International Conference on the Water Crisis in the Asia-Pacific Region
Keynote Speech

Water Crisis in South Asia-Impacts on Life, Livelihood and Environment

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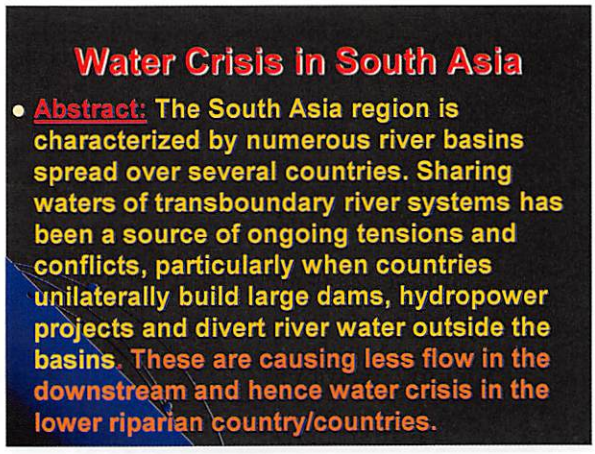
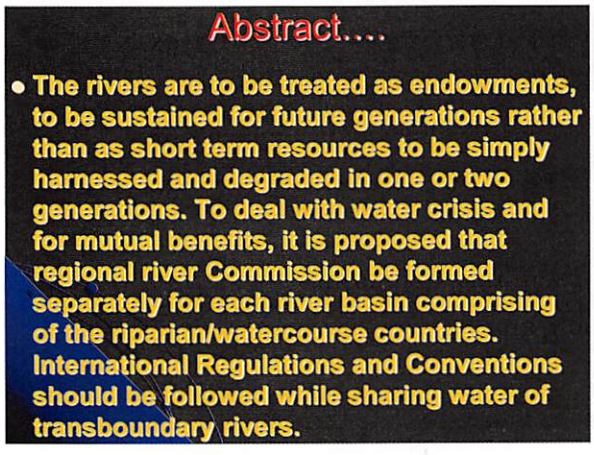
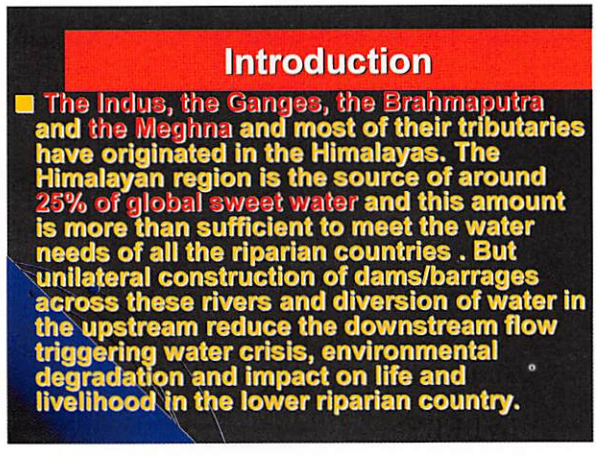


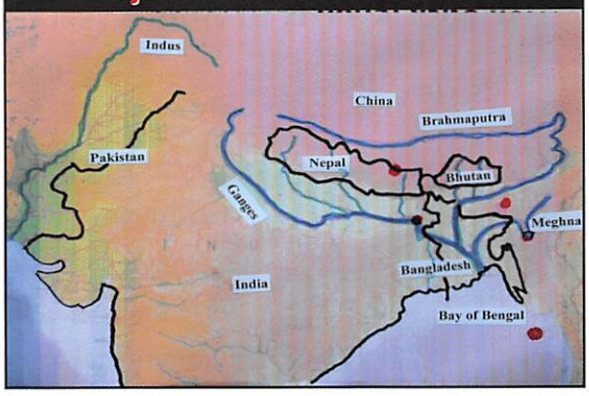




Introduction

- Mekong River Commission (comprising of the governments of Kampuchea, Lao PDR, Thailand and Vietnam) and Indus Basin Treaty (between India and Pakistan) are the two good examples of overcoming water crisis and conflict resolution.
Similarly, Regional River Commissions be formed separately for the Ganges basin, Brahmaputra basin, Meghna basin and other river basins to sustain life, livelihood and environment in all the riparian countries of China, Nepal, Bhutan, India and Bangladesh.

Major Rivers of South Asia



Introduction contd

- The tributaries of the Ganges and the Brahmaputra originate in China, Nepal , Bhutan, India and Bangladeshesh. The Ganges, the Brahmaputra and Meghna carrying water from the upper catchments pass through Bangladesh before discharging into the Bay of Bengal.

River Basins and Riparian Countries

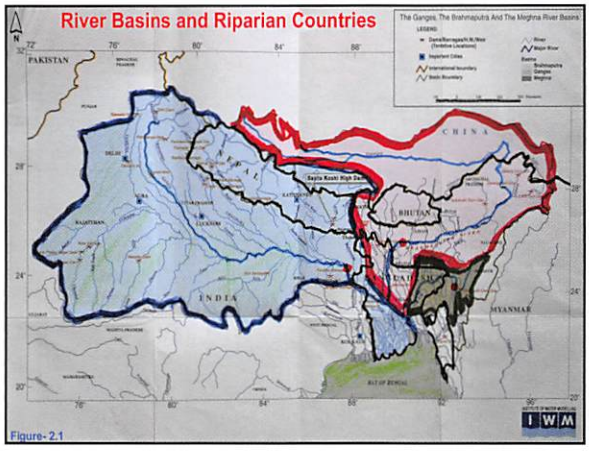


Figure- 2.1

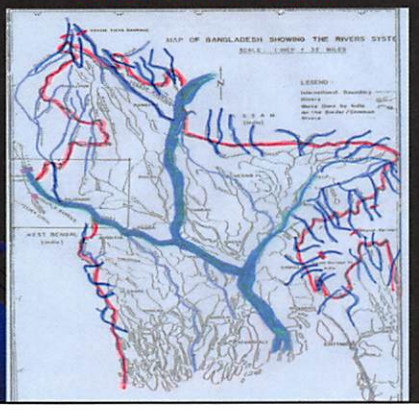
Riparian Counties and River Basin Area

River Basin	Riparian Countries	Total Basin Area (Sq. KM)
Ganga/ Ganges	China, Nepal, India, Bangladesh	10,87,000
Brahmaputra	China, Bhutan, India, Bangladesh	5,32,000
Meghna	India, Bangladesh, Myanmar	1,02,000
	Total=	17,21,000

My lecture will cover mostly water crisis in Bangladesh

- Surface water is carried into Bangladesh by 57 trans-boundary rivers out of which only 3 rivers come from Myanmar and the rest 54 rivers including the Ganges, the Brahmaputra and the Meghna come through India.

Cross Border Rivers



Sources of Bangladesh Water

Wet season: Trans-boundary flow = 93%
(originates in China, Nepal, Bhutan and India)
Rainfall within Bangladesh = 7%
100%

Dry Season: Trans-boundary flow = 99%
(originates in China, Nepal, Bhutan and India)
Rainfall within Bangladesh = 1%
100%

As such Bangladesh is almost totally dependent on transboundary flow

Rice Production:

- Bangladesh now produces enough food to feed its ever increasing population. Thanks to the introduction of high yielding variety of rice called IRRI and BRRI during dry season. Season-wise rice production shows that out of total production of rice

Dry Season Boro Rice constitutes = 70%
Wet Season Aman constitutes = 30%
100%

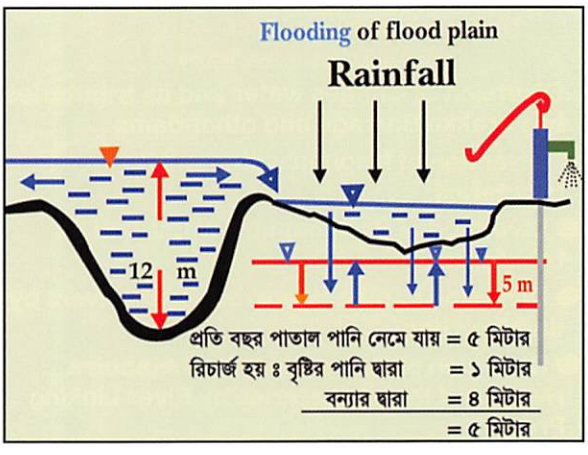
Irrigation Water Supply

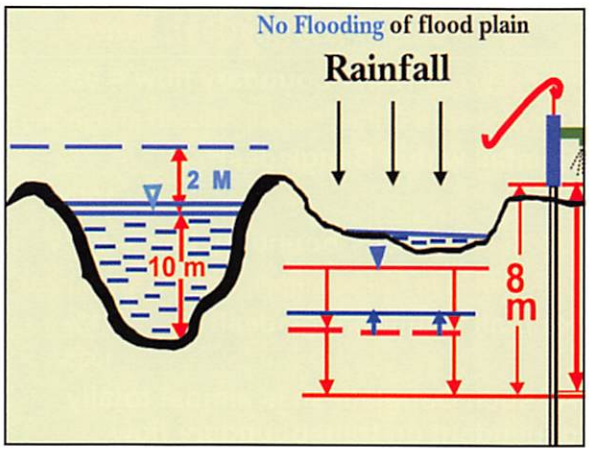
Irrigation water for Dry season Rice:

- The high yielding variety of rice during dry season cannot be grown without full irrigation water supply. This irrigation water comes from
  . Groundwater = 60%
  . River water
  (if river water is available) = 40%
  100%

- Moreover, major portion of drinking water, household water, industrial water, etc comes from groundwater. As a result groundwater table goes down on the average by 16 feet every year. If it depletes below 26 feet groundwater cannot be lifted even by most powerful suction pumps. Bangladesh presently has more than 5 million of such tube-wells. Every year depleted groundwater used to be recharged by

Inundation by normal flood = 12 feet = 80%
Rainfall within Bangladesh = 3 feet = 20%
15 feet =100%



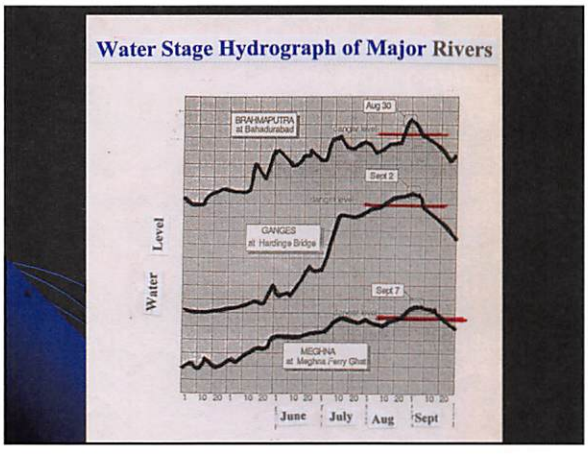


Aman Rice during wet season:

- About 50% of agricultural land in Bangladesh in the Ganges, the Brahmaputra and the Meghna basins used to be inundated by normal flooding and Aman rice used to be grown in these lands. Presently, due to upstream water diversion there is no normal flood in Bangladesh and Aman paddy cannot be grown.

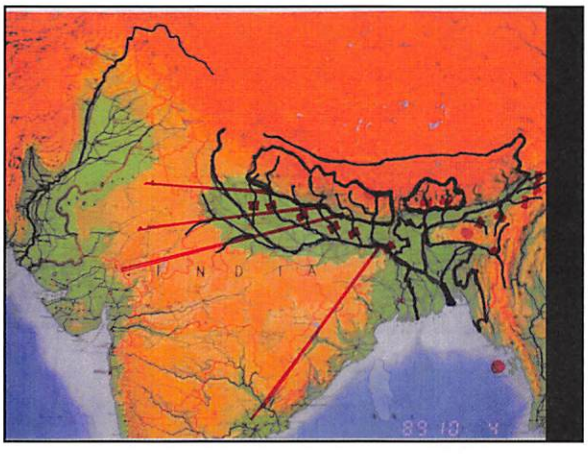
Necessity of River Water in B'desh

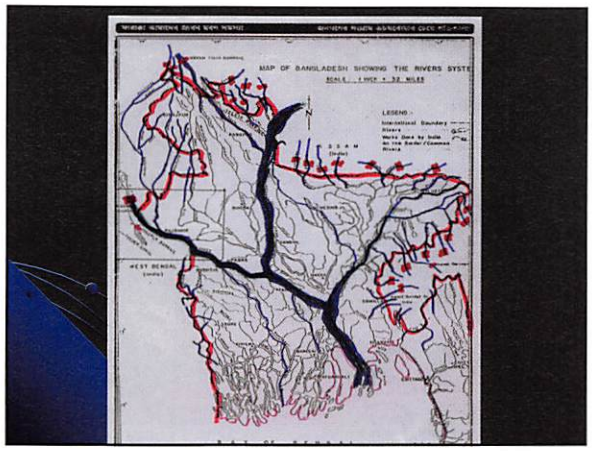
- To push back tidal water that enters inland during flow tide twice a day.
- For recharging of groundwater
- For production of Aman rice.
- For maintaining natural fish habitats.
- For maintaining ecological flow to keep river alive
- For protecting Sundarban, the largest mangrove forest which is a world heritage declared by UNESCO.



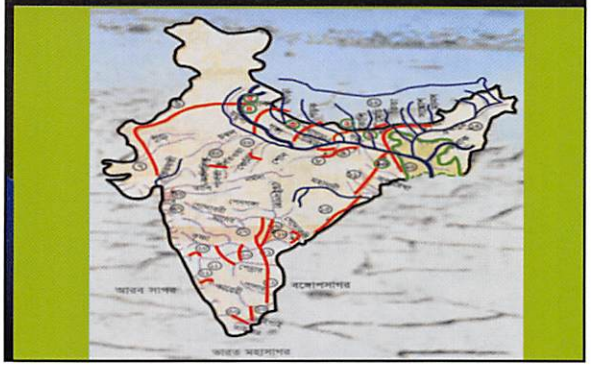
Diversion of Bangladesh water in the Upstream includes

- .Diversion of Ganges water and its tributaries by Farakka Barrage and other dams
- Diversion of Meghna water and its tributaries
- Diversion of Brahmaputra water and its tributaries
- Diversion of other trans-boundary rivers by dam/barrage
- Diversion of Ganges and Brahmaputra rivers and their tributaries by River Linking Project.





Indian River Linking Project



Impact of Farakka Barrage and River Linking Project

- Farakka barrage constructed by India on the Ganges in 1975 only 20 km from the border of Bangladesh and River Linking Project diverting water outside the basin have dried up Ganges and its distributaries in Bangladesh causing environmental devastation. The present annual water flow of the Ganges to Bangladesh is less than 10% compared to pre-Farakka flow.

Ganges River flow in Bangladesh

1971

- Maximum flow = 70,000 cumec
- Minimum flow = 2,000 cumec
- Average flow = 16,650 cumec
- Total Annual flow = 525 BCM

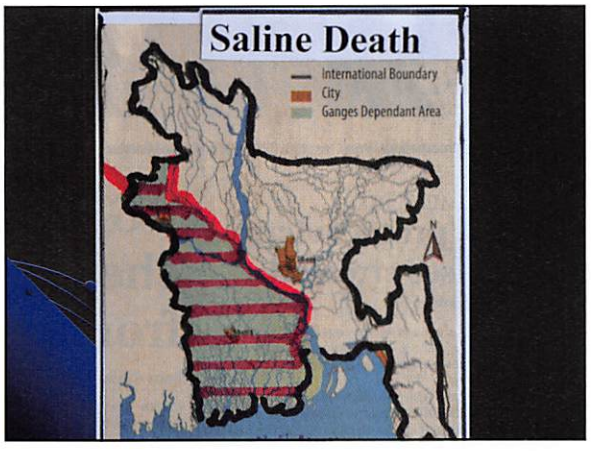
2014

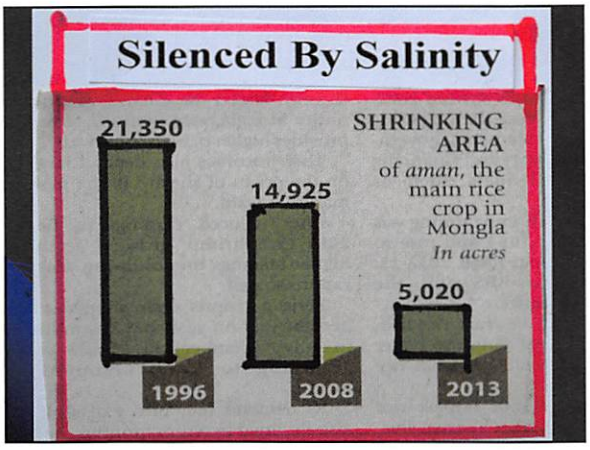
- Maximum flow = 15,000 cumec
- Minimum flow = 250 cumec
- Average flow = 1,600 cumec
- Total Annual flow = 50 BCM

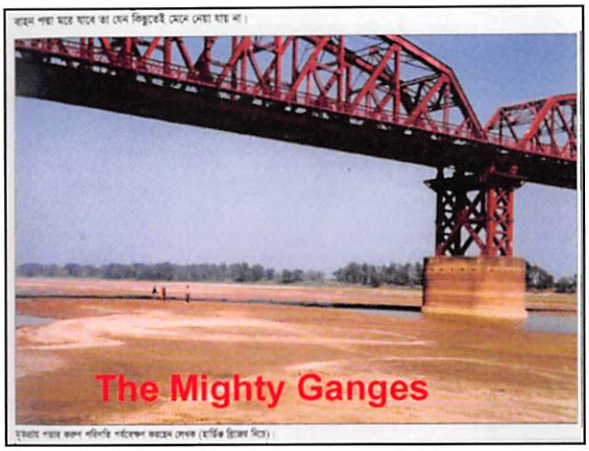
Farakka Barrage....

Due to very little flow of the Ganges river and its distributaries in Bangladesh, sea water has been intruding more and more Inland during high tide in Bay of Bengal. This salinity ingress

1. Has been damaging Sundarban, the largest mangrove forest in the world and which has been declared as the World Heritage by UNESCO.
2. Due to salinity fertile crop lands are being turned into barren useless lands as production of crops has gone down by 80%.







Impact on Brahmaputra and Meghna Rivers in Bangladesh

Brahmaputra River at Bahadurabad

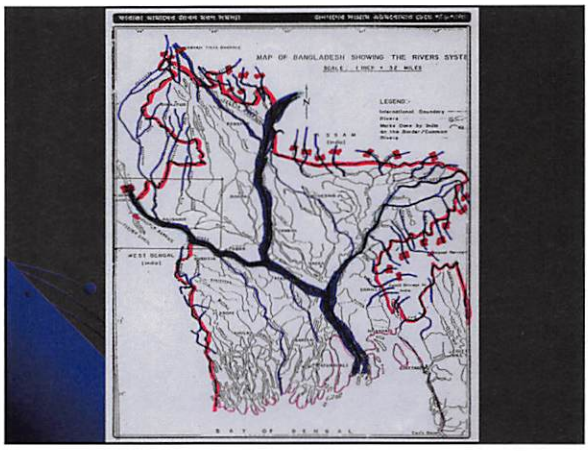
- 1971 Annual Flow= 624 BCM
- 2014 Annual Flow= 437 BCM

Meghna River at Bhairab Bazar

.1971 Annual Flow= 195 BCM

. 2014 Annual Flow= 155 BCM

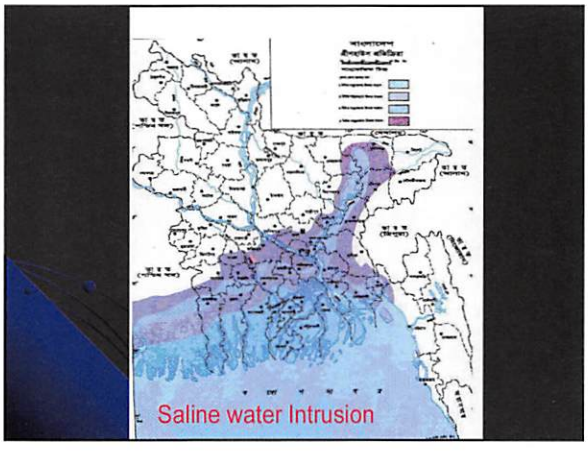
Water crisis will be more severe in Bangladesh if upper Riparian countries divert more river water in future.



Bangladesh Water ways

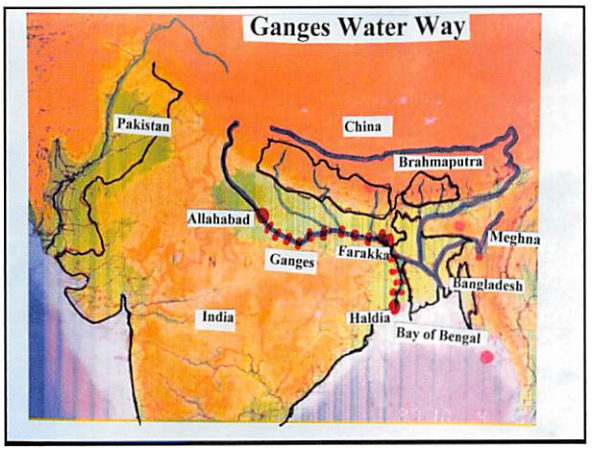
In 1971 perennial waterways in Bangladesh were **24000 km.** But due to reduction of river flow there is accelerated sedimentation of all the rivers in Bangladesh and the waterways have been reduced to only **2000 km.**

Year	Water Way (km)	Passenger Transport (%)	Goods Transport(%)
1971	24,000	32%	40%
1984	8,400	18%	27%
2005	6,000	4%	15%
2012	2,500	3%	10%



Ganges Water Way

- India has finalized a plan to construct 16 dams cum lockgates on 1600 km stretch of the Ganges river from Allahabad to Haldia at an interval of 100 km. This project named as Ganges Water Way will turn the mighty Ganges river into several cascades This project will totally cut off Ganges river flow to Bangladesh.



- Every year more than 1050 BCM of cross boundary flow is necessary to cause normal flooding in Bangladesh and also to push back the tidal saline water. If India implements all water diversion projects it will be diverting 800 BCM. Then Bangladesh will be left with only (1050-800) 250 BCM trans-boundary river flow which will be extremely insufficient to push back tidal saline water and to recharge groundwater through normal flooding.

Annual Water Availability in India:

- India is the largest beneficiary of the Himalayan rivers.

India has a massive volume of water resource.

From river flow	= 1953 BCM
Rainfall and snow melts	= 4000 BCM
Rechargeable Groundwater	= 420 BCM
Total	= 6373 BCM

Annual Water Requirement in India (up to the year 2025):

(Source: Water Perspectives, Issues and Concerns-by Ramaswamy R. Iyer, SAGE Publication, New Delhi)

For irrigation	= 677 BCM
Drinking and domestic use	= 67 BCM
Industrial use	= 28 BCM
Hydro-electricity	= 8 BCM
	Total = 780 BCM
Water loss/wastage	= 120 BCM
	Grand Total = 900 BCM (15%)

International Conventions/Regulations:

. Helsinki Convention, 1966)

. United Nations Convention on the Law of the Non-navigational uses of International Water Courses, 1997

. UNEP Convention 1992

. Ramsar Convention on Wet Lands,1971

. Helsinki Agreement 1992: Convention on the Protection and Use of Trans-boundary Water Courses and International Lakes.

. World Commission on Dams (WCD) 1998, Established by World Bank and IUCN.

International Conventions/Regulations

- United Nations Convention and other international regulations prohibit unilateral diversion of water from common international rivers that will harm other riparian countries.
- Watercourse states shall, at the request of any of them, enter into consultations concerning the management of an international watercourse which may include establishment of a joint management mechanism.

Ganges River Basin

. *Ganges river basin* is spread over China, Nepal, India and Bangladesh. The distribution of the Ganges basin water brought into Bangladesh from the catchment areas in Nepal, India and China is shown below.

- From Nepal = 65%
- India = 25 %
- China = 10%
- Total = 100 %

Brahmaputra – Jamuna River Basin

The Brahmaputra river has originated in the Tibetan region of China and after traveling through China, India and collecting water from Bhutan has entered into Bangladesh. The distribution of the Brahmaputra basin water brought into Bangladesh from China, India and Bhutan is shown below.

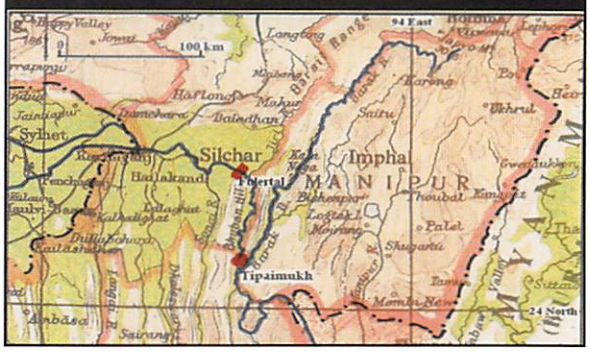
- From China = 40%
- Bhutan = 20%
- India = 40%
- Total = 100%

Meghna River Basin

- The Meghna river has originated from the north-eastern Indian state of Manipur where it is called Barak river. Barak river after flowing through Manipur, Mizoram and Assam states of India has entered into Bangladesh at the north eastern tip. Distribution of Barak-Meghna annual water volume in Bangladesh is given below.
- From India = 50%
- From Bangladesh = 50%

India has a plan to construct Tipaimukh dam and Fulertal barrage in the upstream of Meghna river in India. If implemented, it will totally devastate the eastern half of Bangladesh.

Proposed Tipaimukh Dam on Meghna River



Regional Cooperation For Sustainable use of Himalayan Water - Common Approach

Formation of river basin-wise Regional Water Commission comprising of riparian countries.

.Nepal, India, china and Bangladesh will form the Ganges basin Regional Water Commission

Common Approach…

. China, Bhutan, India and Bangladesh will form Brahmaputra basin Regional Water Commission

. India and Bangladesh will form Meghna Basin Rgional Water Commission.

. United Nations, World Bank and relevant international organizations will monitor, supervise and act as arbitrators.

Common Approach

- Regional cooperation in sharing water resources of the common rivers should aim at uniting the people rather than dividing them.
- Given the current challenges that the region faces, we cannot confine water issues to nation states only; a regional approach that brings peoples perspectives to the centre stage can help create accord over rivers.

Common Approach

- The flow of water in rivers is not material flow alone, it is also a flow of life and yet instead of preserving the natural direction and volume of river flows ensuring ecological preservation and sustainability of common water resources, there is attempt to rewrite the geography of South Asia. There is an urgent need to evolve a regional policy and mechanism on water commons that work transparently, with accountability, and with participation of the impacted riparian country/countries and its people,

Think About Water Crisis in Kagawa

Toshifumi Itano
Professor, Vice President of Kagawa University

Think about water crisis in Kagawa

Key Note Speech

International Conference on the Water Crisis in the Asia-Pacific Region
Feb. 10, 2015 in Kagawa University

Vice President of Kagawa University
Toshifumi Itano

Today's contents I

- The water problem in Kagawa
- History
- Causes
- Why drought happened during a certain cycle?
- Cycle of sunspot and synchronization of drought
- Relationship between rainfall and drought
- Why decrease number of drought?
- Construction of Sameura dam and Kagawa canal

Today's contents II

- Despite of construction of Kagawa canal, we have drought during another cycle.
- Acts against drought
- How to store water in Kagawa?
- How to use ground water?
- Recent advances in seawater desalination

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History of Drought in Kagawa Area

1873年	
1876年	
1893年	
1894年	
1922年	
1924年	
1934年	
1939年	
1944年	
1973年	Takamatsu Drought
1974年	Construction of Kagawa Canal from Sameura Dam
1994年	Japanese Island Drought
2005年	2005 Drought
2007年	

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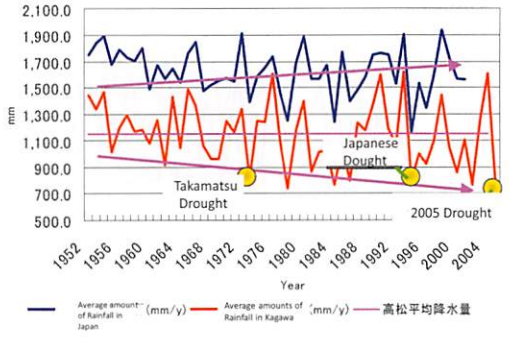
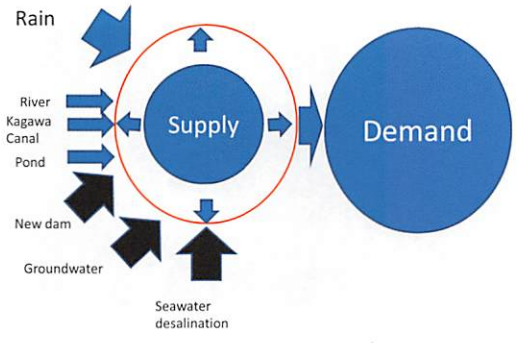
Causes of water shortage

- Enough water isn't supplied.
- Consumption exceeds supply.

Average amounts of Rainfall in Japan and Kagawa



How to increase of water supply?



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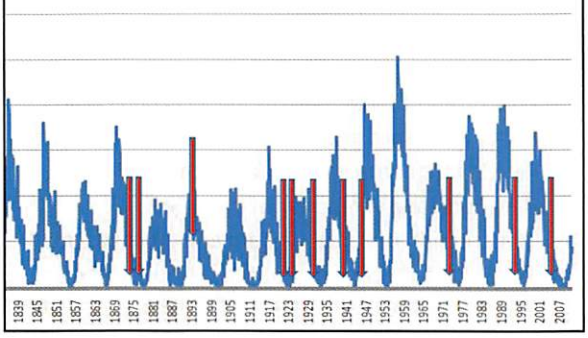
Changes of sunspots (blue line), and Drought at Kagawa area (red allow)



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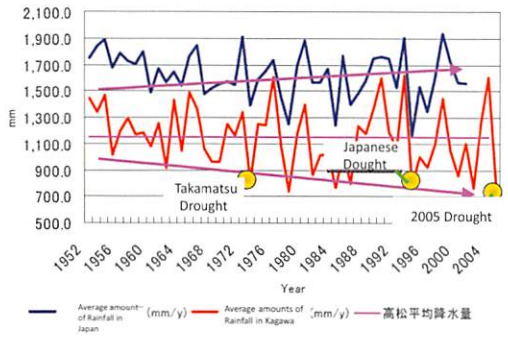

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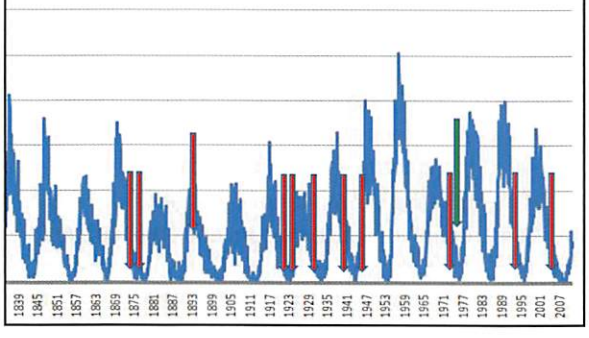
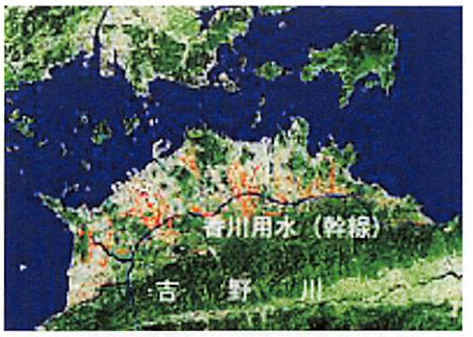


Construction of Sameura Dam

Sameura Dam

Construction of Kagawa Canal



Kagawa Canal

Kagawa Canal

Kagawa Canal

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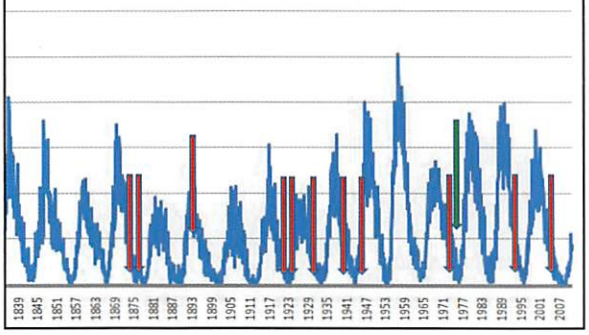

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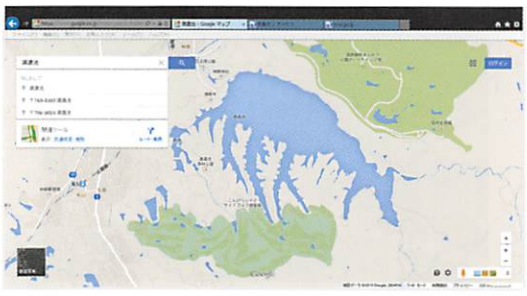
Manou Pond



Manou Pond

Measures Against Drought: Dams

12dams Constructed
3dams under construction

Acts Against Drought: New Dam

Measures Against Drought: Artificial Pond

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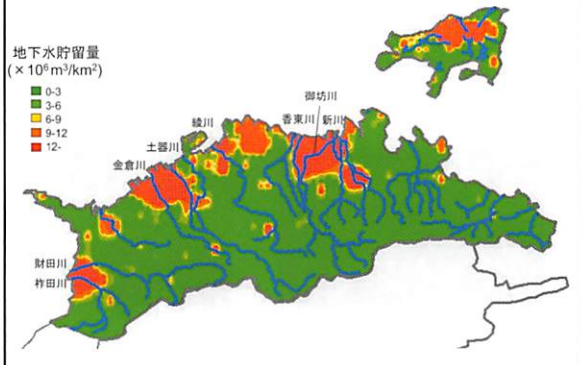
Usage of Groundwater

- Mapping of underground water sources in Kagawa
- How much amount of water are there in each water source?
- How much amount of water can we use in each water source?
- How can we get in each water source?
- How can we store and use in each water source?



香川県における地下水貯留量の推定(越谷ら2011を改変)

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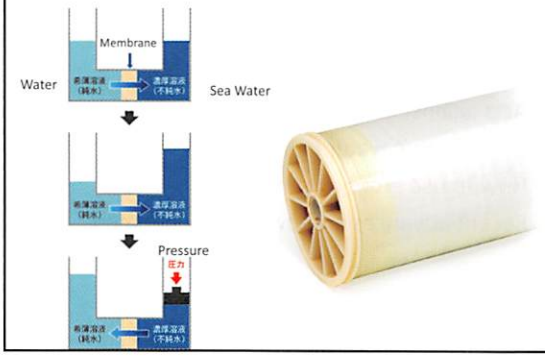
Methods for seawater desalination

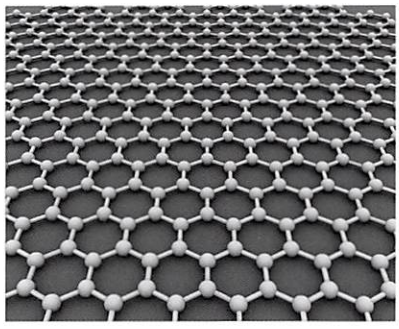
- Evaporation method

- Membrane filtration method
  (1) Reverse membrane filtration method
  (2)Graphen method

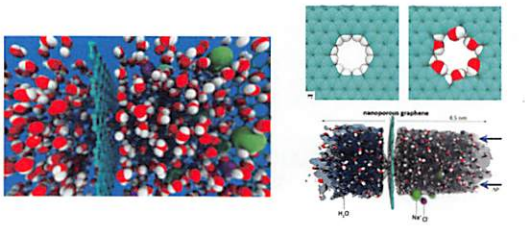
Reverse membrane filtration method



Graphene, Carbon Nano Plate



Filtrate through nano pore



Summary

- Raised water issues in Kagawa historically
- Discussed possibilities for securing water