Political Economy of Energy Cooperation in South Asia

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Energy Security : Critical issue in this Region.

South Asia suffers from energy insecurity and are projected to remain so in the foreseeable future

Disruption of power and other energy supplies : affected both human (food, livelihood, employment and economy) and national security

adversely affected their productive activities, social development and investment climate.

Massive reforms in electricity, gas and petroleum and coal sectors.

Huge and unprecedented scope in cooperation and collective gains

•1.5 billion people of SAARC members country, one-fourth of the world – huge market

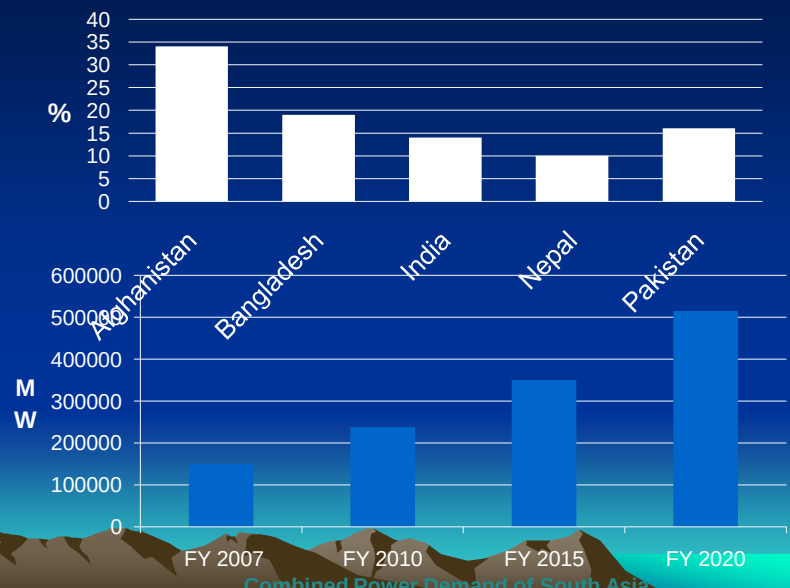
- Per capita annual energy consumption is about 1/4th of the world average
- Power generation per capita about 1/8th world average

High Energy import dependence

- in the range of 20% (Bangladesh) to 100% (Maldives)
- Most of the SAARC Member States are now facing significant amount of power outages due to shortage of generation

Energy needs in South Asia will increase three times within next 15 years

Shortages VS Growing Demand



Combined Power Demand of South Asia

Bangladesh

" Energy crisis puts economy at risk",
"Bangladesh PM Orders 1hr Outage Every Alternate Hour",

The Daily Star, Dhaka, April 6 and 8, 2010

Nepal

"Power cut back to 12 hours",
REPUBLICA, KATHMANDU, April 3, 2010

Pakistan

"Power crisis: Punjab government decides to cease commercial activities after sunset,"
The Business Recorder, Thursday, April 22, 2010

Energy Exchange and Trading :

Economic gains based on regional cooperation in the energy sector has become a firmly established practice across regional groupings.

Cross border energy trade could lead to effective utilisation of natural resources,

increase in supply reliability, economy in operation & mutual support during contingencies,

bring about large scale transformation in sectors contributing to economic growth,

act as the single most effective
confidence building measure (CBM)
through the participation of multiple stakeholders
and
substantially promote market integration in
energy related goods and services .

Several studies : major economic,
social and technical benefits
would accrue to SAARC Members from
power exchanges and trading.

Seasonality factor in both generation and
demand is highly noticeable.

For instance : Bangladesh : a generation capacity
(1200 MW) remains unutilized during the off-peak hrs
They remain shut for these hours.

This capacity can be a ready source for
regional cooperation for import-export of electricity

Nexant : power outages in Bangladesh cost about $ 1 billion
a year and reduce GDP growth by about a 0.5% point.

India : clear seasonality

Peak month (June- September) of
hydel power generation in Nepal and Bhutan
Matched by hot summer months power
starved situations

Micro Level Impact :

a) Bangladesh : Only 17.88% of the rural households electricity connections.
[Overall Access to Electricity – 47%]

If all rural households are given access
Their average income rises to the level of today's electrified households

Total annual household income will increase to Tk 1,775 billion (from the present Tk 1,105 billion)

Annual net gain in income will be Tk 671 billion (26% of the current GDP)
Tk 290.8 billion or 43.3% of the increment will be due to electricity.

Annual consumption of Kerosene by all rural households in Bangladesh
775.53 million liters (Tk 13.95 billion)

If 100% rural households are connected with electricity
Kerosene consumption : drop down to 366.58 million litres
Savings of Tk 7.36 billion worth of foreign exchange and improve environmental conditions

If power trading takes place and 150 MW of power is transferred to rural electrification program; it could result into :

An estimated 55,000 persons would be involved in agriculture using electrified irrigation equipment

- 49,191 persons employment in rural industries;
- 42,431 persons in retail and wholesale shops

SAARC Power Exchange

Three Options :

1 Bilateral

2 Third Country Option :

Import from Bhutan, Nepal and other non-SAARC countries

3 Regional Power Pool Options

Bilateral Options : Success Stories

- India - Bhutan Energy Exchange:
  - Long term PPAs with Department of Energy, Bhutan
    - Chhukha HEP (336 MW); Kurichu HEP (60 MW)
    - Tala HEP (1020 MW)
  - Run-of –the River Projects : 4 Hrs peaking

Electricity export – over 84% of total generation [1,494 MW]
Internal consumption ~ 1152 MU (Peak load 187.5MW)
Annual export ~ 5922 MU

Electricity Sale revenue US $ 203 million
[47% of national revenue].

- A number of hydro projects under development in Bhutan 10,000 MW by year 2020

India - Nepal Energy Exchange

- 100- 150 MW power (Total export-import annual volume 300-400 MU)
- Arrangements/ tariff agreed under bilateral Power Exchange Committee
- Bi-lateral energy trade (export to Nepal) based on commercial terms
  - 2007-08: 15 MU
  - 2008-09: 50 MU
- Limited exchange due to inter-connection limitations
- 400kV Transmission Inter-connection under development

Hydro-electric projects for export under development in Nepal

Nepal - Lost Opportunities

Avg. annual runoff: 225 billion m^3

Theoretical hydro potential 83,000 MW
- about 2.6% of world's hydro power capacity

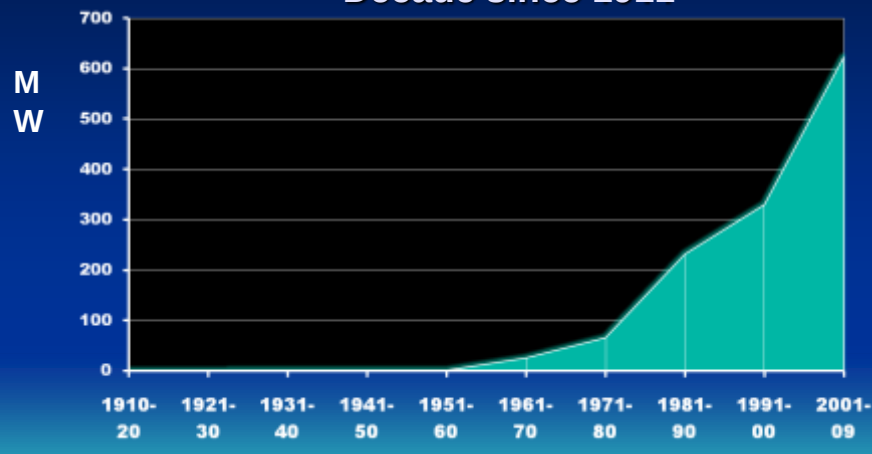
Economically viable : 43,000 MW

So far harnessed : Total Iinstalled capacities in Nepal is 687 MW.

1911 - 2010 : Added hardly 6 MW per annum

Name of power station	Installed capacity (KW)	Commissioning year (A.D.)	Present condition
Pharping	500	1911	In operation
Sundarijal	640	1936	In operation
Panauti	2400	1965	In operation

Cumulative Addition of Hydro Power in each Decade since 1911



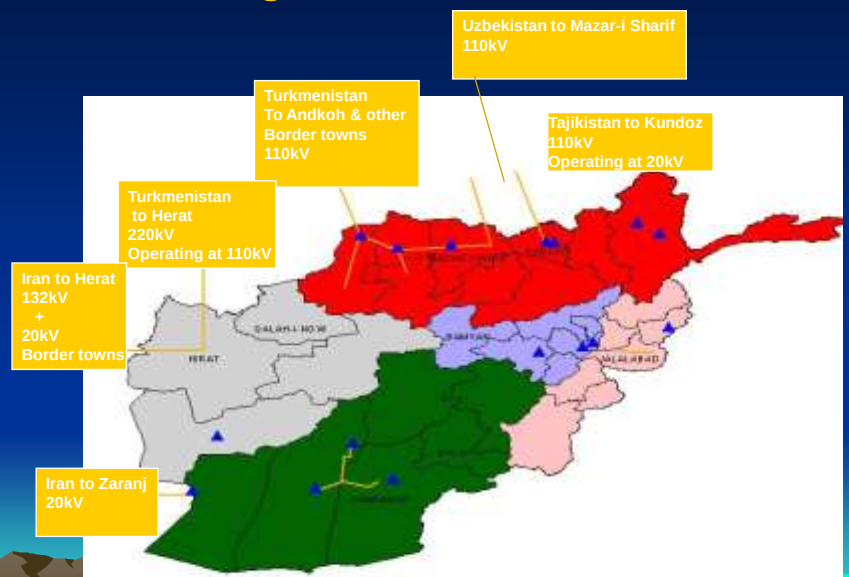
2 Third Country Option

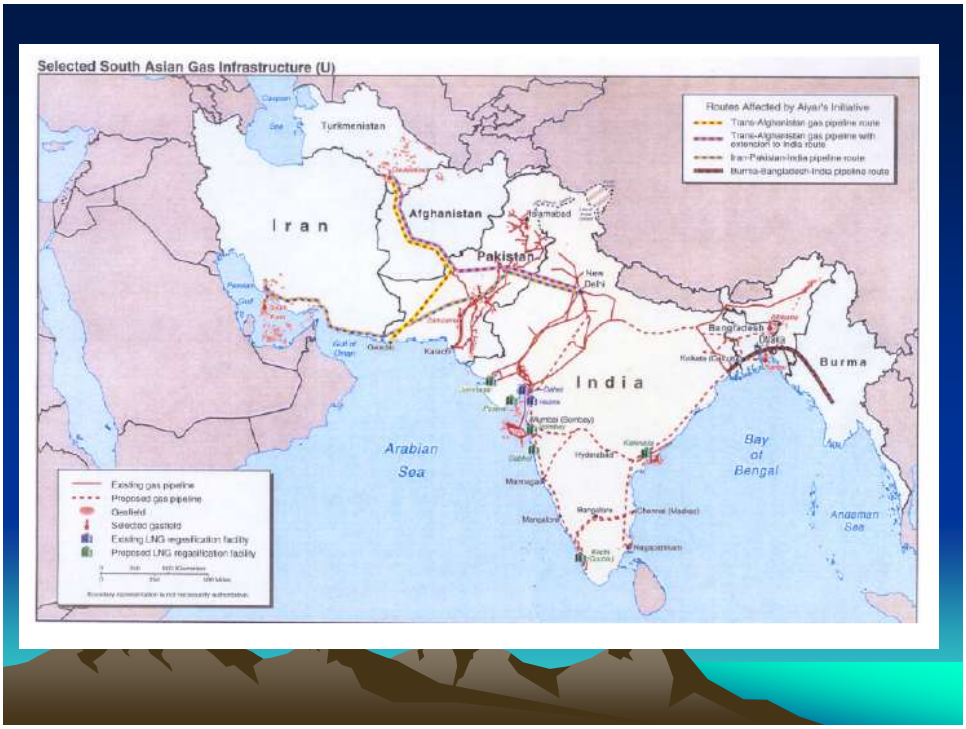
Afghanistan signed a MOU to provide 'TRANSIT' electricity as part of the Central Asia South Asia Regional Electricity Market [CASAREM]

Afghanistan will benefit from the CASAREM transmission line and will be able to meet its future needs as steep growth is expected (especially for Kabul and vicinity)

Tripartite Agreement between India-Myanmar-Bangladesh to import pipeline gas from Myanmar via Bangladesh – Jan 2005

Existing Transmission lines





3 Regional Power Pool Options

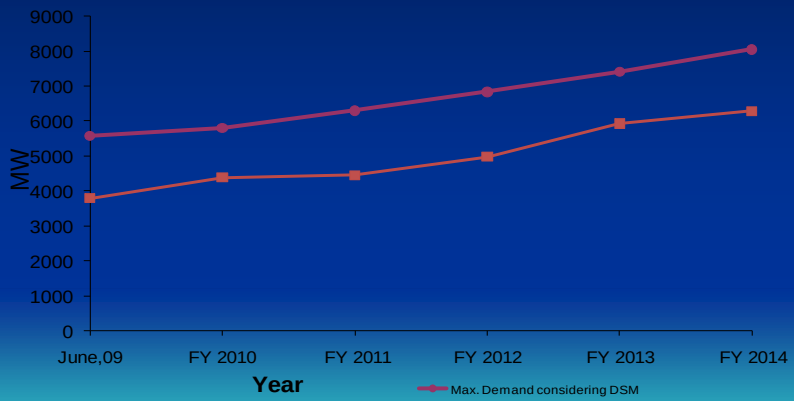
- Some Successful Power Pools based examples of energy exchange:
  - US-Canada exchange under Columbia River Treaty
  - Nordpool (Denmark, Finland, Norway Sweden)
  - Nordpool and EU
  - UK- France
  - South African Power Pool (SAPP)

SOUTHERN AFRICAN GRID

Several Bilateral Options

Example : Exchange of power between India and Bangladesh on both sides: techno-economically viable.

Bangladesh : Demand Supply Gap with Prevailing Generation Addition Plan



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Option A: Limited Power Transfer – based on a 132 kV system;

Option B: Moderate Power Transfer with Accelerated Development – based on developing a 220 kV system

Option C: Moderate Power Transfer with Phased Development – based on an upgraded 220 kV system in conjunction

Investment requirements : $9 million to $52 million (50 MW - 500 MW).

Interconnection between the two grids could pave the way for many more interconnections at distribution substations at 33KV and 11 KV levels to facilitate small exchanges of power all along India-Bangladesh border

Location of Power Generation Facilities in Bangladesh along India-Bangladesh Border

Location	MW)	Approx distance
Near Mizoram Borders	716	30-70 Kms
Kaptai Hydro Electric	180	
Raujan Steam Turbine	420	
Sikal Baha ST	60	
Sikal Bawa GT	56	
Near Tripura Borders	890	30-50 Kms
Shahjibazar GT	96	
Shajibazar GT	70	
Ashuganj ST	128	
Ashuganj ST	450	
Ashuganj combined cycle	90	
Ashuanj GT	56	

Location Power Generation Facilities in India along India-Bangladesh Border

Location	Capacity (MW)	Approx distance
West Bengal	**2000**	**20 – 30 Kms**
Farakka thermal Station ST	2000	
Assam	**240**	**60 – 70 Kms**
Bongaigaon ST	240	
Tripura	**116**	**10 – 20 Kms**
Rokhia GT	32	
Agartala GT	84	

Large Number of Grid Substations at 220-230/132 KV levels on both side of the border.

Some of these substations are so close :
could be interconnected at a very nominal cost
and within a very brief time span
to facilitate power exchange/trading.

Cities/town, such as Agartala, Rokhia and Farakka
on the Indian side of the border,
located on the border itself or extremely close to it.

These existing substations supplying power
in their own territory
could serve the neighboring towns in Bangladesh as well.

List of Substations Located very near to the Border

Sub-Station on Bangladesh Side	Sub-Station on Indian Side	Approx. Distance	Approx. Cost INRs Million
230/132 KV			
Hathazari (3*150 MVA)	NA		
Comilla (N) (3*75 MVA)	Rokhia	30	60
Ashuganj (2* 150 MVA)	Agartala	50	100
Ishurdi (9 * 75 MVA)	Gokarna	100	200
132/33 KV s/s			
Hathazari (2*63MVA)/Chandroghona	NA		
Dohazari (2*40 MVA)	NA		
Cox's Bazar (2*40 MVA)	NA		
Comilla (N) (1*40 MVA)	Rokhia Trip.	30	36
Comilla (S) (4*41 MVA)	Rokhia Trip. (Assam)	30	36
Fenchuganj (2*20 MVA)	Badarpur 132	80	96

Grid Sub-Station	Approx. Distance from Border	Indian State at Border
Comilla (N) (1*40 MVA)	20	Tripura
Comilla (S) (4*41 MVA)	20	Tripura
Fenchuganj (2*20 MVA)	30	Tripura
Chattak (2*20 + 1*41 MVA)	20	Meghalaya
Ahsuganj (3*25 +1*41 MVA)	30	Tripura
Jessore (1*80 + 2*40 MVA)	25	West Bengal
Ishurdi (2*20 + 2*16 MVA)	40	West Bengal
Rajshahi (2*30 + 1*20 MVA)	10	West Bengal
Nawabganj (3*20MVA)	15	West Bengal
Purbasadipur (1*16 + 2*20 MVA)	30	West Bengal
Thakurgaon (2*41 + 1*20 MVA)	30	West Bengal

Trading/Exchange of Small quantities of Power between India and Bangladesh Large number of points exist along

India-Bangladesh border where distance of interconnections between the two sides may be well within 20 to 60 kms.

21 grid substations combining both sides at 230/132 KV levels where distance from the border is less than 20kms.

Grid interconnections on two sides would permit larger power flows and would integrate the two Grid systems to bring them to same frequencies.

Post - Manmohan Singh - Sheikh Hasina Meeting of Jan 2010

- MOU signing is done
- A high level Steering Committee set up.
- Joint Interconnection Study (Ishurdi, Bangladesh-Bahrampur, India) is being done
- Potential Bilateral Energy Cooperation under consideration
- Power Import of at least 500 MW from Western Interconnection (Bangladesh- West Bengal)
- Power Import of at least 300-500 MW from Eastern Interconnection (Bangladesh- Tripura)
- Regional Grid construction for power trade
- Human Resource Development of Utility professionals
- Joint Venture Power Generation Projects, especially large coal power projects

SAARC SUMMIT Declarations

- Islamabad Declaration 2004 : Concept of Energy Ring .
- Dhaka Declaration 2005

- Establishment of the SAARC Energy Centre to promote development of energy resources and energy trade in the region;

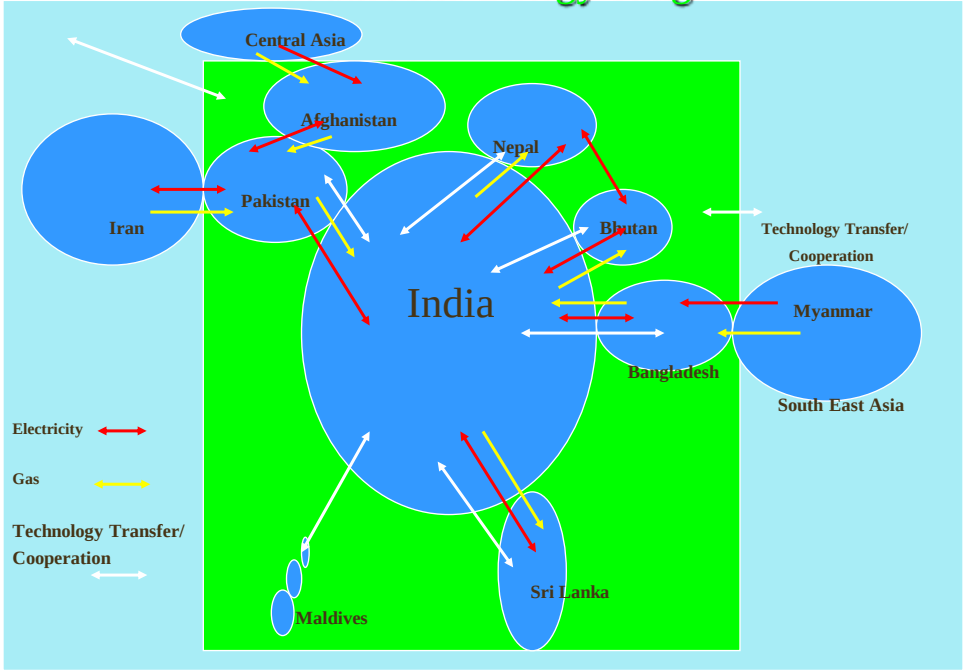
- Colombo Summit 2008
  - Concept of Regional Inter-governmental Framework
- Colombo Meeting of Energy Ministers 2009

-Pursuing Energy Ring and Formation of Sectoral Expert Groups (e.g. gas, electricity, renewable energy etc.)

Thimphu Summit- April 2010
Authorized the SAARC Energy Centre in Islamabad to prepare an Action Plan on Energy Conservation

Noted India's proposal to prepare a *Roadmap for developing SAARC Market for Electricity (SAME) on a regional basis*.

South Asia Energy Ring



Cooperation Challenges

- Just one Single Cross Border three country Project
- Goodwill and confidence buildng
  - Political support/will
- Integrate regional energy planning
- Arrange/meet large fund requirements - Private sector priority
  - Linkages, physical infrastructure (Transmission, gas pipe
- Graduate from bilateral to multi-lateral
- Create competitive regional power market
- Build institutional and HR capacity building

New Areas of cooperation

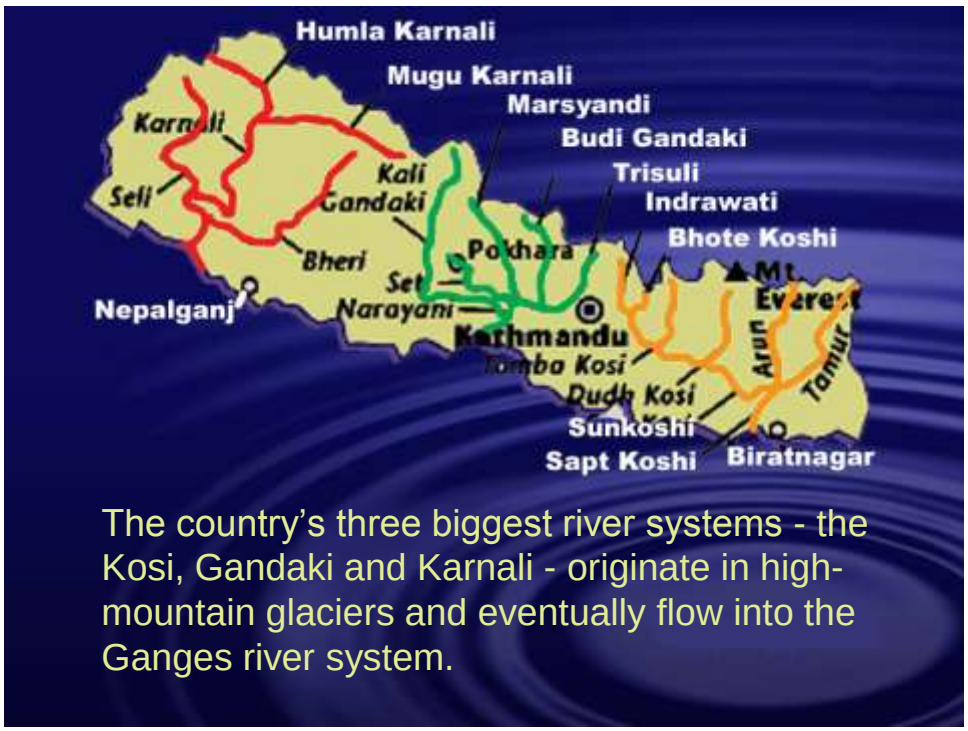
I Climate Change Impact : New Dynamics

Glacial erosions and likely impact on hydrological flows on South Asian river system

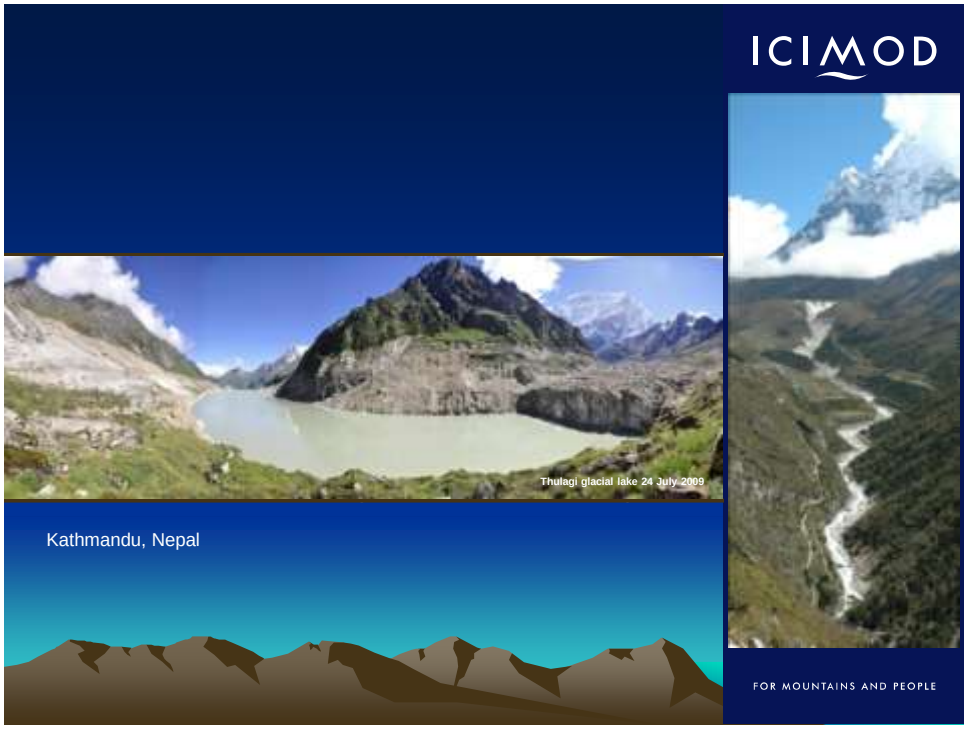
Sea level Rise : Massive submergence and displacement

II Energy efficiency

Installation :energy-efficient infrastructure, equipment & appliances
Develop & harmonize standards, labeling, testing procedures
Launch programs for creating awareness,
training and education, and outreach
Regional Action Plan ?
Like National Action Plan for Climate Change, 2008 of India
National Mission on Enhanced Energy Efficiency provides mandate for market-based mechanisms to promote energy efficiency



The country's three biggest river systems - the Kosi, Gandaki and Karnali - originate in high-mountain glaciers and eventually flow into the Ganges river system.



Glacier	Period	Retreat of Snout (m)	Average Retreat of Glacier (m/y)
Trilokinath (H.P)	1969-1995	400	15.4
Pindari (UA)	1845-1966	2840	23.5
Milam (UA)	1909-1984	990	13.2
Ponting (UA)	1906-1957	262	5.1
Gangotri(UA)	1936-1996	1147	19
	1971-2004* 2004-2005	565	17.15 12.10
Glacier-Arwa valley (UA)	1932-1956	198	8.25
Shankalpa (UA)	1881-1957	518	6.81
Chota Singri (H.P)	1986-1995	60	6.7
Bara Singri (H.P)	1977-1995	650	36.11

*Based on GSI (1999) Proceeding: Symposium on snow, ice and glaciers, A Himalayan perspective organized by Geological Survey of India, Lucknow; *Kumar et al. (2008) Current Science, Vol 94, 2, 258-262.*


thank you
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