“Water for the Future”

Challenges for India and its Industry

31st August 2012

Disclaimer

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The White Paper is intended to set the tone of discussions at this conference. It contains forward-looking statements, particularly those concerning global economic growth, population growth, energy consumption, policy support for water supply. Forward-looking statements involve risks and uncertainties because they relate to events, and depend on circumstances, that will or may occur in the future. Actual results may differ depending on a variety of factors, including product supply, demand and pricing; political stability; general economic conditions; legal and regulatory developments; availability of new technologies; natural disasters and adverse weather conditions and hence should not be construed to be facts.

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August 2012

Industries Shut Down Due to Water Shortage!

Wed, 29 Aug 2012 10:50:42 GMT | By Business Line

Water shortage leaves industry parched

Chennai: A slowing economy and a crippling power crisis have given industry sleepless nights. Adding to its woes is the poor south-west monsoon, which threatens to leave water-intensive manufacturing units high and dry.

Companies that have invested on rain water harvesting and other water saving systems are managing to tide over the shortfall. But, production at a few manufacturing facilities has been hampered.

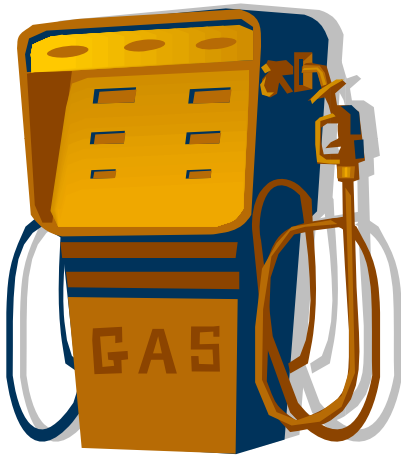
For instance, **Southern Petrochemicals Industries Corporation (SPIC**) has completely stopped production at its **Tuticorin** plant, in southern Tamil Nadu, as there is no water supply. The company said production has been suspended due to reasons beyond its control and that "production would resume once the water supply is restored."

Last month, **Grasim Industries** suspended production at its staple fibre plant in **Nagda** (Madhya Pradesh); also, output at its chlor-alkali plant was reduced by half. However, with the delayed onset of the monsoon, work at these plants resumed gradually.

Alkyl Amines Chemicals too faced production constraints with the Maharashtra Industrial Development Corporation restricting water supply to various industrial units in **Kurkumbh**. Water availability has improved at Kurkumbh, and the company's operations have been normalised. But industrial units in the area may still not be out of the woods.

Drinking Water
` 100/ltr

Petrol
` 100/ltr



This may be the reality soon if we do not act now!

How much water is consumed for ……..

One cup of Tea?  35 liters !

One cup of Coffee?  140 liters !

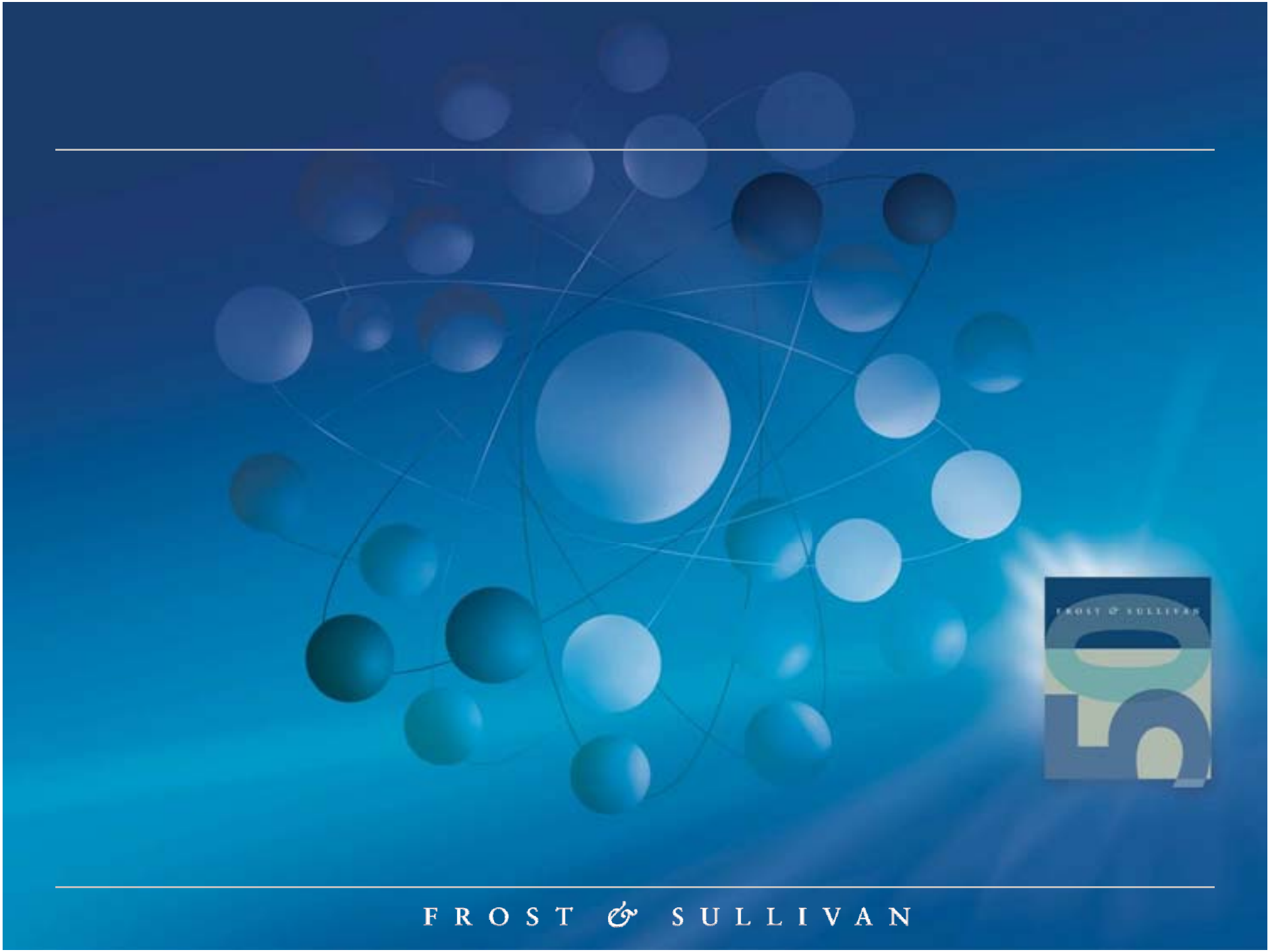
One egg?  135 liters !

One glass of milk?  1000 liters !

Source: Best Water Technology Company Website

Strange but true

Global Water Scenario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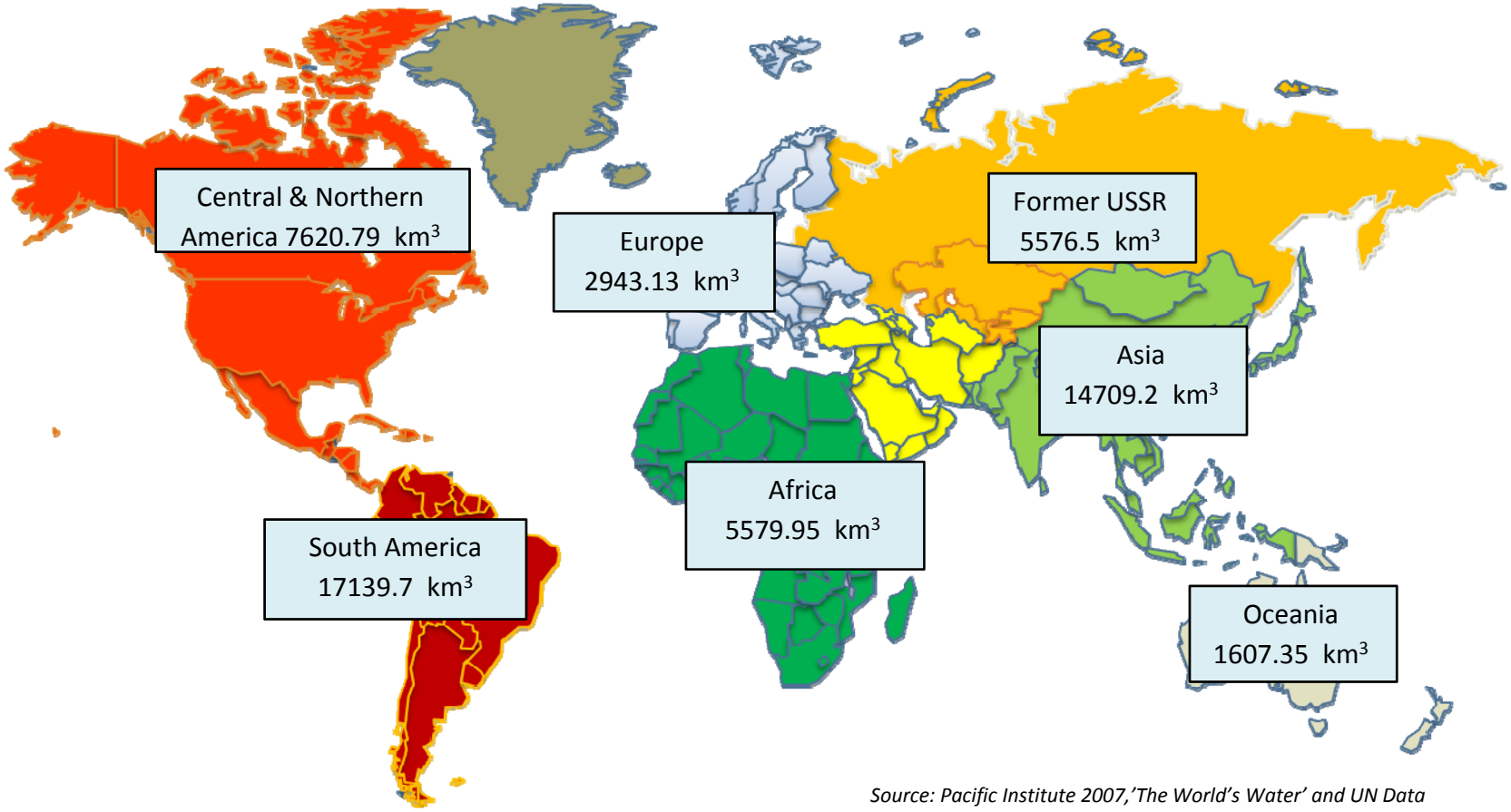
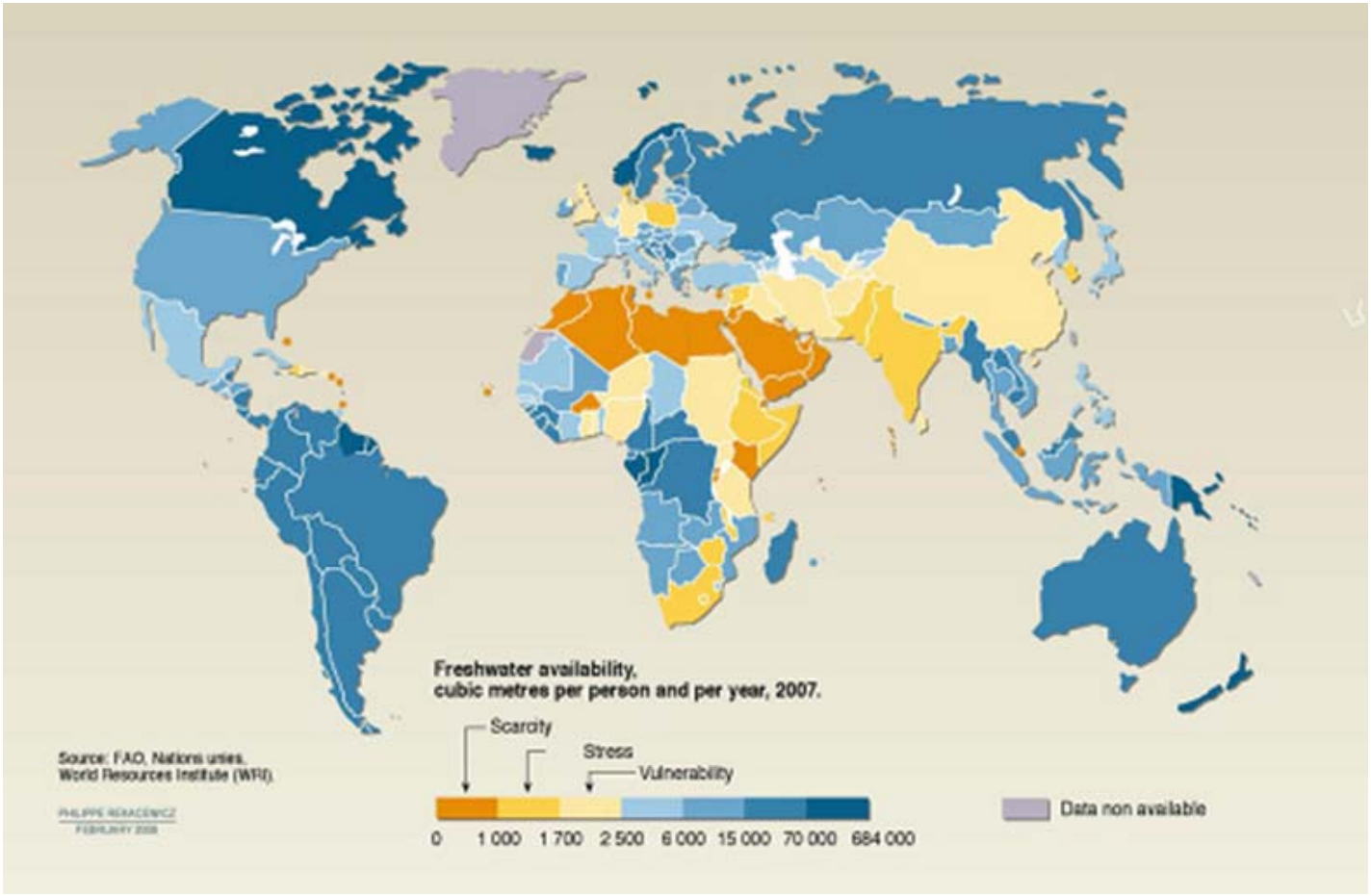
World's Fresh Water Footprint



Source: Pacific Institute 2007,'The World's Water' and UN Data

- South America has the largest quantity of fresh water availability followed by Asia
- But Asia's population is 7.56 times , that of South America

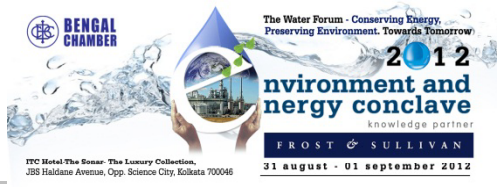
Fresh Water Availability

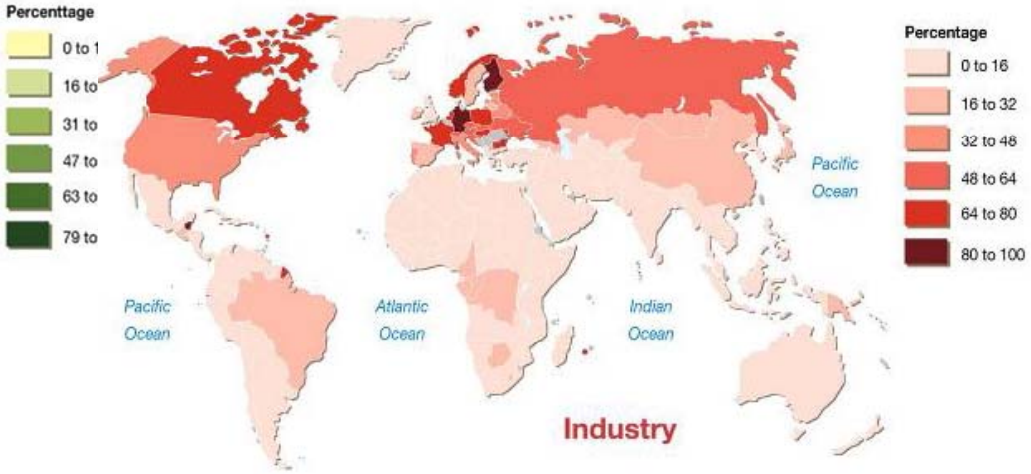


- Water Stress : Per capita water consumption less than 1500 M^3
- Indian is a water stressed country, to see water scarcity in 20 years from now

Source : United Nations Environment Protection Program 2008

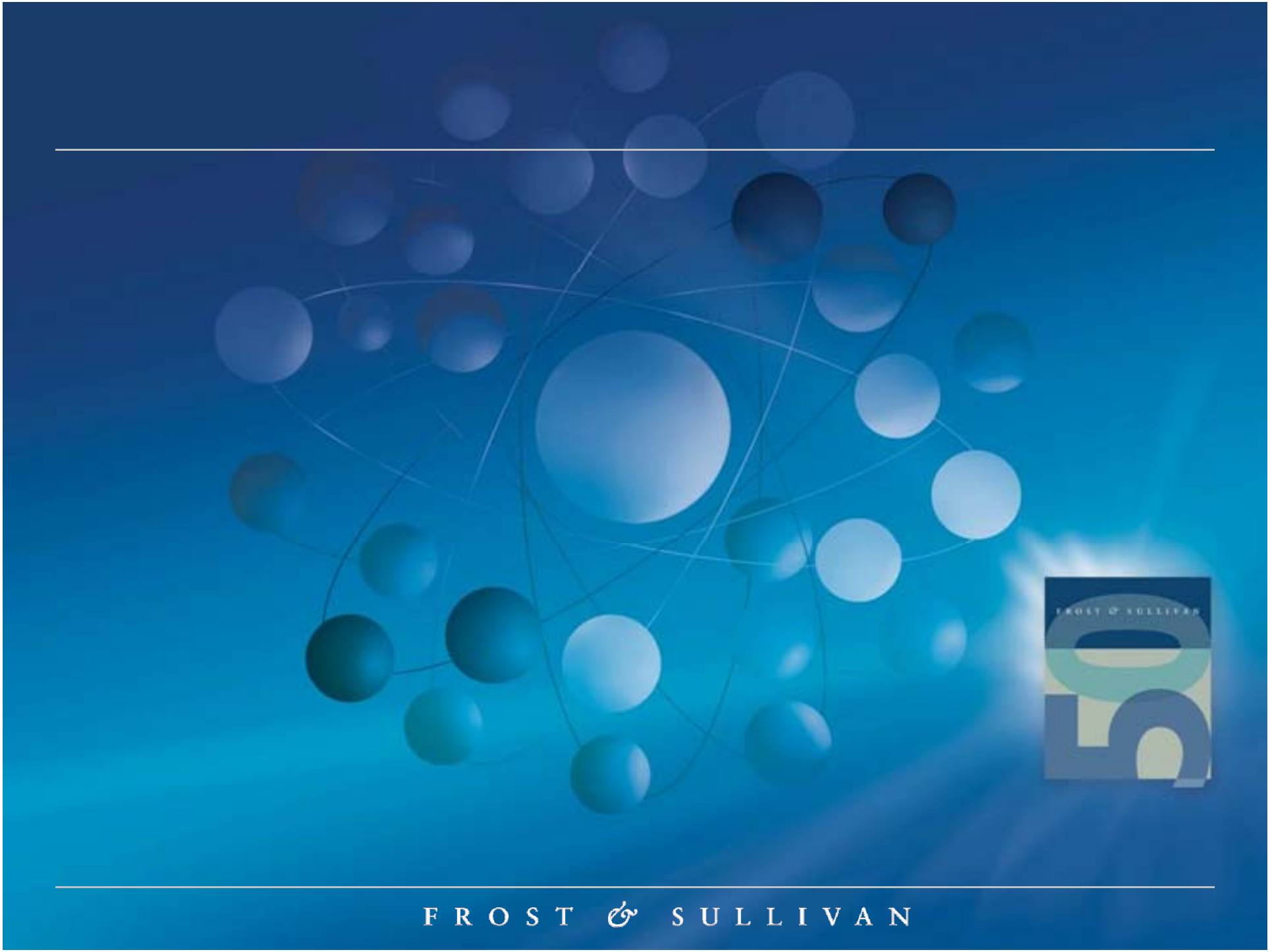
Sectorial Water Use





- Developing countries use more water for agriculture
- Developed nations use more water for industrial and Domestic use
- India's share of water use for agriculture is the highest in the world!
  - 90% as against 70% world average

Source*: World Resources, 2000-2001, People and Ecosystems; "The Fraying Web of life";* World Resource Institute, Washington DC 2000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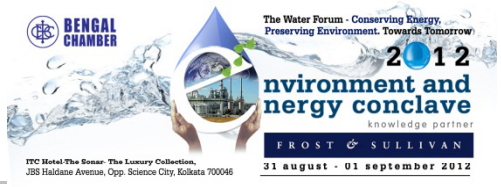
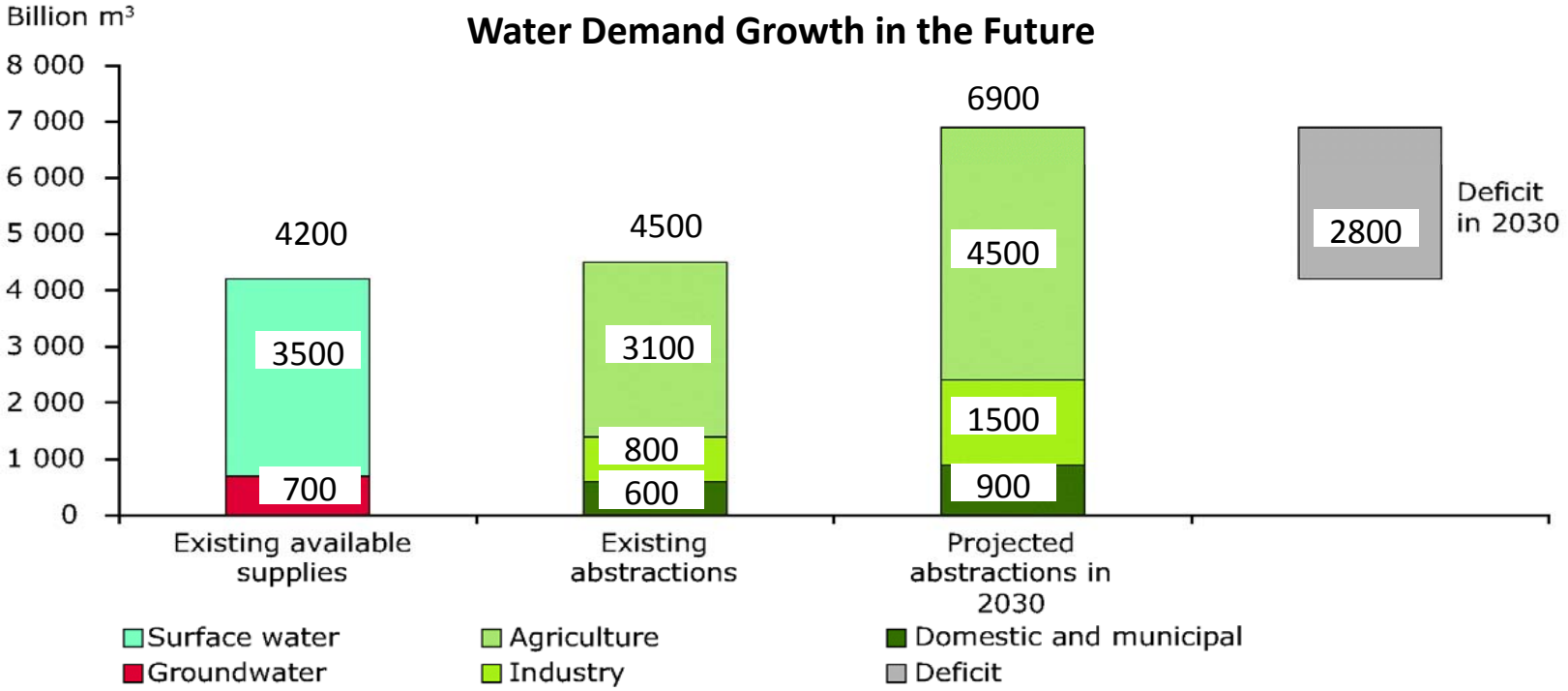
Future Global Water Demand

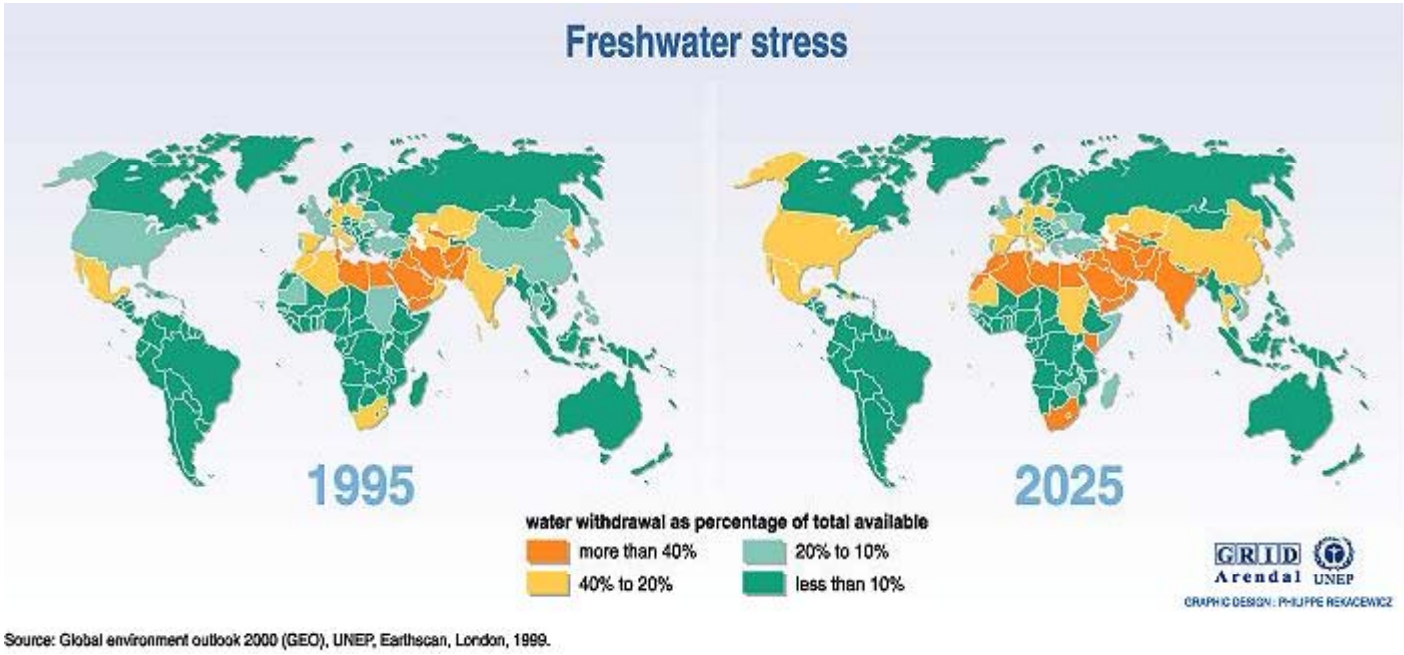




- Considering 1.2% and 3.2% population and economic growth in the future,
  - Water demand is estimated to increase from present 4300 km^3 to 6900 km^3 by 2030-32
  - This will create a supply deficit of 2080 km^3 of water
- Agricultural demand will increase to 4500 km^3 from 3100 km^3 today
- Industrial demand will increase to 1500 km^3 from 800 km^3 today
- Domestic demand will be 900 km^3 from 600 km^3 today
- Unless action is taken now, situation in many parts of the world will be serious

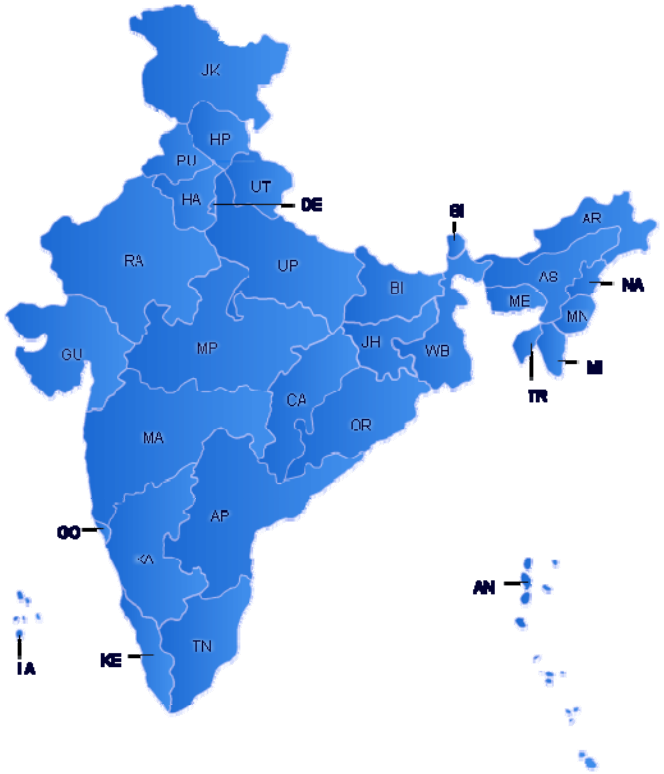
Source: 2030 Water Resource Group

Fresh Water Use by Countries



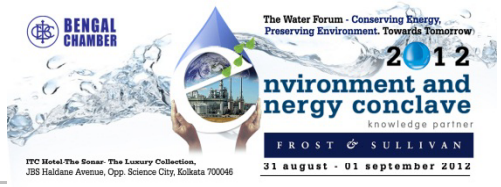
Source: Global environment outlook 2000 (GEO), UNEP, Earthscan, London, 1999.

- To meet the ever increasing demand, countries will be increasing their withdrawal of water from fresh water, thus depleting the resources faster
- India will increase its withdrawal from 30% in 1995 to more than 50% by 2025
- This will lead to scarcity in supply in the future



Indian Water Scenario

Resources

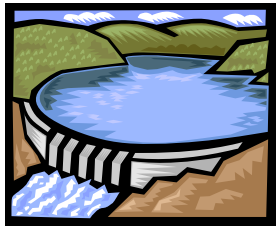


- Each year, rains bring in 4500 km^3 of water in India
- Of this,
  - 250 km^3 gets stored in Dams & Reservoirs
  - 440 km^3 of water flows in to river and is available as surface water
  - 432 km^3 gets stored in aquifers
  - Rest flows in to seas & oceans
- Giving total fresh water availability of 1122 km^3 a year

Natural runoff (Surface water and ground water from the river basins of India)	1869 km^3/year
Estimated utilizable surface water potential	690 km^3/year
Ground water resources	432 km^3/year
Available ground water resource for irrigation	361 km^3/year
Net utilizable ground water resource for irrigation	325 km^3/year

4500 km^3 /year

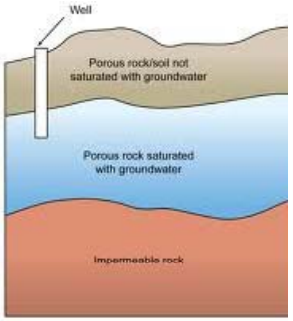
250 km^3



440 km^3

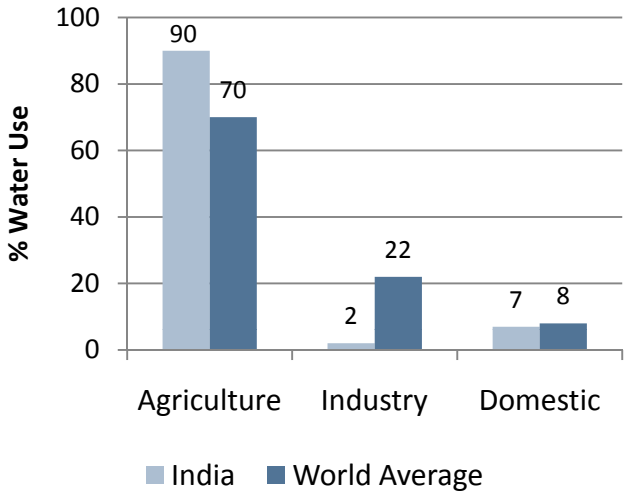
3378 km^3

432 km^3



Source: Central Water Commission of India and IIT Kharagpur

Water Use by Sectors



- India uses maximum amount of water for agriculture in the world
  - 35% higher than the world average
- Where as in the industrial sector, India's consumption is marginal as compared to the global

How efficiently do we use our water?

Sectors	Billion M^3/year
Agricultural water withdrawal	688
Industrial water withdrawal	17
Municipal water withdrawal	56
Total water withdrawal	761

Parameters	China	India	Brazil	Russia	USA	Germany
Total water withdrawal per capita (M^3/inhab/yr)	409.9	**621.4**	330.8	454.9	1583	391.4
Municipal water withdrawal per capita (total population) (M^3/inhab/yr)	50.0	**45.7**	67.0	92.1	216.5	62.2
Water used per Agricultural Produce in 100 M^3/US$	4.86	**22.68**	2.19	1.70	10.62	0.03
Water used per Industrial Produce in 100 M^3/US$	0.38	**0.39**	0.15	0.58	6.61	0.27

Source : Central Water Commission of India, Food & Agriculture Organization of UN and Frost & Sullivan Analysis

Note: Industrial Water includes water for power generation

Agricultural Sector

- India uses about 688 M^3 of water for agriculture every year
  - That's the second highest in the world!
- Rice, Wheat and Sugarcane constitute 91% of crop production in India
  - While for Sugarcane India uses less water than global average
  - For Wheat and Rice, water use is higher than global average
- Lack of use of modern irrigation techniques is resulting in loss of water in this sector

Inefficiency & Over Use!

Adopt modern irrigation methods

Water Footprint in M^3/MT^1		
Crops	India	Global
Wheat	1654	1334
Rice	2850	2291
Sugarcane	159	175

Virtual Water Use for Crops in $M^3/Tonne^2$			
Crops	India	U.S.	China
Rice	4254	1903	1972
Wheat	1654	849	690
Corn	1937	489	801
Soya beans	4124	1869	2617
Sugarcane	159	103	117
Cottonseed	8264	2535	1419
Roast coffee	14500	5790	7488

Source : [1]Grail Research, [2]Food & Agriculture Organization and Lenntech B.V. 2008

Industrial Sector

- Indian industries use 15 M^3 of water every year to give industrial output of US $ 113.041 Billion
  - This is one of the lowest water industrial productivity of water in the world
- Power generation consumes 2 M^3 of water every year to generate 855 Billion Units of power
- It is estimated that industrial water consumption in India will increase from 17 M^3 to 68 M^3 in order to keep pace with economic growth of 7% per annum
- India's water use efficiency being low in industry it is heavily dependent on water supply
- Many of the industries use their own ground water
  - The actual water consumption figures may be much higher

Country	Industrial water use (billion M^3)	Industrial productivity (million US $)	Industrial water productivity (US $ / cubic metre)
Argentina	2.6	77171.0	30.0
Brazil	9.9	231442.0	23.4
India	15.0	113041.0	7.5
Korea, Rep.	2.6	249268.0	95.6
Norway	1.4	47599.0	35.0
Sweden	0.8	74703.0	92.2
Thailand	1.3	64800.0	48.9
United Kingdom	0.7	330097.0	443.7

Source: World Bank, 2001

Industrial Sector	Annual consumption (million cubic meters)	Proportion of water consumed in industry
Thermal power plants	35157.4	87.87
Engineering (Mainly Automobiles)	2019.9	5.05
Pulp and paper	905.8	2.26
Textiles	829.8	2.07
Steel	516.6	1.29
Sugar	194.9	0.49
Fertiliser	73.5	0.18
Others	314.2	0.78

Note: For methodology see www.downtoearth.org.in
Source: Estimated by CSE based on the wastewater discharged data published by CPCB in "Water quality in India (Status and trends) 1990 - 2001".

Low Water Productivity in the Industrial Sector

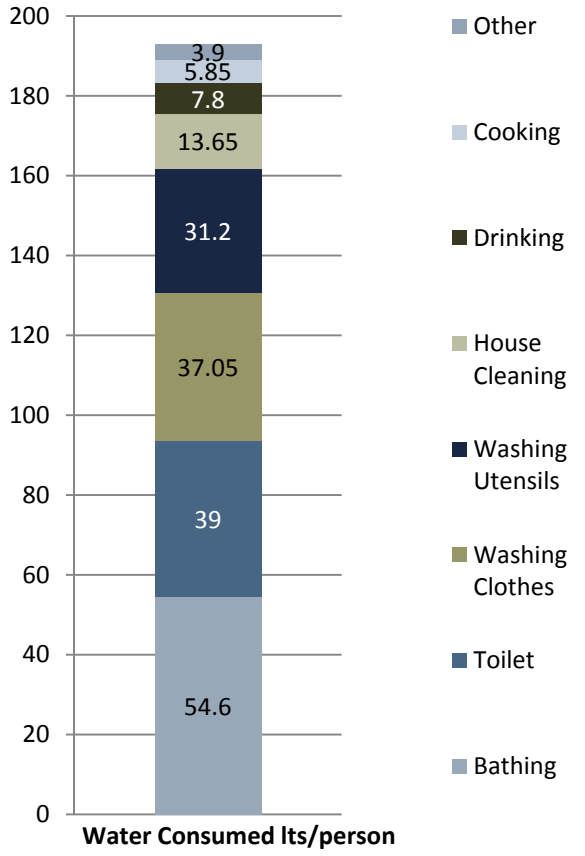
Domestic Sector

- The Domestic Sector consumes 56 M^3 of water every year
  - Of this majority is consumed by the Urban Sector
- This demand is estimated to increase by 4 folds in the next 20 years due to greater urbanization of Indian population
- About 500 Million urban Indians consume 135 – 196 liters of water per day per person
- 24 x 7 water supply is limited to just 15 – 20% of the urban population
- Domestic Water Supply is mostly not metered and a lump sum charge is levied
- With rural Indians, the consumption varies widely from just sustenance to less than 80 liters per day per person

Lack of proper distribution main bane of the Urban population
Inequitable supply of water between Urban and Rural Indians

Source: Food and Agriculture Organization Statistics - Aqaustat

Water Consumed by Average Urban Indian

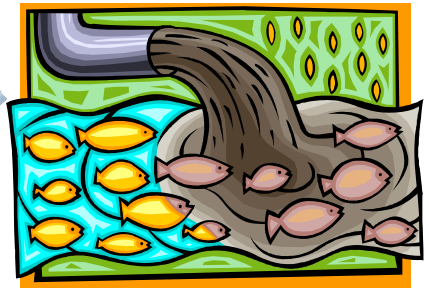


Source: Frost & Sullivan Research

Waste Water Generation and its Use

- India generates 18 Billion M^3 of waste water every year
- Not all waste water from Domestic and Industry is treated
- Only 30% & 7% of sewage from Tier I & II cities is treated
- Rest is discharged untreated in to rivers and fields
- Untreated water is contaminating surface and ground water resources
- Treatment and Recycle will
  - Save precious natural resources from pollution
  - Generate additional 32 Billion M^3 water for reuse annually both for industry and domestic sectors

13.8 Billion M^3



18 Billion M^3 a year

4.2 Billion M^3

Waste Water Recycle and Reuse can be new water resource and help reduce water stress

Source: Central Pollution Control Board and Frost & Sullivan Research and Analysis

Challenges for the Future

Increased Water Demand for food production

- Water demand for food is expected to increase by 2% every year

Challenge : Meet the increased demand from existing resources

Agriculture

Increased Water Demand for industrial growth

- More water for Power Generation
- Higher effluent generation from industries including power generation

Challenges :

1. Effluent Recycle and sludge disposal
2. Adoption of Modern Technologies
3. Increase Water Productivity

Industry

Domestic

Increased Water Demand from Urbanization

- Higher Sewage Generation

Challenges :

1. New sources for Water Supply
2. Water Pricing & Metering
3. Prevention of wastages
4. Sewage Treatment

Recommendations

- **Price electricity for irrigation water**
  - Should be priced based on economic status of the farmers
  - Based on actual consumption of water and therefore electricity
  - Will prevent misuse of water from the agricultural water supply
- **Form the Water Regulatory Body at the earliest**
  - To form policy on Equitable Water Distribution
  - Water Pricing Policy framework to be finalized before the next budget
- **Water Use Efficiency Body to be formed**
  - On the lines of Bureau of Energy Efficiency, form an Water Efficiency Board
  - To give star ratings for:
    - Equipment using water like washing machines, sprinklers, toilets, swimming pools
    - Power generating plants and other process industries using water
    - Residential, Retail, Hospitality complexes
    - Organized farming activity
    - Government to give tax benefits to the users / owners
- **Fair Water Pricing for all Domestic and Industrial Sectors**
  - Based on usage patterns
    - Economic users – those who consume less than the average should pay the lowest
    - Average users – those who consume same as an average user , normal price
    - High users – those who consume above average, premium price

Recommendations

- **Increase the pace for Water Utility Privatization**
  - Beginning has been made, but the progress is slow
  - All Tier I and Tier II cities yet to privatize their water supply
  - Will bring in discipline in usage and efficiency in distribution
  - Decrease water consumption
- **Adopt Modern Technologies in the industries and municipality sector**
  - Sewage and Effluent Treatment Plants
    - MBBR – Moving Bed Bio Reactor
    - MBR – Membrane Bio Reactor
    - SBR – Sequencing Batch Reactor
    - ZLD – Zero Liquid Discharge Plants
    - HRMC – High Rate Media Assisted Clarifiers
  - Integrated Power and Water Plants for Industry and Municipalities
    - Help generate portable water from seawater at a lower cost
- **Rain Water Harvesting to be implemented / made effective in all residential complexes and industrial clusters**
  - Presently, though made compulsory, not a reality
  - Will help reduce the pressure on Municipalities for water supply
- **Sewage and Effluent Recycle must be made compulsory**
  - Compulsory for all Power Plants in the country, new as well as old
  - Financial assistance to be provided for adopting new technologies

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