

# Studies Related to Technology & Climate

**Bob Schock**

*Director of Studies*

*EFNZ, Wellington*

*18 October 2006*





# WEC 2004-2007 Studies Cycle

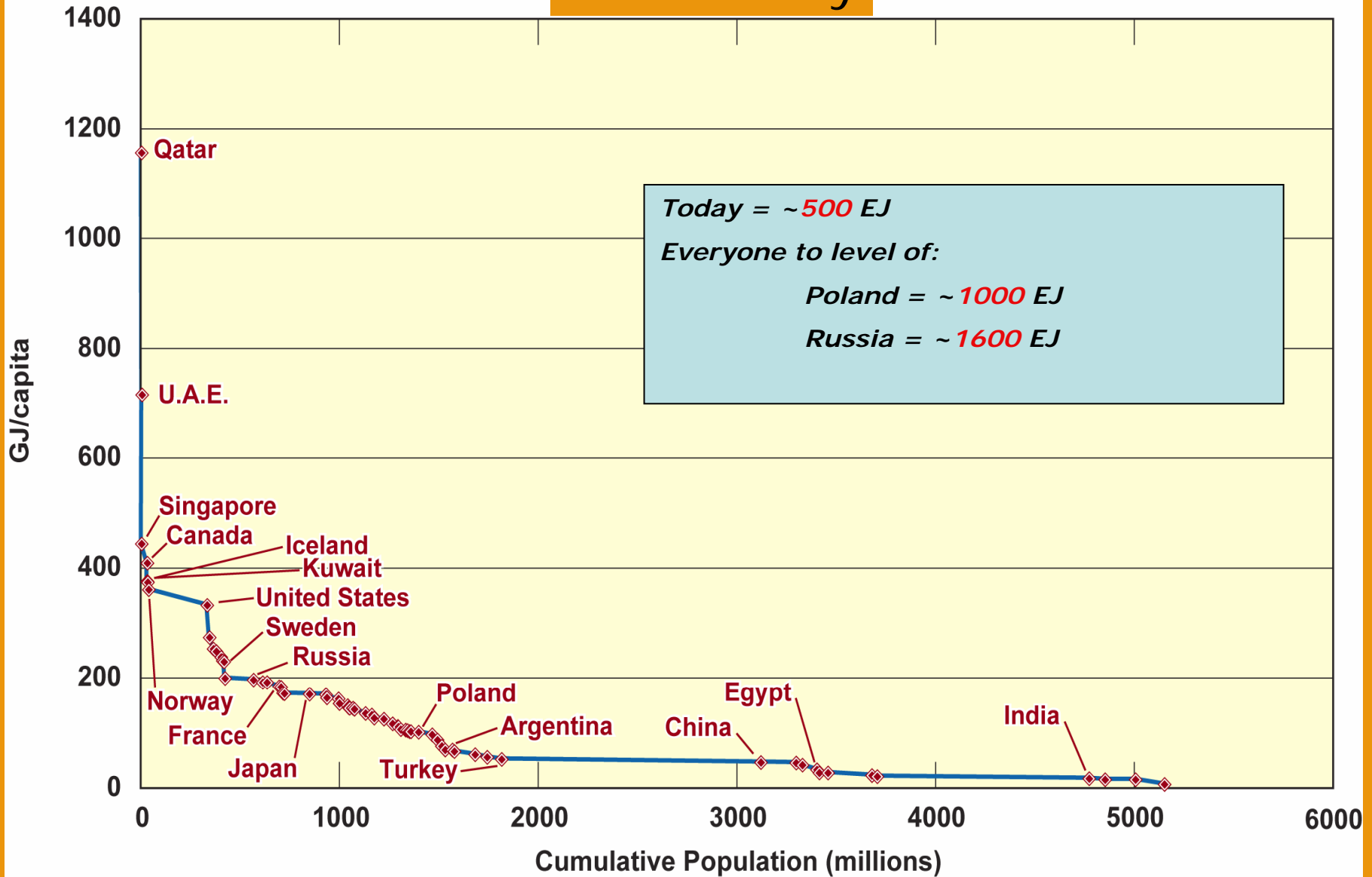


World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

**GOAL - to understand possible energy futures to 2050  
identifying the role that policy actions could play to  
help or hinder the achievement of the WEC 3As**

- **Accessibility to affordable modern energy services for all**

# Accessibility



# WEC 2004-2007 Studies Cycle



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

**GOAL - to understand possible energy futures to 2050 identifying the role that policy actions could play to help or hinder the achievement of the WEC 3As**

- **Accessibility to affordable modern energy services for all**
- **Availability of reliable and secure energy supplies**
- **Acceptability of energy services and supplies with minimal environmental damage and without compromising future welfare**

***Normative Studies***



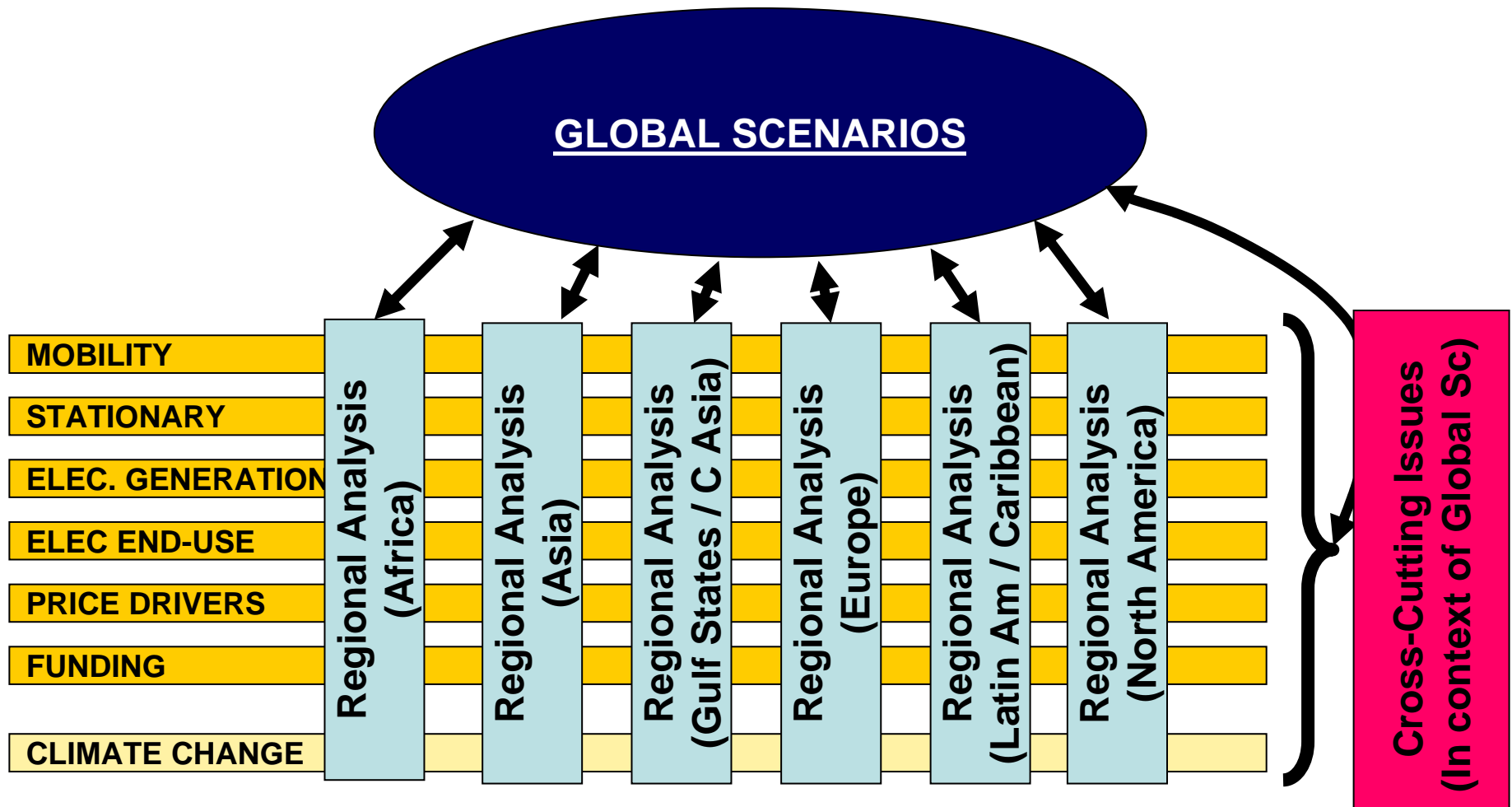
# Uniqueness



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

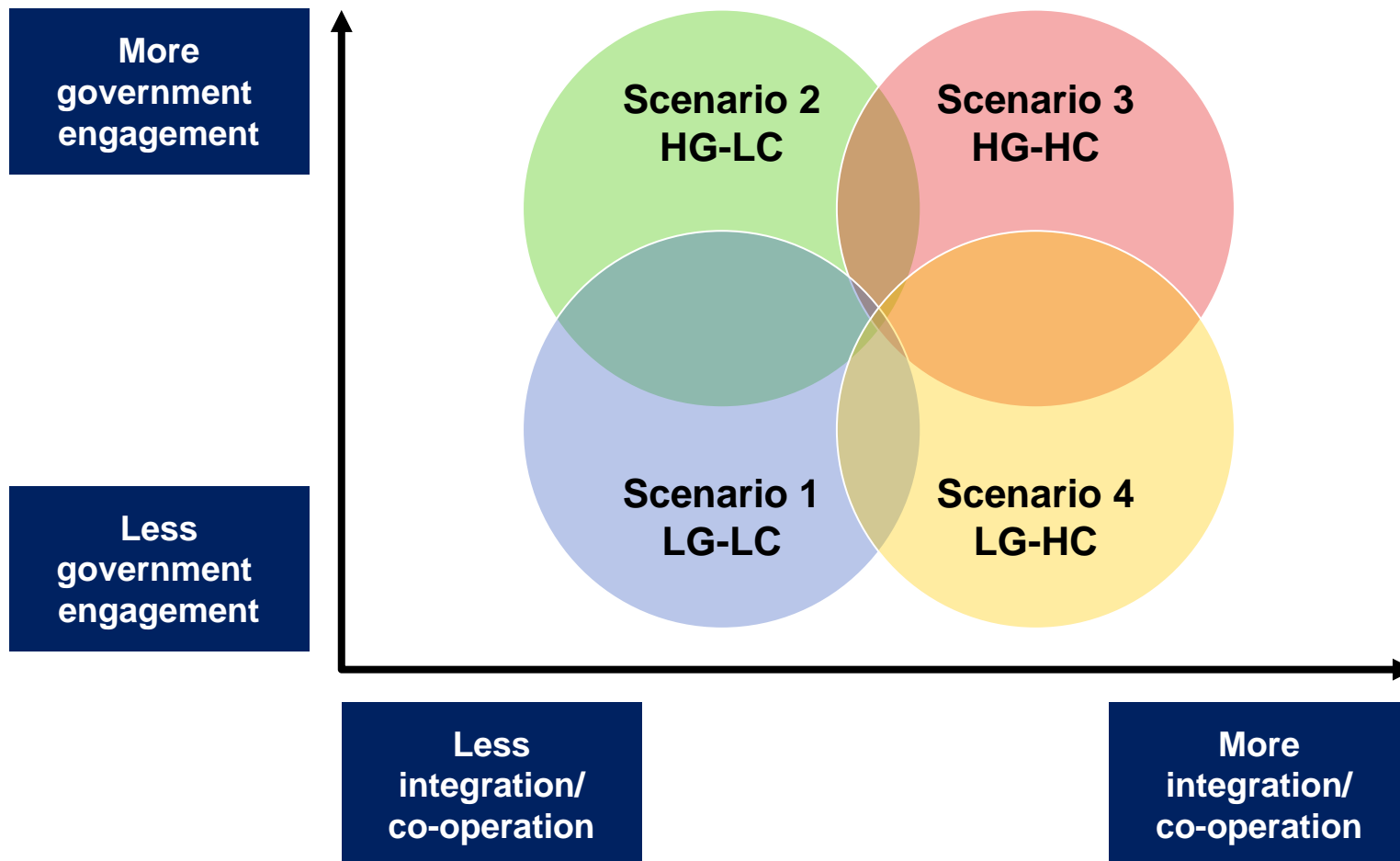
- **Bottom up studies (100 Member Committees)**
- **Never been done for scenarios - i.e., will not be perfect**
- **Will likely change all top-down scenarios**
  - **performing limited modelling for consistency**
- **The richness of regional views and differences are a very valuable product**
- **Likely alter policymakers approach to energy issues**
- **Involves trillion US\$/yr energy services markets**

# Project Organisation





# Possible Policy Scenarios





# Issues, Challenges and Opportunities

- **Energy Supply**
  - Hydrocarbon Supply Challenge
  - Keeping All Supply Options Open
- **End Use**
  - Energy Uses, with Special Emphasis on Mobility Systems
  - Global Conservation Ethic
- **Environmental Impact**
  - Greenhouse Gas Challenge
- **Technology**
  - Technologic Challenges and Opportunities
- **Reform and Financing**
  - Global Market Reform
  - The Financing Challenge
- **Policy and Coordination**
  - National and Regional Supply Security
  - Global Coordination and Support



# Regional Summaries

**Africa** - sees accessibility first, then availability. Accessibility declines in all but HG HC, policy intervention improves availability, need regional cooperation to react to market forces of China/India

**Asia** - sees availability (security) as highest priority, and then acceptability as a serious issue, some economies only see HG HC

**Europe** - 3 regions, sees LG HC as the preferred option, but need HG HC to compete - most countries worried about security

**Latin America and Caribbean** - most countries have gone from HG LC to LG HC, but too fast and think HG HC is needed (more regulation)

**North America** - key problem is acceptability, NIMBY affecting availability (reliability). Currently LG HC for oil & gas (except Mexico HG LC) but more toward HG HC in other commodities

# Energy & Climate Change Study



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

***GOAL - Understand how effective climate change policies might shape sustainable energy development***

- Does not judge climate science, consider climate regimes, examine adaptation strategy outside energy*
- Looking at CO<sub>2</sub> trends, energy-related responses to date, assess policy approaches against 3 As, policy and measures going forward (globally)*



# Regional Differences

Country	Carbon intensity of Energy – CO <sub>2</sub> emissions/toe (tonnes)
<i>USA</i>	<i>2.51</i>
<i>Australia</i>	<i>3.08</i>
<i>Canada</i>	<i>2.12</i>
<i>Germany</i>	<i>2.46</i>
<i>France</i>	<i>1.44</i>
<i>UK</i>	<i>2.33</i>
<i>Sweden</i>	<i>1.04</i>
<i>Russia</i>	<i>2.39</i>
<i>Japan</i>	<i>2.32</i>
<i>Korea</i>	<i>2.18</i>
<i>Thailand</i>	<i>2.12</i>
<i>Brazil</i>	<i>1.57</i>
<i>Argentina</i>	<i>2.06</i>
<i>Mexico</i>	<i>2.34</i>
<i>Saudi Arabia</i>	<i>2.34</i>
<i>Iran</i>	<i>2.56</i>
<i>Syria</i>	<i>2.56</i>
<i>China</i>	<i>2.64</i>
<i>India</i>	<i>1.90</i>
<i>Bangladesh</i>	<i>1.52</i>
<i>South Africa</i>	<i>2.68</i>
<i>Tanzania</i>	<i>0.19</i>



# Regional Differences

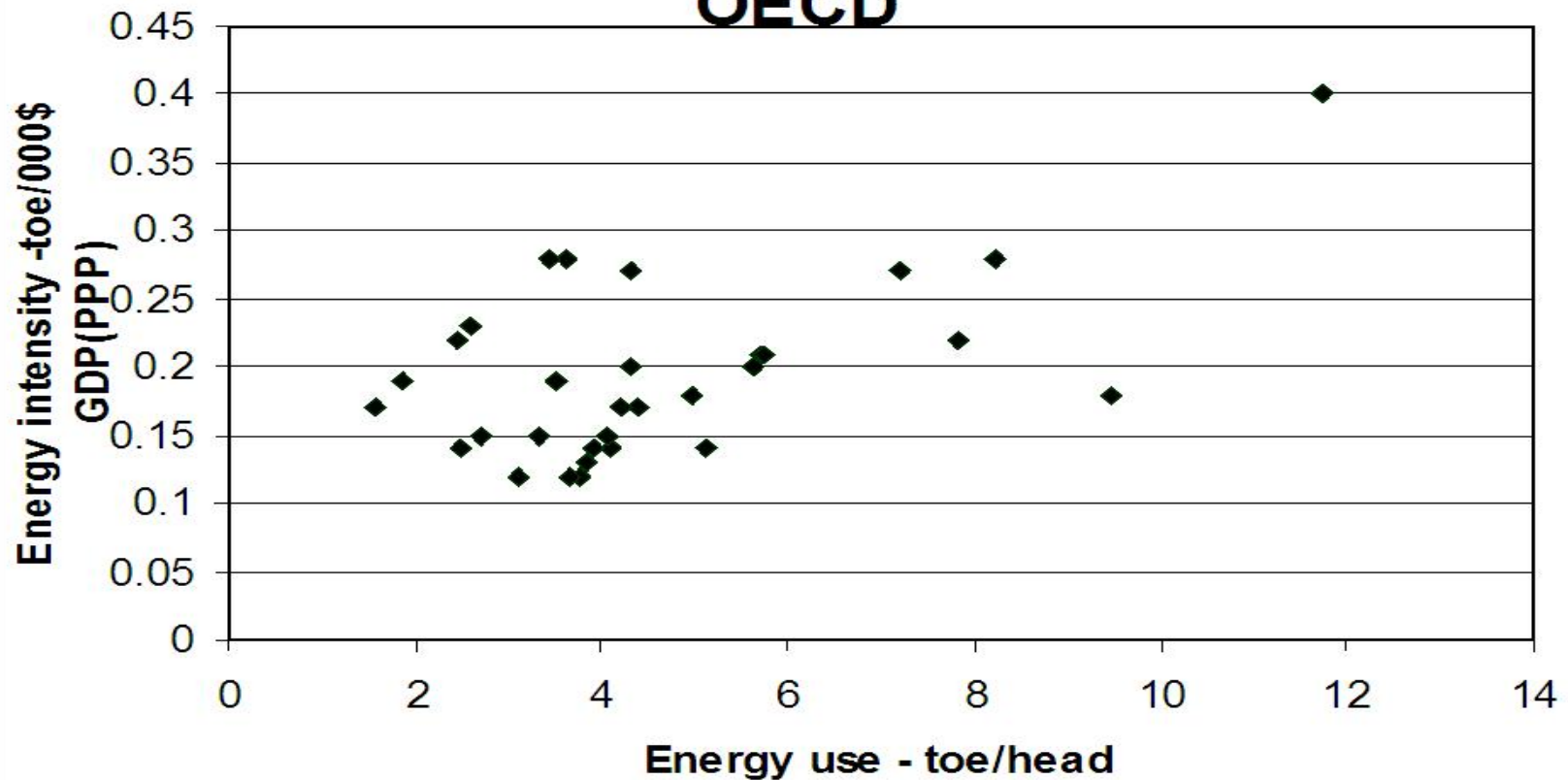
Region	%Increase in CO <sub>2</sub> emissions 1971-2003	Emissions per head 2003 (tonnes CO <sub>2</sub> /capita)	Emissions Intensity (kgCO <sub>2</sub> /US\$GDP using PPPs)
Europe	11	7.75	0.36
Other OECD	5.1	13.9	0.51
EITs	0.1	7.7	1.17
Asia	557	1.16	0.37
Africa	339	0.9	0.40
Middle East	890	6.25	0.95
Latin America	234	1.97	0.29
World	75	3.99	0.51

# Energy Economy OECD



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

## Energy use and energy intensity - OECD

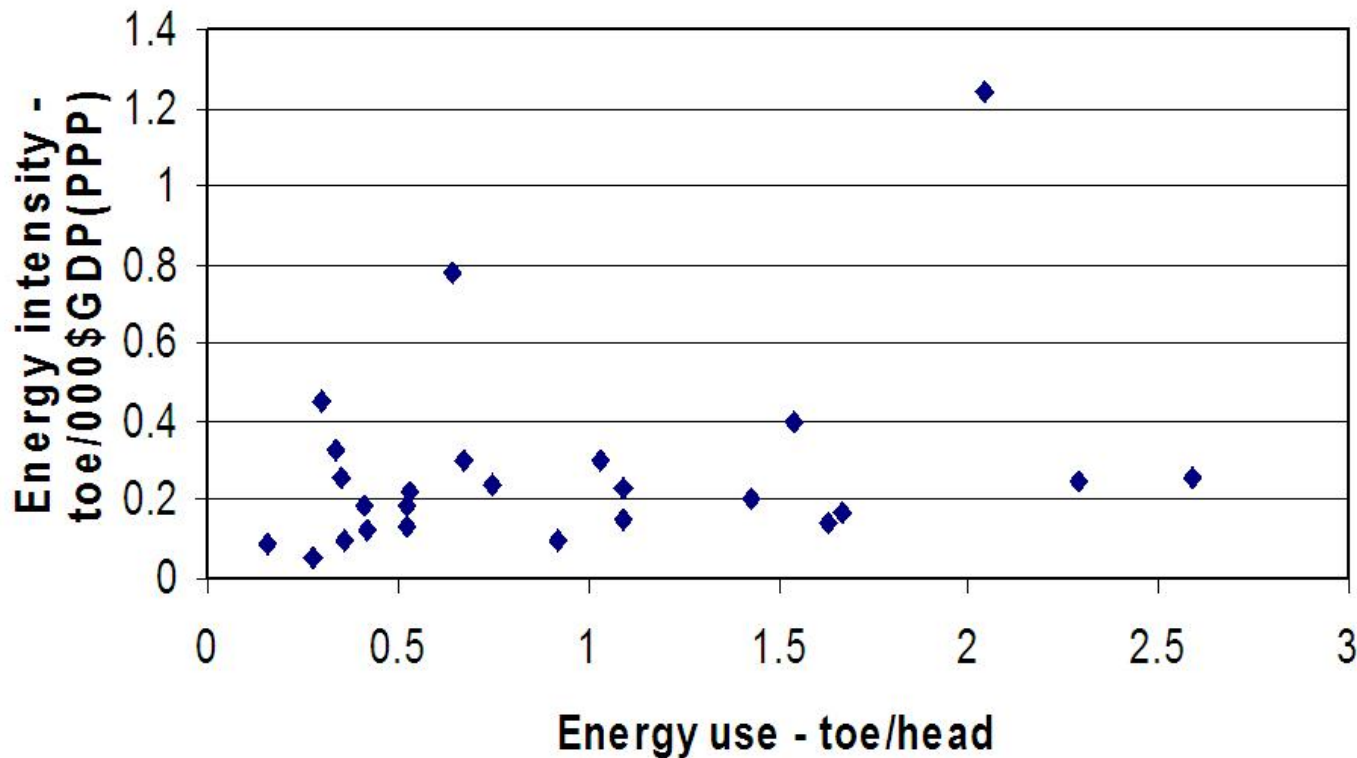


# Energy Economy non-OECD



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

## Energy use and energy intensity - developing countries

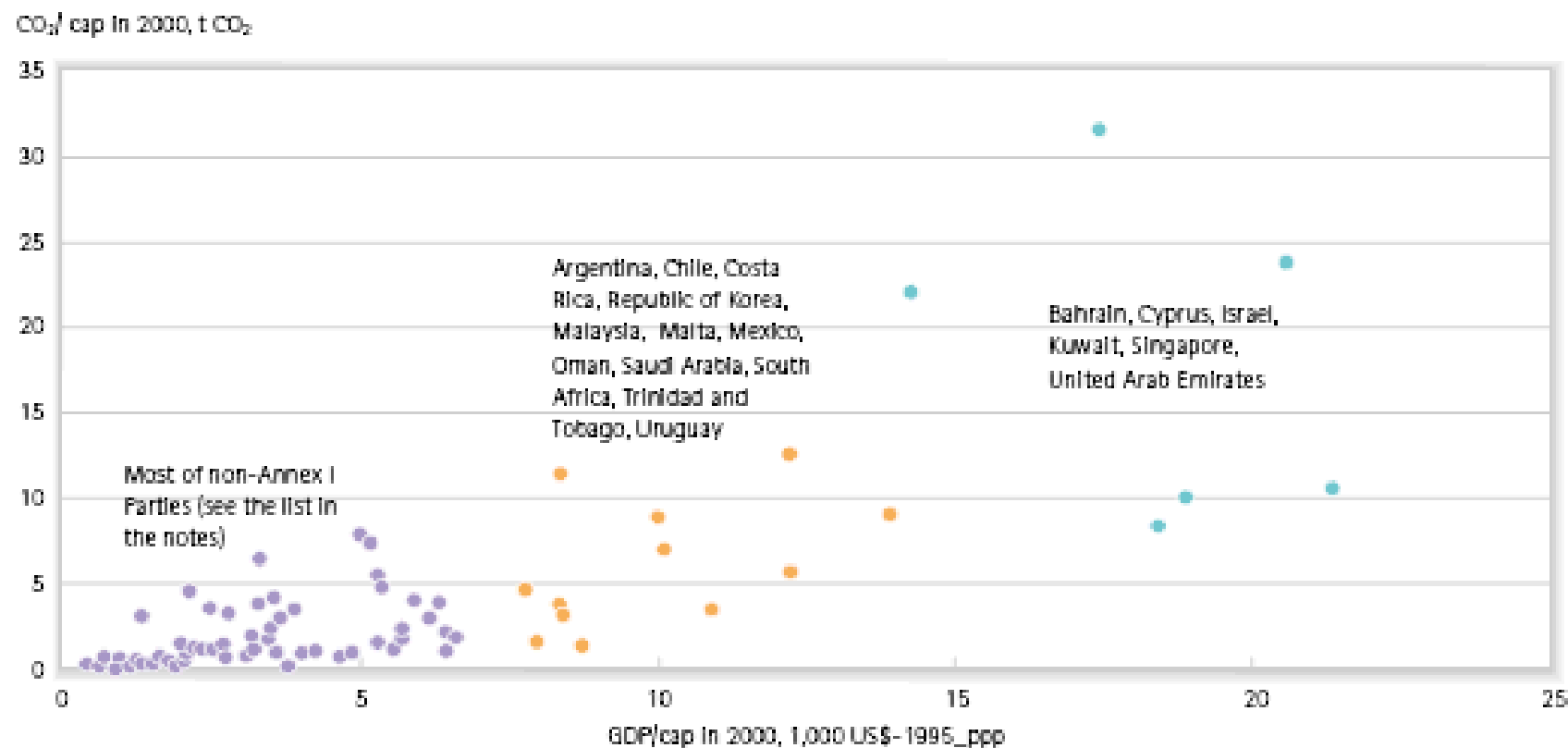


# Economy Carbon non-OECD



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

Figure 2.19 Per capita emissions of non-Annex I countries compared with per capita GDP, 2000



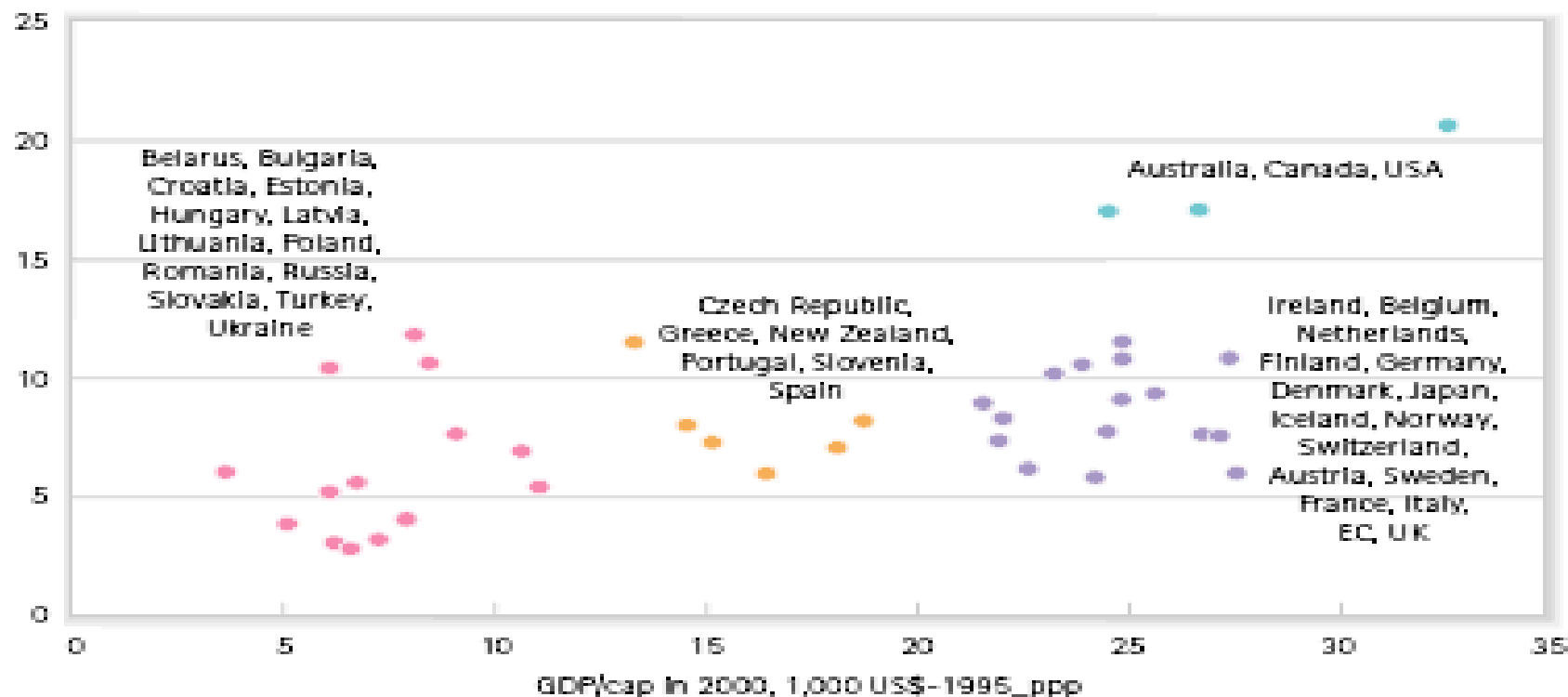
# Economy Carbon OECD



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

Figure 2.6 Annex I countries: comparing per capita emissions and per capita GDP, 2000

CO<sub>2</sub>/cap in 2000, t CO<sub>2</sub>





# Preliminary Observations



World Energy Council  
CONSEIL MONDIAL DE L'ENERGIE

*There appears to be no **automatic** link between economic growth and energy use or between energy use and emissions - thus decoupling emissions from economic development is not in principle inconceivable*

*Some evidence that emissions growth tends to slow down as economies mature - but other factors involved, some more susceptible (economic structure, demand saturation) to policy than others (geography, resources)*

*Areas deserving policy focus are energy intensity and carbon intensity - but they do not appear to be strongly correlated (nor energy intensity with energy use)*

*Some evidence that most significant effect on emissions is reducing carbon intensity, not energy intensity*

*Policy intervention more difficult in transport than electricity*



# Possible Conclusions

*No single driver of emissions and no single area for policy to focus on*

*Broad correlation between increasing wealth and energy consumption but geography, industrial structure, resources, climate, policy stance affect*

*No absolute link between economic development and emissions*

*Good News - possible to grow in more sustainable ways*

*Policies need to account for country differences*

*Some factors susceptible to policy intervention, others are not*



# Cross-sectoral issues

- Energy for integrated rural development / urbanization
- Energy & energy-intensive industries & transport
- Possible constraints on future energy systems
- Capacity-building & investment needs for infrastructure development & technology innovation
- Land-use requirements and issues (incl. agriculture)
- Sustainable energy-intensive future



# The Scenarios Study

- **Utilizes a unique WEC ability**
  - **Bottom up from Member Committees**
- **The richness of regional views and differences are a very valuable product**
- **It is a normative study**
  - **(aim is achieving the 3As)**

*Robert Schock  
Director of Studies  
World Energy Council*

*schock@worldenergy.org  
bob@bobtekoe.net*