Sustainable Energy Policy: Challenges and Prospects for the Developing Countries like Bangladesh

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Abstract

In the 21st century, developing and emerging economies are facing a dua energy challenge: meeting the requirements of thousands of people who still lack of accessing to basic & modern energy services while concurrently participating in a global transition to clean, low-carbon energy systems. And the second reason, emissions from developing countries are emerging rapidly and are contributing to environmental problems. The scenario is more or less same among the developing countries like Bangladesh. These trends have been positive principally. Sustainable energy policies promote the development of aboriginal renewable-energy industries. They will have the additional benefit of creating new economic opportunities, reducing countries' exposure to volatile world energy markets and by curbing outlays for imported fuel, conserving resources for internal investment. There are a number of basis for optimism that indicate developing countries can succeed as sustainable energy leaders, even as they make substantial strides toward closing the gap between energy 'haves' and 'have-nots', for example 68% of total population of Bangladesh have access to electricity in the year 2014 that was 47% in 2009. At the same time, the price competitiveness and reliability of renewable energy technologies has continued to improve, especially in rural areas that are not well-connected to electricity grids. This paper outlines several policy priorities for developing countries alike Bangladesh and other developing countries. None of these policy recommendations will be easy to implement. All will eventually require the active engagement of all sectors.

Keywords: Sustainable policy, economic opportunity, renewable energy, financial constraints

I. Introduction

Since the starting of industrialization, use of different forms of energy and the ability to harness has transformed living conditions for billions of people, freeing them to perform ever more productive tasks and allowing them to enjoy a level of comfort and mobility unprecedented in human history. For most of the last 200 years, steady growth in energy consumption has been closely tied to rising levels of prosperity and economic opportunity in much of the world. Now, humanity is facing energy challenges in different sectors in different forms. This challenge has at least two critical dimensions. On the one hand, it has become clear that current patterns of energy use are environmentally unsustainable and same time, access to energy continues to divide the 'haves' from the 'have-nots'. Globally, a large fraction of the world's population—more than two billion people still lacks access to one or several types of basic energy services. Can we think about the condition of third world countries like Bangladesh and other SAARC countries? Huge reports have been written on the subject of sustainable energy, but far fewer have approached these issues specifically from a developing country perspective. In nations where a significant portion of the population still lacks access to basic energy services, concerns about long-term environmental sustainability often are overshadowed by more immediate concerns about

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energy access and affordability. This report guides the two-tire energy challenge that confronts developing and emerging economies. At a broad aspect, the policy options recommended here will be familiar— similar prescriptions have been widely advocated in energy policy discussions generally and in a variety of the contexts of different developing countries. Successful implementation of a sustainable energy agenda, it will be critical for developing countries to design and implement policies that are both (a) responsive to their particular needs and constraints and (b) advance multiple objectives, including economic and social development objectives as well as environmental ones.

1. Energy Context of SAARC Countries:

Over the last two decades, S-A countries have proved to be one of the fast growing region in the world with an average annual GDP growth rate of ±6%. In spite of such a phenomenal impressive macro-economic growth, most of these countries have failed to harness their share of global export market because of the erratic, inadequate and undeveloped energy and other infrastructures. The sector itself is Capital intensive and has strategic relation with international lending. The most of the developed and developing countries of the world have shortages of energy and looking for different means to attain energy security by reducing foreign dependency and accelerating energy extraction from renewable sources; but making it affordable and easy access to energy for common people would be a long way to go.

a. Access to Electricity in South Asia:

Access to electricity in the South Asian countries are at par with the developing countries' benchmark. But it is largely below the Latin American average while surprising African continent by a large margin as well(see table-1). On the good side, rural electrification of some of the South Asian countries are faring better than the developing country average.

Table-1

Region	Population without electricity **millions**	Electrification rate **%**	Urban electrification rate **%**	Rural electrification rate **%**
India	306	75	94	67
Bangladesh	61	60	90	48
Nepal	7	76	97	72
Pakistan	56	69	88	57
Sri Lanka	3	85	96	84
Latin America	24	95	99	81
Africa	600	43	65	28
Developing countries	1,257	76.5	90.6	65.1

**** Data is for the year 2011;** Source: **World Energy Outlook, IEA, 2013**

b. Electricity Consumption of the Region:

With improved electricity supply a key input to sustainable economic growth, the generation and provision of uninterrupted electricity should be taken into contemplation. Electricity is not available to almost half of the region's 1.5 billion population. This is creating serious constraints in poverty eradication in the rural areas together with hindrances in creating better opportunities for the people.

Table-2: Electric power consumption (kWh per capita)

Country Name	1971	1980	1990	2000	2010	2011
Bangladesh	10.5	18.4	47.8	100.9	247.4	258.6
India	97.8	140.1	269.6	391.0	641.3	684.1
Nepal	6.3	12.9	36.7	60.7	103.4	105.5
Pakistan	91.8	132.8	268.8	358.6	457.8	449.3
Sri Lanka	57.9	96.6	154.2	289.8	449.2	490.2
South Asia	86.9	125.4	242.8	352.3	571.7	605.2
East Asia & Pacific	472.2	712.9	1075.4	1647.7	3063.4	3263.6
Latin America & Caribbean	499.0	881.7	1168.6	1571.6	1954.6	2045.5
LDCs	54.6	62.8	72.2	88.6	172.8	173.8
Sub-Saharan Africa	320.5	478.5	536.9	523.4	530.7	535.7
World	1198.8	1586.3	2120.5	2385.5	2980.9	3044.4

Source: World Development Indicator, World Bank (2014)

c. Investment in Energy Sector in the Region:

South Asia is deficit regarding investment in the energy sector. ADB (2013) reports that Asia and the Pacific will require about USD 11.7 trillion (constant 2006 prices) to meet the business as usual (BAU) scenario. South Asia's investment needs is estimated to be the second largest in the region, amounting to USD 2.3 trillion (20.6 percent of the total investment that would be required). However, India would be accounting for a gigantic 95 percent of the total investment requirement in the South Asian region. Required investment for the South Asian Growth Quadrangle (SAGQ) is presented in the table-3. With deadline differing for each of the countries, questions might arise regarding the implementation status of the investments undertaken by each of the counterparts.

Table-3: Required investment for cross-border energy trade in SAGQ

Country	Investment	Timeline	Estimated Cost
Bangladesh	**Power sector development**	**10 years**	**USD 5-6 billion**
Bhutan	**Power system master plan**	**2003-2022**	**USD 3.36 billion**
India	**Increase generation capacity, transmission and distribution**	**Until 2030**	**USD 680 billion**
Nepal	**Generation and transmission**	**10 years**	**USD 1.22 billion**

Source: SAWTEE (2010)

d. Energy Pricing in the Region:

Lifetime cost-benefit analysis of the energy projects usually precede investments in the energy sector (Squire and van der Tak 1984). Main characteristics of energy projects would include: capital intensiveness, asset specificity, longevity of assets, long gestation periods, large size of projects etc. Hence, it is generally the case that investments in the energy front are guided by public policies catering to specific targets. With each of the countries in South Asia being developing nations the energy pricing strategies need to be established taking a lot of factors into consideration. If energy pricing is set by market supply and demand, then it might be the case that growth of certain sectors in the economics would be heavily discouraged together with a mindset of energy conversion and efficiency. It is seldom the case that energy prices are determined by the market. The characteristics of the sector mentioned earlier and the monopolistic attention allows energy prices to be government controlled. This is exactly the kind of pricing which is pursued in the South Asia,

a formulation which has both its upside and downside. Public welfare, market failure, competitiveness and financial sustainability are the *el primo* facets of the energy pricing in the region. South Asian pricing of energy has no point of reference and is unrelated to the mechanism of the products in the world market. While textbook would show the supply of the energy products at the point where Marginal Cost (MC) = Marginal Revenue (MR) (in the monopoly or oligopoly cases), but this is not the case in the reality.

2. Energy Sector in Bangladesh

Bangladesh is a emerging economy of SAARC countries. It had oil dependencies until early eighties. Major fuel was switched by mid eighties and the beginning of mono fuel dependency. There was arbitrary administrative pricing until 2006. After that vertically integrated state monopoly in both power and energy sector until 1996 except upstream gas and oil. Donor imposed reform initiative started in 1993 including formation of a regulatory body. Then Bangladesh Energy Regulatory Commission (BERC) started its journey by the Bangladesh Energy Regulatory Commission Act,2003. It is expedient to make provisions for the establishment of an independent and impartial regulatory commission to create an atmosphere conducive to private investment in the generation of electricity, and transmission, transportation, storage, supply and marketing of gas resources and petroleum products, to ensure transparency in the management, operation and tariff determination in these sectors; to protect consumers' interest and to promote the creation of a competitive market.

a. Energy Sources of Bangladesh:

From the table-4, it is clear that a lion's share of the energy source for Bangladesh comes from the natural gas which is completely non-renewable sources of energy. And second source is held by the biomass. From the report of *PetroBangla* (as of January/2014), natural gas reserve (proven+ Probable) in Bangladesh is 37.6 trillion cubic feet and recoverable reserve is 26.84 trillion cubic feet. According the report, the remaining reserve is only 15.06 trillion cubic feet. So, no way to switch towards renewable energy sources.

Table-4

Sources	Percentage
Biomass	36.90
Gas	45.41
Petroleum Products	13
Coal	4.25
LPG	0.22
Hydro	0.20
Solar	0.02

Source: *PetroBangla* website

b. Bangladesh Power Sector Vision:

Bangladesh has set its vision to provide electricity to all by the year 2021 at an affordable price. For this, private sector has given due importance for power generation. Policy and regulatory framework have been enacted accordingly. A sustainable fuel mix has been considered in generation planning. It has also been considered the Cross Border Energy Trade. The present status of Bangladesh Power Sector (Table-5) is given below:

Table-5

	2014	2008
Electricity Growth	10%	7%
Installed Generation Capacity (MW)	10341	5453(December/2008)
Maximum Generation (MW)	7418(18 July/2014)	4130
Total Consumers (in Million)	15.4	10.8
Transmission Lines (cktkm)	9536	7991
Distribution Lines (KM)	302,760	260,369
Per Capita Generation (Including Captive)	348	220
Access to Electricity (Including RE)	68%	47%

* **Source:** Bangladesh Power Development Board website

c. Present Status and Vision of Renewable Energy in Bangladesh:

At present total generation from renewable energy sources is 140 MW. According the Energy Policy, 5% i.e. 800 MW of the total generation will be from renewable energy sources by 2015 and by 10% i.e. 2000 by 2020. It has taken some initiatives by Bangladesh government for moving towards the vision like roof top solar installation, development of hydro, wind, biomass based power plants, wind resource analysis and wind mapping in progress, big volume grid tied solar power construction etc.

3. Challenges, Policies and Prospects:

The energy challenges confronting developing countries are significant and growing greater in time. Moreover, it is clear that developing countries will not be able to avoid potentially large adverse consequences without the concerted policy interventions by developing and developed countries alike. It would not be impossible to create a large integrated energy market incorporating the South Asian countries if the various resource endowments, development needs, and demand patterns are fully recognized. The energy resource surplus countries like Nepal, Bhutan, would greatly benefit from energy export-led growth. Other side energy deficit nations would enhance energy security and would benefit from improved energy mix. Nepal, India, Afghanistan, Pakistan, Bangladesh can be benefited by importing and exporting gas and hydro power from central Asia and Iran. Here challenges are national conflict/socio-political issue, lack of mutual understanding and overall benefit.

The region will be benefited greatly with the establishment of an integrated gas pipelines network. Substantial investment would be mandatory for a regional gas pipelines network to be established. The burden can be mitigated if all the SAARC countries contribute towards building natural gas pipeline network. The South Asian countries can establish a common energy fund for those purposes. There is challenge of lack of skilled manpower in the region for adopting sustainable technology for energy sector. The approach should be less of a

competitive game, but more a collaborate one. A proper framework incorporating energy cooperation (energy trade and other measures) would not only mitigate energy scarcity in the region, but will make the region more energy secured, leading to greater prosperity for all the countries concerned. These policy action include:

- Promote energy efficiency and adopt minimum efficiency standards for buildings, appliances and equipment, and vehicles
- Monitor and enforce the energy market through an independent and impartial regulatory authority for balancing among social, political and economic challenges
- Reform and re-direct energy subsidies
- Identify the most promising indigenous renewable energy resources and implement policies to promote their sustainable development
- Seek developed-country support for the effective transfer of advanced energy technologies, while building the indigenous human and institutional capacity needed to support sustainable energy technologies
- Bilateral and multilateral energy trade policy to establish mutual trust and confidence
- Establish a common fund for energy sector development (Here Bangladesh Energy Regulatory Commission (BERC) can be a role model. BERC created "Gas Development Fund" to meet the expenditure for risky gas exploration and production with the end purpose for increasing gas supply in long term and BERC also created "Electricity Maintenance and Development Fund" for increasing of electricity production in national level maintenance and BMRE of electricity generation plants, modernization, rehabilitation and expansion, replacement of old gas generated plant by new ones, rapid increase of electricity generation, by least cost production and subject to gas availability new efficient generation plant installation)
- Accelerate the dissemination of clean, efficient, affordable cook stoves

The different energy supply technologies that will likely play a role in a carbon constrained future have been extensively reviewed elsewhere. The usual list includes renewable energy technologies (e.g., wind, solar, coal and biomass), nuclear technology and advanced fossil-fuel systems with carbon capture and sequestration. Technological options for rural energy are given:

Table-6

Energy Source/service	Present Option	Near Term Option	Medium Term Option	Long Term Option
Electricity	Grid based or no electricity	Natural gas combined cycles, biomass gasifies coupled to internal combustion engines, wind, photo-voltaic, small hydro for remote applications	Biomass gasifies coupled to micro turbines; mini grids with combinations of photovoltaic, wind, small hydro, batteries	Grid-connected photovoltaic and solar thermal, biomass gasifies coupled to fuel cells and fuel cell/turbine hybrids.
Fuel	Wood, charcoal, crop residues, animal dung	Natural gas, liquid petroleum gas,	Syngas, dim ethyl ether	Dim ethyl ether from biomass with

		producer gas, biogas		electricity as a co product
Cogeneration	--	Internal combustion engines, turbines	Micro-turbines with integrated combined cycles	Fuel cells, fuel cell/ turbine hybrids
Cooking	Woodstoves	Improved woodstoves, liquid petroleum gas, biogas	Producer gas, natural gas, dim ethyl ether	Electric stoves, catalytic burners
Lighting	Oil and kerosene lamps	Electric lights	Fluorescent and compact fluorescent lamps	Improved fluorescent lamps, compact fluorescent lamps
Motive Power	Human and animal power	IC engines, electric motors	Bio-fueled prime movers, improved motors	Fuel cells
Process Heat	Wood, biomass	Electric furnaces, cogeneration, producer gas, natural gas/solar thermal furnaces.	Induction furnaces, biomass/solar thermal furnaces	Solar thermal furnaces with heat storage

Source: Adapted from table 10.3, UNDP 2000,p.380

In general, costs for most forms of renewable energy have declined substantially in recent decades. In the early 1990s, only hydropower was competitive with conventional power plants for on-grid applications. Since then, expanding markets and experience-driven cost reductions have made wind and geothermal power competitive or nearly competitive with other, conventional sources. Solar photovoltaic technology remains more expensive but can compete in some off-grid niche market applications. These comparisons are, of course, based on narrow criteria of strict cash flow and ignore other advantages, such as environmental benefits, that renewable technologies can confer (G8 RETF, 2001, p.16-17). Prospects for continued cost reductions are promising given recent rapid growth in renewable energy markets. Over the past several years, the global rate of increase in installed wind and photovoltaic capacity has averaged as much as 30 percent per year, making these some of the most rapidly expanding energy technology markets in the world.

4. Conclusion

The current energy outlook is challenging to say the least. Whether governments are chiefly concerned with economic growth, environmental protection or energy security, it is clear that a simple continuation of current energy trends would have many undesirable consequences at best, and risk grave, global threats to human well-being at worst. The

situation for developing countries is in many ways more difficult than for developed countries. Not only are there obvious resource constraints but access to basic energy services may be lacking for a significant part of their population. It does not mean that cleaner, more efficient technologies will usually be the first choice or that difficult trade-offs can always be avoided. In the near term, many sustainable energy technologies are likely to remain more expensive than their conventional counterparts—and even when they are cost-effective, as is already the case for many efficiency technologies, powerful market failures and barriers often stand in the way. Changing the incentives and overcoming those barriers is for now more a question of political will and coordination than it is one of adequate resources (at least at the global level). That doesn't make the task any easier—quite the contrary. Surveying the current landscape, ample justifications could be found for a profoundly pessimistic view—or an equally optimistic one. Which outlook proves more accurate will depend to a large extent on how quickly developed and developing countries not only recognize, but also begin to act upon, their shared stake in achieving positive outcomes that can be managed only by working together. Developing countries must take the lead in charting a new energy course for themselves, but developed countries must stand ready to provide support, recognizing that they have a vital stake in the outcome.

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