

SAARC Energy Cooperation: Energy Security and Environmental Challenges

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Current Status of South Asia's Energy Sector

- Strong economic growth → energy consumption ↑ → demand for energy ↑
- Economic growth rate is constrained by significant shortages in energy supply in the region
- India, Pakistan, Bangladesh, Sri Lanka and Afghanistan have energy demand surpassing their domestic supply
- Many supply side constraints in the South Asian energy sector
- Bhutan and Nepal have energy resources, hydropower, far in excess of their domestic needs that can be traded within the region. Bangladesh, India and Pakistan have potential for significant electricity and gas trade within South Asia

Energy Security Concerns of South Asia

- The recent escalation in world oil prices have placed an enormous burden on foreign exchange reserves to the detriment of national economies
- Sri Lanka and Maldives, which lack indigenous fossil fuel sources, are especially hard hit
- India, Pakistan and Bangladesh now meet less of their demand with indigenous fuel sources and face mounting energy import bills
- The region is under immense social and political pressures to secure reliable, sustainable and reasonably priced energy supplies
- Energy security is an inevitable reality for vital economic development throughout South Asia

South Asia Energy Consumption in the Global Context

- South Asia contributed to 6.3% of world's total energy consumption in 2004 which was 5.7% in 1997
- 38% of the total energy consumption in South Asia constitutes non-conventional energy sources: Animal waste, wood, biomass, etc.
- Average energy consumption in 2004 was 486 kg of oil, which was 27.1% of the world average consumption of oil in 2004 (Imports of crude oil range from 25% of commercial energy consumption in the case of Bhutan to 100% in the case of Maldives)
- South Asia's total energy consumption was 584.6 million toe (Tonnes of Oil Equivalent) of which 420.2 million toe was commercial energy and the remaining share includes non-commercial sources like biomass

Energy Consumption Composition: 2007

- Natural Gas dominates Bangladesh's energy mix accounting for 68% of the total energy consumption
- India depends heavily on coal that accounts 50% of total energy consumption
- Afghanistan, Maldives, Nepal and Sri Lanka heavily rely on oil products
- Bhutan has the highest share of hydro power accounting for 70% of the total energy consumption
- Pakistan has a mixed bag of energy consumption which diversifies among oil products-27%, natural gas-55% and primary electricity-12%

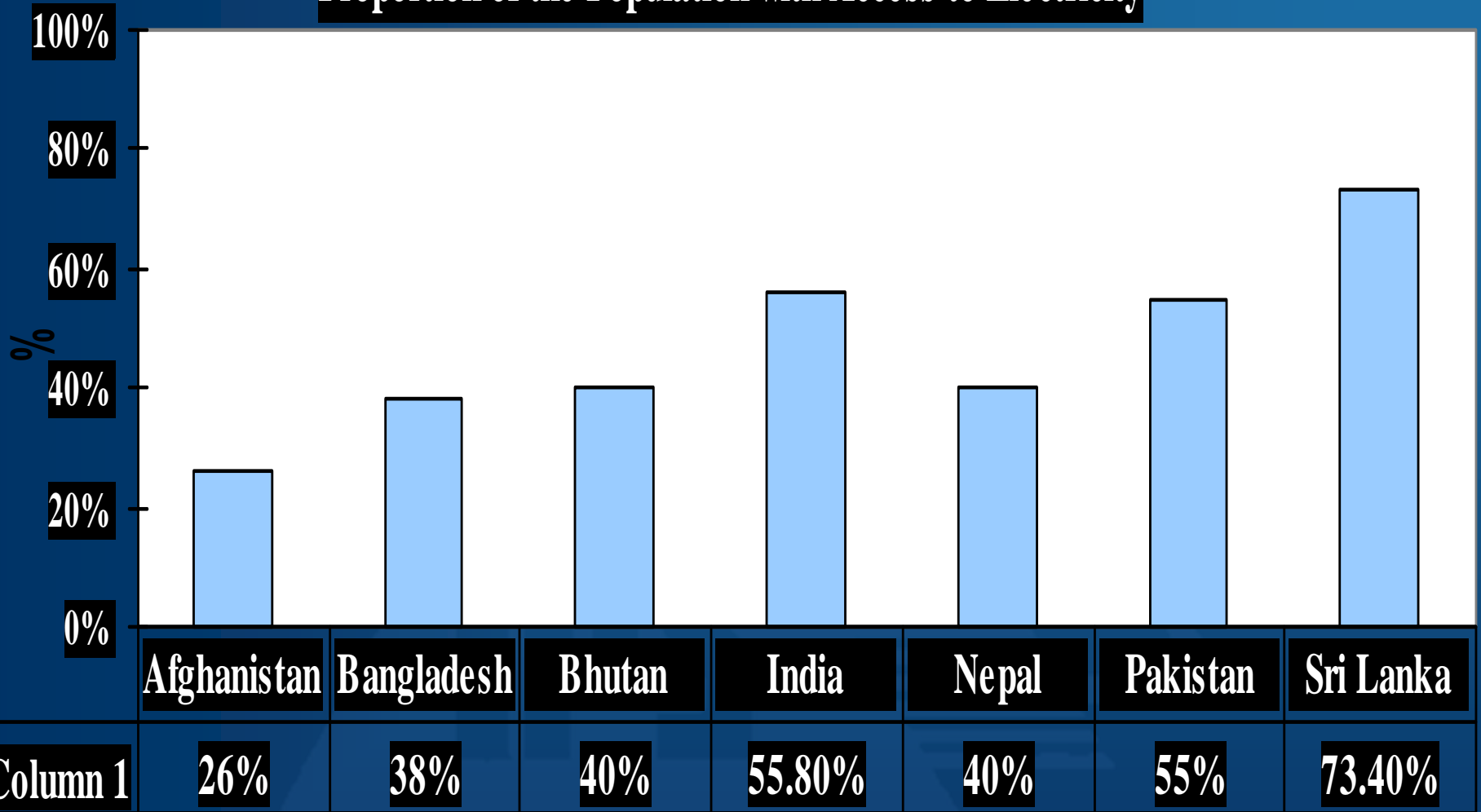
Energy Consumption Pattern in 2007 (In Million Tonnes of Oil Equivalent)

Item	Afghanistan	Bangladesh	Bhutan	India	Maldives	Nepal	Pakistan	Sri Lanka
Commercial Fuel	6.91	16.64	0.29	106.0	0.19	7.40	23.36	3.58
Coal	0.00	0.00	0.01	171.0	0.00	0.17	3.30	0.00
Oil Products	0.21	3.71	0.04	124.0	0.27	0.77	15.21	3.01
Natural gas	0.11	0.00	28.0	28.0	0.00	0.14	6.47	0.83
Hydro electricity	0.03	0.12	18.0	18.0	0.00	0.14	6.47	0.83
Nuclear Energy	0.00	0.00	0.00	8.5	0.00	0.00	0.42	0.00
Total Primary Electricity	0.03	0.23	0.12	26.5	0.00	0.14	6.89	0.83
Total Commercial Energy	0.35	12.20	0.17	349.5	0.27	1.08	52.79	3.84
Total Energy Consumption	7.26	28.80	0.46	455.5	0.46	8.48	76.15	7.42
% share of biomass in total	95.00	58.00	63.00	23.0	41.00	87.00	30.00	48.00
Per capita commercial energy consumption	16.00	89.00	243.00	335.0	759.00	44.00	355.00	200.00

Source: RIS, 2008



Proportion of the Population with Access to Electricity



Source: Data obtained from the report "Potential and Prospects of Regional Energy Trade in the South Asia Region", World Bank, 2008

Problems of Access: High Cost & Poor Quality

- Electricity is relatively costly in South Asia
- Losses in electricity in transmission and distribution
- Many South Asian countries experience economic loss due to poor quality of power – e.g. industrial sector in Nepal lost US\$24 million, amounting to 4.43% of the industrial GDP in the year 2001, Bangladesh has lost Tk. 47 billion of a production due to poor quality of power, etc.

Energy Endowments of South Asia

- South Asia is not abundant with fossil fuel resources, especially oil
- Proved oil reserves in South Asia were 6.2 billion barrels of oil that is equal to approximately 0.5% of world reserves at the end of 2006
- India holds a majority of shares of regional oil reserves which was 5.7 billion barrels
- South Asia's proven natural gas reserves were estimated to be 81.4 trillion cubic feet, which is approximating 1% of the world total at the end of 2006
- South Asia accounts for nearly 11% of the world total coal reserves, which adds up to 105.3 billion short tonnes

Energy Resource Endowments of South Asia

	Hydro Power		Oil		Gas		Coal	
	Potential (MW)	% Utilized	Mtoe	Reserves to Production	Bcm	Reserves to Production	Mtoe	Reserves to Production
Afghanistan	0	0	-	-	120	>160	-	-
Bangladesh	775	30.0	0.9	-	434	36	724	724
Bhutan	50000	10.4	0	0	0	0	0	0
India	301000	10.2	740.0	22.0	920	29	91631	~200
Nepal	42915	1.2	0	0	0	0	5	0
Pakistan	40000	16.0	39.0	13.0	795	23	3100	~900
Sri Lanka	2000	63.0	0	0	0	0	0	0

Source: RIS, 2008

Supply-Side Constraints

- Lack of domestic investment by the private sector (local) due to shortcomings in regard to rules and regulations (power purchase agreements, etc.)
- FDI restricted due to same reasons
- Insufficient infrastructure development and institutional constraints
- Old Acts of Parliament governing energy needs amendments

Energy Trade

- Net Energy imports of South Asia was 19% of total energy use in 2004
- Nepal imports 11% and Sri Lanka imports 45% of total energy requirements
- South Asia's energy resources are distributed unevenly in the region and there are complementarities among the nations
- SACs use domestically available energy resources and depends on imports for the energy deficit
- Energy surplus and deficit nations of the region and its neighbourhood are not strongly linked
- Hydropower potential of Nepal and Bhutan, which exceeds their domestic demand, and natural gas reserves of Bangladesh could be traded amongst regional members to fulfil the rapidly expanding energy requirements, especially in India and Pakistan
- Abundant energy endowments of the neighbouring countries like Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan, Kyrgyz Republic, Iran and Myanmar can become crucial for the region's energy security

Energy Integration in South Asia

- Bhutan exports hydro power to India (with grant assistance from India)
- Afghanistan imports power from Iran, Uzbekistan, etc.
- Nepal imports as well as exports electricity to India
- Pakistan imports power from Iran
- Regional energy cooperation is increasingly used as a preferred forum for instituting energy sector reforms and constructing and modernising of new energy infrastructure, especially cross border energy power lines and pipelines
- For this purpose integrating regional energy markets is essential with appropriate regulatory framework and guidelines. This will facilitate large investment in the Energy sector
- SAARC Working Group on Energy and SAARC Energy Centre are the key bodies overlooking the ways and means of energy integration. SAARC Power-Grid, Trans-SAARC Gas Pipelines, SAARC inter-connections, etc., have featured in the South Asia energy dialogue

Impediments for Energy Trading

- Progress is very slow on energy integration
- Existing potential for regional energy trading has not been exploited due to:
 - Lack of political will and mistrust (e.g. 1996 power trade agreement between India and Nepal is yet to be ratified by the parliament of Nepal, Mahakali Treaty to develop a hydropower project in the Mahakali river is hardly progressing, proposed gas pipeline from Myanmar to India via Bangladesh and the proposed Iran-Pakistan-India gas pipeline are at a standstill, etc.)
 - General fear of sharing resources with neighbours
 - Frequent changes of governments and consequently changes of policy

Part II

Renewable Energy Status and Environment Challenges

Current Status of the Renewable Energy Usage: Bangladesh

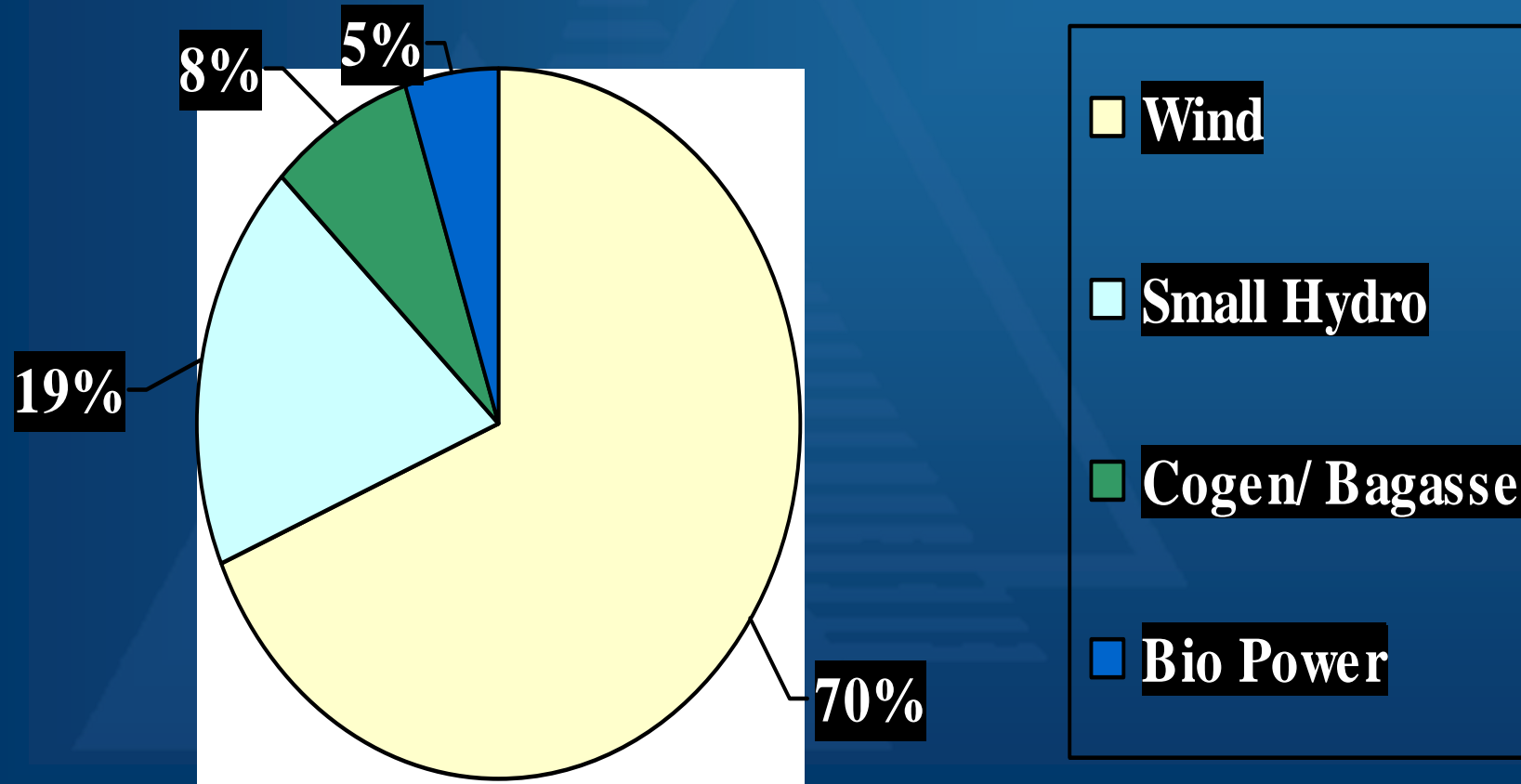
- 19,596 biogas plants have been installed
- Currently, about 60 small private enterprises are producing briquettes from rice husk and saw dust
- According to an official estimates, there is a cattle population of 24 million and poultry population of 75 million in Bangladesh -- can produce about 3 billion cubic feet of biogas
- At present, Solar energy utilisation in Bangladesh is about 0.15 watt/sq. metre land area, whereas the availability is above 208 watt/sq. metre.
- Biomass energy consumption has declined from 83% in 1980 to 67% in 1995

Bhutan

- Bhutan has an estimated hydropower potential of 30,000 MW and so far only 468 MW of this potential has been harnessed
- The large forest coverage not only provides catchments for conserving the water resources but is also a source of renewable biomass energy for meeting the primary needs of most of the people especially in the rural areas
- India has been the lead donor in providing both technical and financial assistance to develop the numerous hydropower projects in Bhutan
- Northern Indian states close to Bhutan has power shortages while Bhutan has a large hydropower potential and this complements the sustained efforts in economic cooperation for mutual benefits

India

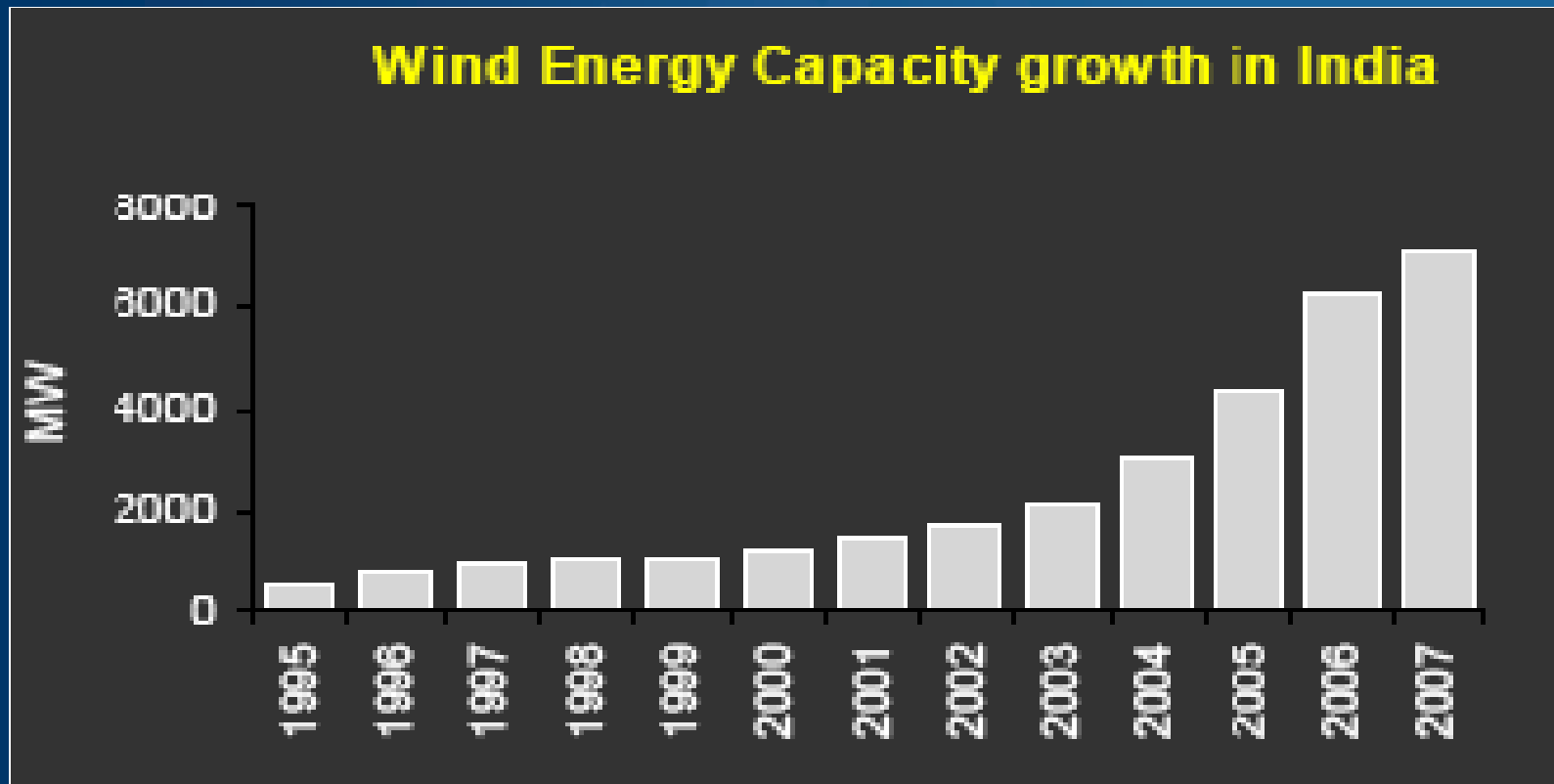
Renewable Energy Capacity in India in 2007



Source: Ministry of New and Renewable Energy, India

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- India is the 4th largest producer of wind energy in the world with a capacity of 7 GW and the capacity growth has now reached an annual rate of 40%



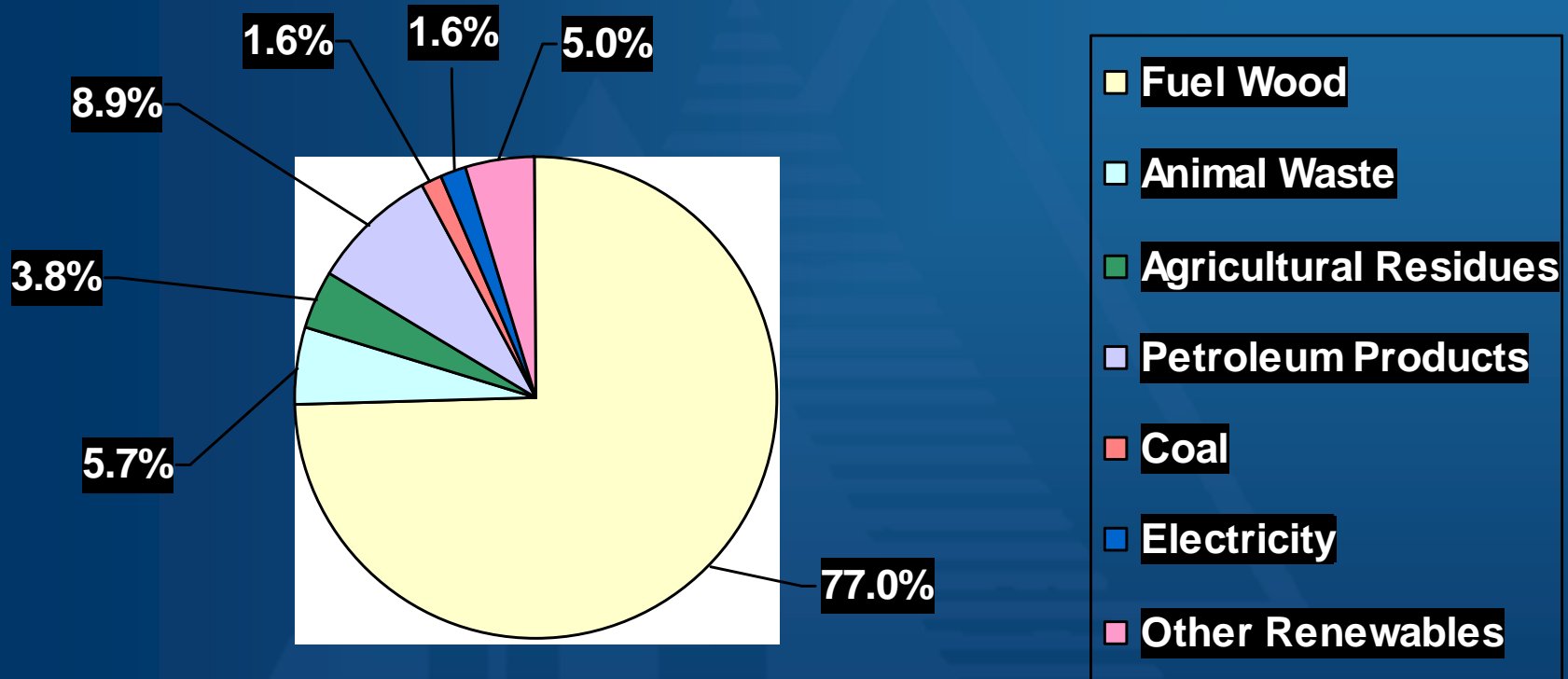
Source: Singh, Kuljit, 2008. Renewable Energy in India: Opportunities and Challenges Transaction Advisory Services

Maldives

- Wind, solar, waves, and biomass are some of the most promising options among Maldives's renewable energy sources
- Main source of energy for domestic purposes in most of the outer islands has been biomass: branches from trees and shrubs, coconut husks, dry coconut leaves, coconut shells, and municipal solid waste
- According to the Municipality Waste Management Section in Male, the typical composition of municipal solid waste is: paper and cardboard (33%), kitchen waste (15%), and construction waste (52%)
- Fuel wood is used for cooking and smoking of fish
- Due to the depletion of wood resources and subsequent restrictions on deforestation, households have switched from biomass to kerosene and LPG for cooking

Nepal

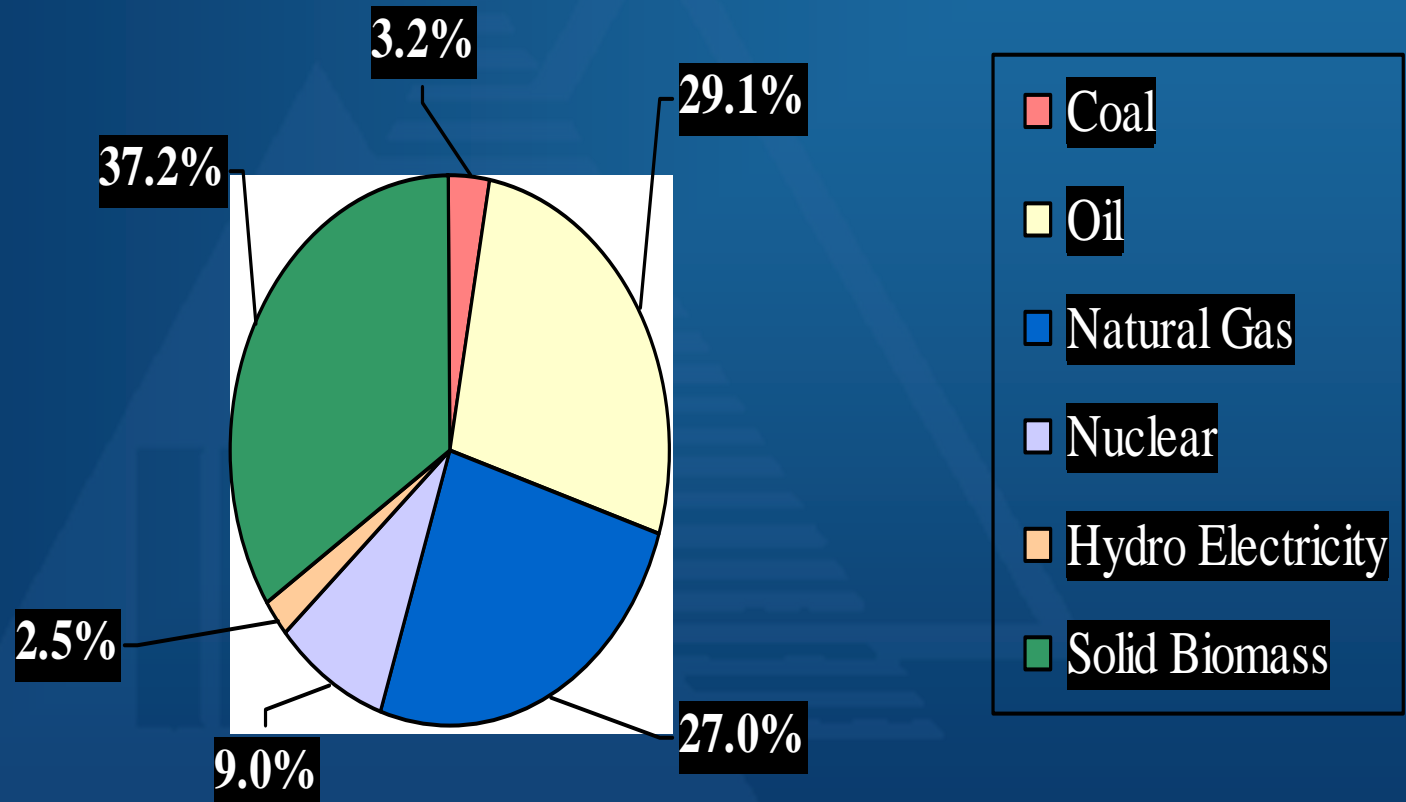
Energy Consumption in Nepal in 2002/2003



Source: Bhattarai, Tara Nath, 2006, Renewable Energy Development Strategies and Solid Biomass Fuels in Nepal

Pakistan

Energy Consumption in Pakistan in 2001



Source: International Energy Association (IEA)

Sri Lanka

- Main indigenous primary energy sources of Sri Lanka are hydro electricity and biomass, constituting more than 56% of the primary energy supply in 2004
- Solar and village hydro power only have the potential to meet the energy needs of around 15-20% of the off-grid population in Sri Lanka
- Village Dendro Schemes can be constructed to serve off-grid communities that do not have the hydro potential and are unable to afford solar
- **Biomass** consumption in Sri Lanka account for about 48% of the total primary energy supply; consumed mostly by households, tea, rubber and brick and tile industries
- Biomass consumption increases by 3% annually
- Sawdust, which is a potential fuel, is still wasted in Sri Lanka
- Coir dust is exported to European countries in briquette form as a soil conditioner and thus no longer freely available as a potential fuel

Environmental Challenges

- Carbon Dioxide emissions in Maldives and India increased rapidly (resulting a rise in sea water levels)

Country	CO ₂ emissions (metric tonnes per capita)		
	1990	2000	2003
Afghanistan	NA	NA	NA
Bangladesh	0.14	0.20	0.24
Bhutan	0.23	0.71	0.63
India	0.80	1.14	1.19
Maldives	0.71	1.82	2.05
Nepal	0.03	0.13	0.11
Pakistan	0.63	0.77	0.68
Sri Lanka	0.22	0.53	0.53

Source: World Development Indicators database

Future Energy Needs

- Forecasted energy requirements of South Asian countries for the year 2020 indicate that the region cannot fulfil its demand of:
 - 2,124.3 billion kwh of electricity
 - 304.6 million toe of oil products
 - 219.5 million toe of gas
 - 470.3 million toe of coalwith the available conventional resources
- Region will have to accommodate non-conventional resources like wind power, dendro power, and bio fuel into the energy mix and form a regional cooperation amongst its members to satisfy the expected energy demand of 2020

Future Prospects

- Bangladesh intends to meet most of its commercial energy needs from natural gas
- Bhutan and Nepal intend to develop their hydro power to meet their energy needs and to export electricity to neighbouring countries
- Pakistan anticipates that it will have to import gas from 2010 and begin to utilise its coal resources
- Sri Lanka plans to develop indigenous hydro power and bio fuel and to import coal for power generation
- India focuses on optimal utilisation of its coal and hydro electric sources and diversify its supply mix by introducing more renewable energy and nuclear energy. India aims to explore and source oil and gas resources beyond its boundaries

Policy Implications

- A similar Agreement to the ASEAN Energy Development Agreement is required for South Asia
 - Accumulation of non-conventional energy sources and remove existing constraints for the entrance of renewable energy into the power grid
- A pledge to provide incentives and rewards to encourage energy efficiency and renewable energy development
 - At the micro level, national energy efficiency targets could be achieved by enforcing industries, institutions or domiciles to achieve a specified minimum level of efficiency
 - The target groups can be rewarded with tax concessions or tax breaks in electricity fees if they achieve the set objectives and to further motivate them
- Execution of awareness programmes for the general public to support national energy efficiency
 - Thailand has exercised a nationwide effort to highlight the importance of energy conservation in 2005

Thank You

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