Save water for the future generations.

Department of Water Resources

Major and Medium Irrigation

Prof. Aravind Galagali, Director, KBJNL

"One who solves the problem of water is worth two Nobel Prizes, one for Peace and another for Science."

-John F. Kennedy

Department of Water Resources

Major and Medium Irrigation

2030 **Water** Resources Group

Join hands to conserve water

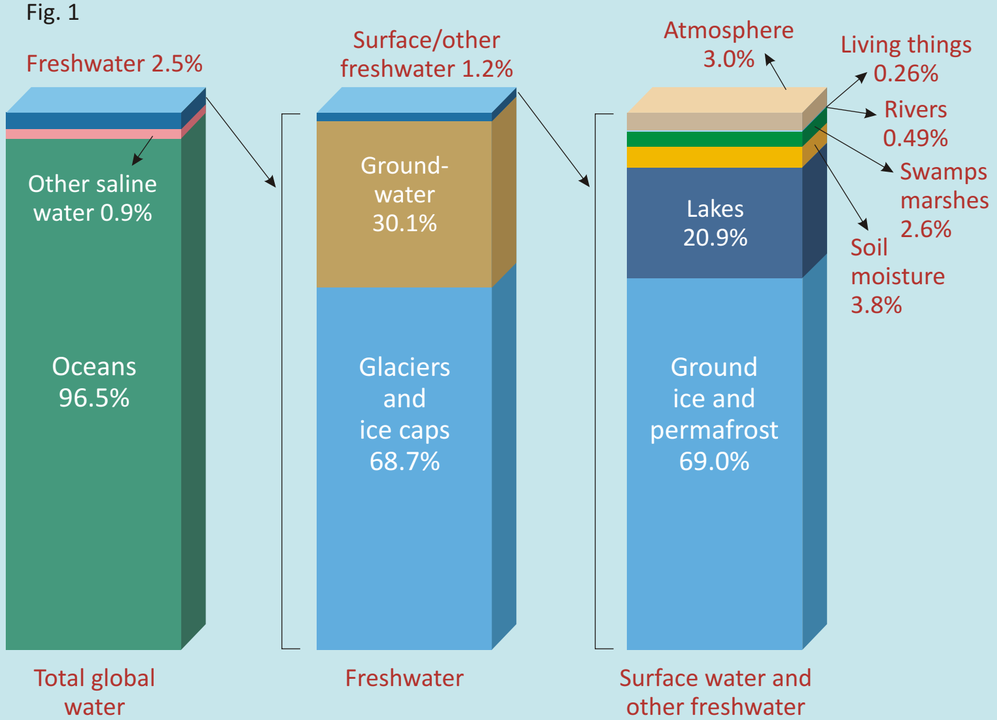
An appeal to corporate sector

"There will be constant competition over water, between farming families and urban dwellers, environmental conservationists and industrialists, minorities living off natural resources and entrepreneurs seeking to commodify the resources base for commercial gain"

-UNICEF report on Indian water.[1]

Where is Earth's Water?

Fig. 1



Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, Water in Crisis: A Guide to the Worlds Fresh Water Resources.
Note: Numbers are rounded, so percent summations may not add to 100.

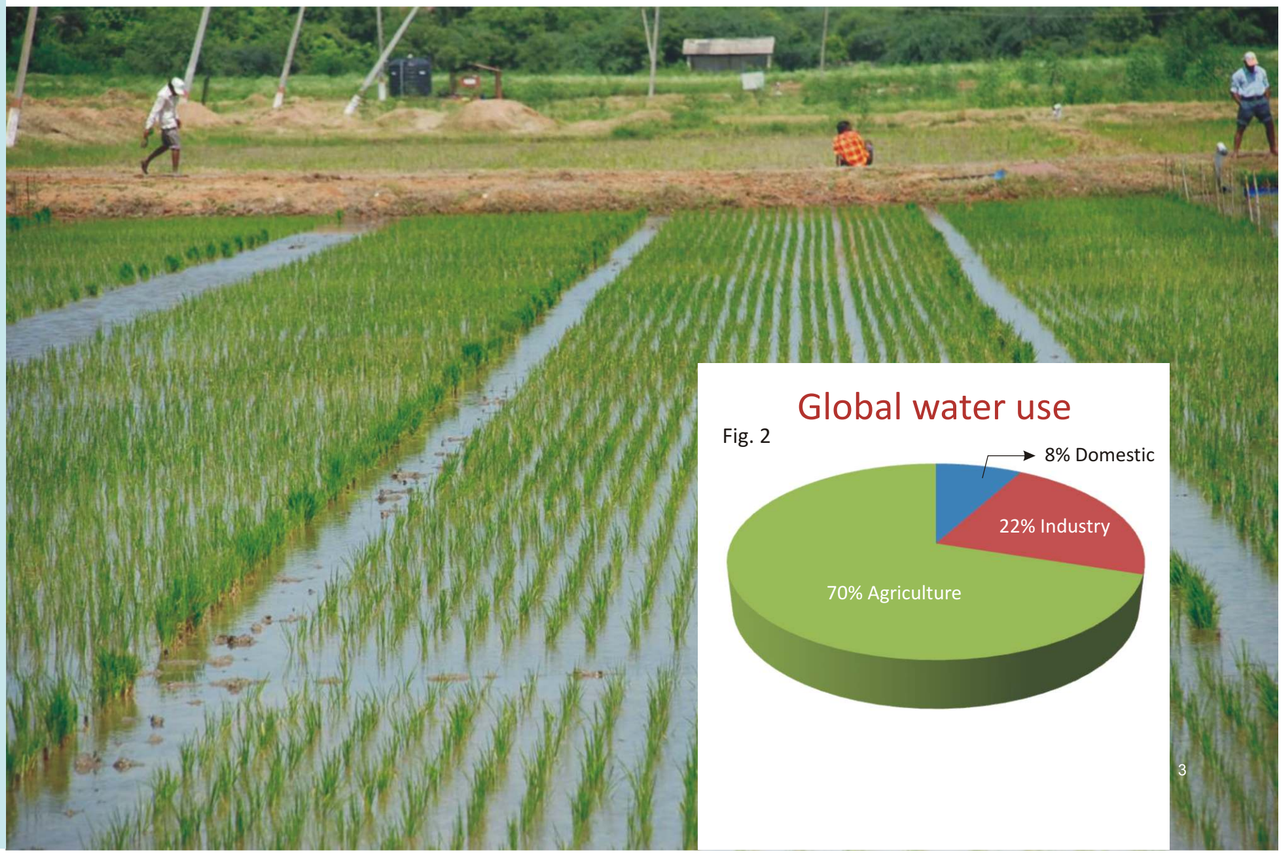
Fresh Water - Natural, Precious and Scarce

Fresh water* is the world's most natural, precious, and scarce resource. It constitutes less than 3 percent of the world's water. Of this, only 33 percent is accessible; the remaining 67 percent is tied up in icebergs, glaciers, and snowcaps (figure 1).

Worldwide, water use is growing twice as fast as the human population, increasing the gap between supply and demand. According to 2030 Water Resources Group (2030WRG), an innovative and neutral public-private-civil society partnership, by 2030 global freshwater demand is set to be 40 percent above existing, reliable, and sustainable supplies of freshwater.

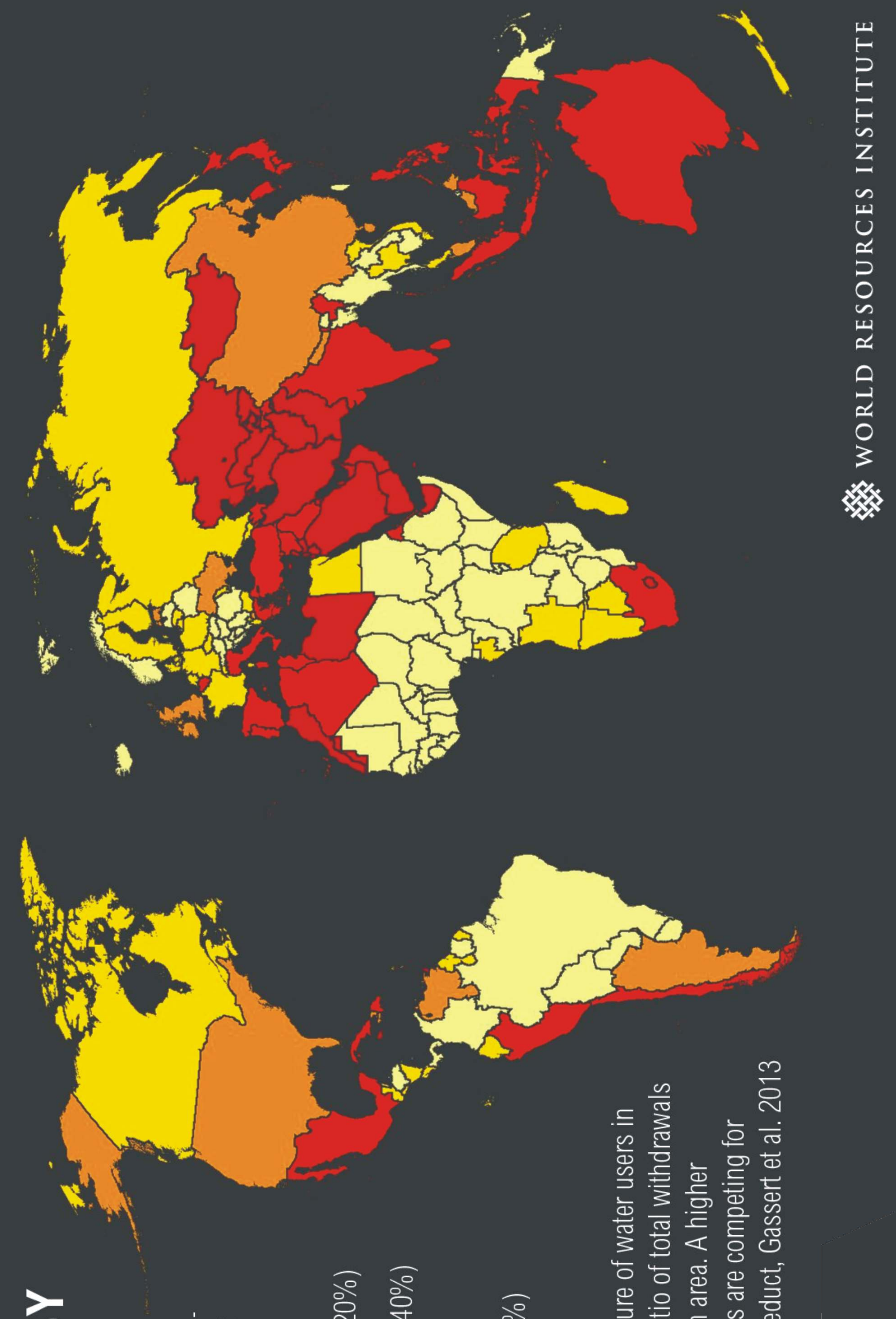
Severe water scarcity will lead to life threatening consequences; water-borne diseases, low agricultural and industrial productivity and drinking water shortages.

*Only fresh water is fit for human consumption. Salt water needs to be desalinated before consumption. Also, desalination is an expensive process.



Global water use

Fig. 2



WATER STRESS BY COUNTRY

ratio of withdrawals to supply

- Low stress (< 10%)
- Low to medium stress (10-20%)
- Medium to high stress (20-40%)
- High stress (40-80%)
- Extremely high stress (> 80%)

This map shows the average exposure of water users in each country to water stress, the ratio of total withdrawals to total renewable supply in a given area. A higher percentage means more water users are competing for limited supplies. Source: WRI Aqueduct, Gassert et al. 2013

The Water Scarcity Challenge

Water is humanity's most vital resource, yet its supply is taken for granted. We turn on the water tap, even when not needed. We use a hose to clean a car when a bucket of water will do. We use the shower longer than necessary. In agriculture, flood irrigation is an example of rampant wastage.

Municipalities and farmers dig bore wells deeper than ever before. As a result, groundwater tables experience precipitous declines.

Any country which draws between 40 and 80 percent of available water is classified as a high water-stress country. Those drawing more than 80 percent are bracketed as 'extremely high water-stress' countries. During droughts, we draw more water than the rate of recharge from our aquifers, reservoirs and the ground. As a result, our underground water tables are being depleted much too fast and aquifers are drying up.

Climate Change – Compounding the Water Equation

In a growing democracy like India, the strain of population growth, industrialization and urbanization is making the resources scarce.

The fragile connection between water, food, energy and land exacerbates the water problem, made worse in the context of climate change. **The water-energy co-dependency necessitates ever-increasing demand of water for power generation and in turn, higher energy requirements for water.** On the other hand, food security is inextricably linked to water security, given water's criticality as an input for agriculture. Land availability complicates the dynamics. There is competition for limited land resources for agricultural production, manufacturing, power generation, urban settlements and natural habitats. Moreover, economic prosperity is increasing per-capita calorie consumption, shifting dietary patterns towards more energy and water-intensive foods, further increasing per-capita withdrawals.

Climate change leads to increased uncertainty in water resource availability at local levels, which manifests in the form of adverse impacts to crop productivity, rural livelihoods, and ecosystems. Environmentally, socially, and economically sustainable solutions are needed to tackle the ever-changing climate equation in India.

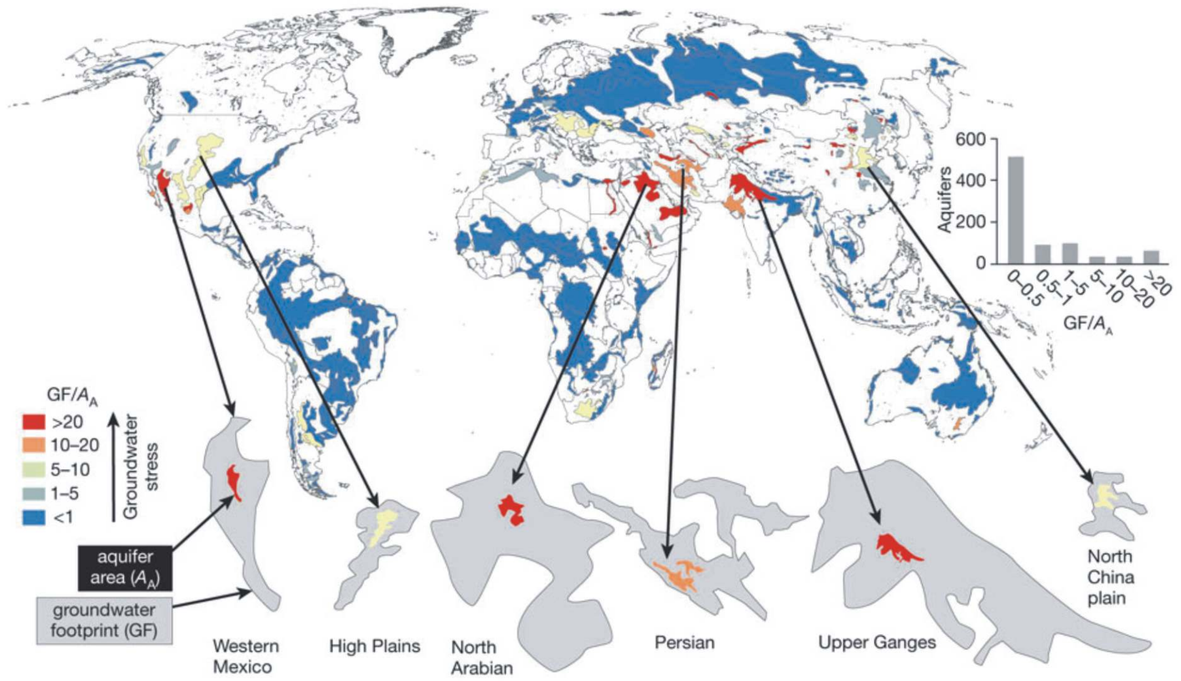


Fig. 3

The Nature study, published by researchers at McGill and Utrecht University in the Netherlands, offers a map showing the regions where the use of water from these aquifers vastly exceeds the rate at which they're being refilled by rain.

Are we drying up our groundwater sources?

India with 39 million ha equipped with groundwater irrigation, stands first among the countries with largest groundwater irrigated areas, followed by China with 19 million ha and USA with 17 million ha. In India, groundwater use in irrigation is increasing, both in absolute terms and as a percentage of total irrigation. Uncontrolled groundwater extraction exceeds recharge capacity. In the process, both agriculture and ecosystems are under threat.

The size of the global groundwater footprint is estimated at about 3.5 times the actual area of aquifers. About 1.7 billion people rely on aquifers that are rapidly being depleted, placing ecosystems under threat. Major food producing regions of the world are dependent on freshwater from huge groundwater aquifers that were built up over thousands of years. These aquifers are now being sucked dry by irrigation and other uses faster than they are replenished by rainwater.

The imbalance in India is astounding. For example, the underground reservoir of the Upper Ganges in northern India needs 54 times as much rain as it receives to refill the water used by farmers and the local population (gray “footprint” shown at the bottom of figure 3).

Urban Areas - Rising thirst for water

According to a UN report, 200,000 people move into cities every day. Every second, the world's urban population grows by two. 91 percent of this migration happens in developing countries. Today, half of the world's population (3.5 billion)lives in cities. Of this, 827 million live in slums, which often lack adequate water and sanitation services.

The demand for water in cities is rising. Cities in Asia already face problems related to water scarcity. An estimated 70 percent of the world's population will live in urban areas by 2050 and the demand for water will increase five-fold, according to a Citigroup study.

India has 4 percent of the world's water resources, (figure. 4), but supports 16 percent of its population and 15 percent of its livestock. India's rapidly growing population, which is expected to reach 1.6 billion by 2050, is putting pressure on its limited water resources.

The demand for drinking water in India is divided between urban and rural populations in the ratio of 4:6. People in cities consume more potable water due to the intensive use of amenities such as flush toilets and washing machines. The urban population, which constitutes 30 percent of the total population, is expected to grow to 50 percent of the total population by 2025. With governments being unable to adequately meet the need for potable water, people in cities are increasingly turning to groundwater, steadily depleting underground aquifers. Compared to the urban population, people in rural areas require less water for their day-to-day living.

Bangalore's gross water demand, which was 1,556 MLD in 2010, is expected to rise to 1,775 MLD in 2016 and 1,986 MLD in 2020. While Bangalore's supply, with the completion of Cauvery Stage 4, Phase 2, went up from 900MLD to 1,400 MLD, it is inadequate to meet even the current demand and the future looks anything but certain.

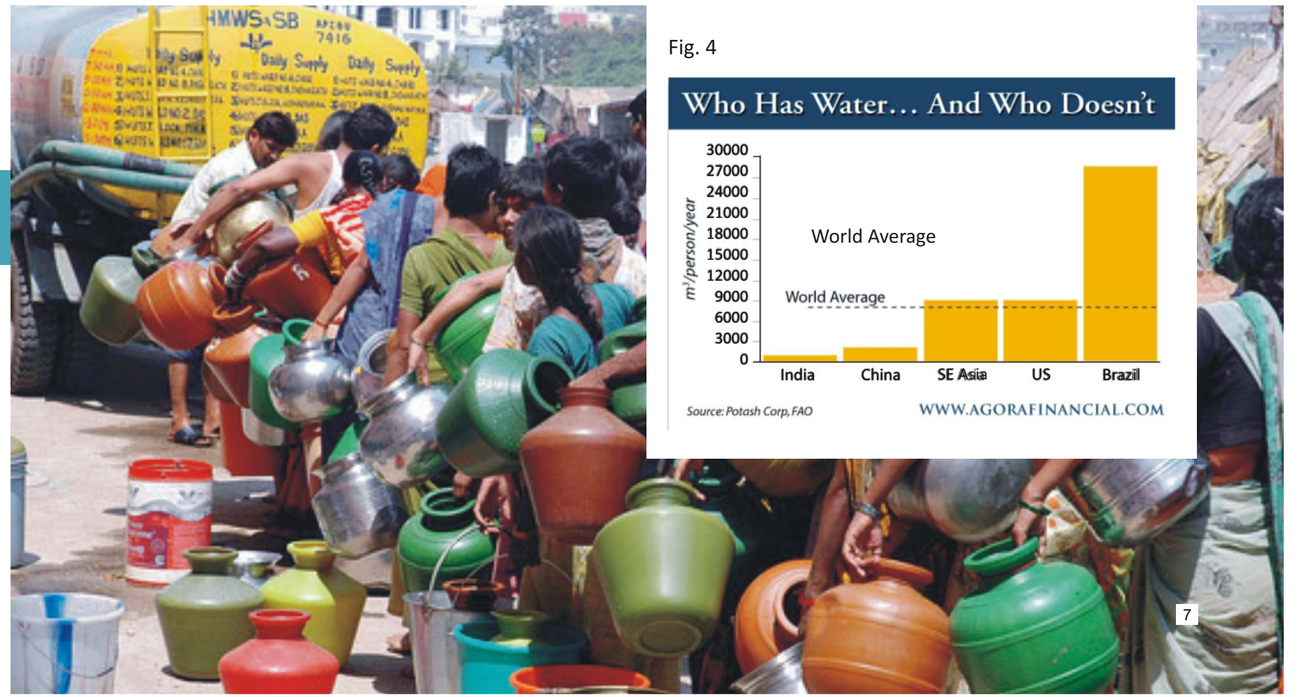
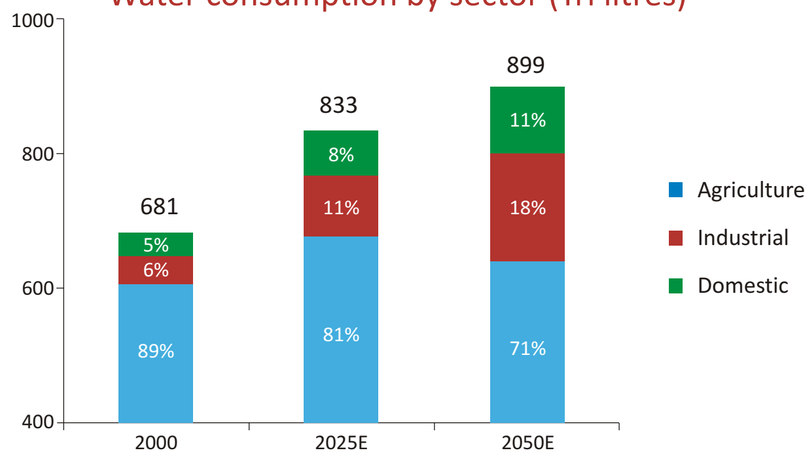


Fig. 4

Fig. 5



Source: Water: The India Story. Grail Research, March 2009. Available online : http://www.grailresearch.com/pdf/ContenPodsPdf/Water-The_India_Story.pdf

Rising water consumption in industries

According to the Ministry of Water Resources, the industrial sector accounted for about 6 percent of total freshwater abstraction at the beginning of this century, while the Central Pollution Control Board (CPCB) pegs the figure at 8 percent.

According to World Bank estimates, current industrial water use in India is about 13 percent of total freshwater withdrawal. Grail Research(The India Story, March 2009) calculates that the demand for industrial use will constitute 11 percent or 91.63 trillion liters in 2025 and 18 percent or 161.82 trillion liters in 2050 (figure 5).

Industries consume water and also pollute it. According to the World Development Report (WDR) of 2003, 70 per cent of industrial waste in developing countries is dumped without treatment, thus polluting the usable water supply.

Future industrial water demand will inevitably put pressure on available freshwater resources, both due to water consumption and water pollution. To add to this, India scores poorly in terms of industrial water productivity, which at $3.42/cubic meter is among the lowest in the world.

Industries/Corporates have a responsibility in sustainable water use

The growth of industries and the corporate sector is steadily increasing their percentage of overall consumption of water. In light of this, they have a responsibility for sustainable water use and contributing to water conservation initiatives. If industries contribute to water conservation through their CSR initiatives, they can benefit in the long run. A part of the conserved water in various sectors can be made available to meet their water requirements.

Water Gap – Why stakeholders should look to the irrigation industry?

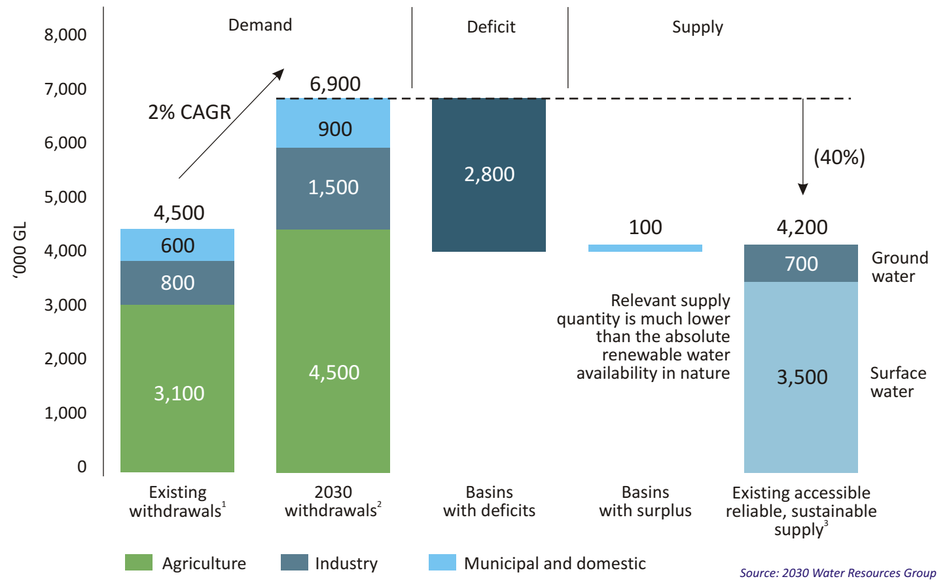
2030 Water Resources Group (2030WRG) is an innovative public-private-civil society platform for collaboration at the global, national, and local levels. It mobilizes stakeholders from public and private sectors, civil society, centers of academic expertise, and financial institutions to engage in fact-based, analytical water security approaches and coalition building. Its aim is to support governments in their long-term development and economic growth plans by catalyzing sustainable water sector transformations and accelerating reforms. Select global 2030WRG partners include Nestle, Pepsi Co, International Finance Corporation (IFC), United Nations Development Program (UNDP), World Wildlife Fund (WWF), and Swiss Agency for Development and Cooperation (SDC).

2030WRG's report entitled **Charting Our Water Future (2009)** estimates that by 2030, global freshwater demand is set to be 40 percent above existing accessible, reliable and sustainable supply of freshwater (figure 6).

The India analysis of the 2030WRG report (figure 7) outlines a 50 percent water demand-supply deficit by 2030, amounting to 755 billion cubic meters. Due to agriculture's high share in the country's overall water consumption patterns, changes made here are the lowest-cost measures to close the gap. Around 80 percent of the gap can be addressed through a combination of agricultural water productivity and crop yield enhancement measures.

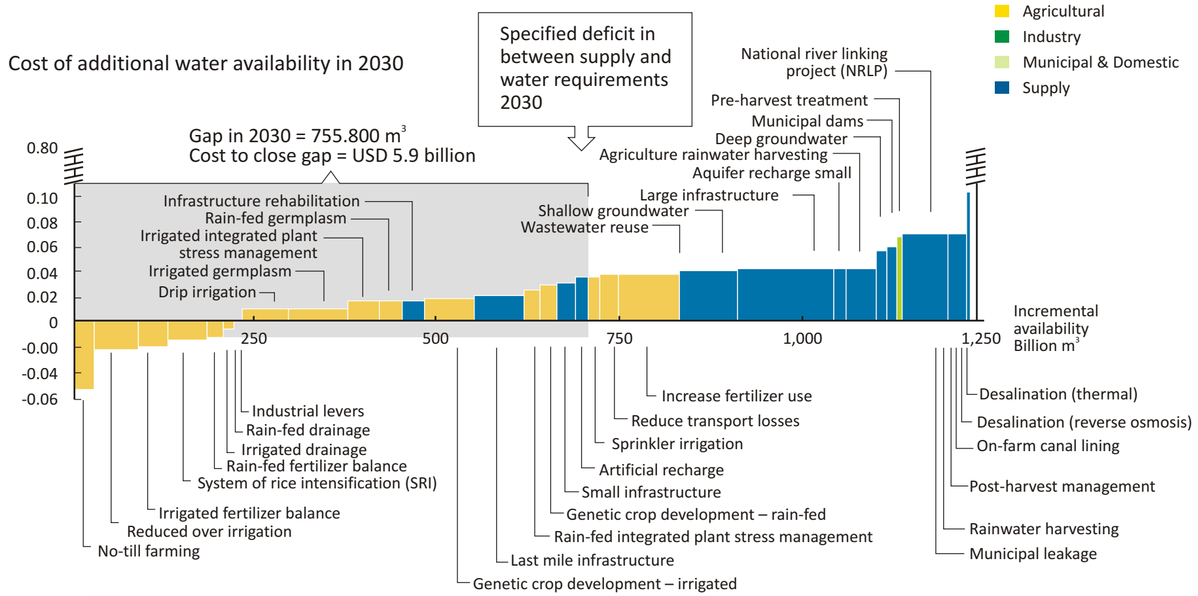
Increasing water productivity of irrigated agriculture, including improved water application through drip irrigation, provides a significant opportunity to bridge the water supply-demand gap. This entails either increasing efficiency of water use by producing the same yield with less water, or increasing production using the same amount of water – more crop per drop. This underscores the key role expected to be played by the irrigation sector to drive innovation and productivity gains to improve the country's overall water resources situation.

Fig. 6



Source: 2030 Water Resources Group

India-Water availability cost curve

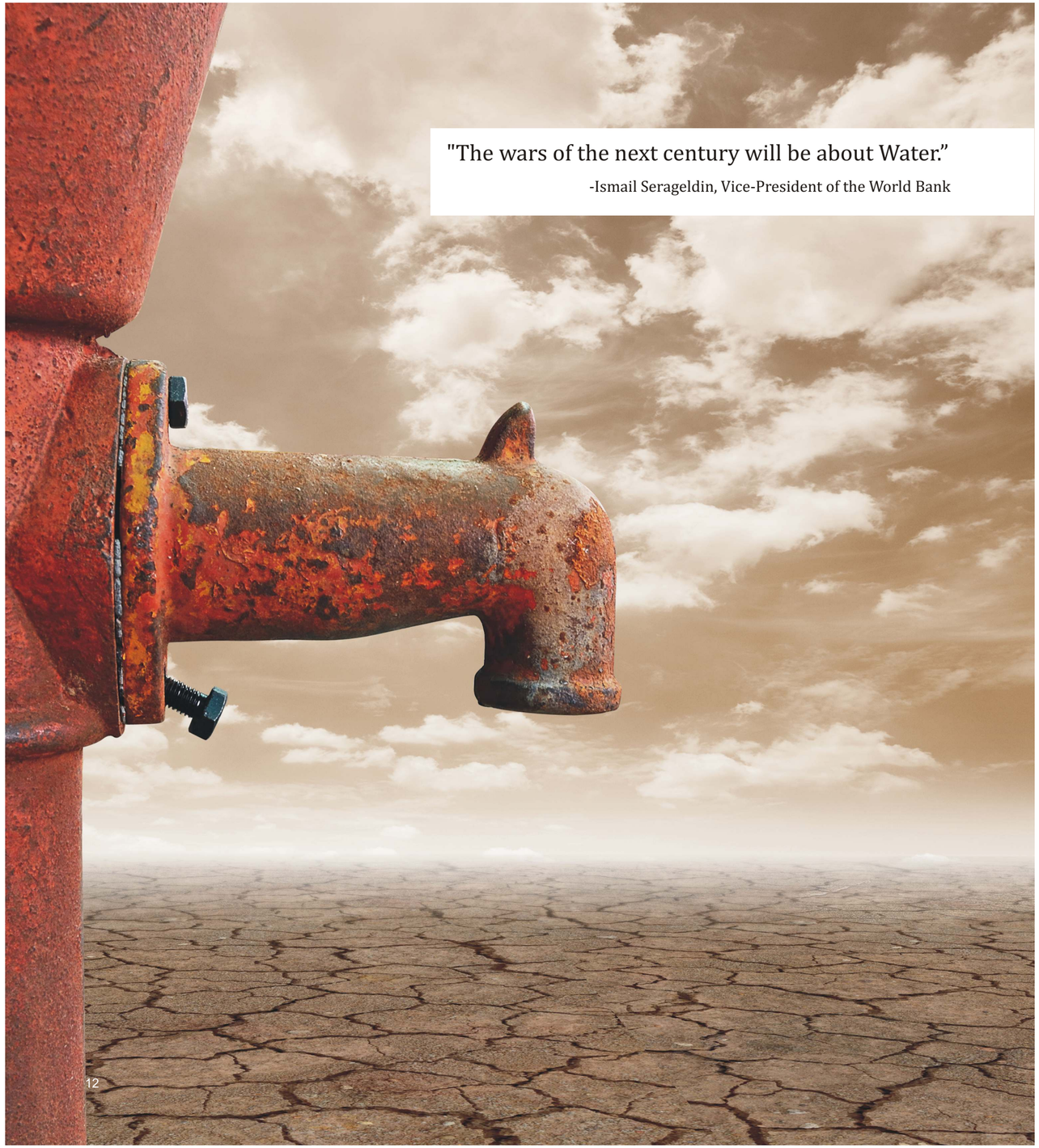


Source: 2030 Water Resources Group

Fig. 7

Karnataka - A water-stressed state

Karnataka is among India's most water-stressed states. Its percentage of arid areas is next only to Rajasthan in the country. 68% of the state's farmland is without irrigation. 54% of the its geographical area is drought-prone and it has been a victim of frequent droughts. 38% of its population is living in urban areas as against 28% for the country as a whole. 26% of its ground water area is over-exploited. All statistics paint a bleak picture of the state's water situation and make it imperative for the state to adopt better water management practices.



"The wars of the next century will be about Water."

-Ismail Serageldin, Vice-President of the World Bank

Micro Irrigation for Sugarcane - A Water Conservation Initiative by the Government of Karnataka

The Department of Water Resources (Major and Medium Irrigation), Government of Karnataka, is launching a state-wide water conservation project in sugarcane cultivation from January 2015. Under this project, around 4,34,000 hectares will be brought under drip irrigation over three years. The project will be implemented through a multi-party agreement among farmers, government, micro-irrigation companies, banks, and sugar companies, with 2030 Water Resources Group as a key facilitator.

Benefit 1

Reduction in consumption of water

The project envisages a huge reduction in consumption of water. According to rough estimates, the successful implementation of the project will reduce water consumption by 186 TMC at 100 percent implementation, 139 TMC at 75 percent implementation and 110 TMC at 60 percent implementation (of the around 300 TMC water required for cultivation of sugarcane in the state every year).

*TMC: Thousand million cubic feet

Benefit 2

Incremental income to farmers

Under conventional/flood irrigation, an average of 87 tons of sugarcane is produced in one hectare. Under drip irrigation, the yield increases to around 170 tons. Thus, 7.38 million tons of sugarcane can be produced in 434,000 hectares under drip irrigation, as against 3.87 million tons under conventional irrigation methods. Monetarily, this translates to an incremental income of Indian rupees 7,204 crore. The project will also result in huge reductions in consumption of planting material, fertilizer and labor. Thus, at 100 percent implementation, the total incremental income from 434,000 hectares for all the farmers together would be Indian rupees 8,763 crore.

Benefit 3

Incremental benefit to Sugar Mills

The project will result in a total incremental benefit of Indian rupees 4,998 crore (Indian rupees 2,213 crore through incremental sugar recovery at 1 percent+ Indian rupees 2,785 crore through byproducts, which include bagasse and press mud).

Benefit 4

Savings in Power

Drip irrigation needs less power as pumps are not operated for long hours. This will result in a saving of 7,492 lakh units of power or Indian Rupees 449.52 crore at Indian Rupees 6 per unit across 434,000 hectares.

Benefit 5

Benefits go Government

The government will benefit by saving 186 TMC of water and Indian rupees 450 crore worth of power. It will earn Indian rupees 1,216 crore worth of additional power from cogeneration and Indian rupees 661 crore in additional taxes. Surplus water can be used to bring more area under irrigation, distribute water to tail-end areas, and supply more water to industries and for domestic consumption.

Benefit 6

Benefits to industries and citizens

Surplus water can be used to meet demand from industries and for drinking water requirements in rural and urban areas.

Water requirement for Sugarcane cultivation on 4.34 lakh ha

Flood irrigation
330 tmcft

Drip irrigation
144 tmcft

Savings
186 tmcft
(56 percent)

Savings in power
Rs. 450 crore

Additional availability of co-generation power
1,200 MW

Revenue through Taxes
661 crore

Total sugarcane growing area in Karnataka: 4.34 lakh ha

Average yield and revenue per hectare

Flood irrigation	Drip irrigation
Total yield 87 tonnes	Total yield 170 tonnes
Revenue Rs. 1.74 lakh	Revenue Rs. 3.40 lakh

Incremental Yield - 83 tonnes per ha

Incremental Revenue - Rs. 1.64 lakh per ha

Total yield and revenue from 4.34 lakh ha

Flood Irrigation	Drip Irrigation	Total Increase
378 lakh tonnes Rs. 7,500 cr	738 lakh tonnes Rs. 14,700 cr	360 lakh tonnes Rs. 7,200 cr

Corporates/Industries' Role in Sustainable Water Use

Private sector strengths in management, accelerated delivery and technologies can be leveraged by encouraging private companies to play a key role in water conservation and reducing water pollution. This sector can reduce consumption of industrial water and support government water conservation efforts through corporate social responsibility (CSR) initiatives. Karnataka Government's micro-irrigation for sugarcane initiative offers private companies a great opportunity to participate. They will benefit in the following ways:

(1) Increased availability of water around corporate operational units and/or in the supply chain.

(2) Alignment of corporate sustainability goals with CSR objectives.

(3) Freeing up of water resources for potential use by other sectors, including industry.

(4) Development of models and demonstration of private sector leadership in participatory approaches for water sustainability, particularly sustainable agriculture with significant socio-economic outcomes for rural communities.

Value creation for stakeholders in 4 years for 100% area (in Rs.)

Investment @ Rs. 1.00 lakh/ha		1200 Cr	1200 Cr	1940 Cr	-NIL-
		Year 1	**Year 2**	**Year 3**	**4th Yr Onwards**
		Total 1.2 Lakh HA	**Total +1.2 Lakh HA**	**Total +1.94 Lakh HA**	**Total 4.34 Lakh HA**
Farmer Incremental Income		2,452 Cr	4,905 Cr	8,869 Cr	8,869 Cr
Sugar Mills Incremental Net Profit		1,382 Cr	2,764 Cr	4,998 Cr	4,998 Cr
Govt/Yr	Water	51 TMC	102 TMC	186 TMC	186 TMC
	Power	307 Cr	614 Cr	1111 Cr	1111 Cr
	Taxes	183 Cr	366 Cr	661 Cr	661 Cr

186 TMC of water, Rs. 1,111 Cr of power & Rs. 641 Cr of taxes

Cumulative incremental value creation for all stakeholders in 3 years Rs. 15,639 crores + 186 TMC of water/year

Note: All Calculations Ref and Methodology: Task Force Report on Micro Irrigation -2004

Proposed Subsidy/Incentive Options

The Government of Karnataka,with the 2030 Water Resources Group,will promote micro-irrigation for sugarcane to catalyze large-scale drip irrigation adoption. Private sector participation is being sought in multiple ways, particularly through:

(1) Unlocking commercial finance through financial institutions (50 percent).

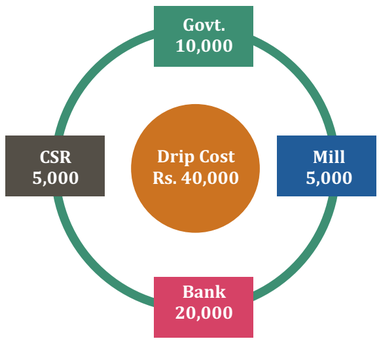
(2) Working with private and public sugar mills to incentivize farmers to adopt drip irrigation adoption (contribution of 12.5 percent).

(3) Raising CSR/ sustainability funds from private companies to improve water resource availability in Karnataka (12.5 percent).

Private companies are encouraged to come forward under the CSR Mandate of the Companies Act 2013 to supplement the government's efforts to achieving water security in the agricultural sector and equitably deliver the benefits of growth.

(25% GoK+ 12.5% Mills+10% CSR/Others)

Possible Funding Model Rs./acre



Subsidy - Rs. 20,000 (50%)

Bank Loan - Rs. 20,000 (50%)

*Actual cost may be higher at Rs 60-70K depending on additional infra requirements/pressure criteria/ MIS specs

Sri Siddaramaiah
Hon'ble Chief Minister
Govt. of Karnataka

Sri M. B. Patil
Hon'ble Minister for Water Resources
(Major and Medium Irrigation),
Govt. of Karnataka

An Appeal for Participation of Corporate Sector in Water Conservation

Water is vital and precious to all living beings and the ecosystem. The available fresh water needs to be judiciously withdrawn, shared, and conserved, keeping in mind the general well-being of every stakeholder. If we fail to check the fast depletion of our aquifers and declining groundwater tables today, we will not be forgiven by our future generations.

It is important for every stakeholder to take steps to manage our water resources better and support initiatives taken by others for sustainable water use. At this critical phase of global evolution, we can ignore water conservation only at our own peril.

Every stakeholder should seriously look at the irrigation sector for water conservation. This sector is the major user of surface and groundwater. It consumes 70 percent of the withdrawn freshwater in the world thus providing immense scope for water conservation.

The Department of Water Resources, Government of Karnataka, has made water conservation an area of priority. It has set clear goals for water conservation and aims to use the surplus water to bring more area under cultivation and meet the water needs of the domestic and industrial sector. The department believes that its initiatives can trigger a major movement in water conservation and, in the end, provide effective solutions to the problem of water scarcity.

The 'drip for sugarcane' project entails providing a huge financial support of Indian rupees 4,500 crore, including incentives, to farmers to encourage them to adopt micro-irrigation.

We appeal to the corporate sector to come forward and support the initiative under its CSR framework, and join hands with us to conserve water. We also welcome suggestions to further enhance the scope of our initiatives for water conservation. We look forward to a positive response on this important issue.

Yours sincerely
M. B. Patil