Government of India
Ministry of Jal Shakti

NITI Aayog

3rd WORLD WATER SUMMIT 2019
Water Management Locally - Globally
21-23 August 2019 | New Delhi, India

SGES

Coastal Reservoirs-New Era Solution for Water Woes

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Vice Chairman, India Chapter, International Association for Coastal Reservoir Research (IACRR)
Elected National Executive Committee Member – Indian Geotechnical Society, New Delhi


Kuala Lumpur


INAUGURATION OF INTERNATIONAL ASSOCIATION
FOR COASTAL RESERVOIR RESEARCH (IACRR)


IACRR
Date: 16 August 2017
Time: 2 - 6 pm
Pacific Hotel Ballroom C


NSW
Office of the
Chief Scientist
& Engineer

WB study: Climate change to hit living standards of 600m Indians

Could Dent GDP By 2.8%: World Bank

Amit Bhattacharya
@timesgroup.com

New Delhi: Unchecked climate change will dent India's GDP by 2.8% and depress the living standards of nearly half the population by 2050, with people living in the severe "hotspot" districts of central India, particularly Vidarbha, staring at the prospect of an over 10% dip in economic consumption.

These are the findings of a first-of-its-kind World Bank study that quantifies the economic impacts of rising temperatures and changes in rainfall in different parts of the country due to global warming.

The study South Asia's Hotspots, released on Thursday, projects a 2% fall in the country's GDP — in terms of per capita consumption expenditures — even if the 2015 Paris Agreement goals of containing global warming to 2 degrees C is achieved.

A 2.8% drop in GDP will cost India $1.1 trillion by 2050. The loss in the severe hotspot districts, with an average 9.8% drop in consumption, will amount to over $400 billion, the study says.

The report finds that inland regions are at far higher risk of economic losses due to rising temperatures than coastal or hilly areas, with the maximum impact likely to be felt in central and north India. Among states, Chhattisgarh and Madhya Pradesh are projected to witness over 9% dip in living standards by 2050 in the business as usual scenario.

The Vidarbha region, a ground zero of farm distress in the country, is projected to be in the centre of climate-related misery as well. Seven of the 10 major "hotspot" districts mentioned in the report are in Vidarbha.

"Temperature rise is a slow-moving disaster that's not talked about much," said economist Muthukumara Mani, the lead author of the study. "A lot of focus of climate change studies is on extreme events so people tend to ignore these gradual changes happening for the last 50-60 years." The study found that nearly 300 million people in India today live in places that will become moderate or severe hotspots by 2050 under the unchecked climate-change scenario.

Full report on www.toi.in

A SLOW-MOVING DISASTER

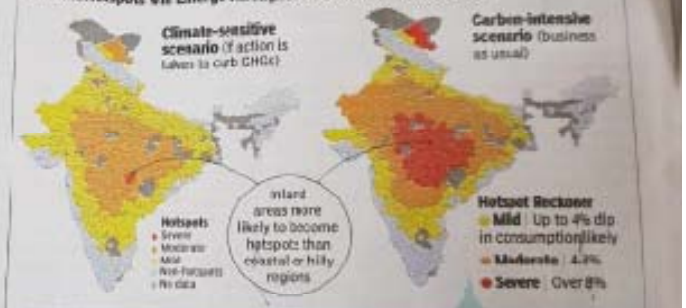
600 million Indians, nearly half of country's population, live in places likely to become moderate or severe climate hotspots by 2050

By 2050, India is likely to see 2.8% drop in GDP, a loss of $1... trillion, if greenhouse gases aren't controlled

WHAT IS A CLIMATE HOTSPOT?

➤ It's a location where gradual changes in average temperature and rainfall patterns will have negative impacts on living standards in future

Climate Hotspots Will Emerge Throughout Indian Hinterland by 2050



Hotspot Reckoner

- **Mild** | Up to 4% dip in consumption likely
- **Moderate** | 4-8%
- **Severe** | Over 8%

Worst-hit States

Vidarbha Faces Max Heat

Region may have 7 out of 10 worst hit districts

*Projections for 2050 if world doesn't curb greenhouse gases; Source: World Bank report, South Asia's Hotspots; Graphic: Sunil Singh

THE TIMES OF INDIA, BENGALURU | SATURDAY, JUNE 2, 2018

Water-Stressed India May Not Be Able To Meet Its future Demand

Experts say community-driven, nature-based solutions are the mantra to correct India's grim water situation, reports **Radheshyam Jadhav** *in the first of a series for the second edition of TOI's Water Positive campaign*

More than 80-70% of India is vulnerable to drought and one-third of the country's districts have faced more than four droughts in the past decade even as the number of drought-prone areas increased by 27% since 1997.

Not only that: There are about five million springs across India, nearly 3 million in the Himalayan region alone, which are facing the threat of drying up due to increasing water demand, changing land use patterns, and ecological degradation.

Experts stress that sustainability of groundwater must be the focus of policy programmes and projects to mitigate this situation as India is the world's largest user of groundwater, which provides 60% of the country's drinking water needs. If supplies nearly two-thirds of its irrigation water over the last four decades, and 64% of the total addition to irrigation has come from groundwater.

"We must understand where groundwater comes from and ensure maintenance of the recharge mechanisms, be it rivers, wetlands, forests, local water bodies. At the same time, we must avoid or minimise all interventions that adversely affect recharge systems," says Himanshu Thakkar of the South Asian Network on Dams, Rivers and People. "We need to ensure regulation of groundwater and such regulation cannot happen through centralised institutes, but through decentralised, aquifer-level, community-driven efforts."

Emphasising on rainwater harvesting, Thakkar said that big dams and interlinking of rivers would be of no help. The United Nations "World Water Report 2018 recommends nature-based solutions (NBS) for water. "NBS mainly address water supply through managing precipitation, humidity, and water storage, infiltration and transmission, so that improvements are made in the

RUNNING OUT OF WATER?

India's third will grow...

In 2050, India's water demand projected to reach: 1180 billion cubic metres

Outstripping the total availability of: 1137 billion cubic metres

4,600 cubic km
Global water demand per year

Increase 28%-30% to between 5,500 and 6,900 cubic km per year by 2050

Over half the world will face water scarcity...

27% of the global population or 1.9 billion people live in potential severely water-scarce areas

Nearly 50% of global population or 3.4 billion people live in potential water-scarce areas at least one month per year

...most 75% of the affected people live in Asia

By 2050, people living in water scarce areas could increase to 4.85-5.3b, **more than half the estimated global population**

From 2017-2050, world population expected to increase from 7.7 billion to between 9.4 and 10.2 billion, two-thirds of this population will be living in cities

MAKE INDIA WATER POSITIVE
A TIMES OF INDIA INITIATIVE

BE A TOI CHANGE LEADER

If you have contributed to conserving water either for yourself or for society at large, share your story with us at **waterpositive@timesgroup.com**

"We need to ensure regulation of groundwater via decentralised, aquifer-level, community-driven efforts."

current annual water use estimate of 634 BCM. These estimates suggest there is little scope to meet any additional demand.

As increasing population means water availability per capita is reducing. The average annual per capita water availability in 2001 and 2011 was assessed at 1,820 cubic metres and 1,545 cubic metres, respectively, and projections are that this could reduce further to 1,341 cubic meters and 1,140 cubic meters by 2021 and 2031, respectively.

"Annual per capita water availability of less than 1,700 cubic metres is considered a water-stressed condition, whereas annual per capita water availability below 1,000 cubic metres is considered as a water scarcity condition.

Water availability of many regions is way below the national average and are considered water stressed/water scarce," the Union water resources ministry recently informed in Lok Sabha.

World Water Summit 2019 – 21st to 23rd August 2019

As liquid as it gets

BY **PATHMA SUBRAMANIAM**

Earth's glaciers and polar caps are melting at an astonishing speed. Taps in South Africa almost ran dry last year while India and Australia recently faced severe droughts — the likes of which has not been experienced in decades.

Water is becoming one of the most coveted resources as global warming, pollution, urbanisation and an increasing population exert pressure on minute global freshwater reserves. To exacerbate the water shortage, millions of people across the world fall sick or die every year from diseases associated with

Residents fill their containers with drinking water from a municipal tanker in New Delhi, India, which is grappling with

World Water Summit 2019 – 21st to 23rd August 2019


Water scarcity hits paddy transplantation

Coverage of which, pulses also lower

'Water scarce in 566 villages'

70 Villages Get Drinking Water Through Tankers

Times News Network

Gandhinagar: As the temperatures rise, the Gujarat government declared 566 villages to be suffering water scarcity and put relief measures in place. The government has started providing drinking water through tankers in 70 villages.

State revenue minister Bhupendrasinh Chudasama reviewed the water scarcity situation in the state. The state government has started providing fodder at Rs 2 per

gos are in Surendranagar, Kutch, Rajkot and Botad districts.

Chudasama said, "Compare to 42% at this time last year, water levels in the 2014 major dams is at 57.45% this year and there is no need to panic. Wherever required,

Kutch industries to work on saving water

Times News Network

Ahmedabad: Faced with water shortage and subsequent production losses, industrial units in Kutch have themselves taken up initiatives to address their water woes by setting up water storage facilities, sea water desalination plants, rain water harvesting and sewage treatment plants.

As against the requirement of 150 million litres per day (MLD) requirement, industries get less than 60 MLD. "Shortage of water causes production loss to the tune of Rs. 10,000 crore annually to industrial units operating in

deration of Kutch Industries Associations (FOKIA).

In order to combat water shortage many companies have themselves started taking various steps. Some of the companies have set up their sea water desalination plants, while another corporate group has established sewage treatment plant.

Other initiatives include rain water harvesting and creation of surface water storage facilities.

"A Rs. 1,300 crore sea water desalination plant near Bhadreshwar in Kutch has also been planned. We have identified a number such projects under our Rs. 3,000

PYASA

GUJARAT

vardhmanenvirotech.com

5

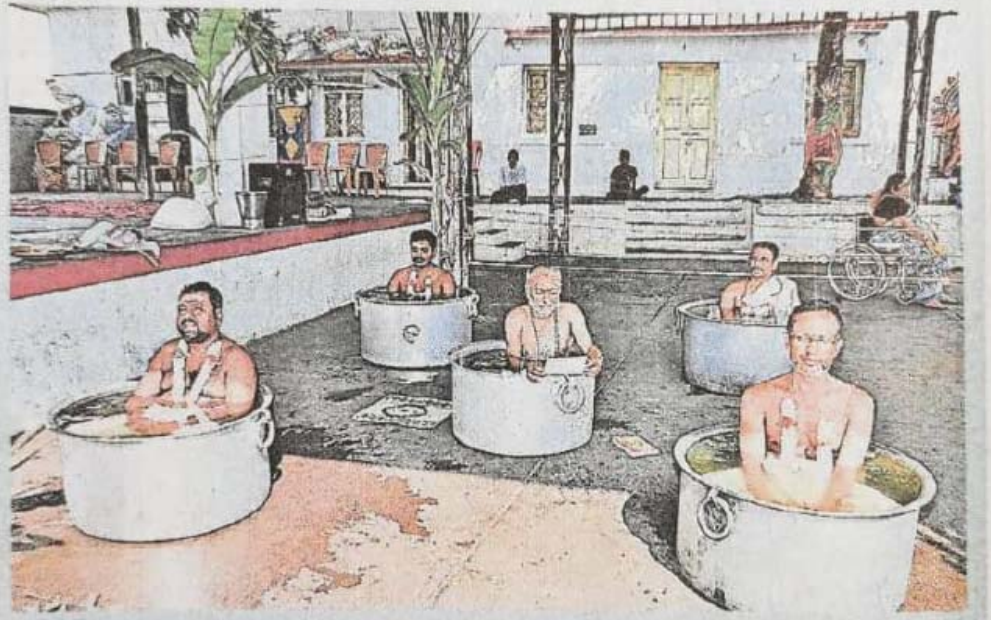
印度

4人搭火車熱死
36人死於高溫

印度国家灾害管理局官员周三说，已有36人死于高温。

印度首都新德里周二录得最高摄氏48度，北部拉吉斯坦邦的楚鲁镇来到51度，平了历史高温纪录。国家灾害管理局干旱与热浪专家斯里瓦斯达瓦："这是史上最高一次，2015年仅有9邦来到这个高温，今年预计有23个！"

"我们证实已有36人死于高温，去年是25人。大部分都是离乡来到城市办工且睡在路边的穷苦人家。"



持续2周的高温，周一传出有4人日前在搭乘火车期间"难以忍受"车厢内的高温中"热死！"他们是搭火车从泰姬陵所在的阿格拉前往印度南部城市孔巴托，

占西时身亡。

图为本月6日，印度班加罗尔一家庙宇，5名印度教士坐在注满水的大盆中，向雨神求雨。（互联网照片）

Praying Water for Bangalore


SOS MOMENT FOR
WAR FOR WATER
WATER RESERVOIRS RUN DRY
www.
Indiatoday
.in
AURANGABAD, MAHARASHTRA
486
INDIA TODAY
427
REPUBLIC TV
425
TIMES NOW
BARC UNIVERSE, 23RD MAY 2019, GMP'000, MEGA CITIES
www.indiatoday.in
NEWS
FLASH
WATER RUNNING OUT
21 cities to run dry within a year


ये दिन भी आसकता है
PETROL
DIESEL
WATER
पानी बचाओ


HOW BAD IS THE
WATER CRISIS IN INDIA?
(A TIMLINE FORECAST)
2019
CHENNAI ALMOST RUNS OUT OF WATER
2020
21 CITIES INLCUDING BENGALURU, DELHI, HYDERABAD TO RUN OUT OF GROUNDWATER
2030
40 % OF INDIANS WILL HAVE NO ACCESS TO DRINKING WATER.
2040
THERE WILL BE NO DRINKING WATER IN ALMOST ALL OF INDIA.
impulse
SOURCE : COMPOSITE WATER MANAGEMENT INDEX BY NITI AAYOG | UN REPORT ON WATER CONSERVATION

Every drop counts

As India reels from the effects of a severe water shortage, startups have begun offering innovative ways to help people access safe drinking water. But how feasible are these solutions?

SNEHA BHATTACHARJEE

This year saw a city run out of water completely. It was one of the world's greatest tourist destinations. Cape Town. Government reports suggest India's per capita availability of water has been reducing progressively due to an increase in population and the country is facing water stress. To add to this, a report titled, "The state of the world's water" by WaterAid says India has the lowest per capita access to clean drinking water – close to 163 million Indians are said to be suffering from this scarcity. At the same time, the report adds that it is also one of the world's most-improved nations for reaching the most people with clean water.

Further, it states the challenges faced by the country as: Falling groundwater levels, drought, demand from agriculture and industry, pollution and poor water resource management. Despite the government restructuring rural water programme with a goal to reach 90 per cent of rural households with piped water by 2022, the challenges will only intensify as "climate change contributes to more extreme weather shocks".

"What we need currently is accountability of the existing resources and ensure that whatever is available to us, is maintained well," says Dhamnesh Shah, an independent researcher on environment from Chennai. On one of his research projects to an area in North Chennai, Shah came across people paying for using 20 litre jar bottles. "The groundwater has been left to no use because there has been constant deposition of garbage right above the source of water. In such a situation, the common man has no choice but to pay and use water," he adds.

As the government data suggests India's average annual per capita water may reduce to 1,340 cubic meters in 2025 and 1,140 cubic meters in 2050, it is a welcome relief to see some organisations using natural resources, IOT (Internet of Things) to provide accessibility to safe and clean drinking water.

Take the case of Hyderabad-based Uravu Labs. Co-founder Swapnil Srivastava told Business Standard they source water from "air" using solar energy. "A panel that can be installed on the rooftop that will attract water in the night, use sunlight through the day to heat it up, a condenser that will cool the water and then supply to the user through pipes," says Shrivastava. They are still four to six months away from their official launch but are hoping to tie up with the government and the NGOs and reach places and people who do not have access to clean drinking water and where the infrastructure is missing.

Bengaluru based OCEO works on "pay per use" model. "The water purifier is IOT enabled and is installed at the user's location. They can recharge or buy water credits online through mobile and web application," says Vikram Gulecha, one of the co-founders. This way, the user pays only for the purified water and there is no cost involved for machine and maintenance. "There is a zero capping on minimum consumption of water for the user.

The government restructured the rural water programme to reach 90 per cent of households with piped water by 2022

Though we have observed that 15-20 litres per day is consumed by a household, users can consume as many litres of water from the device without having to worry about its maintenance for a lifetime," adds Gulecha. "

Gurugram based Swajal has water ATMs or shops across 15 states. Their idea has been to provide for accessibility in public places and small hamlets. Swajal started in 2011 for cluster o' villages. The water ATMs come with solar pumps, and use locally available water. The machines are all self-run and have been programmed for self-cleaning too. "We have for every 30 machines, one technician available. Our machines are connected via IOT to our data centre in Delhi where we monitor their maintenance," says Vibha Tripathi, one of the founding partners, Swajal. This year, they are launching this project in areas where water quality is bad, and also teach people about water conservation and rainwater harvesting.

"It may sound great but come to think of it, we have actually let go of our water resources to private players. A resource that is already diminishing," feels Shah. "At the end of the day, we are using environment to produce water; isn't it putting pressure on the environment further?", he concludes adding instead the government should look at cleaning the already existing resources and ensure people have safe drinking water in their homes without paying for it.

THE OTHER INDIA

People welcoming river water

Drinking water as the substance to transformation

http://blueplantenetwork.org

Projected water demand in India for various sectors (Govt of India 2006)

Sector	Standing Sub-Committee of MOWR			NCIWRD		
Year	2010	2025	2050	2010	2025	2050
Irrigation	688	910	1,072	557	611	807
Drinking water	56	73	102	43	62	111
Industry	12	23	63	37	67	81
Energy	5	15	130	19	33	70
Other	52	72	80	54	70	111
	813	1,093	1,447	710	843	1,180

All values in BCM.

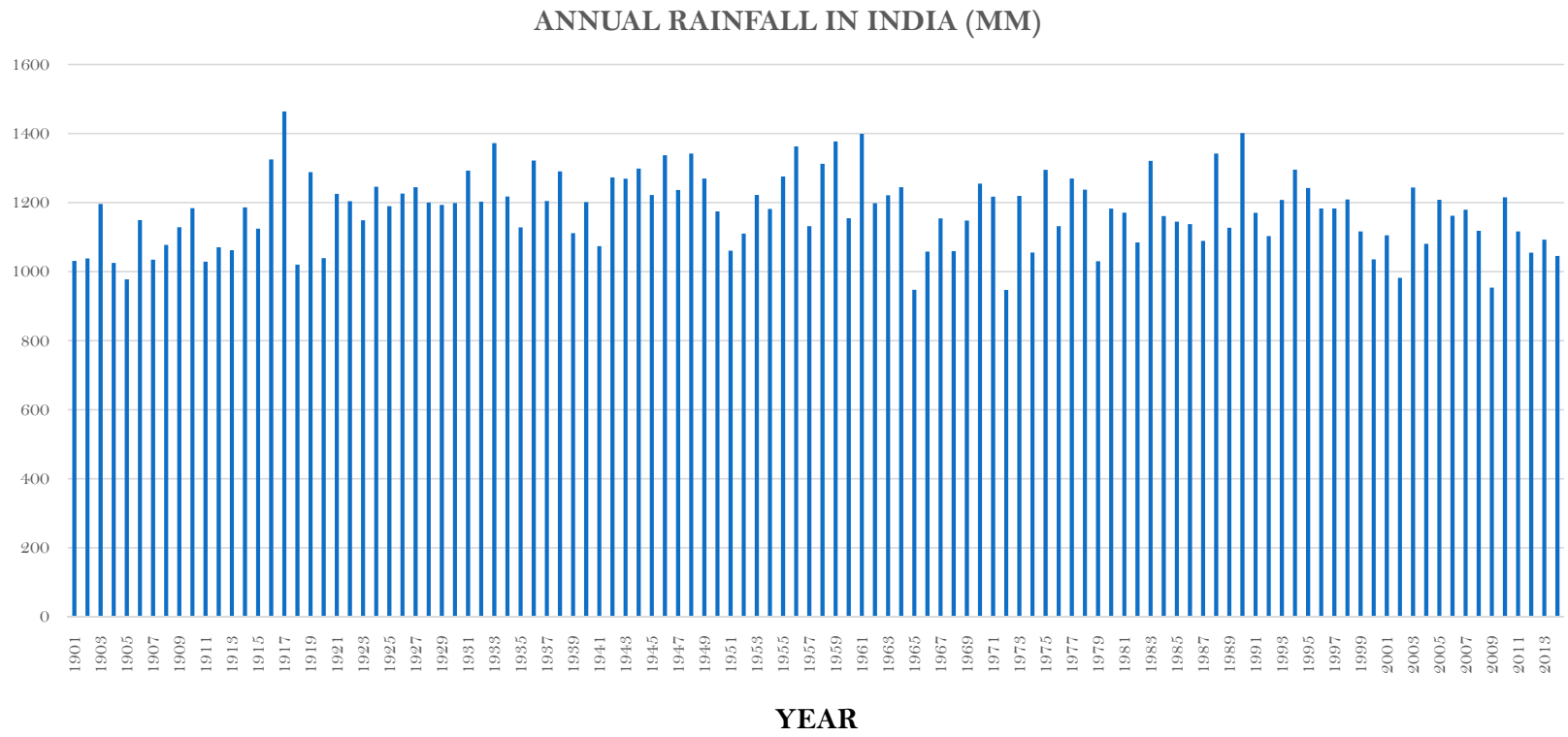
Sources and Options we have to address water supply issue?

Sources: Rainwater, Surface water, Subsurface flow, Ground water and Sea water

Primary renewable source of freshwater is Rainfall

OPTIONS

- More inland reservoirs
- Interlinking of rivers – to optimize the surface water
- Ground water
- desalination plants,
- wastewater reuse facilities,
- **Coastal reservoirs**



AVERAGE ANNUAL RAINFALL IN INDIA IS 1176 MM

Global Dam Construction

- Very few large dams after 2000
- More and more people have realized the problems of large dam construction on land
- Silting process – reduce storage – 75% silt will be left on land

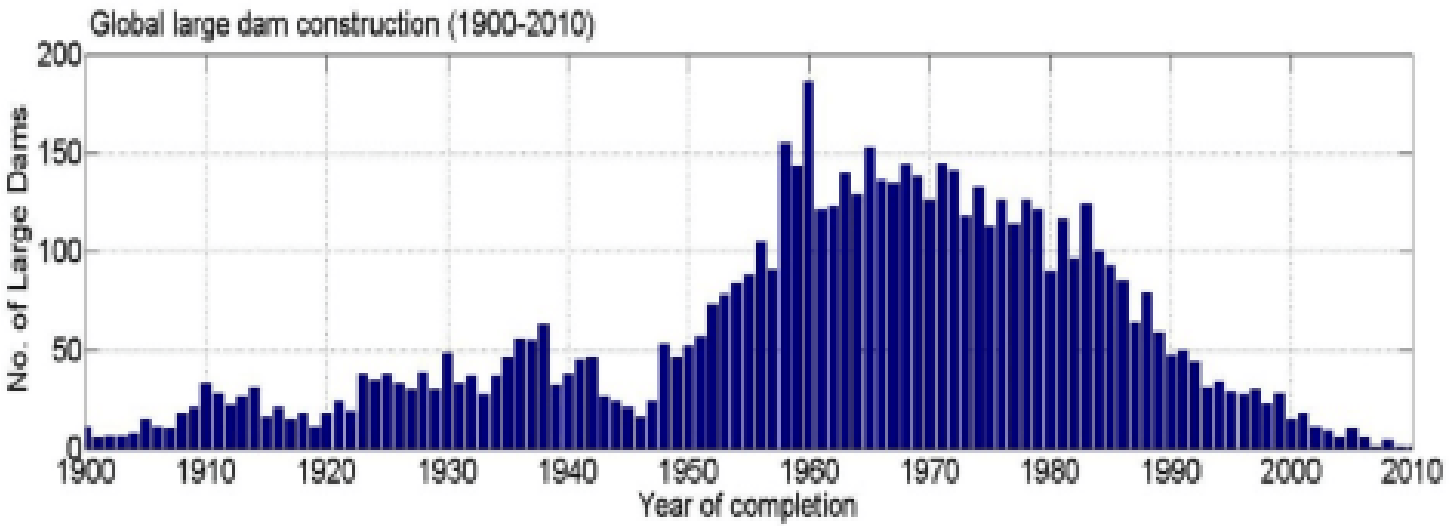
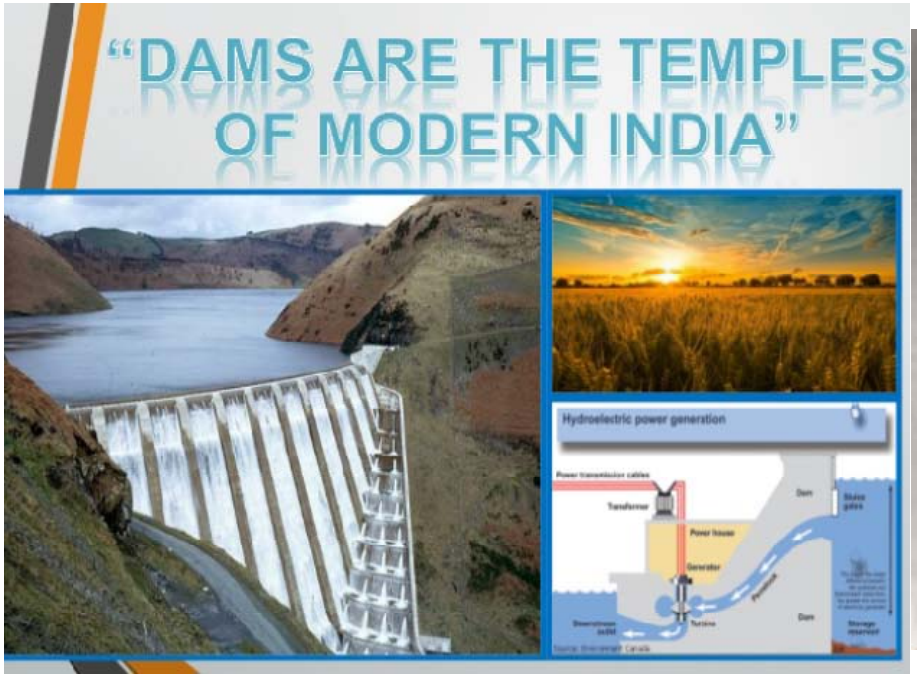
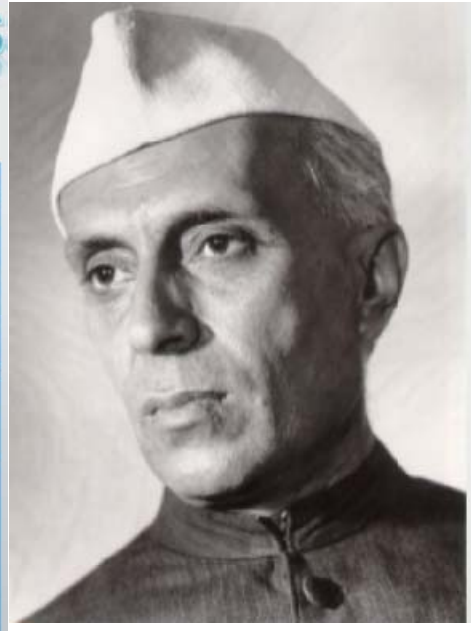


Figure 1. Global dam construction over the past 100 years, Source: Global Reservoir and Dam (GRanD) Database.





Dams are the temples of modern India, where I worship...

--Jawaharlal Nehru, 1954. First Prime Minister of independent India

India – A country of rivers

7 MAJOR RIVERS

- Indus
- Ganga
- Brahmaputra
- Godavari
- Krishna
- Narmada
- Tapi
- Mahanadhi
- 400+ - Main Tributaries

India has more than 5000 large dams

3rd LARGEST DAM BUILDING COUNTRY IN THE WORLD

COASTAL RESERVOIRS

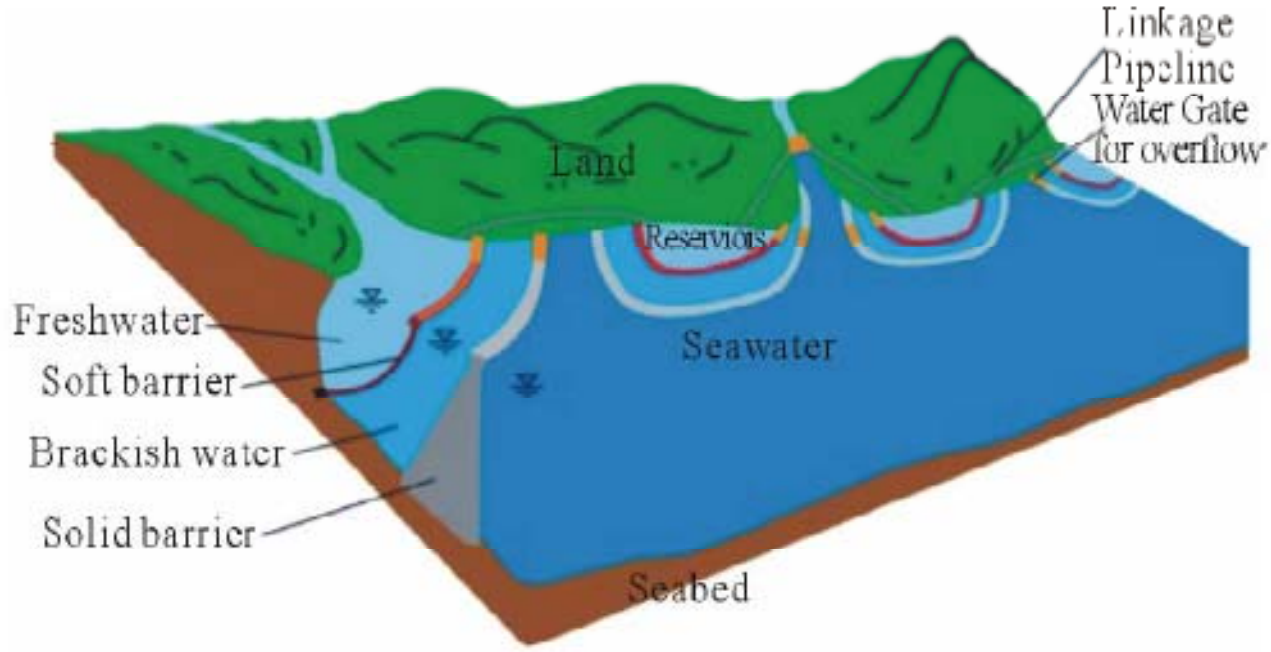
What is Coastal Reservoir?

- **Definition:** a water storage in a large water body where inside and outside waters are different in physical, chemical, biological parameters. Simply, a freshwater reservoir inside seawater.

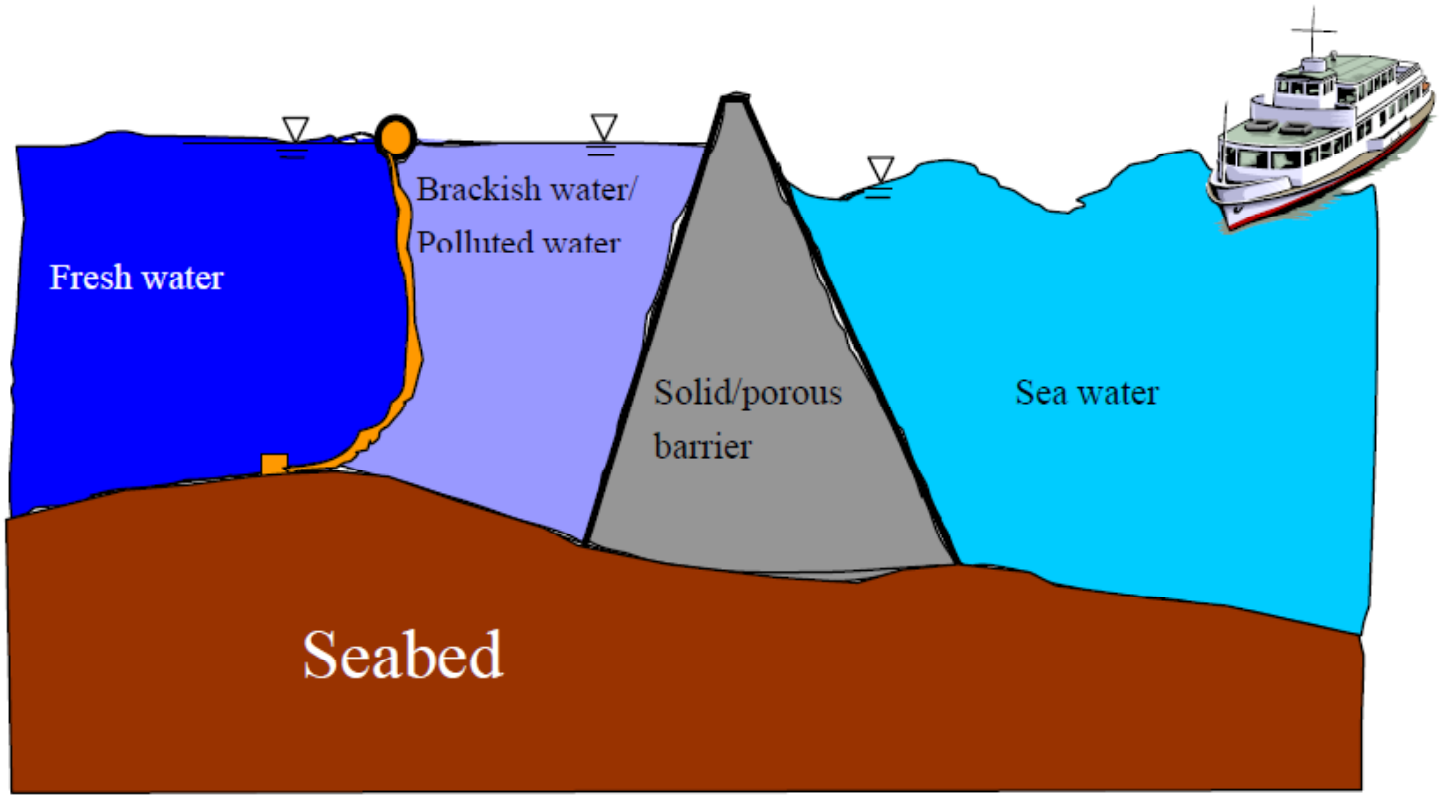
- location: inner, outer or beside a river mouth.
- Purpose: drinking, irrigation, industrial usage, flood defense, reclamation, energy storage, red-tidal control, fish farming, ballast water recycle…..

10

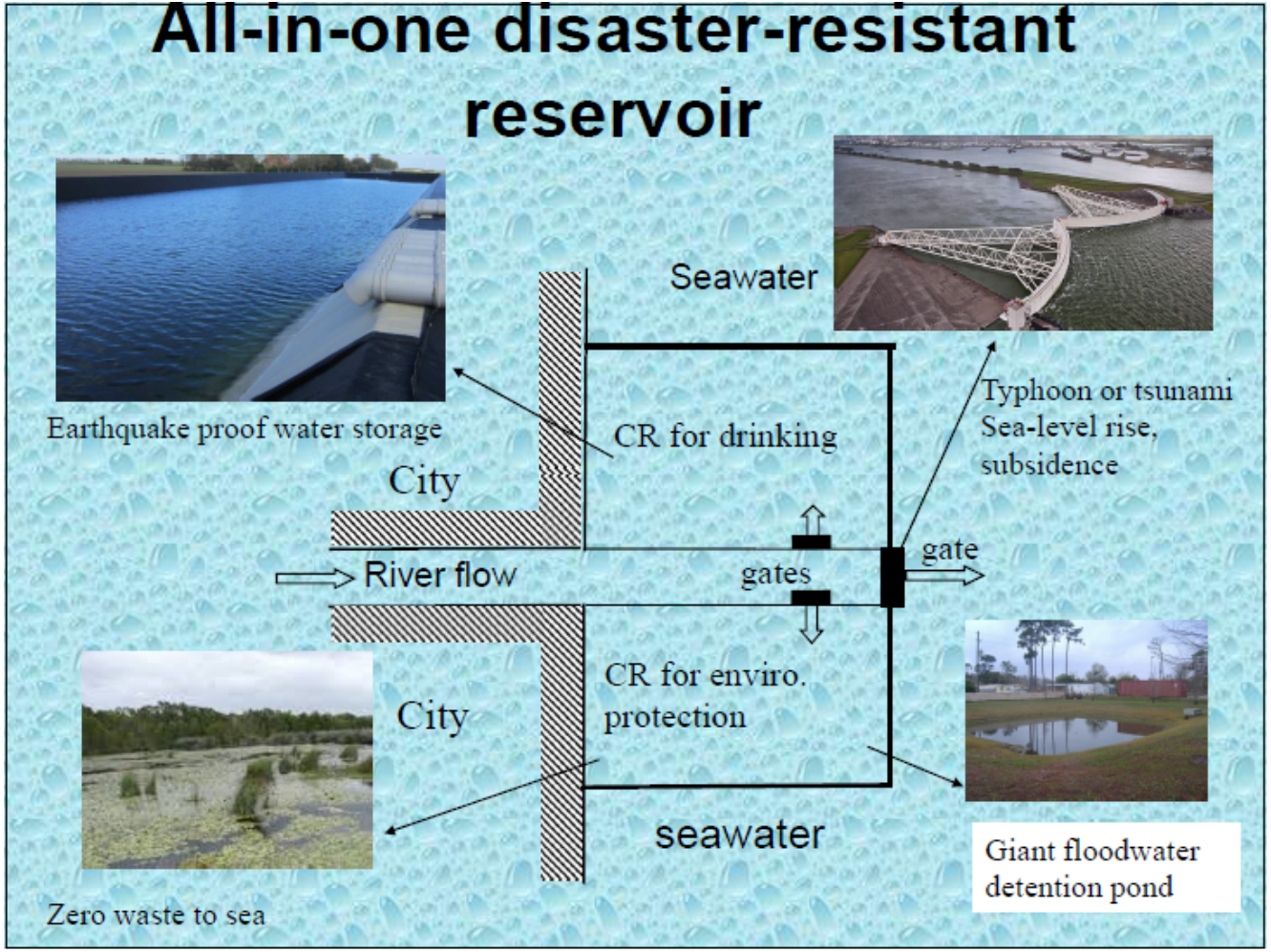
Coastal Reservoirs



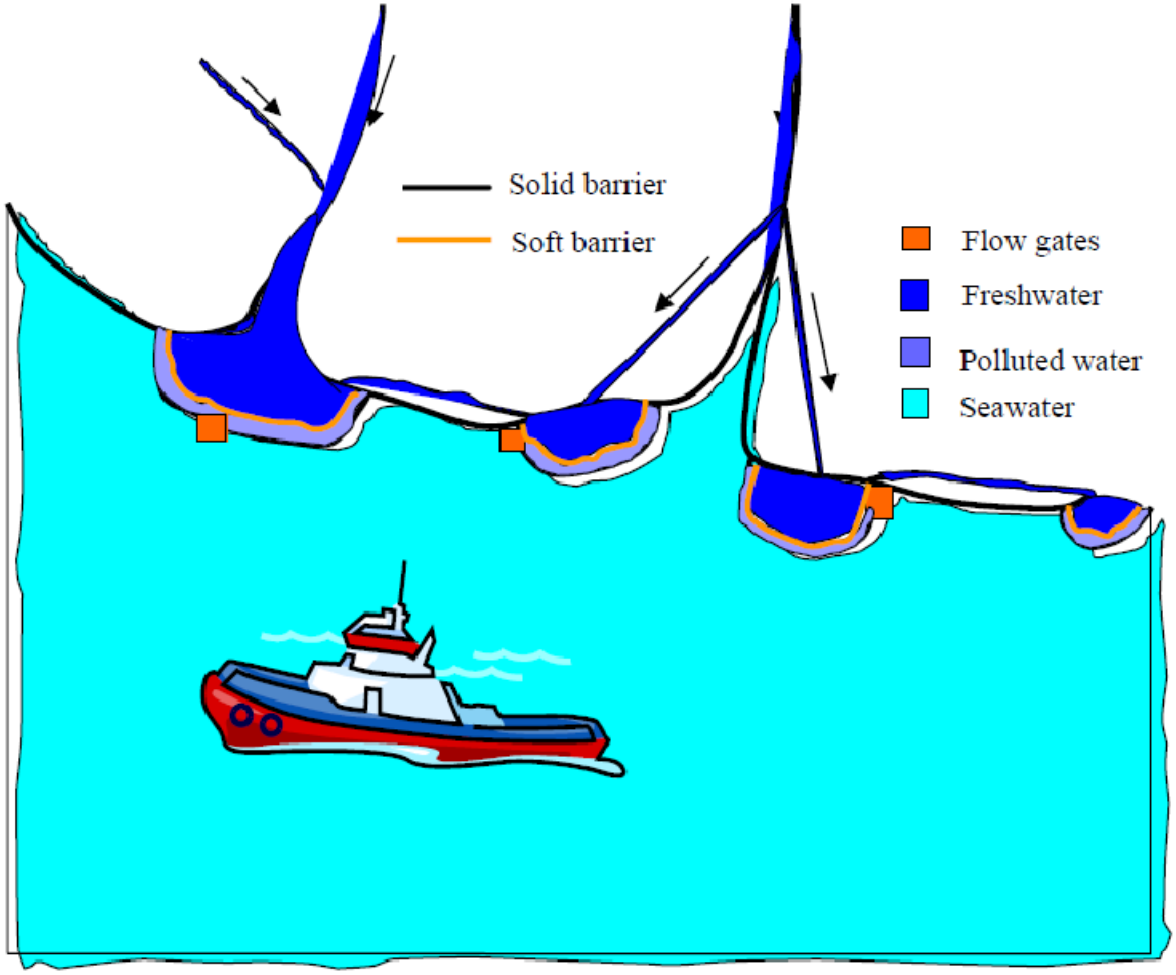
Coastal Reservoirs



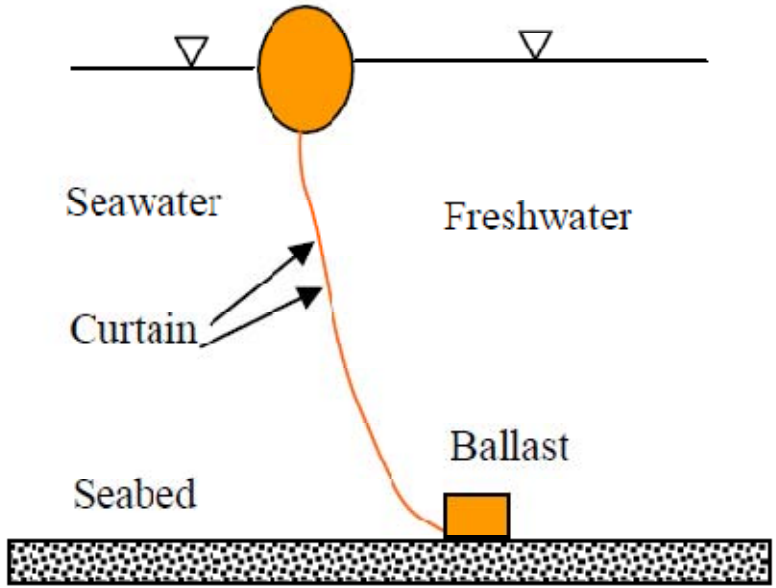
Typical Cross Section of Coastal Reservoir



Schematic of Coastal Reservoir that Enables storage of Fresh water during river floods (Jianli Liu et.al 2013)



Coastal Reservoir with Soft Dam



Coastal Reservoir with Soft Dam

Sea based reservoirs Vs on Land reservoir's

Item	Coastal Reservoir	On land reservoir
Dam Site	Sea (Inside / outside river mouth)	Valley (limited area)
Water level	At sea level	Above sea level
Pressure	Low pressure along with wave surges	High water pressures
Catchment area	Entire Catchment of the river course	Partial catchment
Seepage	By density difference (Slow)	By head difference (fast)
Pollutant	Land based and sea water	Land based
Land acquisition	Nil	High
Environmental damage	Nil (no forest damage, no displacement of people, etc.)	Very high (difficult to build dams now a days)
Water Supply	By pumping	Mainly by gravity
Construction cost	Low	High

Advantages of sea based reservoirs

No harm to any of the river basins and no alteration to the river course (no temporary diversions as well)

No disturbance to any forest cover

No submergence of land

No physical displacement of people and their villages / towns

Agriculture activity can be augmented

Coastal erosion can be minimized

Ground water recharge due to fresh water in estuarine areas

Intrusion of saline water into wells will reduce

Freshwater dredging will provide sand for construction

Advantages of sea based reservoir

Earthquake resistant sea walls

Solar panels on the sea wall – Solar energy

Tidal energy at the wall

Roadways over the sea wall, Fresh water Fishing, Navigation and Tourism

Real estate opportunities

Length and width of sea wall - serve as a deep water fishing harbor - benefit the fishing community.

Increase in industrial, recreational and fisheries activity around this fresh water

Existing Coastal reservoirs around the world

(modified after Yang and Kelly, 2015)

Country	Name	Purpose
Netherlands	1. Afsluitdijk in the Ijsselmeer, 1932 2. Zuider Zee, 1937	Flood control Flood control
India	Thanneermukkom bund, 1974	Agriculture
South Korea	1. Sihwa, 1994 2. Saemanguem, 2010	Tidal energy Land reclamation and fresh water
Hong Kong	1. Shek pik, 1968 2. Plover cove 3. High land	Fresh water
China	1. Qingcaosha, 2011 2. Chenhang, 1992 3. Baogang, 1985	Fresh water
Singapore	Marina barrage, 2008	Fresh water
United Kingdom	Cardiff Bay project	Freshwater and coastal area development

On 25 September 1933, the Afsluitdijk, NETHERLANDS was officially opened

Construction of Large Freshwater reservoirs in Bays – Hong Kong

- 1963-64 – Water Rationing – every 4 days for 4 hours of water supply – use of sea water for flushing
- Fresh water reservoirs in the sea
  - The Shek Pik reservoir – 1957 to 1963 – 24M cubic meters
  - Plover Cove reservoir – 1968 – 230 M cubic m
  - High Island reservoir – 1978 – 290 M cubic meters
- Continuous water supply was restored
- Desalination plant commissioned in 1975 was even decommissioned

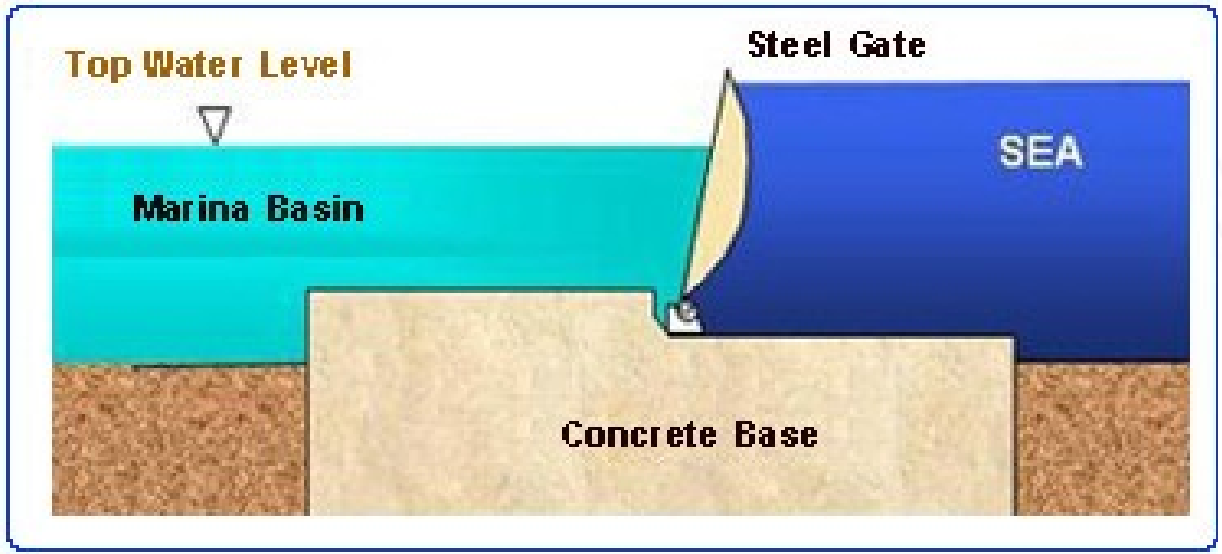
Coastal Reservoirs of Hong kong

Shek Pik reservoir

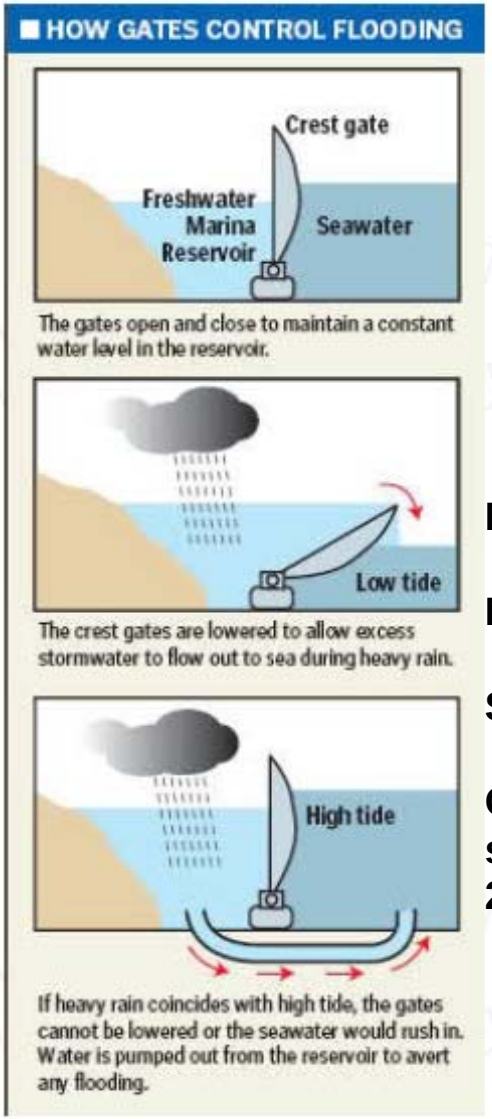
High Island Reservoir

Plover Cove Reservoir

HOW DOES THE BARRAGE WORK?



Nine numbers of 26.8-metre-long hydraulically operated steel crest gates, will be built across the 350m wide Marina Channel to keep out sea water.



Marina Reservoir,

Marina Bay,

Singapore -2008

Operations started Nov 20, 2010

Saemangeum Seawall- KOREA

Qingcaosha Reservoir in Shanghai

Coastal reservoirs –Under Planning stage

1. Pluit Reservoir Revitalization Project, Jakarta, Indonesia,
2. Kalpasar project, Gulf of Kambhat, Indian Water Project, Gujarat,
3. Sydney and other coastal cities, Australia,
4. New York , USA
5. Netravati river project, Mangalore, India

The India's Water Scenario

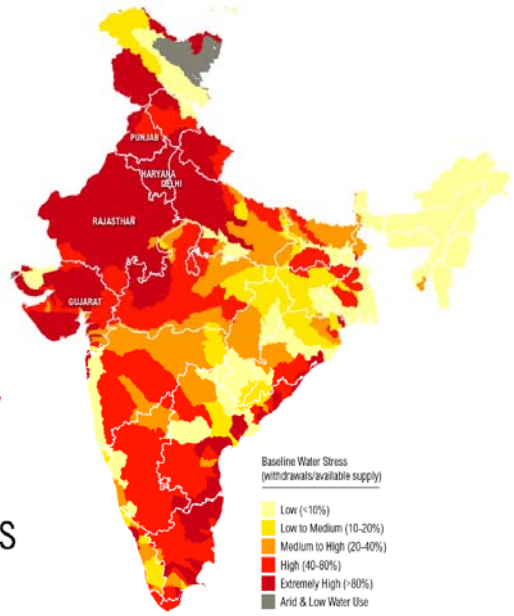
Rainfall
1176mm

Built more than 5000 Dams
Standing 3rd in World

Fresh Water Shortage

- Availability of freshwater per capita is declining
- WATER STRESS – Developing world
- Water demand in coastal regions is also increasing
- India is not running out of water but Water is running out of India

54% of India Faces **High** to **Extremely High** Water Stress



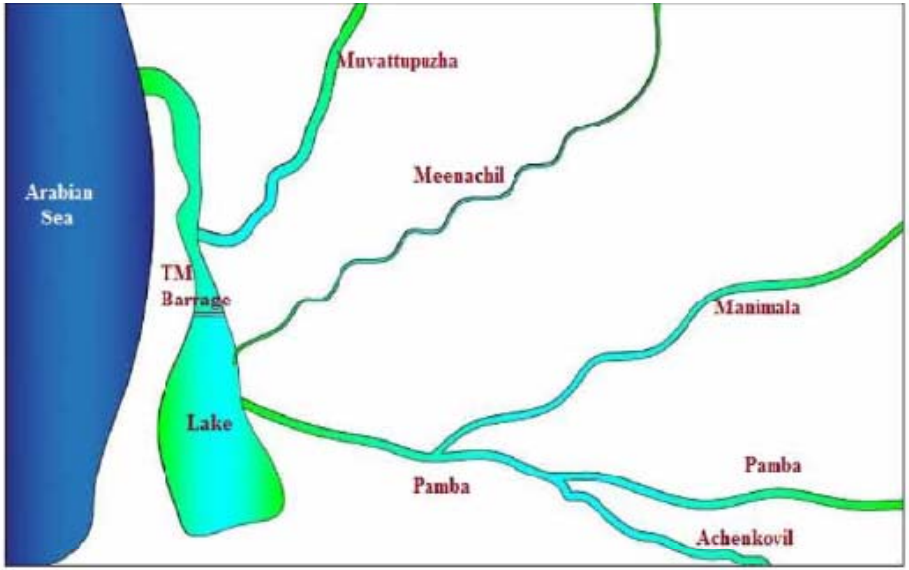
www.indiawatertool.in

WORLD RESOURCES INSTITUTE

COASTAL RESERVOIRS

INDIAN SCENARIO

Bird's eye view of Thannermukkom barrage



Location of barrages across Vembanadu Lake

(S Kolathayar et.al 2018)

(a)

Coastal reservoir in the Gulf of Khambhat in Gujarat State

(b)

Development plan to supply water for the entire Gujarat coast using the CR (Kalpasar (2016)

First International Seminar on Coastal Reservoirs Research
&
Review meeting of BWSSB project on Feasibility studies of Coastal reservoir across Netravathi River

UNIVERSITY OF WOLLONGONG AUSTRALIA

SAHYADRI COLLEGE OF ENGINEERING & MANAGEMENT MANGALURU

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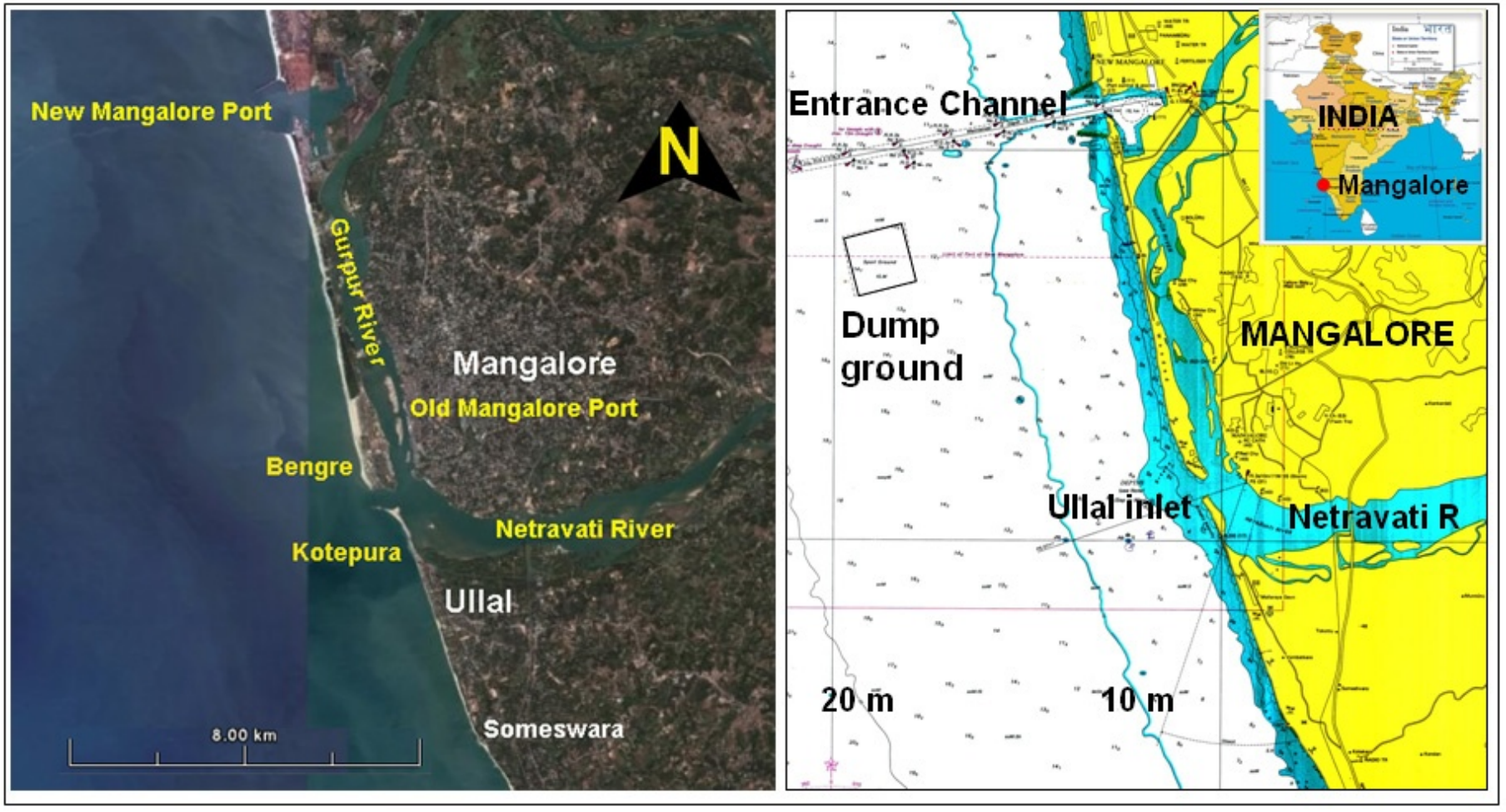
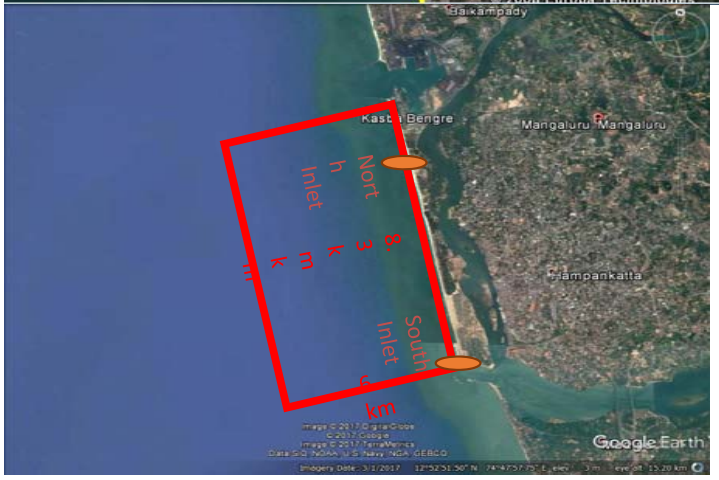
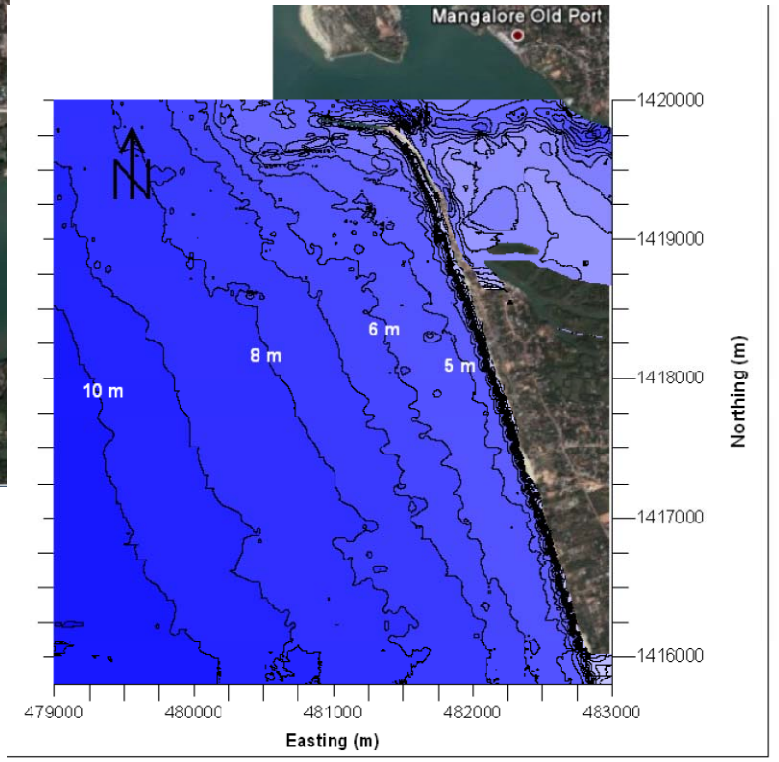

New Mangalore Port
N
Gurpur River
Mangalore
Old Mangalore Port
Bengre
Netravati River
Kotepura
Ullal
8.00 km
Someswara
Entrance Channel
INDIA
Mangalore
Dump ground
MANGALORE
Ullal inlet
Netravati R
20 m
10 m





The bathymetry of the Ullal project area.

Feasibility Implications

- Enough water available? **YES** upto 385 TMC per year
- Can the water requirement of Bangalore & Mangalore be met? **YES.** Just with less than 10% of runoff
- Is Water quality good enough? **YES** No major treatment needed
- Is proposed reservoir safe from natural hazards? **YES.** Can provide extra safety against Tsunami hazard
- Will this enhance the overall coastal livelihoods? **YES** **Provided Fresh water fishing is encouraged. Need to bring awareness.**
- Cost Effective? **YES**

43

An Attractive, Clean and Beautiful Mangalore Waterfront City in Future with proposed coastal reservoir

The first International workshop on Coastal Reservoirs was organized on 19th July 2017 at Amrita University Coimbatore which was participated by 60 delegates from various organizations in India and abroad.

World Water Summit 2019 – 21st to 23rd August 2019

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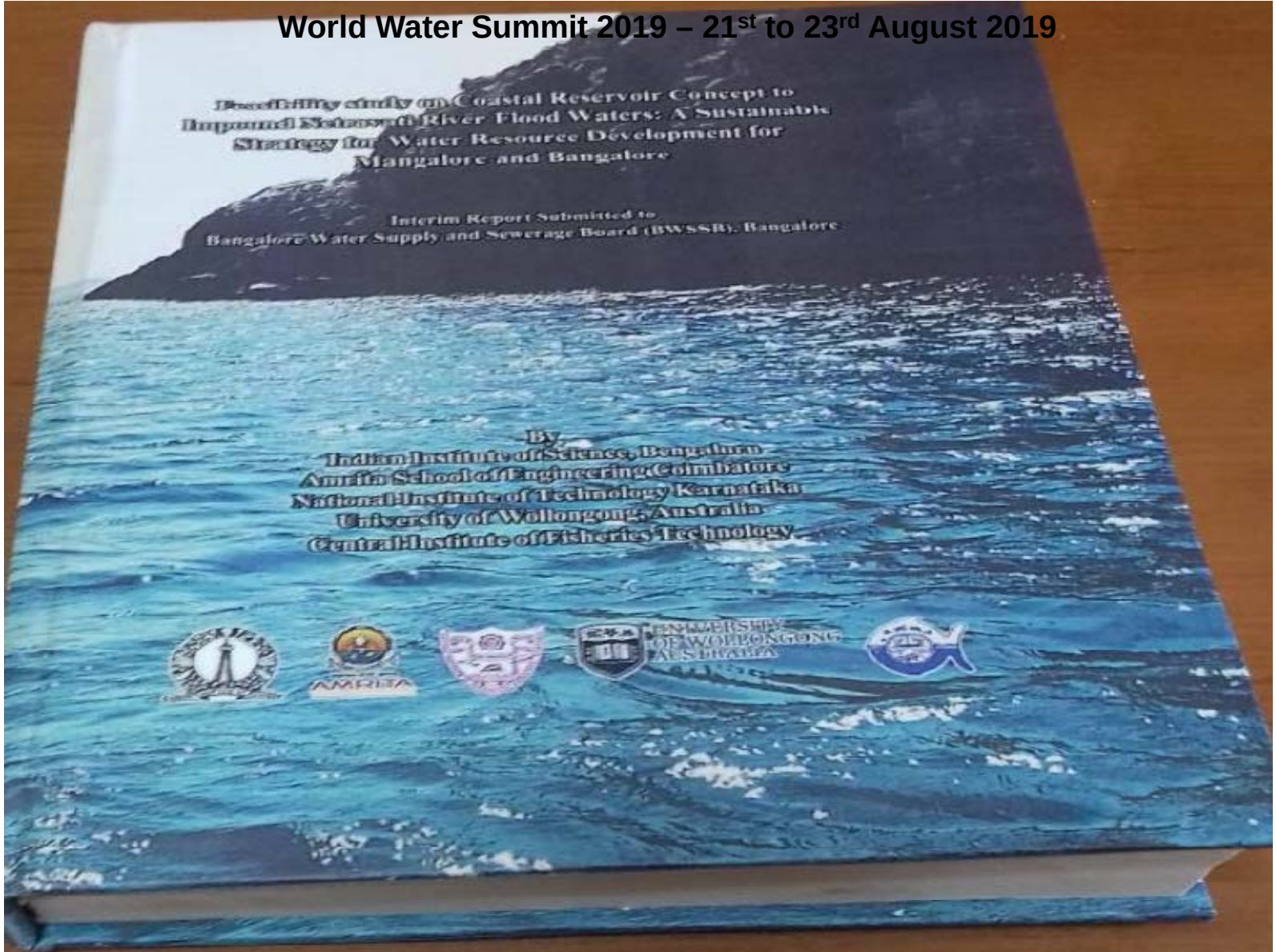
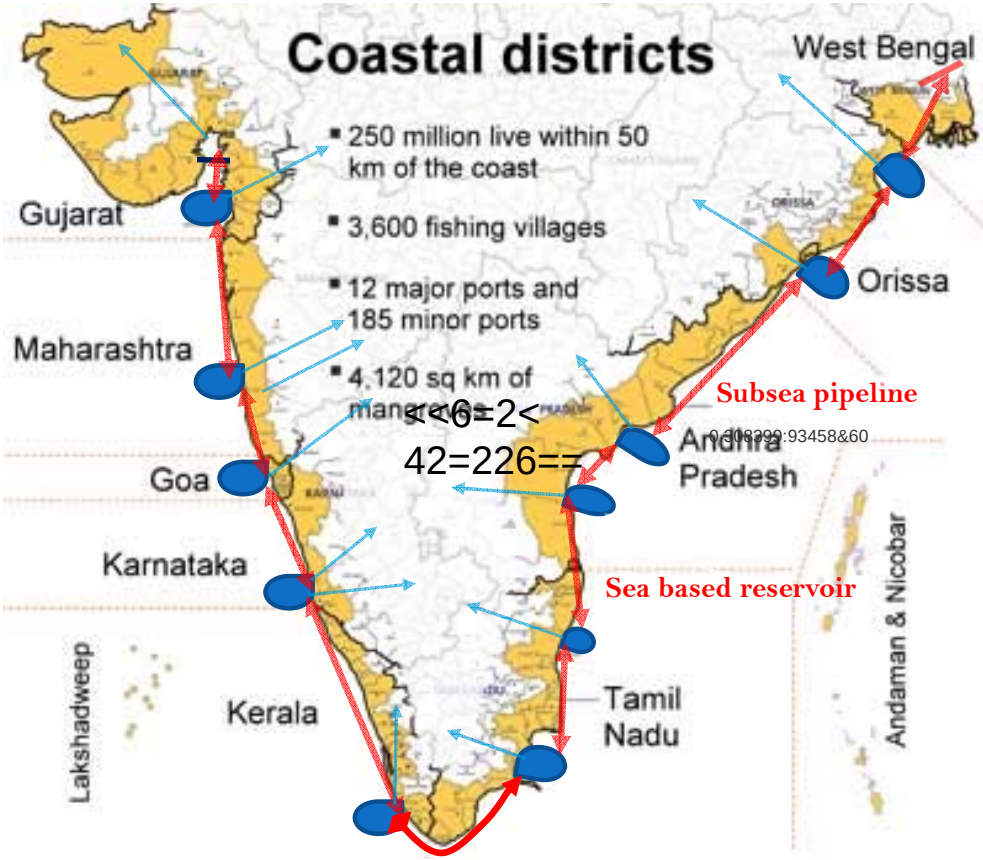


SAROVAR MALA



- coastal reservoirs – 1110 BCM connected through sub **surface** pipeline in ocean – Perennial water source by connecting to Ganga / Hooghly river

- Reservoirs along with solar power generating stations to generate enough power to pump the treated fresh flood waters to interior dams and ponds / tanks

- 4500 kms of pipeline connecting 12 Reservoirs

- Size of reservoirs – can be small also if we can use the kere's and existing dams to store water in peninsular India
- Water will be available throughout as Ganga basin is being connected to southern grid

Indian patent No: TEMP/E-1/44294/2016-CHE – Smart water network to store river flood water in sea based reservoirs and a method of Interlinking these reservoirs (Sarovar Mala)

River basins Considered

- Godavari
- Mandovi
- Nethravathi
- Mahanadhi
- Ponniyar
- Tapi
- Vaippar
- Kallada


Possible coastal reservoirs
PERLIS
Kangar
LANGKAWI
Alor Setar
KEDAH
THAILAND
Kota Bharu
MALAYSIA
George Town
PENANG
KELANTAN
Kuala Terengganu
PERAK
TERENGGANU
Ipoh
SOUTH CHINA SEA
Cameron Highlands
PAHANG
Kuantan
SELANGOR
Kuala Lumpur
NEGERI SEMBILAN
Tioman
MELAKA
JOHOR
SINGAPORE
N

Australia's water crisis

THE AUSTRALIAN

Editorial: Drought shows political failure

14 Oct 06

The states are to blame for water problems, not nature

Water crisis limits growth

Population cap cal as part of long-term planning for south-east Queensland

6 PRIMESPACE

RURAL

Gearing up for a war over water

THE AUSTRALIAN

When all the rivers run dry

We are facing the death of our greatest river system, write **Selina Mitchell** and **Asa Wahlquist**

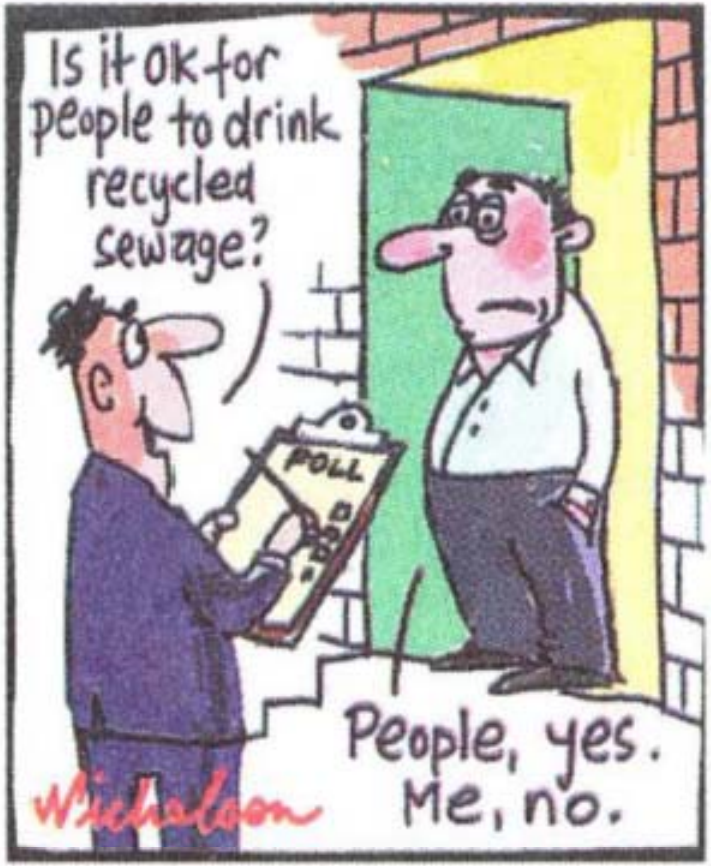
14 Oct 06

How to do without dams?

NEWSPOLL

Drink recycled sewage

Percentage support	
Yes	69
No	29



What will be the future reality?

Summary and Conclusion

1. IACRR recognises that world is not running out of water, but water is running out of our river mouths

2. Water dominates every policy and other Sustainable Development Goals.

3. Coastal Reservoirs provide a solution to water-food-energy nexus

4. Water can quench disputation to promote peace and harmony life

5. Welcome to Join IACRR and make your contribution to the world

1st IACRR World Congress in October 2020

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Thank You