate than the world average.



Annual growth rate (2005-2030)

NRE and others: 1.3%

Nuclear: 5.1%

Hydro: 3.0%

Gas: 3.6%

Oil: 2.2%

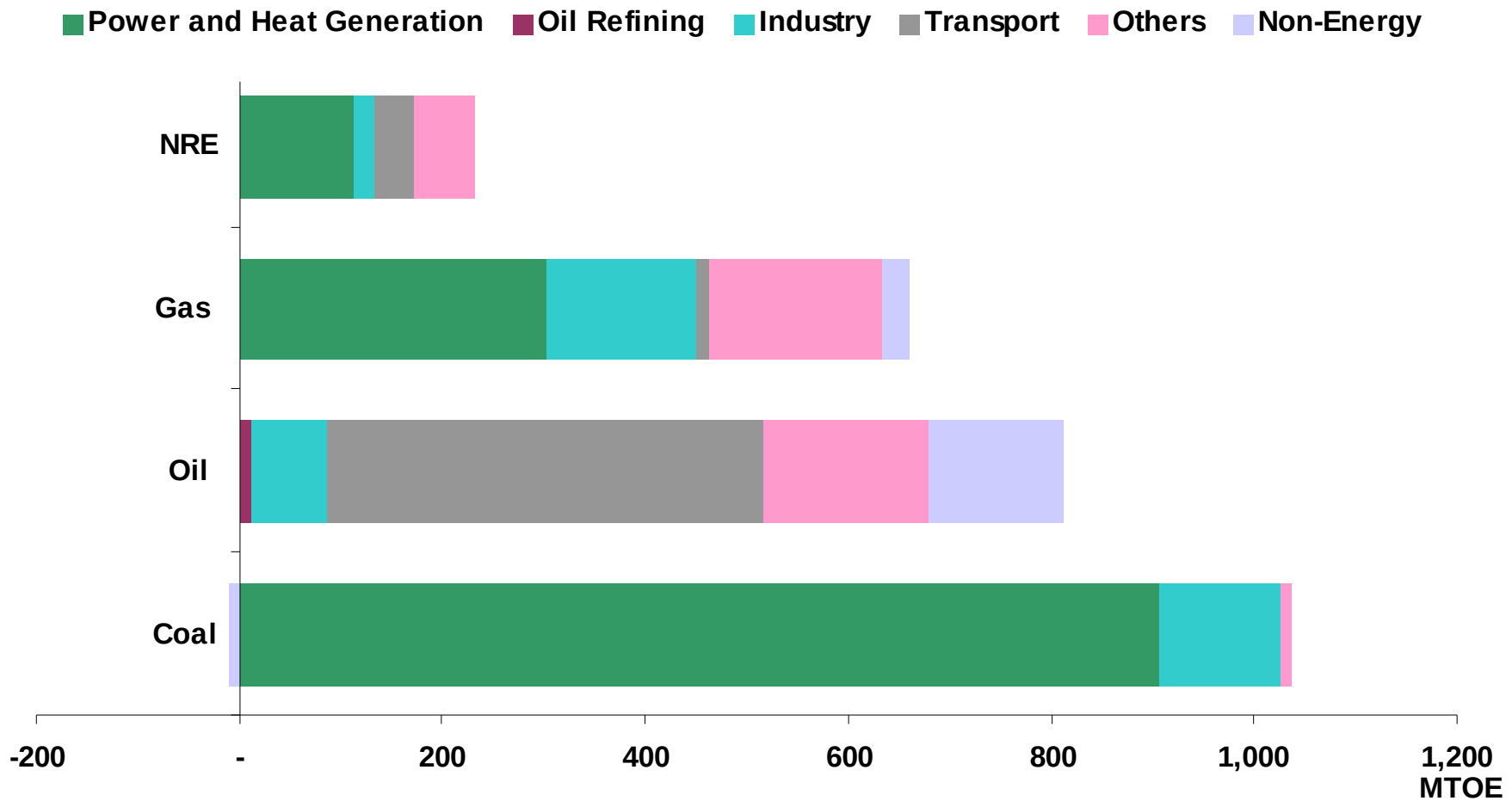
Coal: 2.1%

Source: Asia Pacific Energy Research Centre.

Incremental Growth by Energy Type and by Sector

(2005-2030)

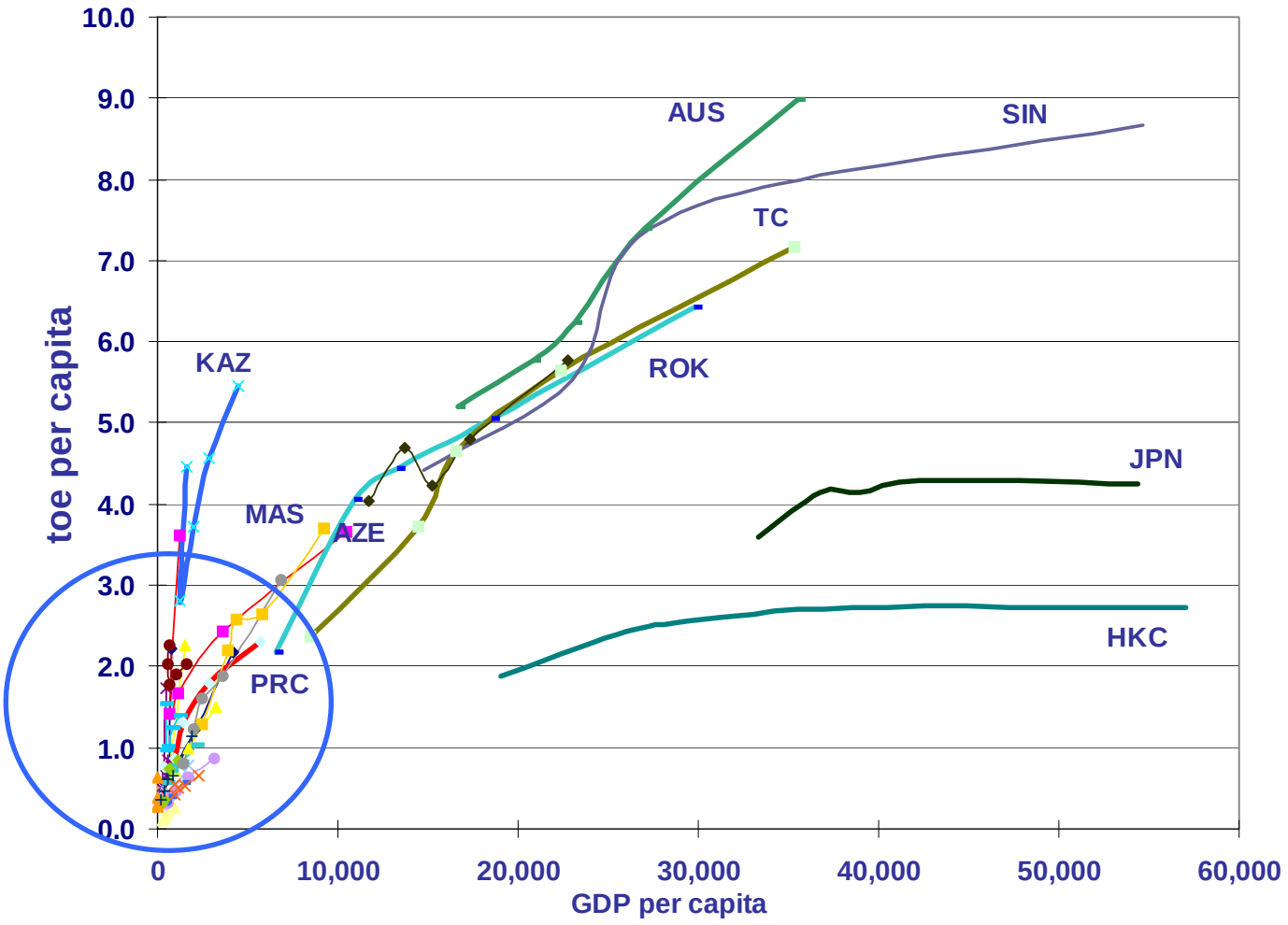
Coal to lead the overall demand growth, followed by oil and natural gas.



Source: Asia Pacific Energy Research Centre.

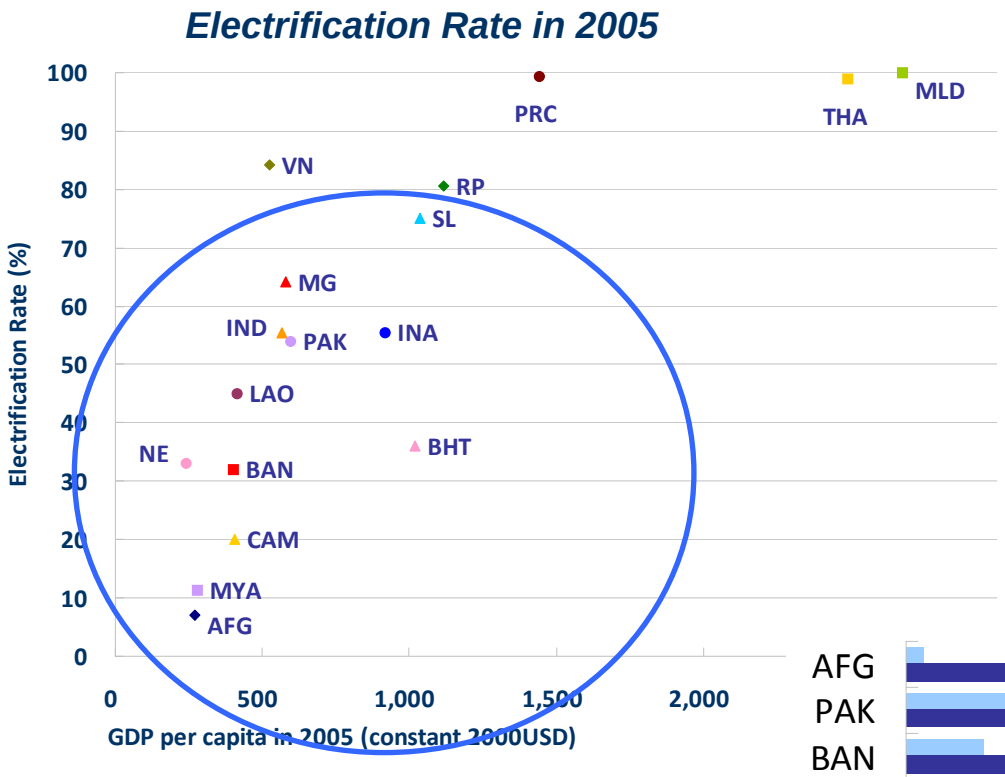
Total Primary Energy Demand per capita (1990-2030)

Asia and the Pacific to lead the world's energy demand growth, while the per capita energy demand will remain relatively low for most of the DMCs.



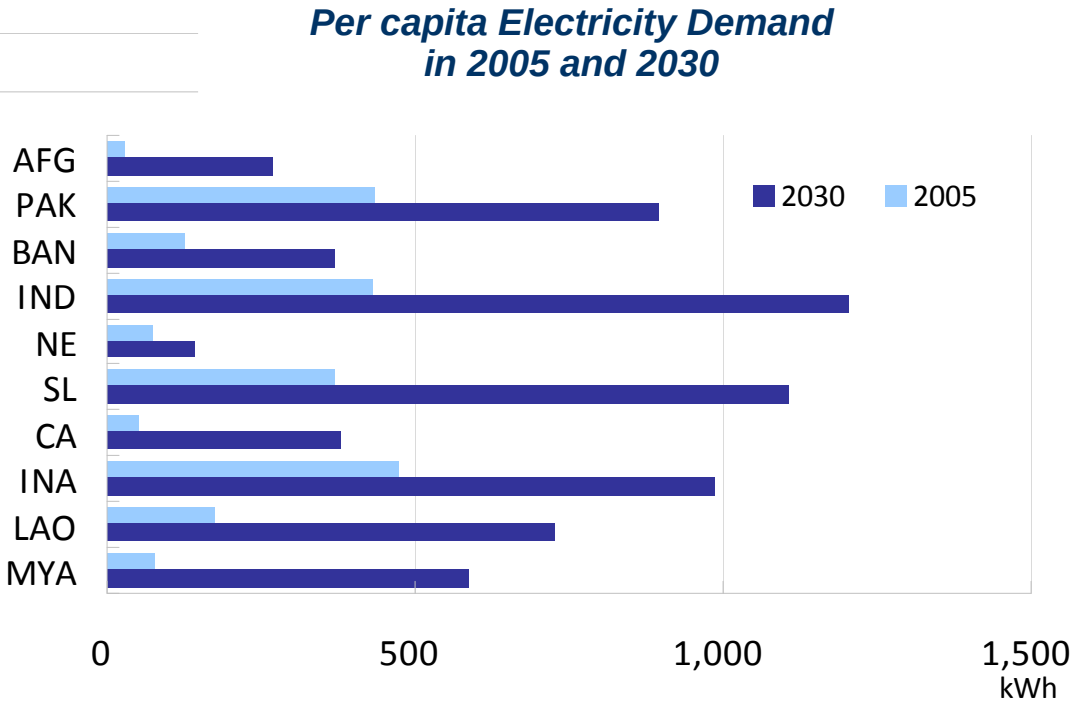
Source: Asia Pacific Energy Research Centre.

Energy Access



Source: Asian Development Bank (2009)

Per capita electricity demand may expand at those countries with income level below 1,500 USD. Access to the electricity supply infrastructure needs improvement.

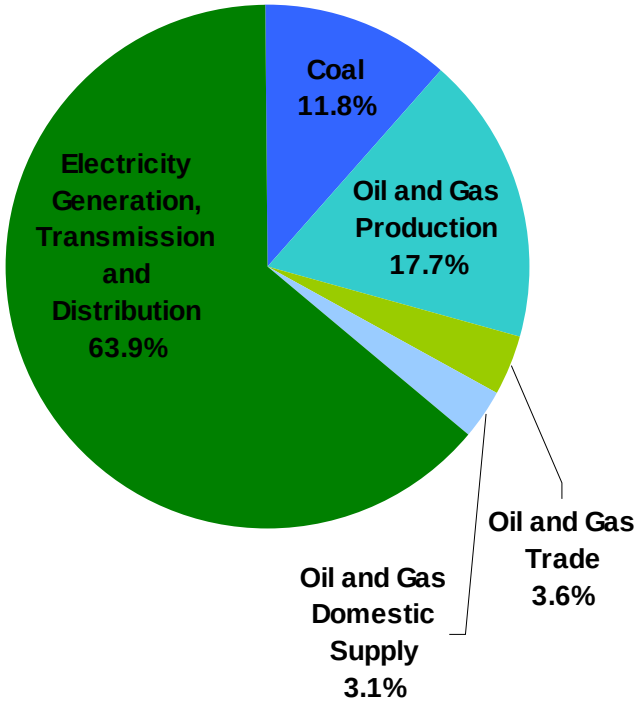


Source: Asia Pacific Energy Research Centre.

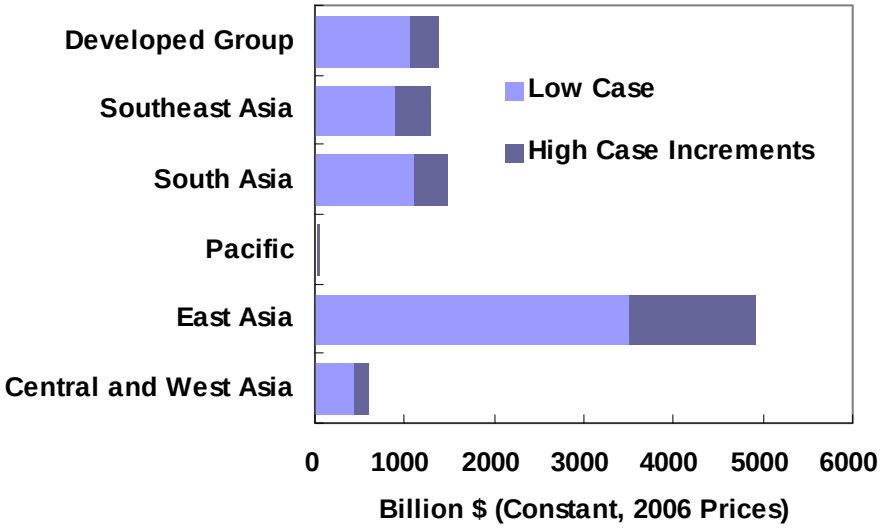
Energy Investment by Sector and by Subregion

Asia and the Pacific will require between $7.0 trillion and $9.7 trillion of investment in the energy sector.

Energy Investment by Sector (High Case)



Energy Investment by Subregion



Source: Asia Pacific Energy Research Centre.

Energy Outlook for CAREC Members

GDP

CAREC members' total GDP to grow faster than the ADB's average, increasing the share from 19% in 2005 to 35% in 2030.

	GDP (billion constant 2000 $)			Annual Growth Rate		
	2005	2015	2030	2005-2015	2015-2030	2005-2030
Afghanistan	6.8	14.2	39.4	7.7%	7.0%	7.3%
Azerbaijan	9.9	29.9	78.8	11.7%	6.7%	8.6%
PRC	1,893	3,981	8,274	7.7%	5.0%	6.1%
Kazakhstan	30.0	47.2	76.7	4.7%	3.3%	3.8%
Kyrgyz Republic	1.6	2.5	3.7	4.3%	2.5%	3.2%
Mongolia	1.5	2.5	3.9	5.1%	3.0%	3.9%
Tajikistan	1.5	2.4	3.9	4.8%	3.2%	3.8%
Uzebekistan	17.9	32.6	58.7	6.2%	4.0%	4.9%
CAREC Total	1,963	4,113	8,539	7.7%	5.0%	6.1%
ADB DMCs	4,791	8,619	16,899	6.0%	4.6%	5.2%
ADB Total	10,301	14,883	24,520	3.7%	3.4%	3.5%

Source: Asian Development Bank.

Population

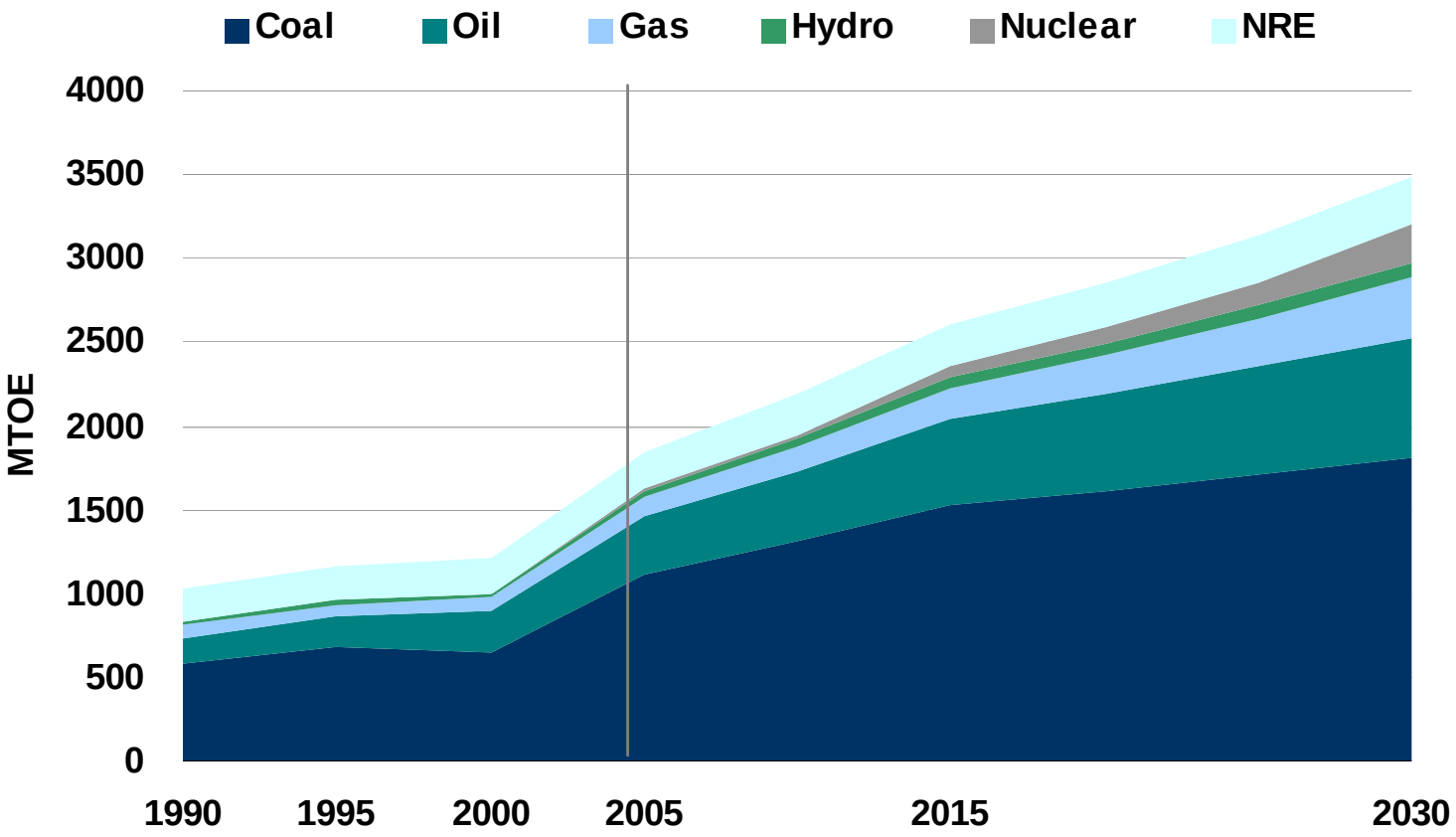
Overall population of CAREC members will reach 1593 million in 2030 from 1403 million in 2005, growing at 0.5% per year.

	Population (millions)			Annual Growth Rate		
	2005	2015	2030	2005-2015	2015-2030	2005-2030
Afghanistan	25.1	35.6	53.3	3.6%	2.7%	3.1%
Azerbaijan	8.4	9.0	9.6	0.8%	0.4%	0.6%
PRC	1,313	1,389	1,458	0.6%	0.3%	0.4%
Kazakhstan	15.2	16.3	17.1	0.7%	0.3%	0.5%
Kyrgyz Republic	5.2	5.8	6.3	1.1%	0.6%	0.8%
Mongolia	2.6	2.9	3.2	1.0%	0.8%	0.9%
Tajikistan	6.6	7.7	9.4	1.6%	1.4%	1.5%
Uzebekistan	26.6	30.6	35.2	1.4%	0.9%	1.1%
CAREC Total	1,403	1,497	1,593	0.7%	0.4%	0.5%
ADB DMCs	3,551	3,954	4,435	1.1%	0.8%	0.9%
ADB Total	3,703	4,107	4,583	1.0%	0.7%	0.9%

Source: United Nations Population Prospects

Total Primary Energy Demand by Energy Type

Energy demand of CAREC members to grow at 2.6% per year - slightly faster than the average growth rate of Asia and the Pacific.



Annual growth rate (2005-2030)

NRE and others: 1.0%

Nuclear: 11.9%

Hydro: 2.9%

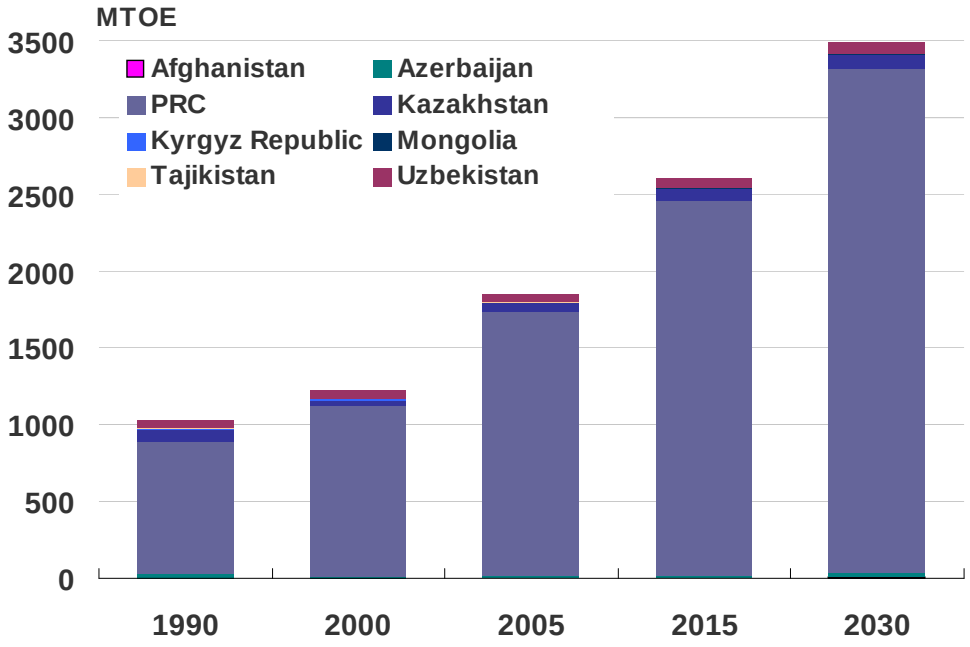
Gas: 5.1%

Oil: 3.0%

Coal: 1.9%

Source: Asia Pacific Energy Research Centre.

Total Primary Energy Demand by Country



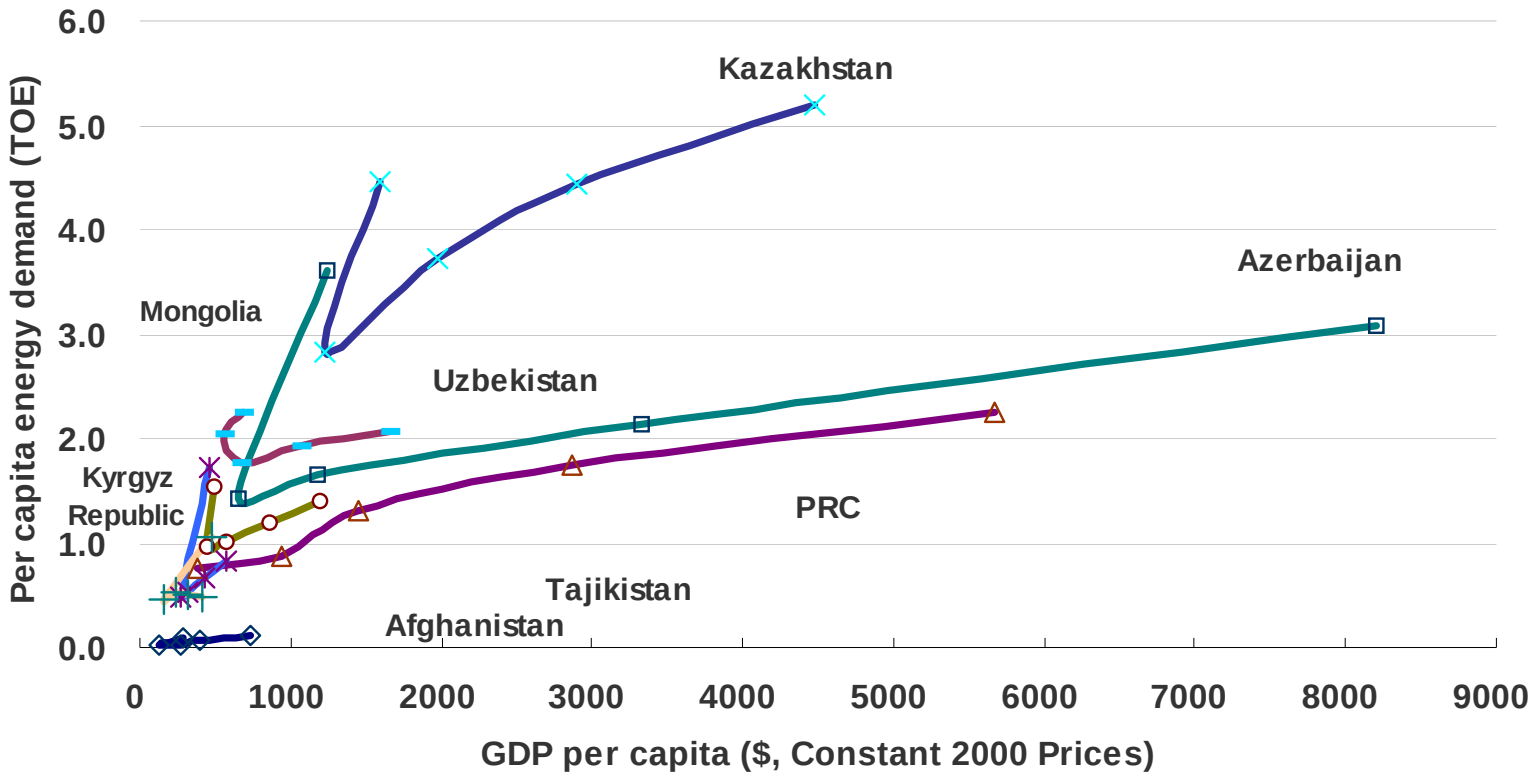
PRC to account for about 94% of total primary energy demand in CAREC members. Diverse growth trends by member – ranging from Tajikistan's 1.2% at the slowest to the Afghanistan's 9.5% at the fastest.

	1990	2000	2005	2015	2030	1990-2005	2005-2030
Afghanistan	1.2	0.7	0.7	2.5	6.5	-3.9%	9.5%
Azerbaijan	26.1	11.6	13.9	19.3	29.5	-4.1%	3.1%
PRC	863.2	1105.9	1720.1	2440.4	3280.8	4.7%	2.6%
Kazakhstan	73.6	42.2	56.7	72.3	88.9	-1.7%	1.8%
Kyrgyz Republic	7.6	2.4	2.8	3.8	5.3	-6.5%	2.6%
Mongolia	3.4	2.4	2.6	3.4	4.5	-1.8%	2.2%
Tajikistan	5.6	2.8	3.4	3.9	4.6	-3.2%	1.2%
Uzbekistan	46.4	50.4	47.0	59.2	72.6	0.1%	1.8%
CAREC Total	1027.1	1218.4	1847.1	2604.8	3492.6	4.0%	2.6%
ADB Total	2402.0	3143.2	4025.3	5247.1	7215.2	3.5%	2.4%
Share in ADB	43%	39%	46%	50%	48%		

Source: Asia Pacific Energy Research Centre.

Per capita Energy Demand by Country

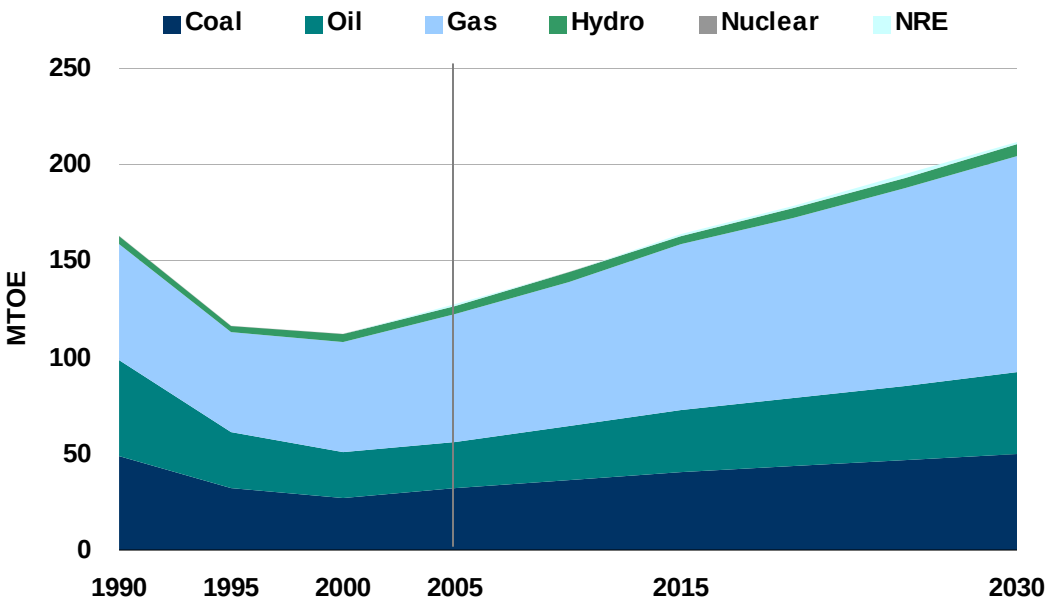
Different economic development level, industry structure and climate results in wide variations in per capita energy demand in CAREC Members.



Source: Asia Pacific Energy Research Centre.

Total Primary Energy Demand by Energy Type – Excluding PRC

Primary Energy Demand



Annual growth rate (2005-2030)

NRE and others: 4.1%

Nuclear: -

Hydro: 1.4%

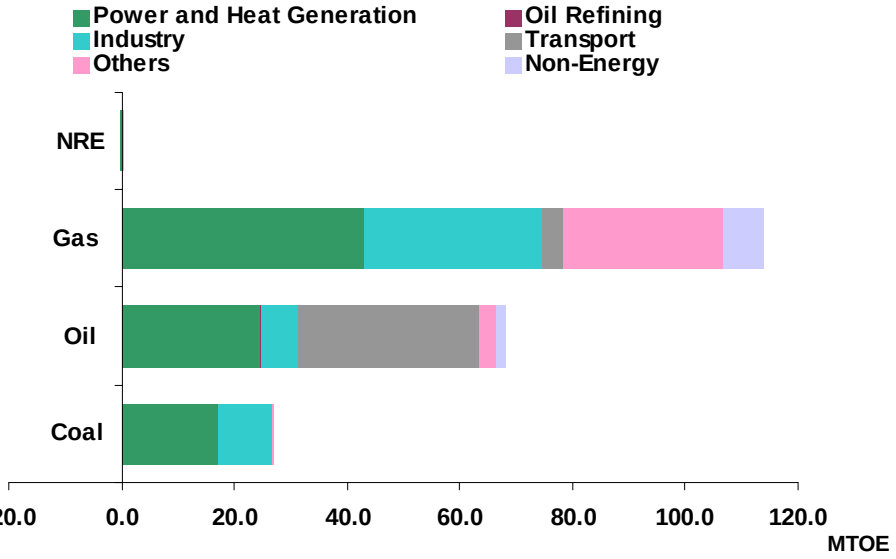
Gas: 2.1%

Oil: 2.3%

Coal: 1.8%

Energy demand of CAREC members – excluding PRC to grow at 2.1% per year. Given the resources availability, natural gas will maintain the dominant share in total energy mix at 53%.

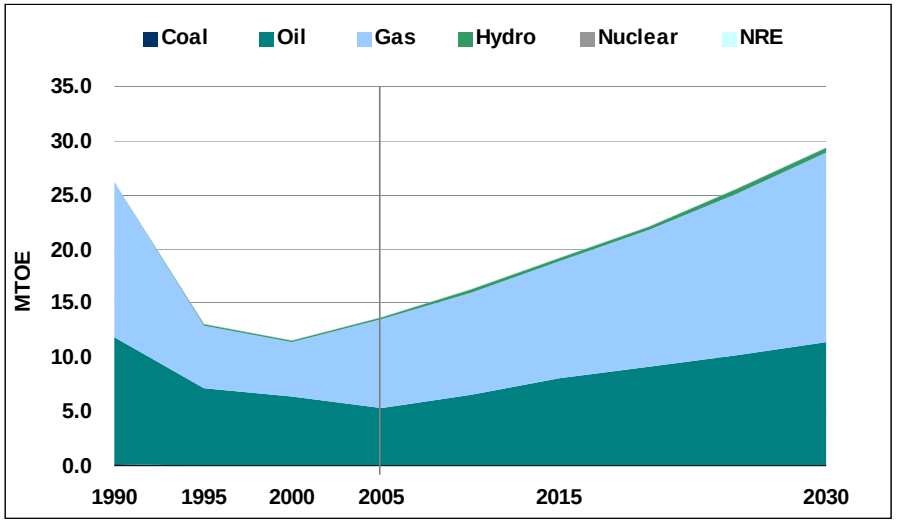
Incremental Growth by Type



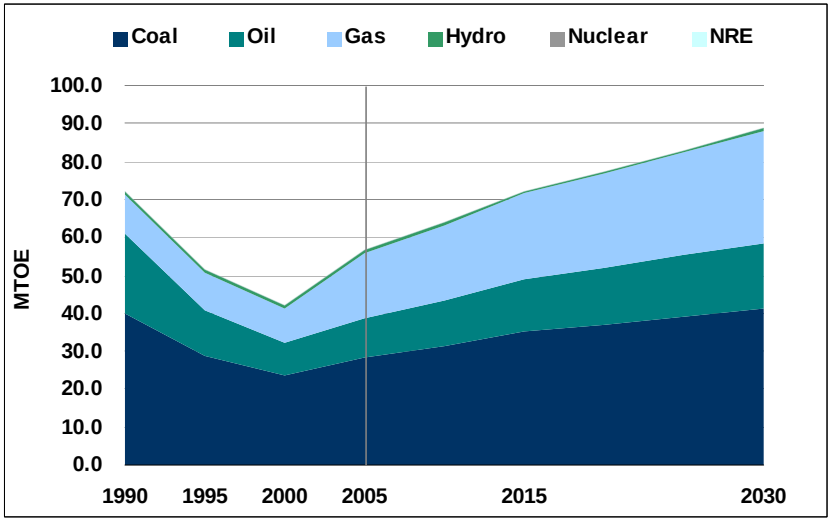
Source: Asia Pacific Energy Research Centre.

Primary Energy Demand – Selected Countries

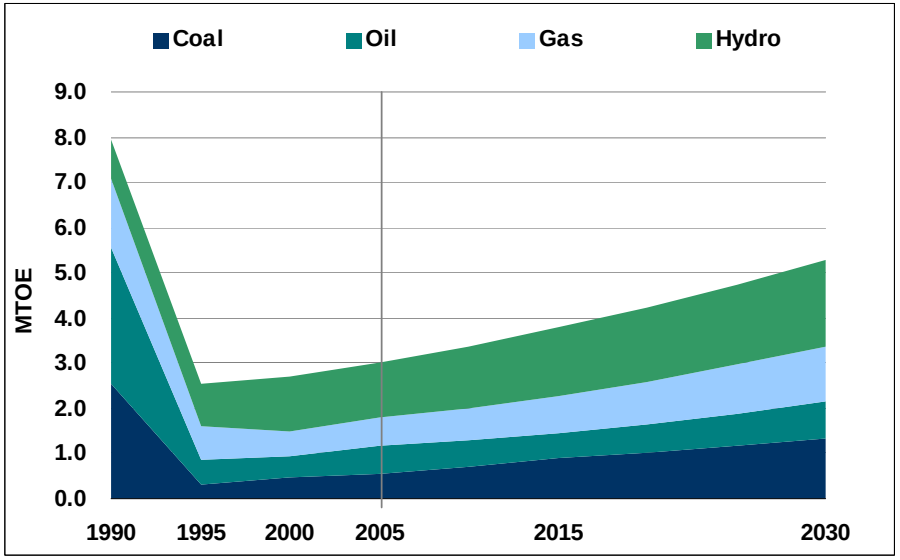
Azerbaijan



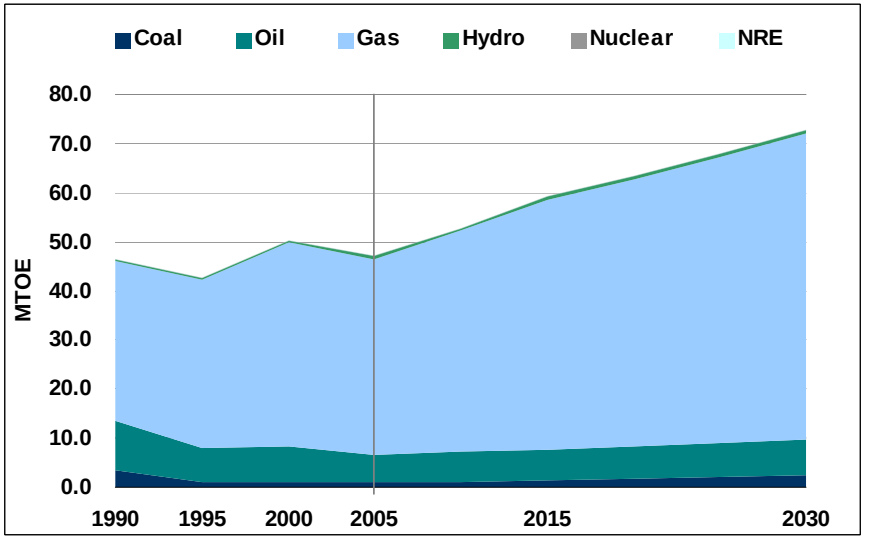
Kazakhstan



Kyrgyz Republic



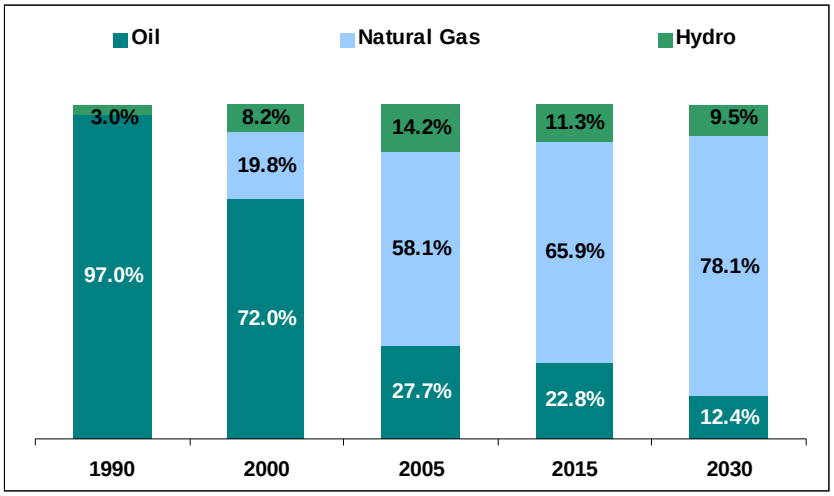
Uzbekistan



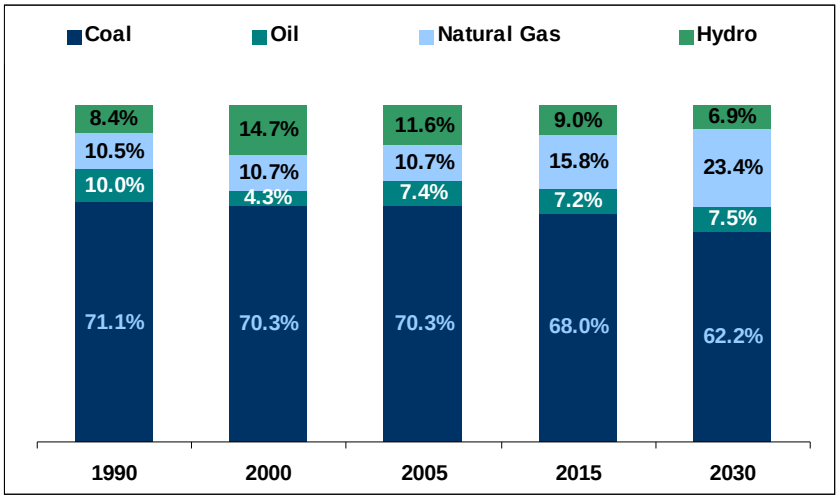
Source: Asia Pacific Energy Research Centre.

Generation Mix – Selected Countries

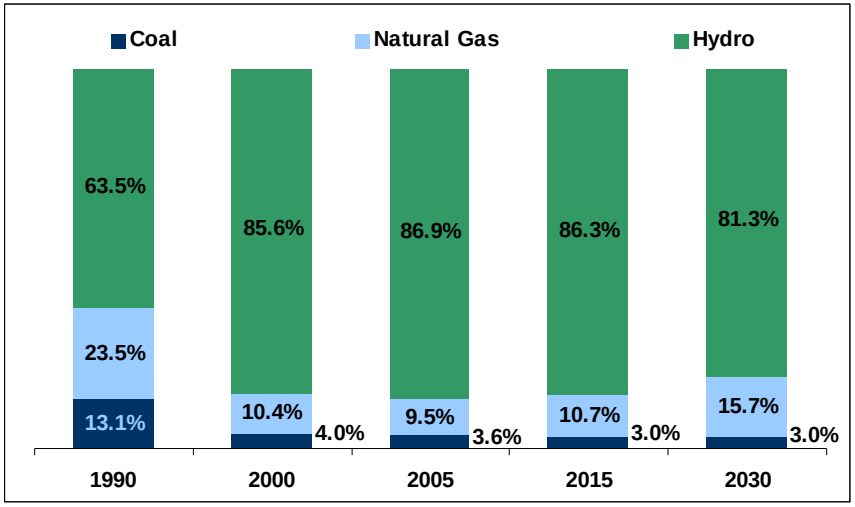
Azerbaijan



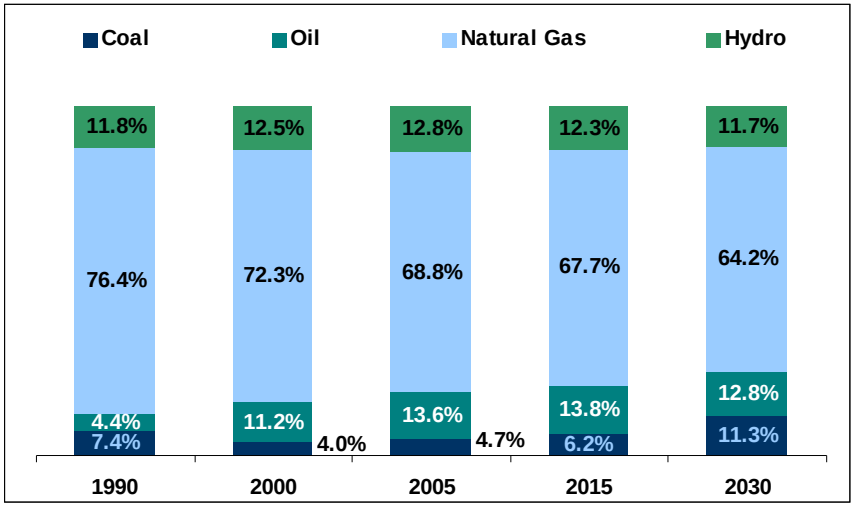
Kazakhstan



Kyrgyz Republic



Uzbekistan

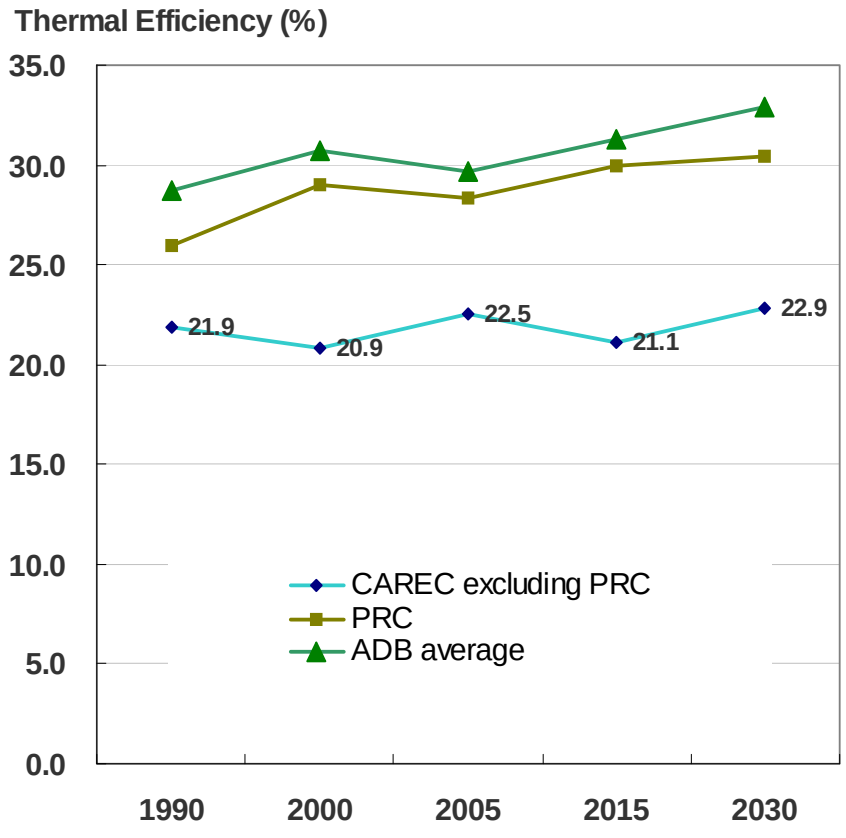


Source: Asia Pacific Energy Research Centre.

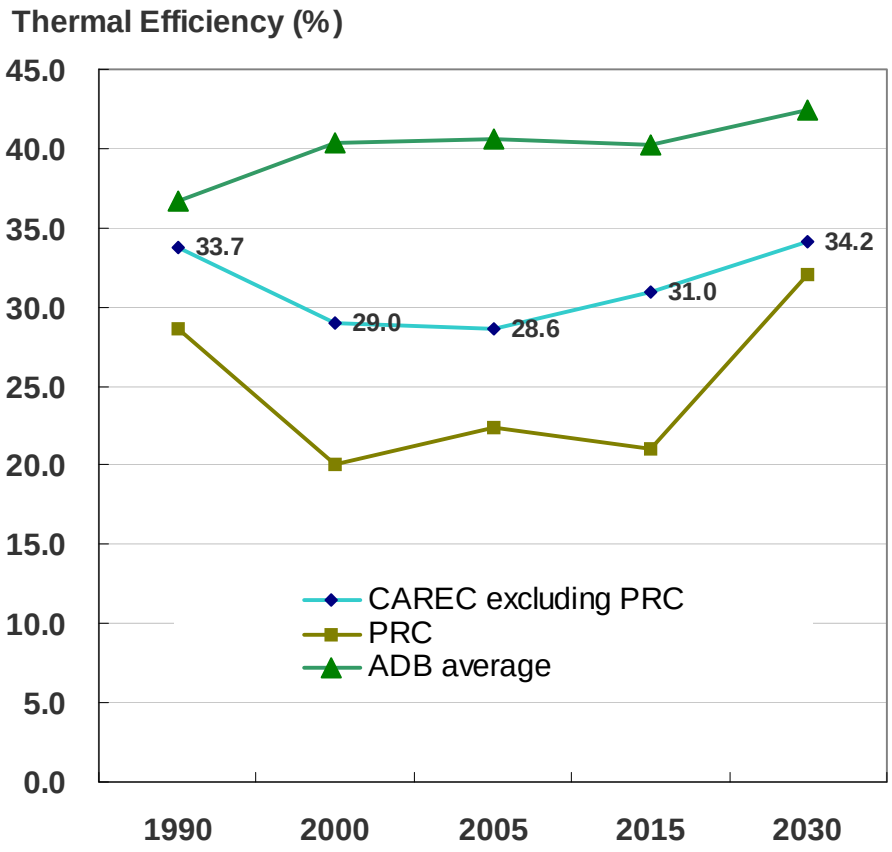
Thermal Efficiencies in Generation: coal and natural gas

Substantial rooms for improving thermal efficiencies through renovation and replacement

Coal-fired generation

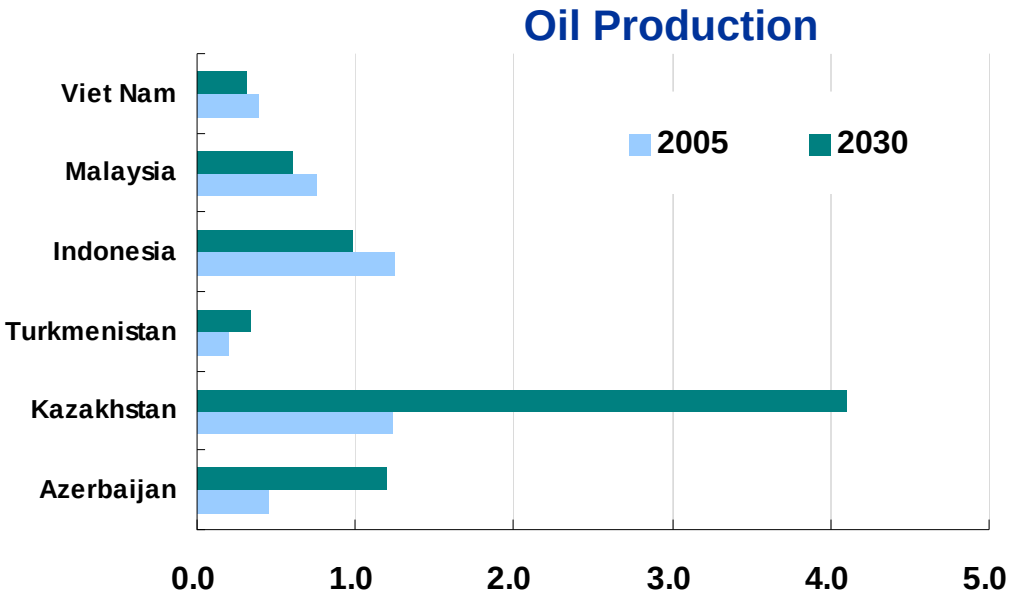


Natural gas-fired generation



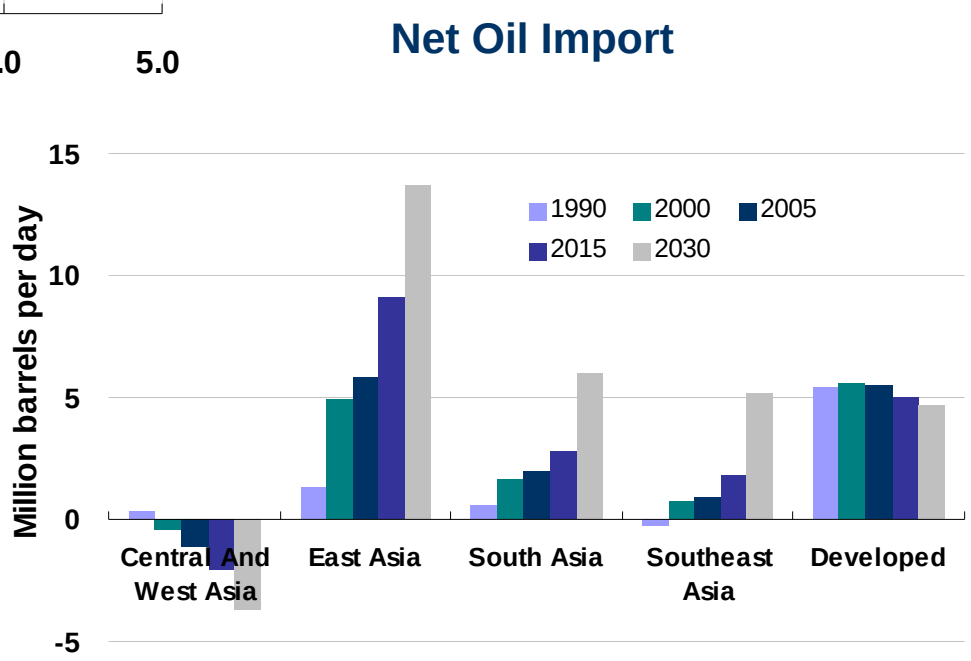
Source: Asia Pacific Energy Research Centre.

Oil Import Dependence – Selected Countries



Expanding oil production from some CAREC members in contrast to declining oil production from Southeast Asia.

Where to and how to secure oil supply poses challenges to Asia and the Pacific. CAREC members have potential to ease the tight balance between oil demand and supply.



Source: Asia Pacific Energy Research Centre.

Energy Security and Regional Cooperation

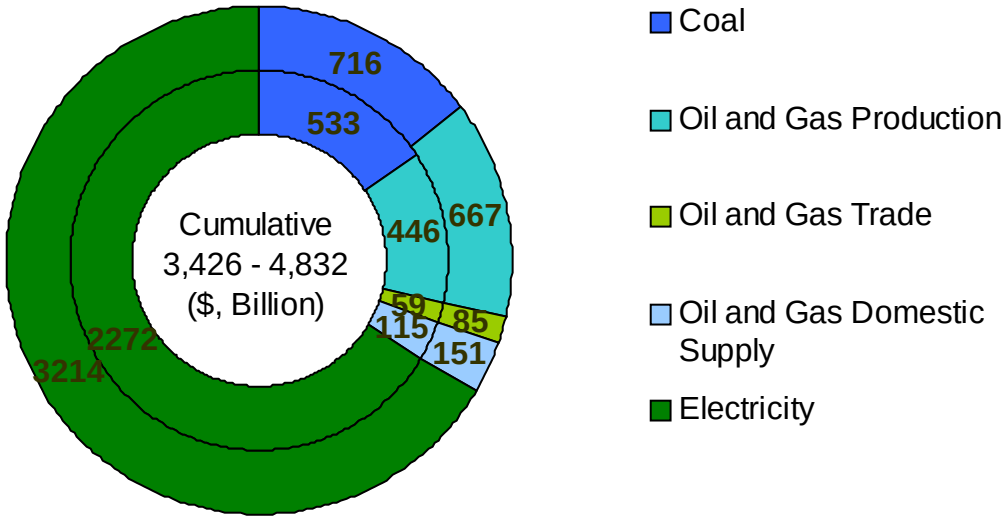
Regional inter-dependence may deepen for the energy supply security and mutual prosperity.

	Year	Sector	Project Description	Investment
People's Republic of China				
Kazakhstan	2003	Oil	North Buzachiy oil field development	-
	2003	Oil	Development of Morskoe, Karatal, Dauletaly blocks	-
	2004	Oil	Acquisition of FIOC's asset in Kaz (6 blocks)	-
	2005	Oil	Acquisition of PetroKazakhstan, Canada	$4.18billion
	2006	Oil	Acquisition of Nations Energy Canada's asset in Kazakhstan	$1.9billion
	2006	Oil	Oil pipeline construction and supply (10million ton/year)	$3billion
	2007	Gas	Gas transit pipeline (may supply gas in the future)	$2.2billion
Azerbaijan	2002	Oil	Acquisition of Salyan Oil (Kursang-Karabagli oil field)	$52million
	2003	Oil	Kebibe oil field development (PSA)	-
	2003	Oil	Acquisition of Commonwealth Gobusta from Rosco (62.8%)	$10.5million
	2003	Oil	Development of offshore Pirsage oil field	$700million
Uzbekistan	2004	Oil	Agreement of oil&gas development	$100million
	2005	Oil	Development agreement of 23 blocks and etc	$910million
	2005	Oil	Establishment of JV (UzCNPC Petroleum)	$383million
	2005	Oil	Development of Andizhan oil field	$160million
	2007	Gas	Gas transit pipeline	-
Japan				
Kazakhstan	2004	Oil	Participation in the Kashagan Field developing consortium (6.7%)	$10billion
Azerbaijan	2005	Oil	Development of ACG project and BTC pipeline	-
Korea				
Kazakhstan	2006	Oil	50% of Egizkara oil field (reserve of 20billion barrel)	-
Kazakhstan	2006	Oil	45% of ADA block (reserve of 100billion barrel)	-
Kazakhstan	2006	Oil	27% of Zhambyl oil field	-

Source: Asia Pacific Energy Research Centre.

Energy Investment Outlook

Energy Investment Outlook by Type (low case and high case)



CAREC members will require between $3,426 billion and $4,832 billion of investment to meet the growth in energy demand and increase energy production.

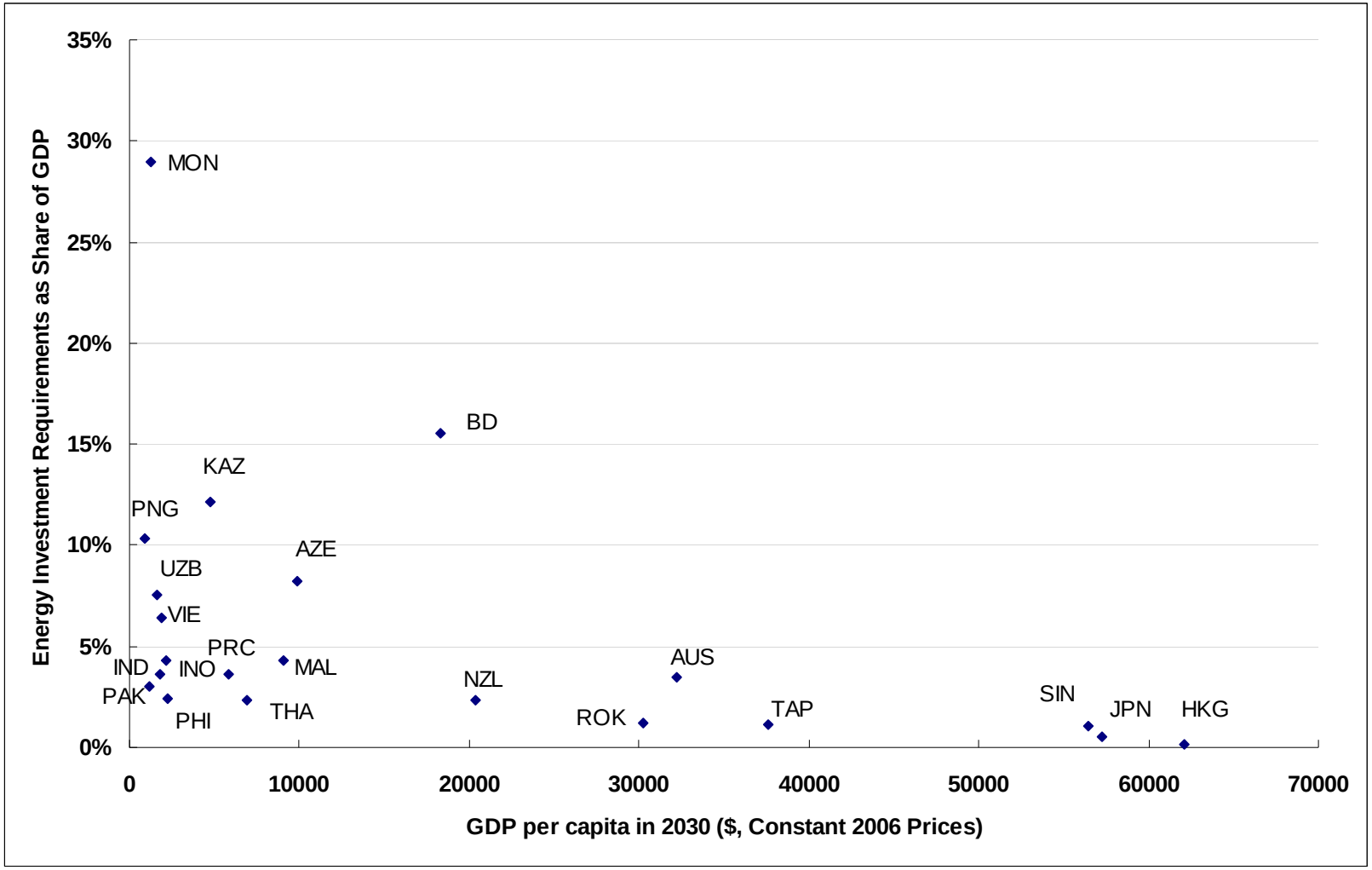
Energy Investment Outlook by Country (low case and high case)

Investment requirements (2005-2030)	$ billion, constant 2006 prices	
	Low Case	**High Case**
Afghanistan	10	13
Azerbaijan	65	96
PRC	3,122	4,406
Kazakhstan	121	169
Kyrgyz Republic	14	18
Mongolia	15	20
Tajikistan	24	33
Uzbekistan	48	67

Source: Asia Pacific Energy Research Centre.

Burden of Energy Investment Requirements

Higher burden of energy investment requirements for some CAREC members.

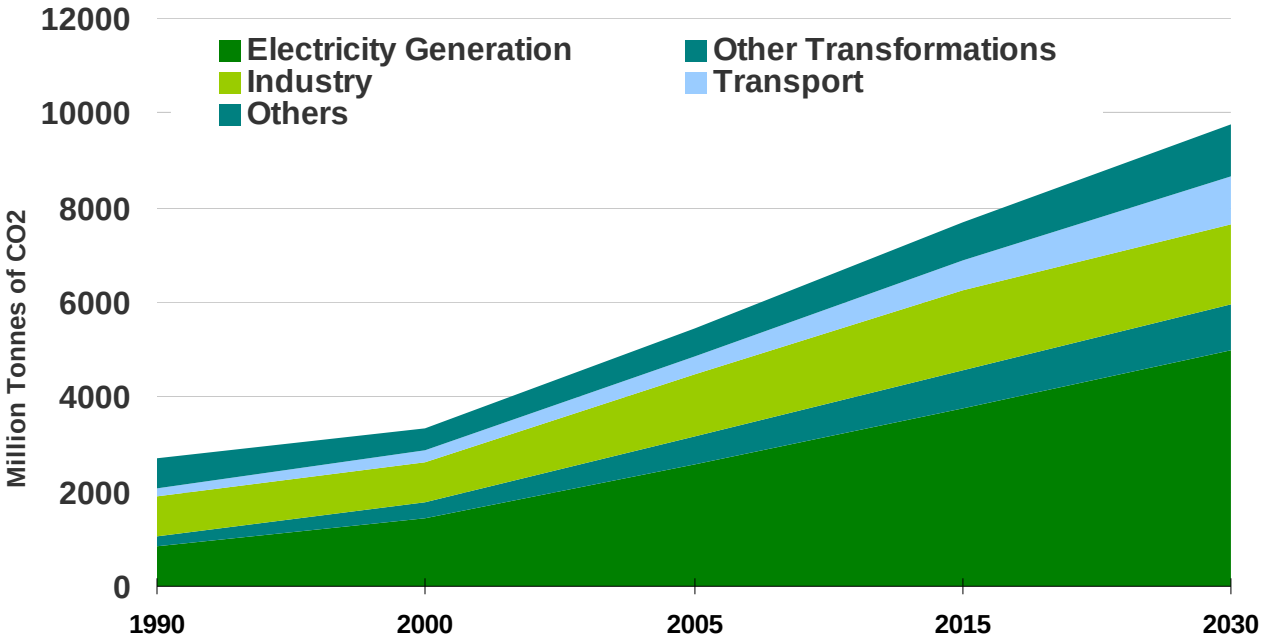


AUS = Australia; AZE = Azerbaijan; BRU = Brunei Darussalam; PRC = People's Republic of China; HKG = Hong Kong, China; IND = India; INO = Indonesia; JPN = Japan; KAZ = Kazakhstan; KOR = Republic of Korea; MAL = Malaysia; MON = Mongolia; NZL = New Zealand; PAK = Pakistan; PHI = Philippines; PNG = Papua New Guinea; SIN = Singapore; TAP = Taipei,China; THA = Thailand; UZB = Uzbekistan; VIE = Viet Nam.

Source: Asia Pacific Energy Research Centre.

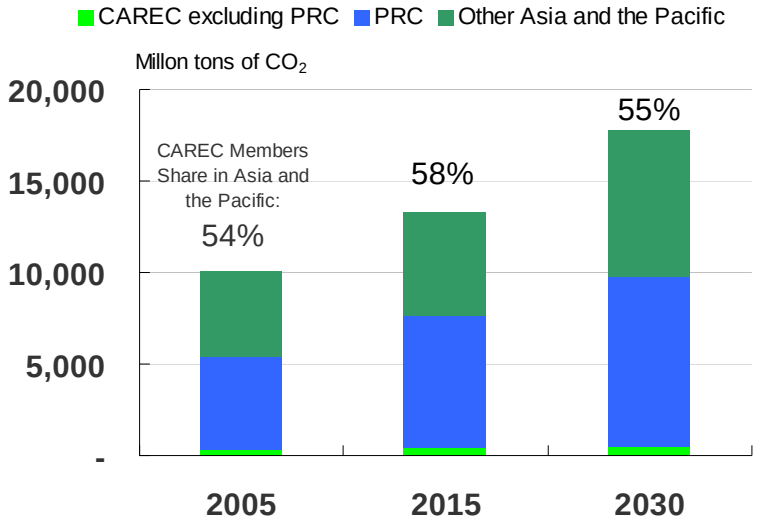
CO_2 Emissions Outlook

CO_2 Emissions Outlook by Sector



CO_2 Emissions Outlook for CAREC members and the rest of Asia and the Pacific

CO_2 emissions of CAREC members are projected to increase from 454.7 Mt-CO_2 in 2005 to 929.1 Mt-CO_2 in 2030. Nearly half of the projected growth in CO_2 emissions will come from the power sector.



Source: Asia Pacific Energy Research Centre.

CO_2 Emissions Intensity (CO_2/TPED)

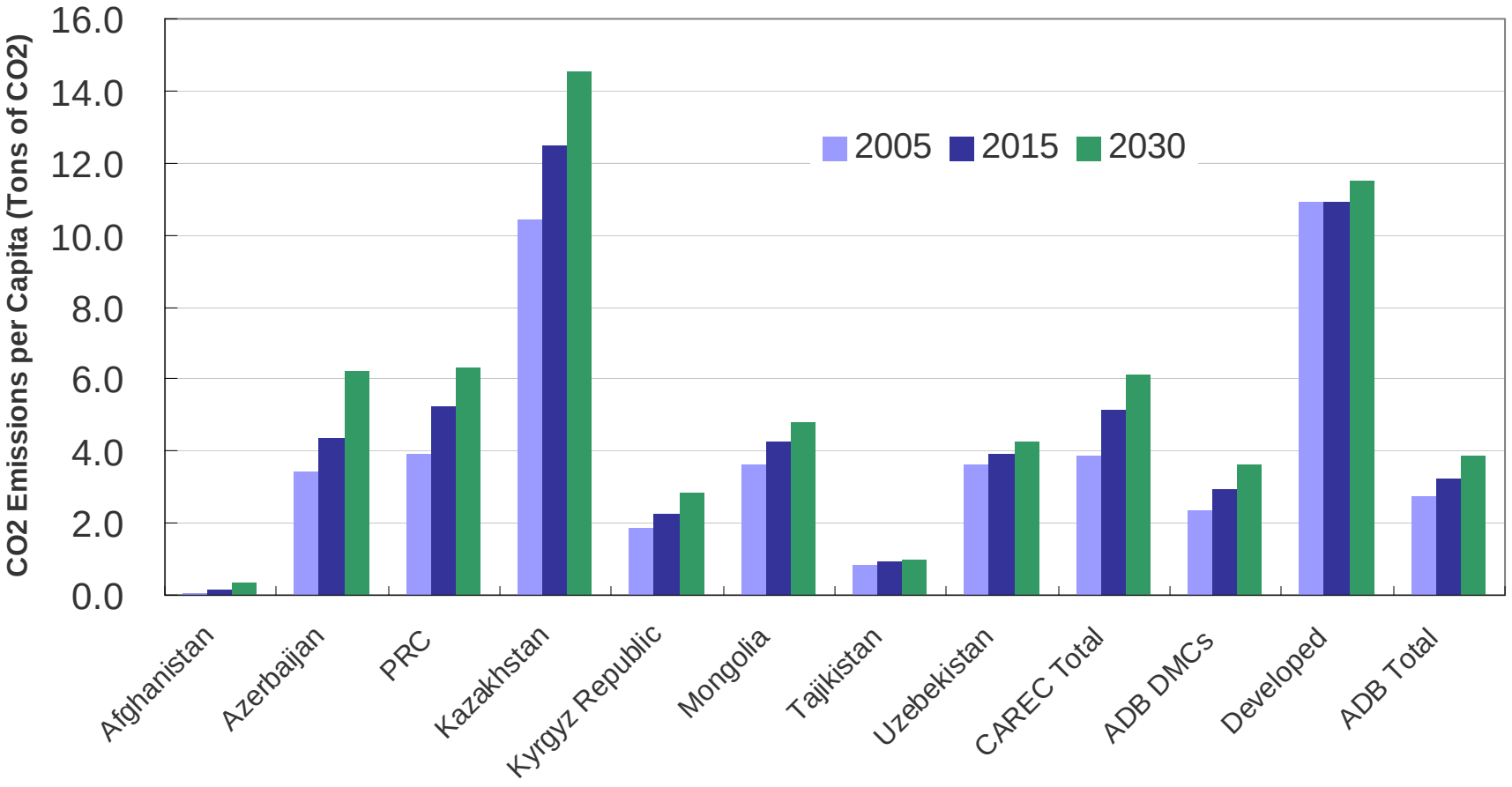
CAREC members' CO_2 emissions intensity will improve slightly reflecting the introduction of low carbon emitting sources in some members.

	1990	2000	2005	2015	2030	2005-2015	2015-2030	2005-2030
Afghanistan	2.40	1.29	1.49	2.25	2.70	4.2%	1.2%	2.4%
Azerbaijan	2.28	2.29	2.05	2.04	2.03	0.0%	-0.1%	0.0%
PRC	2.59	2.79	2.98	2.98	2.81	0.0%	-0.4%	-0.2%
Kazakhstan	3.17	2.93	2.79	2.81	2.80	0.1%	0.0%	0.0%
Kyrgyz Republic	3.33	3.55	3.47	3.43	3.40	-0.1%	-0.1%	-0.1%
Mongolia	3.64	3.61	3.60	3.55	3.46	-0.1%	-0.2%	-0.2%
Tajikistan	2.11	1.46	1.61	1.86	2.00	1.4%	0.5%	0.9%
Uzebekistan	2.38	2.02	2.04	2.03	2.06	0.0%	0.1%	0.0%
CAREC Total	2.62	2.76	2.94	2.95	2.79	0.0%	-0.4%	-0.2%
ADB DMCs	2.24	2.35	2.50	2.57	2.49	0.3%	-0.2%	0.0%
Developed	2.50	2.40	2.49	2.31	2.24	-0.8%	-0.2%	-0.4%
ADB Total	2.30	2.36	2.50	2.54	2.46	0.1%	-0.2%	-0.1%

Source: Asia Pacific Energy Research Centre.

Per capita CO_2 Emissions

Wide diversity in CO_2 emissions per capita due to the difference in economic development levels, industry structure and energy choice.



Source: Asia Pacific Energy Research Centre.

Implications

- CAREC members' energy demand is projected to increase at diverse trends given *the diversity in the pace of economic development, industry structure, climate conditions, and technology levels.*
- Some CAREC members have *great potential to ease the projected tight balance between energy demand and supply* of Asia and the Pacific.
- *Substantial rooms exist to improve energy efficiency* in energy supply infrastructure, and appropriate incentives need to be in place to attract investment.
- *Burden of investment requirements for CAREC members tend to be large.* Cooperation among countries in Asia and the Pacific may create mutual prosperity through obtaining necessary financial and technological transfer to develop energy supply infrastructure for CAREC members. Cooperation among CAREC members through electricity trade, for example, can reduce the overall investment requirements.

Moving Forward

- First consolidation of energy data from various sources
- Member's feedback
- **Focal / Contact points**
- Training needs
- Toward set up a robust energy data system

Thank you

For More Information

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