

Energy Security of Bangladesh in the Context of Energy Security in the Asia-Pacific Region

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1.1 Asian Civil Engineering Coordination Council (ACECC)

- **Total 12 Members (from 12 Countries) of The Asian Civil Engineering Coordination Council (ACECC) [www.acecc-world.org]. Of which 9 Members are Represented by Civil Engineering Societies and 3 Members are Represented by Engineering Institutions (EA-Australia, IEB- Bangladesh, IEP- Pakistan).**

- 1. American Society of Civil Engineers (ASCE)**
- 2. Chinese Institute of Civil and Hydraulic Engineering (CICHE)**
- 3. Engineers Australia (EA)**
- 4. Indonesian Society of Civil and Structural Engineers (HAKI)**
- 5. Institution of Civil Engineers (ICE India)**
- 6. Institution of Engineers, Bangladesh (IEB)**
- 7. Institution of Engineers, Pakistan (IEP)**
- 8. Japan Society of Civil Engineers (JSCE)**
- 9. Korean Society of Civil Engineers (KSCE)**
- 10. Mongolian Association of Civil Engineers (MACE)**
- 11. Philippine Institute of Civil Engineers (PICE)**
- 12. Vietnam Federation of Civil Engineering Associations (VFCEA)**

1.2 ACECC Objectives

- 1. To promote and advance the science and practice of civil engineering and related professions for sustainable development in the Asian region.**
- 2. To encourage communication between persons in charge of scientific and technical responsibility for any field of civil engineering.**
- 3. To improve, extend and enhance such activities as infrastructure construction and management, preservation of the precious environment and natural disaster prevention.**
- 4. To foster exchange of ideas among the member societies/institutions.**
- 5. To cooperate with any regional, national and international organizations to support their work, as the ACECC deems necessary.**
- 6. To provide advice to member societies/institutions to strengthen their domestic activities.**
- 7. To achieve the above objectives, international conferences called the Civil Engineering Conference in the Asian Region (CECAR) will be held on a triennial basis as the main activity of the ACECC**

1.3 ACECC Technical Committee

Out of 20 Technical Committees, 1 Committee (20) is Responsible for Energy

1. TC1*Asian and Pacific Coastal Network (JSCE)
2. TC2*Integrated River Management (JSCE)
3. TC3*Inter-regional Cooperation for Great Mekong Sub-region (JSCE)
4. TC4*The Sumatra Offshore Earthquake and the Indian Ocean Tsunami (JSCE)
5. TC5*The Sustainable Development of Civil Engineering (CICHE)
6. TC6*Quantitative Risk Assessment for Hazard Mitigation (ASCE)
7. TC7Disaster Mitigation and Preparedness Strategies (PICE)
8. TC8*Harmonization of Design Codes in the Asian Region (JSCE)
9. TC9Infrastructure Report Card (KSCE)
10. TC10Life-Cycle Consideration in Civil Engineering (ASCE)
11. TC11Code of Practice for the Use of Stabilizing Agents in Flexible Pavement (EA)
12. TC12Railway Technology Renewal and Expansion in Asian region (JSCE & CICHE)
13. TC13BIM (CICHE & KSCE)
14. TC14Sustainable Infrastructure (ASCE)
15. TC15River Environment (JSCE & KSCE)
16. TC16ITS-based Solutions for Urban Traffic Problems in Asia Pacific Countries (JSCE & KSCE)
17. TC17Anti-Corruption (ASCE & PICE)
18. TC18Long Span Bridge (HAKI & KSCE)
19. TC19Promotion of the Asian Concrete Model Code in the Asian Region (KSCE)
20. **TC20Renewable Energy for Sustainable Development in Asia and Pacific Countries (KSCE)** 4

*Corresponding TC activities were completed

1.4 Importance of Energy Issues in ACECC's Program

- ❖ Energy is not an Active Agenda of ACECC**
- ❑ TC20: Renewable Energy for Sustainable Development in Asia and Pacific Countries (KSCE).**
- ❑ Sustainable Development Sub-Committee Report of ACECC has highlighted the important issues to be considered for the Sustainable Development of Civil Engineering (TC5).**
- ❖ Civil Engineers are responsible for Design, Construction of all the Major Infrastructures including Energy Infrastructures (e.g. hydro power dam, coal mines, coal handling port facilities, oil & gas pipelines, power plants etc.). Civil Engineers play important role in Sustainable Development of Energy.**

1.5 University Level Energy Program for Civil Engineers in University of California, Berkley

- ❖ **Energy, climate, and infrastructure systems are closely tied together, and these connections manifest in many forms. Our society cannot function without energy and infrastructure systems. Energy systems with the lowest possible greenhouse gas footprint are a key to mitigating climate change. Civil infrastructure systems are a backbone of society, and they are also major users of energy that needs to be reduced for a more sustainable development.**
- ✓ **The objective of the Energy, Civil Infrastructure and Climate (ECIC) program is to educate a cadre of professionals who will be able to analyze from engineering, environmental, economic, and management perspectives complex problems such as energy efficiency of buildings, environmentally informed design of transportation systems, embodied energy of construction materials, electricity from renewable sources, and biofuels, and address such overarching societal problems as mitigation of greenhouse gas emissions and adaptation of infrastructure to a changing climate. The ECIC program also promotes research at the intersection of energy, infrastructure and climate science [<http://www.ce.berkeley.edu/programs/ecic>].**

2.1 Objectives of the Presentation

- ❖ One of the important objectives of ACECC is to Promote and Advance the science and practice of Civil Engineering and related professions for sustainable development in the Asian region.
- ❖ The objective of present paper is to highlight the Energy Security issues of Bangladesh in the context of the Energy Security in the Asia Pacific Region.
- ❖ Characteristics Features of Bangladesh:
 - ✓ High Population density (1188 person/sqkm in 2012);
 - ✓ Low income (US\$ 840/capita in 2012);
 - ✓ Least Developed Country (LDC);
 - ✓ Depends on energy import from other countries;
 - ✓ Technological capability of the country is weak;
 - ✓ Financial capability is weak;
 - ✓ Institutional capabilities for planning, design, construction of large infrastructures are weak (weak capability for Transfer of Technology).

2.2 Energy Security & Energy Crisis

- ❖ **Energy Security has different meaning to Energy Producing, Consuming and Transit Countries. It has many dimensions [Energy Charter Secretariat, 2015].**
- ❖ **In simple term-**
 - **Energy Supply > Energy Demand [Energy Security]**
 - **Energy Supply = Energy Demand [Energy Security]**
 - **Energy Supply from Domestic Sources < Energy Demand [Energy Shortage].**
 - **Energy is Recognized as a Critical Input for Sustainable Development in Bangladesh.**
 - **Attempts are made to Achieve and Maintain Energy Security by Import of Energy (e.g. coal, oil, electricity etc.) from other Countries.**

2.3 Energy-Economy Nexus in Bangladesh

- Increase in per capita consumption of commercial energy (e.g. coal, oil, natural gas, hydropower) to increase per capita GNI.

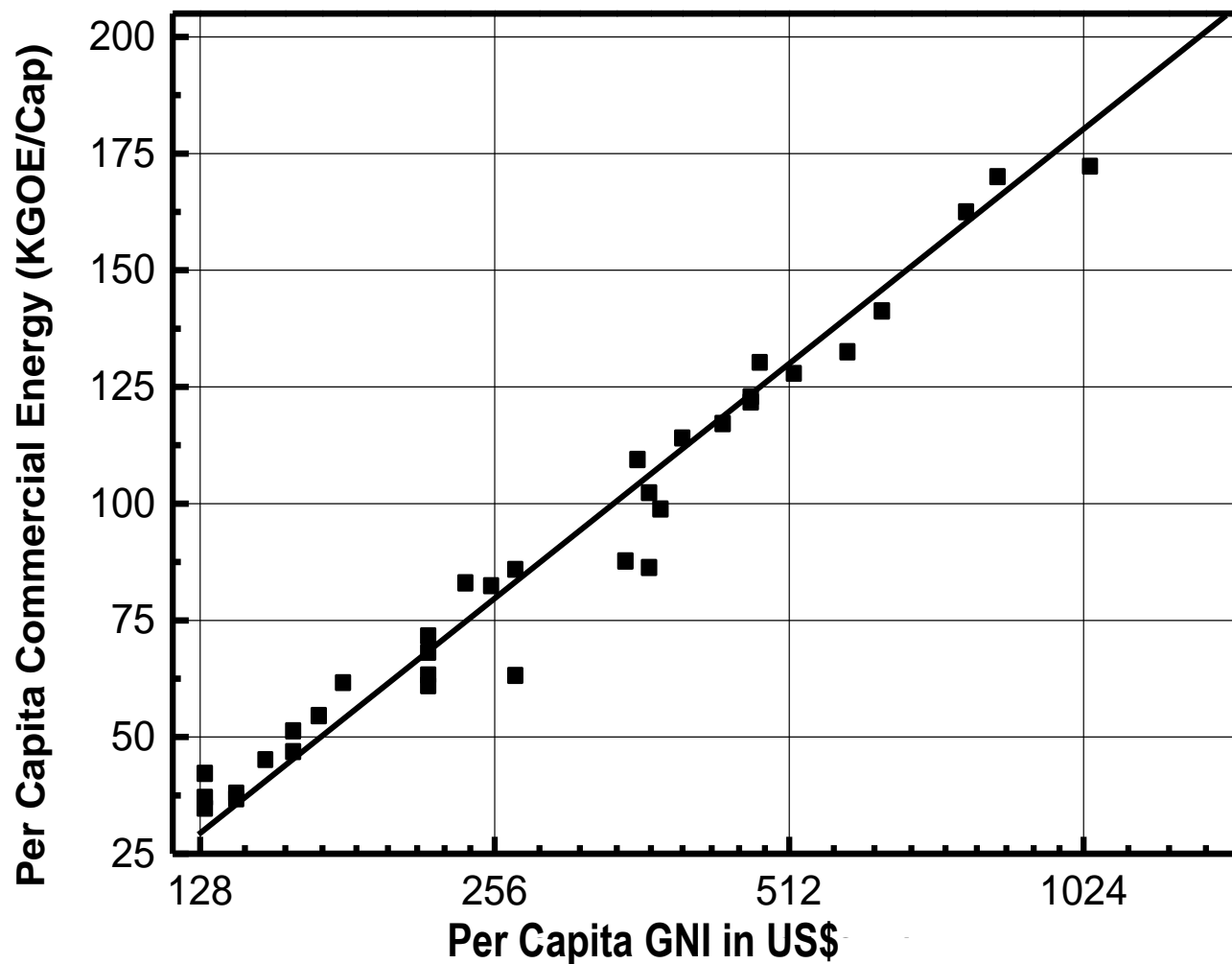


Figure 1: Per Capita Commercial Energy Consumption Vs Per Capita GNI of Bangladesh During 1980-2013

2.4 Energy-Economy Nexus in Regional Countries

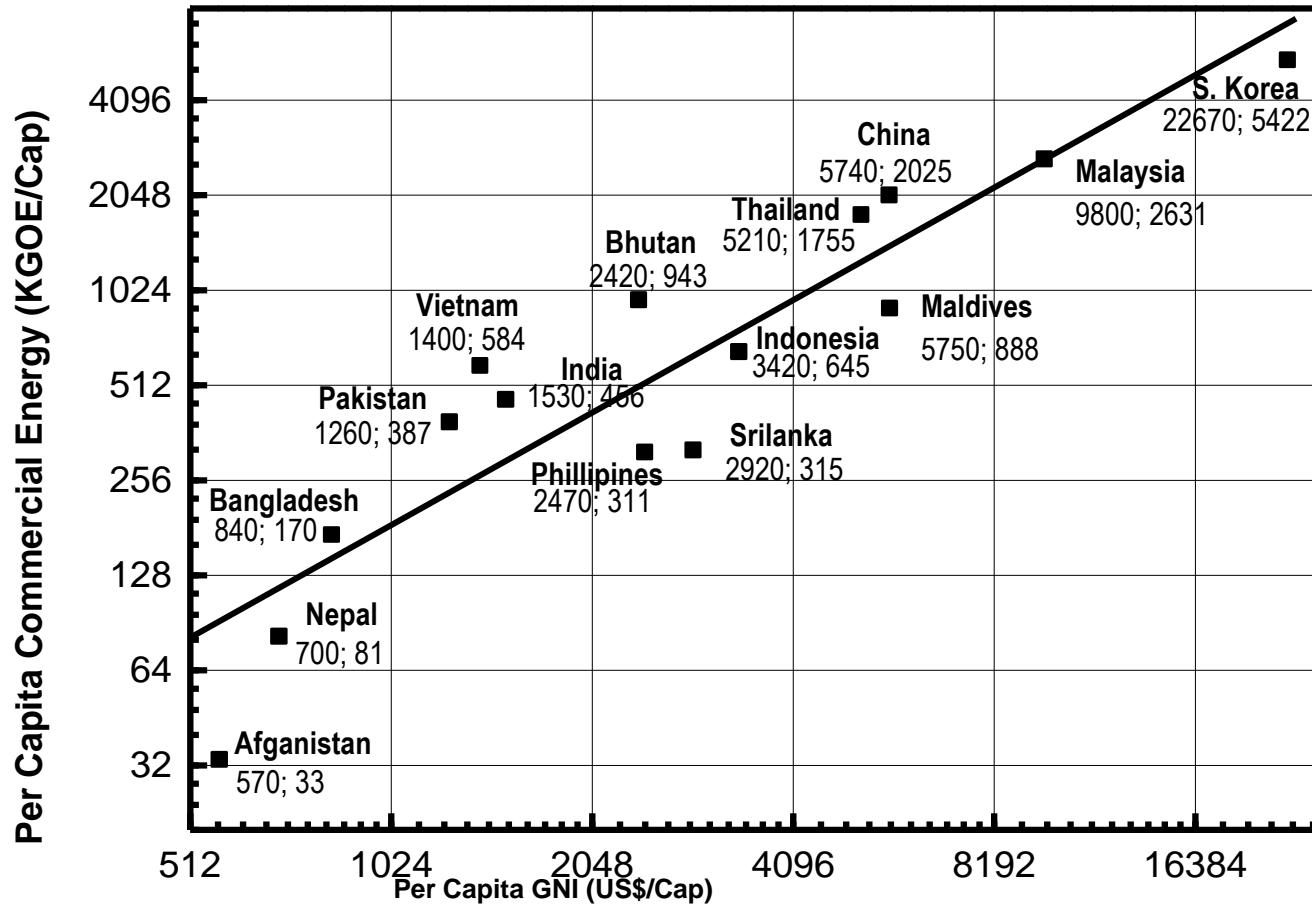


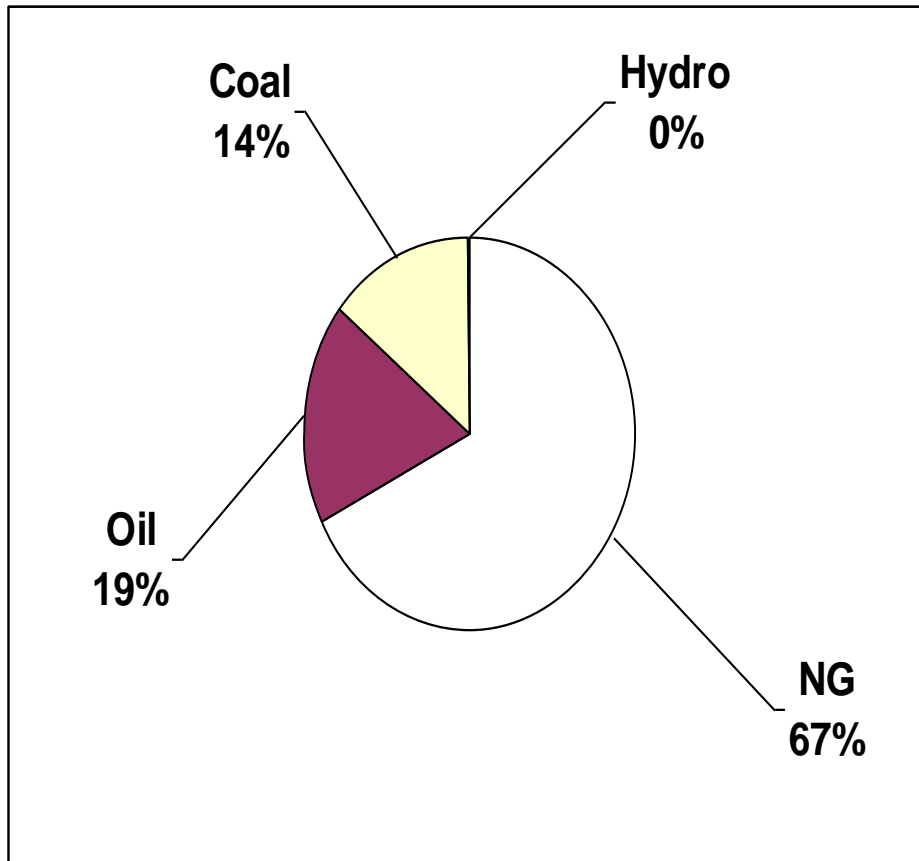
Figure 2: Per Capita Commercial Energy Consumption Versus Per Capita GNI in 2012

2.5 Bangladesh Intends to become a Middle Income Country by 2020

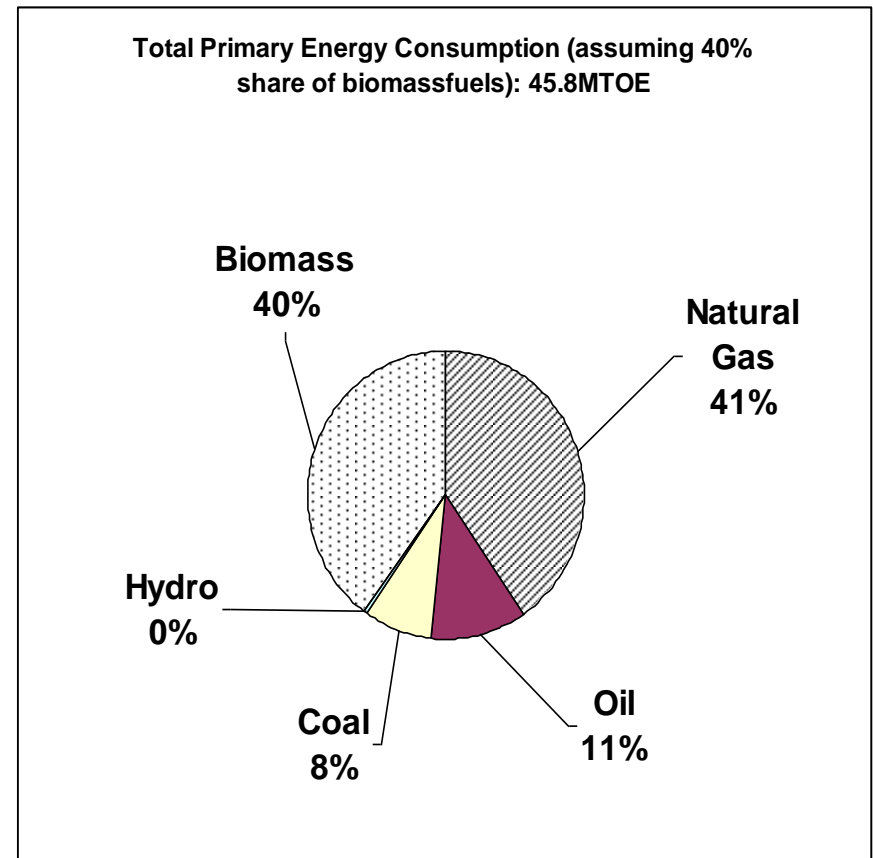
Economic Status in 2012	Per Capita GNI(US\$/Cap)	Per Capita Energy (kgoe/Cap)
Low-Income	590	360
Bangladesh	840	170
Lower-Middle-Income	1893	687
Middle-Income	4370	1281
Upper-Middle-Income	6969	1893

- In 2012 per capita GNI of Bangladesh: US\$ 840 & per capita commercial energy consumption (170 kgoe/Cap) and total energy consumption 26.4 mtoe.
- ❑ By 2020 Bangladesh wants to reach the level of middle income country: US\$/Cap 4370. It may be very difficult to attain the level.
- ✓ By 2020 it may be possible to reach lower-middle-income country: US\$/Cap 1893 level; Per capita commercial energy consumption to reach (500 kgoe/Cap) and total energy consumption 82.75mtoe.

2.6 Energy Consumption of Bangladesh in 2013



Total Primary Commercial Energy Consumption



Total Primary Energy Consumption Including Biomassfuels

- ❖ Oil, Part of Coal & Electricity Imported
- ❖ Bangladesh's Dependence on fossilfuels will continue.
- ❖ Bangladesh will also have to maintain sustainable supply of biomassfuels (fuelwood, agricultural residues, animal dung) to meet subsistence energy needs.

3.1 Energy Cooperation has Important Role in Meeting Future Energy Needs of Bangladesh.

- ❖ **Energy is a strategic commodity.**
- ❖ **Risky capital investment.**
- ❖ **Time required for exploration, production, transportation etc.**
- ❖ **Requires multi-stakeholders participation.**
- ❖ **Require specialized negotiation skill.**
- ❖ **Energy negotiations take long-time to achieve success.**
- ❖ **Many stakeholders are involved in regional energy cooperation projects.**
- ❖ **Two globally recognized forums play important roles in planning, implementation and management of energy co-operations on a sustainable basis.**
- **They are Extractive Industries Transparency Initiative (EITI) and Energy Chartered Treaty (ECT).**

3.2 Existing Energy Cooperation between Bangladesh & Other Countries

- ❖ Between Bangladesh and China (B-C): Coal mine, Coal terminal; JV Power generation.**
- ❖ Between Bangladesh and India (B-I): Import of Coal, electricity & petroleum; JV Power generation.**
- ❖ Between Bangladesh & Russia (B-R): Nuclear Power, Hydrocarbon Exploration.**
- ❖ Between Bangladesh & Japan (B-J): Coal Fired Power Plant.**
- ❖ Between Bangladesh & Myanmar (B-M): Hydropower (MoU) & Natural gas (in future).**

3.3 Energy Import of Bangladesh

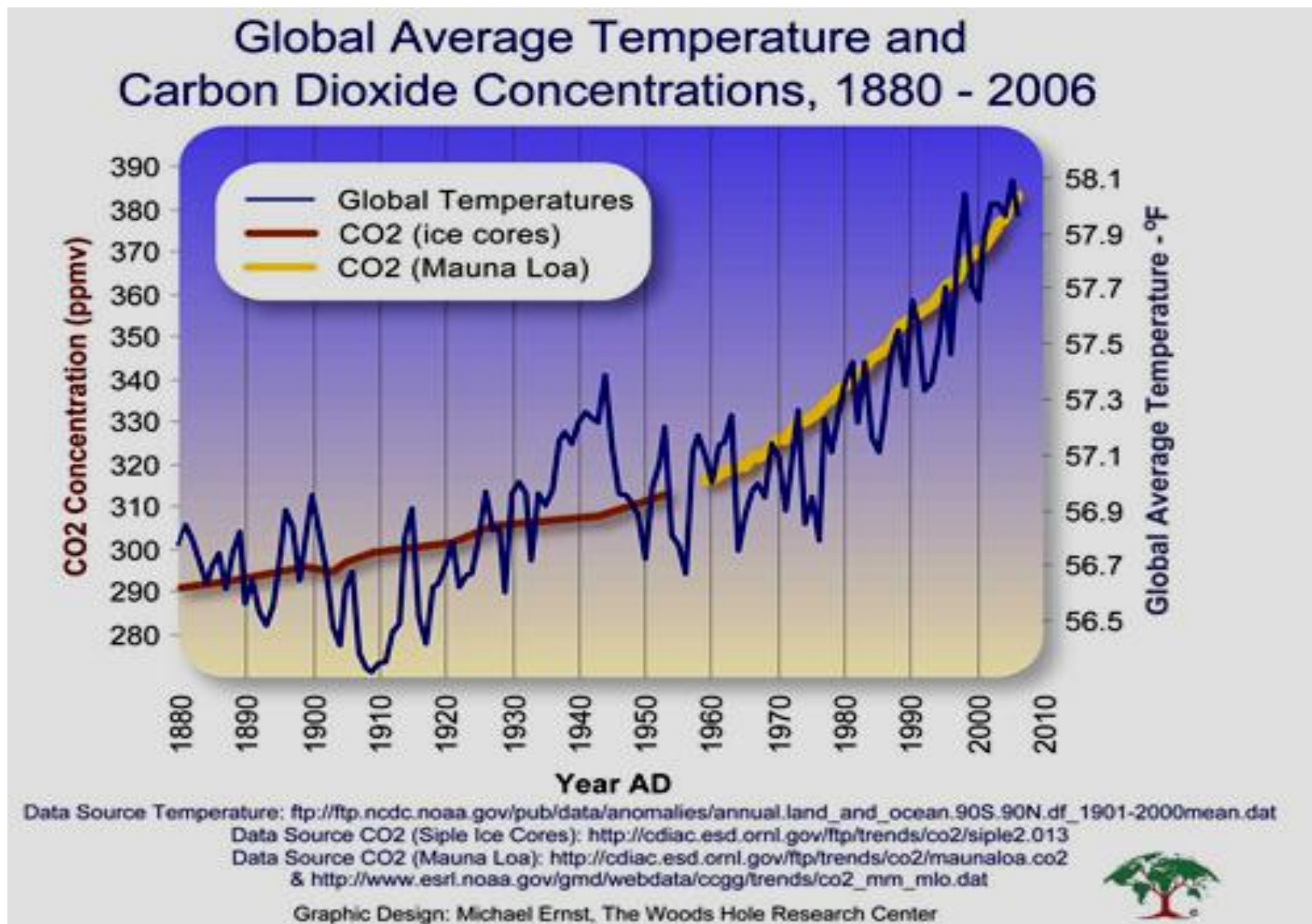
- ❖ Import of petroleum fuels from Middle-East**
- ❖ Sub-Regional Energy Cooperation**
- Bangladesh-India Electricity Import**
- Bangladesh-India Petroleumfuels Import (Feasibility)**
- Bangladesh-Bhutan, Nepal, India Multi-lateral Electricity Import (Prospect)**
- Bangladesh-Myanmar Electricity Trade (Prospect)**
- Bangladesh-Indonesia Coal Import (Prospect)**
- Bangladesh-Australia Coal Import (Prospect)**
- Bangladesh-Qatar LNG Import (MoU)**

3.4 Energy Consumption & Climate Change

- **Consumption of Non-Renewable Fossilfuels (coal, oil, gas) Responsible for Emission of Green House Gases (GHGs).**
- **Accumulation of GHGs in Earth's Atmosphere Contributes in Global Warming.**
- **Reserve of Non-Renewable Energy Sources are Finite, it will be Exhausted in future. So In-Exhaustable Renewable Energy Sources should be used in Meeting future Energy Needs.**
- **GHG Emissions from Fossilfuels in Descending order- Coal, Oil, Natural Gas.**
- **Tariffs of Fossilfuels in Ascending order- Coal, Oil, Natural Gas.**
- **Countries prefer to use Cheaper Fuels (e.g. coal) to Reduce Cost of Energy, but at High (Cost) of GHG Emissions.**
- **Advised to Reduce Fossilfuels Consumption through Substitution with Nuclear Energy & Renewable Energy Sources. Very difficult to implement the proposition.**
- ❖ **Average Per-capita CO₂ Emission of the World in 2011: 4.59 tonnes**
- ❖ **Average Per-capita CO₂ Emission of Bangladesh in 2011: 0.33 tonnes**

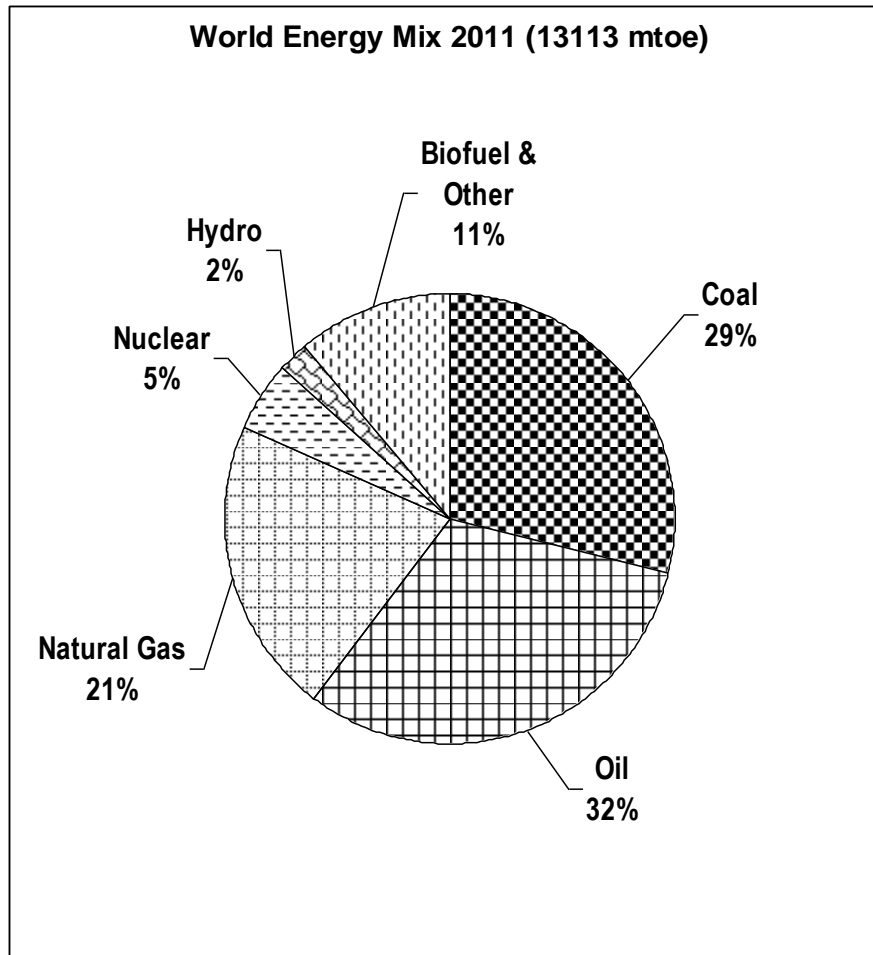
3.5 Energy Consumption & Climate Change

Global Warming and CO₂ Level Rise

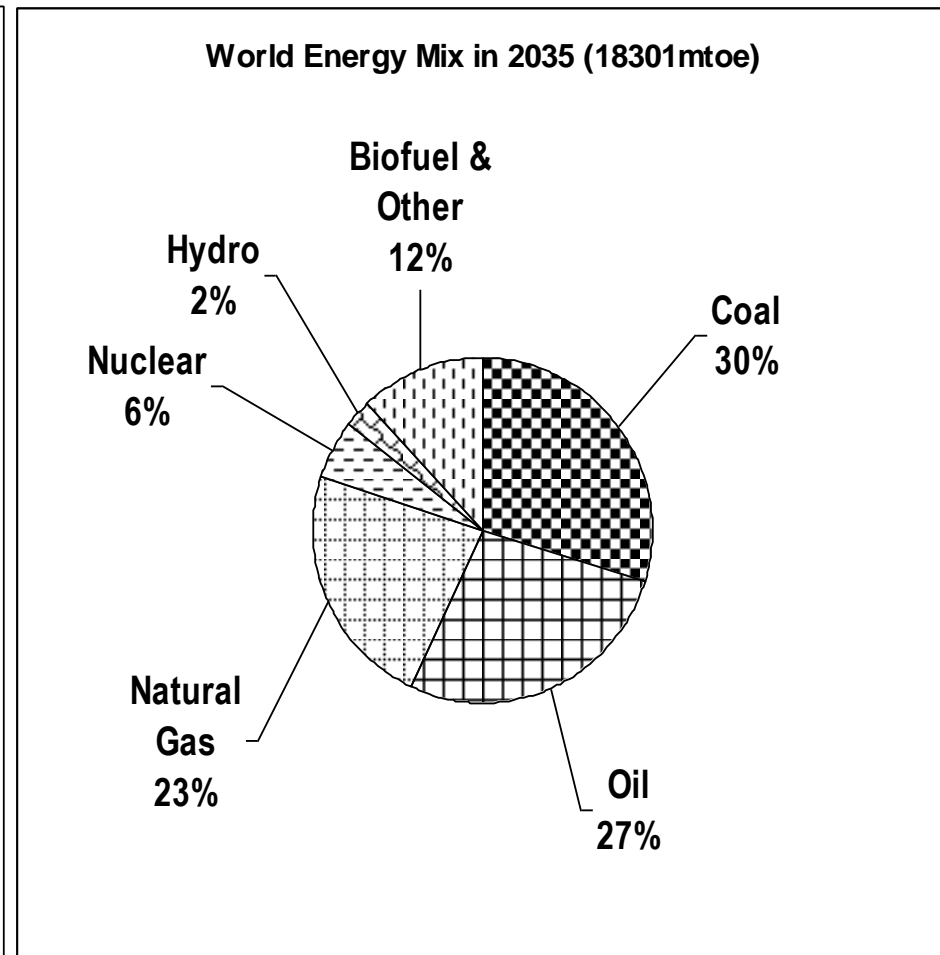


(CO₂ Level 290ppm in 1870 Increased to 395PPM in 2013.)

3.6 Importance of Fossilfuels in Meeting Future World Energy Needs



Source: IEA 2013



Source: IEA 2011

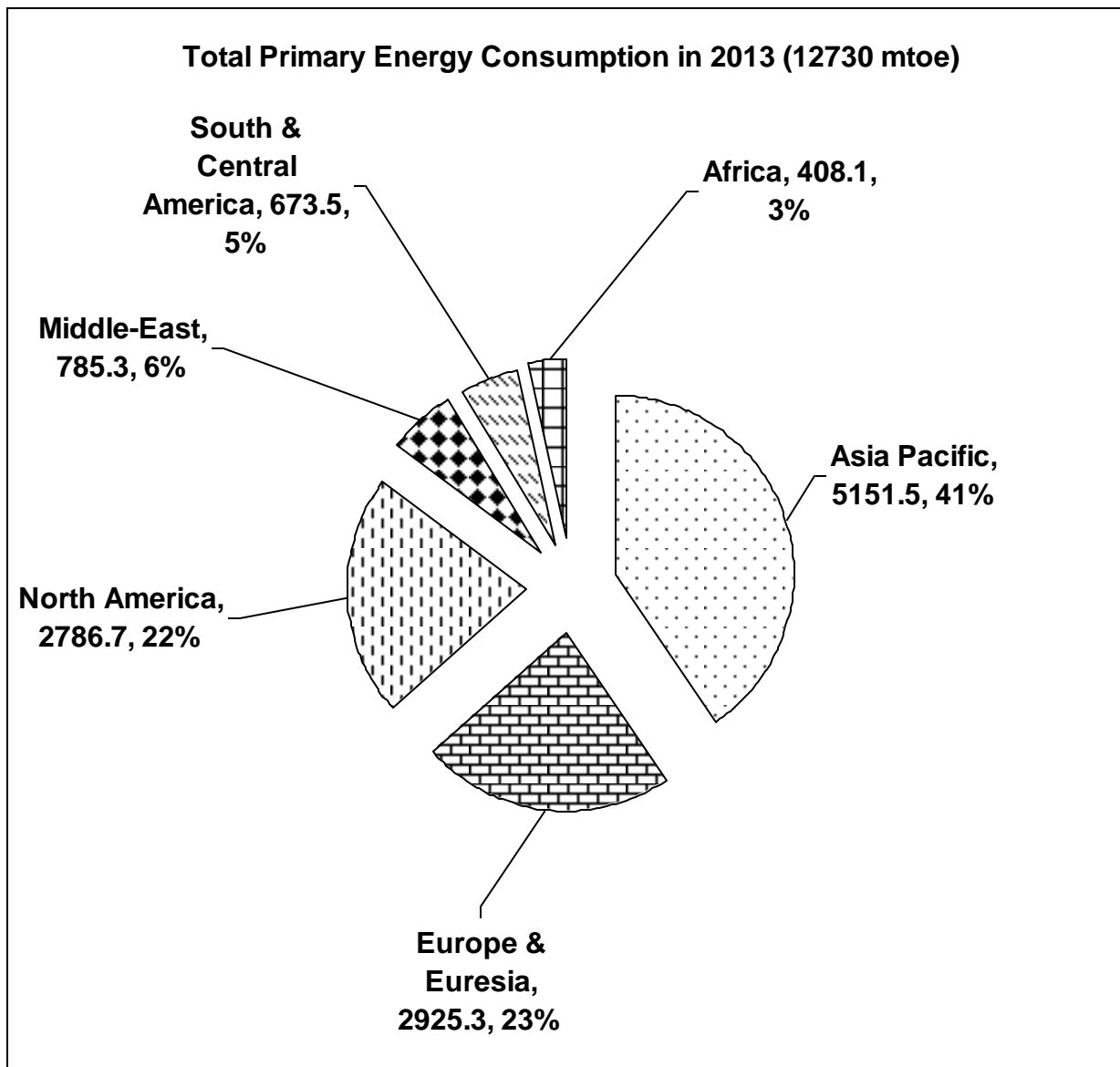
3.7 Importance of Fossilfuels in Meeting Future World Energy Needs

World Energy Situation in 2011 and 2035

Particulars	2011	2035
Total Energy (mtoe)	13113	18301 (+39.6%)
Fossilfuels (percent)	82	80
Renewable (percent)	13	14
Nuclear (percent)	5	6

- Total Energy Consumption increased by 29.6% between 2011 and 2035
- Share of fossilfuels decreased from 82% to 80%
- Share of RE and Nuclear increased from 18% to 20%
- World's dependence on fossilfuels will continue
- R/P=Reserve/Production in 2011. How many years the reserves will last if the production is continued @ 2011?
- R/P of coal = 109 years, R/P of oil=53 years and R/P of gas=56 years
- It may take very long time to substitute fossilfuels with nuclear energy and renewable energy resources.

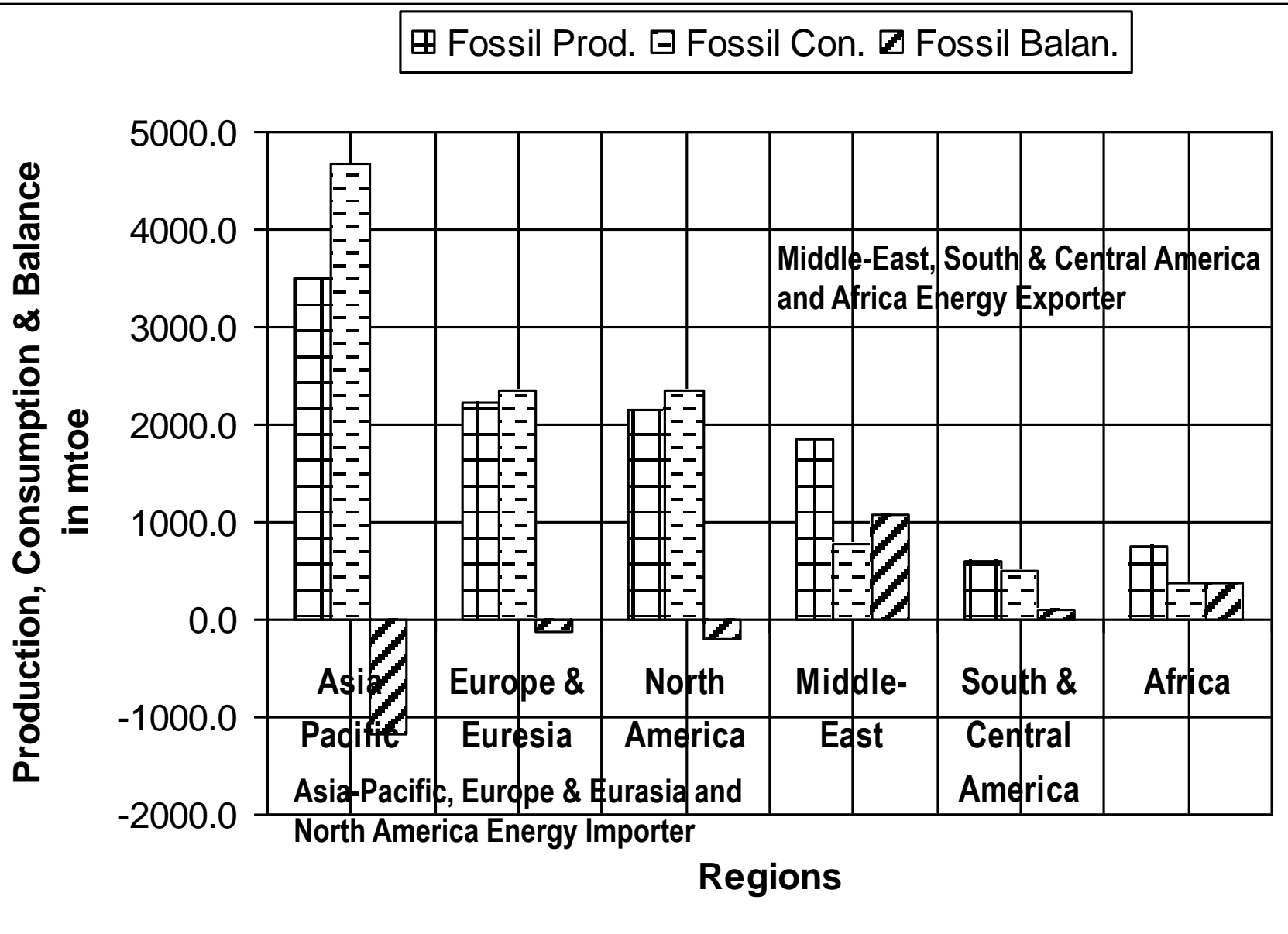
3.8 Primary Energy Consumption in Different Regions of the World



3.9 Fossilfuels Production, Consumption, Balance & Distribution of Primary Fuel Consumption in Different Regions in 2013 (in mtoe)

Regions	Fossilfuels			Total Primary Consumption	Percent Non-Renewable	Percent of Total
	Fossil Prod.	Fossil Con.	Fossil Balan.			
Asia Pacific	3507.80	4686.70	-1178.90	5151.50	90.98	40.47
Europe & Eurasia	2217.30	2345.60	-128.30	2925.30	80.18	22.98
North America	2144.20	2351.20	-207.00	2786.70	84.37	21.89
Middle-East	1841.40	778.50	1062.90	785.30	99.13	6.17
South & Central America	595.10	492.60	102.50	673.50	73.14	5.29
Africa	749.60	377.50	372.10	408.10	92.50	3.21
Total World	11055.40	11032.10	23.30	12730.40	86.66	100.00

3.10 Production, Consumption & Balance of Fossilfuels in Different Regions in 2013



3.11 Countries of the Asia-Pacific Region



Countries of the Asia Pacific Region: Brunei, Cambodia, China, China Hong Kong SAR*, Indonesia, Japan, Laos, Macau, Malaysia, Mongolia, North Korea, Philippines, Singapore, South Asia (Afghanistan, Bangladesh, India, Myanmar, Nepal, Pakistan, Sri Lanka), South Korea, Taiwan, Thailand, Vietnam, Australia, New Zealand, Papua New Guinea, Oceania.

3.12 Observations on Energy Consumption in the Asia Pacific Region

- ❖ In 2013, Asia Pacific Region Consumed 41% of total energy of the World.**
- ❖ Major energy consuming countries are located in the AP region: China 1st, India 4th, Japan 5th, South Korea 8th.**
- ❖ Energy exporting countries of the AP Region in 2013: Australia, Indonesia, Malaysia, Myanmar, Vietnam.**
- ❖ 22.8% Energy Consumed in the Region was met by importing energy from other regions. It is the most Energy Scarce Region of the World.**
- ❖ 91 percent of total energy consumption was met by non-renewable energy resources.**
- ❖ Renewable energy played marginal role in meeting energy needs.**

4.0 Challenges & Opportunities for Regional Energy Trade

4.1 Factors Inhibiting Trade in the Past

- (1) Political and Security Considerations (Lack of Trust)**
- (2) National Policies and Political Mindset**
- (3) Infrastructure Constraints**
- (4) Poor Operational Efficiency and Lack of Creditworthiness of Utilities**
- (5) Ownership Structures and Contracting Practices**
- (6) Sector Structures and Regulations**

4.2 Emerging Factors Conducive to Energy Trade

- 1) Changes in the Development Approach and Growth Dynamism**
- 2) Increases in Power Transfer Capacities**
- 3) Evolution of National Power Markets**
- 4) Increasing Involvement of the Private Sector**
- 5) Proposals to Improve the Commercial Performance of Utilities**
- 6) Structural and Institutional Changes with Potential to Favor Trade**
- 7) Efforts to Lessen Political Tensions**
- 8) Growing Interests in Regional Cooperation Efforts**

4.3 Opportunities for Regional Energy Trade & Energy Market in Asia (1)

4.3.1 Inter-Regional Energy Trade (the Western Energy Market)

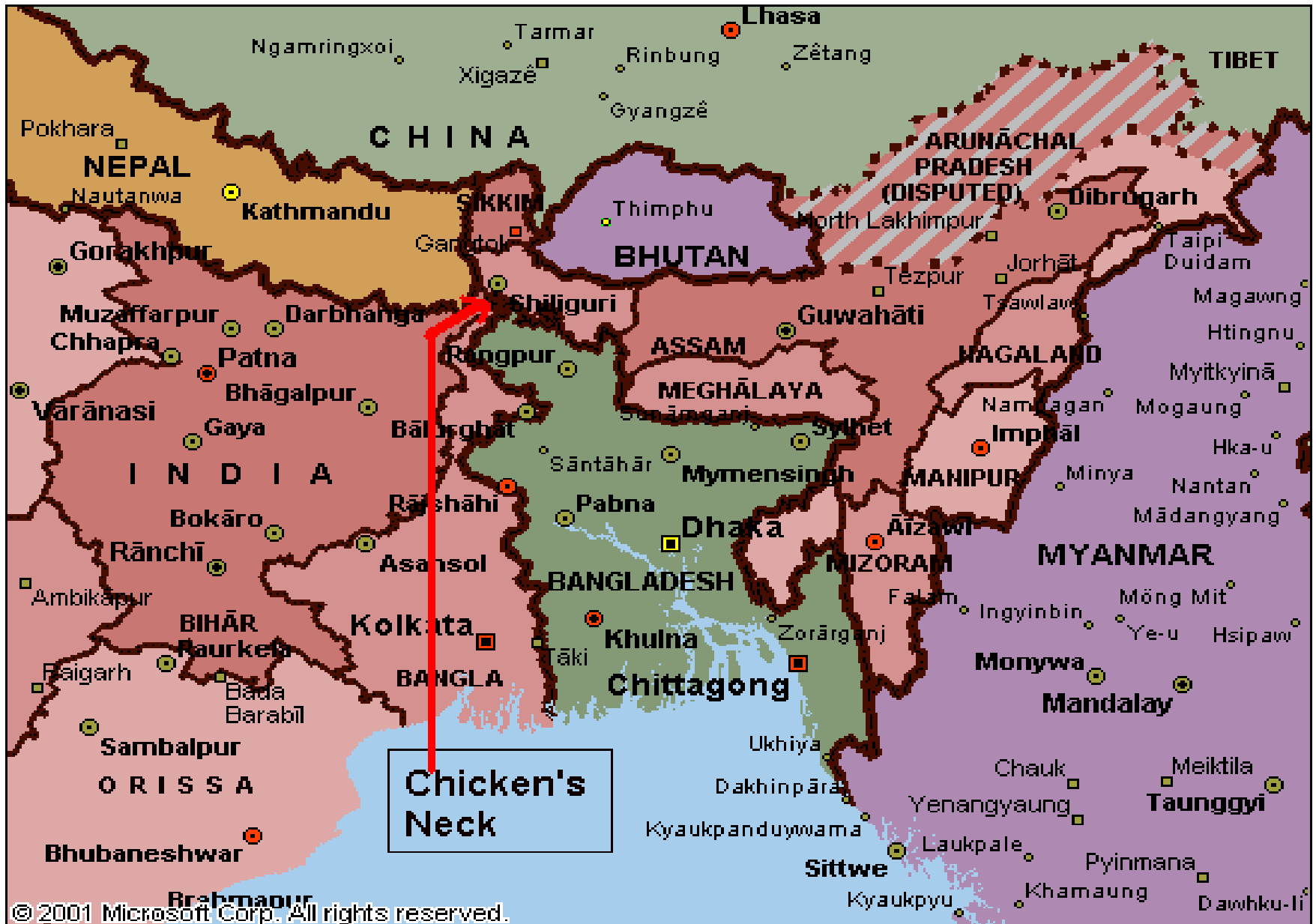
- 1) Central Asia–Afghanistan Bilateral Electricity Trade**
- 2) Iran–Pakistan Bilateral Electricity Trade**
- 3) Pakistan–India and Pakistan–Afghanistan Bilateral Electricity Trade**
- 4) Central Asia–South Asia Multilateral Electricity Trade**
- 5) Turkmenistan-Afghanistan-Pakistan-India (TAPI) Natural Gas Trade via Pipeline**
- 6) Iran–Pakistan–India (IPI) Natural Gas Trade via Pipeline**
- 7) Qatar–Pakistan–India Submarine Gas Pipeline**

4.3 Opportunities for Regional Energy Trade (2)

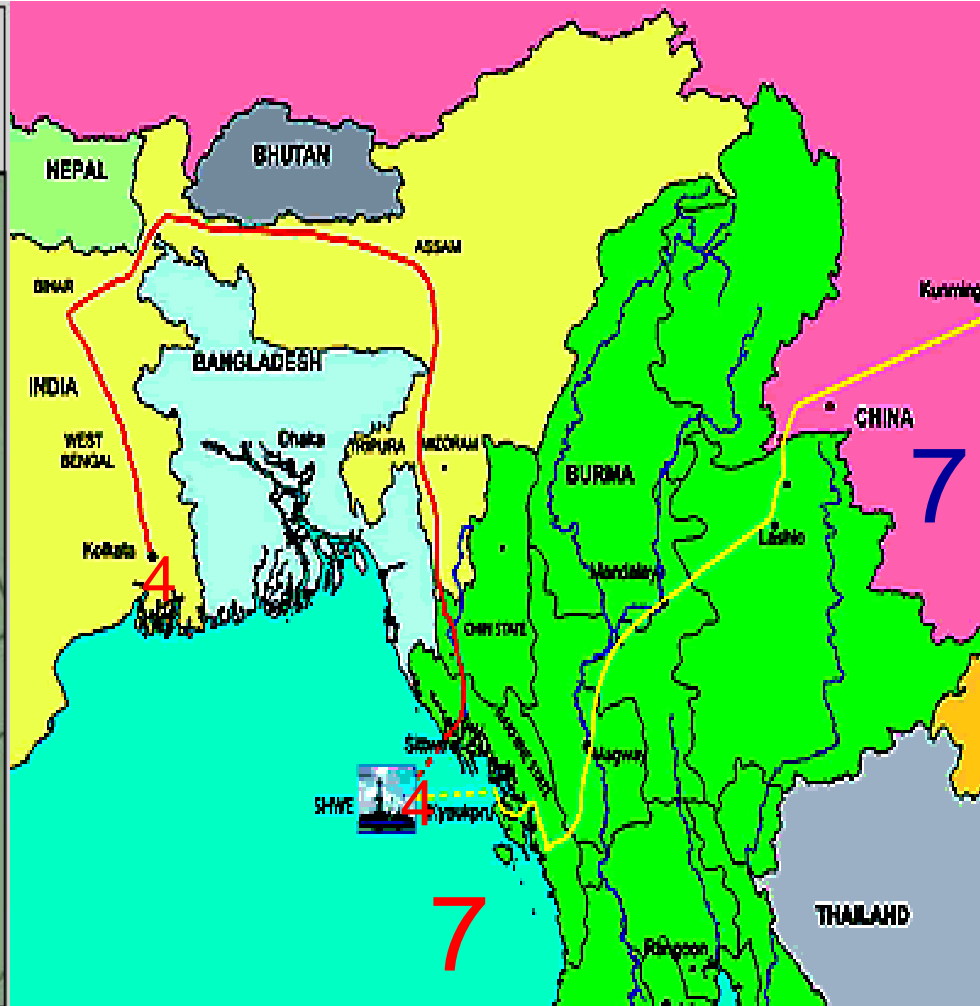
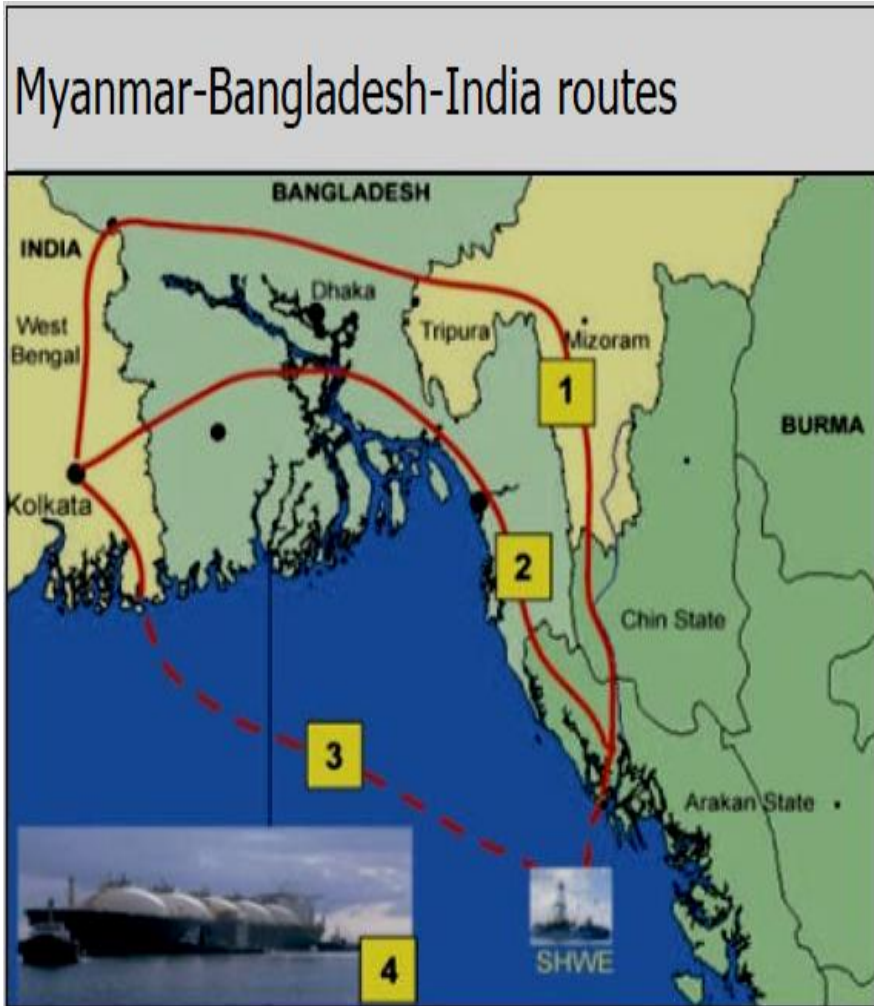
4.3.2 Intra-Regional Energy Trade (The Eastern Energy Market)

- 1) India–Sri Lanka Bilateral Electricity Trade**
- 2) Nepal–India Bilateral Electricity Trade**
- 3) Bhutan–India Bilateral Electricity Trade**
- 4) Bangladesh–India Bilateral Electricity Trade**
- 5) Bangladesh, Bhutan, Nepal & India Multilateral Electricity Trade**
- 6) Myanmar-India Natural Gas Trade**
 - 6(1) Myanmar–India-Bangladesh-India (onshore route)**
 - 6(2) Myanmar–Bangladesh-India (onshore route)**
 - 6(3) Myanmar-India (offshore route)**
 - 6(4) Myanmar-India (onshore route)**
- 7 Myanmar-China Natural Gas Trade (onshore route)**
- 8 Myanmar-Bangladesh Electricity Trade (MoU signed)**
- 9 Myanmar–India Bilateral Electricity Trade**
- 10 Bangladesh–India Bilateral Gas Trade**

Chicken Neck is a Critical Area of Concern for India's Security



Myanmar-India Natural Gas Trade Through Proposed 4 Routes



Myanmar-China Natural Gas Trade (onshore route)

China's trans-Myanmar oil and gas pipelines

Pipeline's will bring 12 million tonnes of crude oil and 12 billion cubic metres of gas a year into China



Source: shwe.org

REUTERS

Reuters graphic/Catherine Trevethan

01/02/10

Myanmar-China Oil Pipeline (onshore route) Established to Minimize Risk of Passing through Sea Route via Strait of Malacca



4.4 Government Actions and Initiatives for Promoting Energy Trade (1)

4.4.1 Facilitating Emergence of Trade

- **Energy Trade to Be Perceived as Enhancing Energy Security**
- **Encourage the Private Sector to Play a Greater Role in Cross-Border Investments and Trade**
- **Seek Accession to Energy Charter Treaty**
- **Pay Attention to Integrity of the Transit Countries**
- **Prepare for the Commercial Approach to Trade**
- **Keep the Price Expectations Realistic**
- **Political Commitment to Drive the Prioritized Trade Transactions**

4.4 Government Actions and Initiatives for Promoting Energy Trade(2)

4.4.2 Enabling The Evolution of Competitive Regional Energy Markets

- 1) Create Technical and Commercial Coordination for Regional Trade**
- 2) Strengthen the Role of Regional Cooperation Organizations**
- 3) Strengthen Transmission Links and Complete the Ongoing Sector Restructuring Process**
- 4) Step up the Operational and Commercial Efficiency of Utilities**
- 5) Adopt Sustainable Tariff and Social Protection Framework**
- 6) Improve the Credibility, Competence, and Accountability of Regulation**

4.5 The Role of International Financial Institutions and Bilateral Donors

- 1) Identifying Trade Opportunities and Facilitating Inter-country Agreements**
- 2) Structuring Project Investments**
- 3) Structuring Transmission and Trading Facilities**
- 4) Promoting Strategic Sector Reforms in Participating Countries**
- 5) Evolution of Export/Import Contracts and Dispute Resolution Mechanisms**
- 6) Supporting Transmission and Distribution Expansion**
- 7) Risk Mitigation**
- 8) Priority in the Country Assistance Strategies**
- 9) Coordination among International Financial Institutions (IFIs) and Bilateral Donors**

5.1 Way Forward

- ❖ **In the 21st Century, Global energy situation has become quite complex and dynamic. In the Asia Pacific Region, Energy Security has become Challenging Tasks. Efforts should be made to meet the challenges through dynamic Regional Energy Cooperation.**
- ❖ **To support energy security of a country, it would be appropriate to consider in establishing a dedicated unit within the Ministry of Foreign Affairs to deal with Energy and Climate Change Issues on a continuing basis, to support energy security of their respective countries.**

5.2 Future Options

- ❖ Intra-Regional Energy Cooperation for Energy Trade.**
- ❖ Sub-Regional Energy Cooperation for Energy Trade.**
- ❖ Participation in International Energy Charter Treaty.**
- ❖ Participation in EITI.**
- ❖ Climate Change and Energy Security are Integral Part of Foreign Policy.**
- ❖ Active Participation of the Ministry of Foreign Affairs in Energy and Climate Change Issues.**

5.3 Action Program for Consideration of the Government of Bangladesh (GOB)

- ❖ Establish Institutions at MOFA to Support Ministry of Energy on a Continuing Basis to Ensure Energy Security:**
 - Establish Energy & Climate Change unit in MOFA to Accumulate, Analyze & Update Information on Energy-Cooperation/Trade.**
 - Strengthen Capacity of the special unit at MOFA for Dynamic & Proactive Energy Diplomacy.**
 - Energy Diplomats should be given higher education & training on energy related issues.**
 - Energy Diplomats should participate in the seminars, workshop related to energy in own & the countries of their posting.**
 - Junior Energy Diplomats should be posted in energy resources rich and major energy consuming industrialized countries in a planned manner with the objective to gather experience & move to higher levels of posting (e.g. Junior/Medium/Senior Energy Diplomats) through practical experiences.**

5.4 Action Program for MOFAB

- ❖ Possible Tasks of the Energy Diplomats (MOFAB)**
- ✓ Be Informed about Country Energy Situation (Current & Future).**
- ✓ Be Informed about Regional & Global Energy Situation- Energy Resources (available locations), Energy Technologies, Energy Transportation modes, Energy Trade (routes), Energy Market, Energy Tariffs, Technology Transfer etc.**
- Be Informed about Inter & Intra Regional Energy Cooperation Agreements.**
- Be Informed about outcomes of Climate Change Negotiations (mitigation and adaptation measures).**

5.5 Action Program for ACECC

- ❖ ACECC may consider in Constituting a Technical Committee on Role of Civil Engineers in Sustainable Development of Energy for the Countries of the Region (TC21).**
- ❖ ACECC may consider in Strengthening Capabilities of Bangladesh and Other Member Countries in Transferring Civil Engineering Technologies in Mega Projects by Institutionalizing Transfer of Technology Unit.**
- ❖ ACECC may consider in Introducing Green Rating of Construction Industries in Bangladesh through IEB.**

Thank You