

A photograph of a blue body of water with several boats in the distance. The text is overlaid on the image.

WATER SCARCITY and SECURITY IN INDIA

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NO LIFE WITHOUT WATER

Water is needed to

- Keep the growing population free from thirst
- Increase food production
- Support 500 m livestock and fishery
- Ensure industrial production
- Generate eco-friendly hydro-power
- Conserve biodiversity and environment

**India is likely to face Water Stress by 2025
and Water Scarcity by 2050**

(Water stress: Per capita availability of 1000 – 1700 m³ /year)

Water scarcity: Per capita availability of 500 - 1000 m³ /year)

PRESENTATION PLAN

- Water resources and utilisation scenario
- National programmes and policies
- Strategy for sustainability
- Lessons learnt



GLOBAL WATER AVAILABILITY

- 70% Earth Surface covered with water
- Total water reserves: 1400 m km³
- 97.5% Water is salty
- 2.5% Water is fresh (35 m km³)

Out of total fresh water -

68.7%% is frozen in ice caps

30% is ground water

0.3% is surface water (Lakes 87%, swamp 11% and river 2%)

- Only 1% (0.007% of total water) is useable

GLOBAL POPULATION (GP) vs. FRESHWATER RESERVES (FWR)

	% of GP	% of available FWR
Asia	60	36
Africa	13	11
Australia, Oceania	1	5
South America	6	26
North / Cent. America	8	15

PER CAPITA WATER USE

Continent	Per Capita Water use (m ³ /yr)
Africa	245
Asia	519
North and C. America	1861
South America	478
Europe	1280
USSR (Former)	713

CURRENT WATER USAGE

Usage (%)	World	Europe	Africa	India
Agriculture	69	33	88	83
Industry	23	54	5	12
Domestic	8	13	7	5

FUTURE WATER USAGE

Year	Agriculture	Industry	Domestic	Per Capita
India	(Billion litres/day)			(Lit/day)
2000	1658	115	93	88.9
2050	1745	441	227	167.0
China				
2000	1024	392	105	82.7
2050	1151	822	219	155.4
U S A				
2000	542	605	166	582.7
2050	315	665	187	484.6

WATER RESOURCES IN INDIA

- Av. Annual Rainfall 1170 mm
- Total Available Water 4000 Bm³
(Rainfall + Snowfall + Glacier melt)
- Water Losses 1047 Bm³
- Net Available Water 1953 Bm³
 - Surface water 1521 Bm³
 - Ground water 432 Bm³
- Net Utilisable Water 1123 Bm³
 - Surface water 728 Bm³
 - Ground water (Repl) 395 Bm³

WATER DEMAND PROJECTION

IWMI Projection

Sector	2000		2025		2050	
	Total Bm ³	% from groundwater	Total Bm ³	% from groundwater	Total Bm ³	% from groundwater
Irrigation	605	45	675	45	637	51
Domestic	34	50	66	45	101	50
Industrial	42	30	92	30	161	30
Total	680	44	833	43	900	47

GOVT.OF INDIA Projection (NCIWRD)

Total	800	1093	1447
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IRRIGATION DEVELOPMENT IN INDIA

- Total cultivable area: 182 m ha
 - Net sown area: 140 m ha
 - Irrigated area: 62 m ha (44%)
- Potential area under irrigation: 140 m ha
 - Through surface: 76 m ha
 - Through ground water: 64 m ha
- Irrigation potential already created: 107 m ha
- Effective area under irrigation by 2025:
 - IWMI Estimation: 76 m ha
 - Government of India Estimation: 104 m ha
- Further scope for increasing potential
 - Interlinking river for using flood water: 35 m ha
 - Artificial recharging of ground water: 36 Bm³

CROP PRODUCTION TRENDS

Drivers

Past trends
1979-1981 1989-1991 1999-2000
Projections
2025 2050

Crop area (million ha)

Net sown area	141	142	141	142	142
Net irrigated area	38	46	55	74	81
Net groundwater	18	25	34	43	50
Net canal and tank area	20	22	21	31	31
Gross irrigated area (GIA)	49	62	76	111	117
Gross crop area (GCA)	172	183	189	208	210
Grain crop area - % of GCA	74	69	65	58	57

Crop yield (tons/ha)

Average grain yield	1.0	1.4	1.7	2.4	3.1
Irrigated grain yield	1.5	2.1	2.6	3.6	4.4
Rain-fed grain yield	0.6	0.8	1.0	1.3	1.8

HYDRO POWER DEVELOPMENT

- Estimated Hydro Power Potential : 150,000 mw
- Hydro Power Developed so far : 21%
- H P Projects under Implementation : 10%
- Problems:
 - Difficult sites
 - Forest conservation
 - Interstate issues

PER CAPITA WATER AVAILABILITY IN INDIA

Year	Population (Million)	Per capita water availability M ³ /year
1951	361	5177
1955	395	4732
1991	846	2209
2001	1027	1820
2025	1394	1341
2050	1640	1140

(Source: Govt. Of India, Ministry of Water Resources(2009))

Drivers of Water Usage in India

Parameters	Present	Future
Population	1.3 bn. in 2005	1.66 bn. in 2050
Urbanisation	28.2% in 2007	55.2% in 2050
Per capita income	\$468 in 2007	\$6735 in 2050
Industrialisation: Contribution to GDP	29.1% in 2000	40% by 2050
Demand for water	30 Bm ³ in 2000	161Bm ³ in 2050
Agriculture: water intensive crops		Increase to 80% by 2050

Challenges in Water Sector

- Low per capita availability of water
- Over-exploitation of ground water: 0.4 m/yr dip
- Sub optimal utilisation of created water facilities
- Pollution of water sources
- Slow progress in infrastructure development
- Poor impact of watershed development projects
- Impact of Climate change: 0.76°C rise in 100 yrs.
- Lack of incentives for efficient water use

WATER CRISIS



A typical summer day in the Western Ghats

ACCESS TO SAFE DRINKING WATER

Urban India

Year	% Population
1990	90
2000	93
2008	96

Rural India

1990	58
2008	73

Improved Sanitation Coverage (% Population)

Year	Rural	Urban
1990	70	49
2008	21	54
2010	30	65

CAUSES OF WATER POLLUTION

- Pollution of Rivers and Ground water
 - Discharge of untreated sewage and industrial effluent cause severe water pollution: Out of 36 m t/day sewage, only 50% is treated in Delhi;
 - Only 31% of waste water generated by 23 major cities is treated, rest are polluting 18 major rivers
 - Many rivers are contaminated by fluorides, nitrites and toxic metals; 66 m people suffering from fluorosis
 - Excessive application of fertilisers polluting ground water
 - 70% water consumed in Rural India is unsafe.
 - 80% rural illness, 21% transmittable diseases and 20% death of children under 5 years, are linked to unsafe water

WASTAGE OF WATER

- Only 35% rain water is used effectively
- Heavy soil erosion along river banks is causing floods and forcing rivers to change their direction
- 40 m ha flood prone; 8-10 m ha affected every year:
Floods in 2007-08 caused 3659 deaths, loss of 0.114 m livestock and damaged 3.5 m houses
- 70% Irrigation water, 48% river water wasted
- Flood irrigation turning agriculture expensive
- 20 m wells pumping water with free power, resulting in depletion of ground water and intrusion of sea water in coastal areas

ASSET TURNED INTO LIABILITY



EFFICIENCY OF WATER USE IN AGRICULTURE

Water foot print (Lit/kg)

Crops	India	World
Wheat	1654	1334
Rice	2850	2291
Sugarcane	159	175
Cotton	18694	8242
Milk	1369	990
Eggs	7531	3340
Chicken	7736	3918

NATIONAL WATER POLICY 2002

- Transform available water to utilisable water
- Non-conventional method for water use
- Supply to water shortage areas
- Judicious allocation of water for different uses
- Regulation on ground water exploitation
- Sustainability of existing water bodies
- PPP for water resource development and distribution
- Master Plan for flood control
- Development of drought prone areas
- Interstate water sharing policy

POLICY CHANGES NEEDED

- **Agricultural Sector**

- Improve water usage efficiency
- Adoption of rainwater harvesting and watershed management techniques
- Reduce subsidies on power
- Prevent groundwater exploitation – customised pricing
- Implement National River Link Project:
Connects 30 rivers and canals to generate 175 m km³ water

- **Industrial Sector**

- Encourage recycling and treatment of industrial wastewater through regulations and subsidies

- **Domestic Sector**

- Policy for mandatory rainwater harvesting in cities
- Propagate efficient water usage

AUGMENTATION OF WATER RESOURCES

- Increasing water storage capacity
- Efficient ground water recharging
- Control of soil erosion and floods, inter-linking rivers
- Judicious distribution for different uses
- Development of watersheds
- Managing irrigation through pipelines and micro-irrigation systems, through user groups
- Development of crop varieties with low water needs
- Explore economic desalination of sea water

PRIORITY AREAS FOR ACTION

- Reducing gestation period of Irrigation projects: Land acquisition and R&R to be taken up simultaneously with project formulation
- Afforestation on denuded lands and river banks
- Increasing irrigation efficiency : 35% to 50% in surface system and 65% to 75% in ground water system
- Enforcing financial viability through metered water supply
- Development of multi-disciplinary professionals
- Research on monitoring of ground water; efficient water use
- PPP for empowering local users for management
- Enforce ban on flood irrigation and free power supply

SCOPE FOR WATERSHED DEVELOPMENT

- 63% cultivated lands in rain fed areas have potential for soil and water conservation and crop improvement
- Watershed Development Coverage
 - Area developed till X Plan: 51 m ha
 - Area covered during XI Plan: 36 m ha
- Scope for additional coverage: 125 m ha
 - Rain fed area: 85 m ha
 - Wastelands: 40 m ha

IMPACT OF RIDGE TREATMENT



Role of Vegetation on Water Conservation



WATERSHED DEVELOPMENT:

HOLISTIC PROGRAMME APPROACH

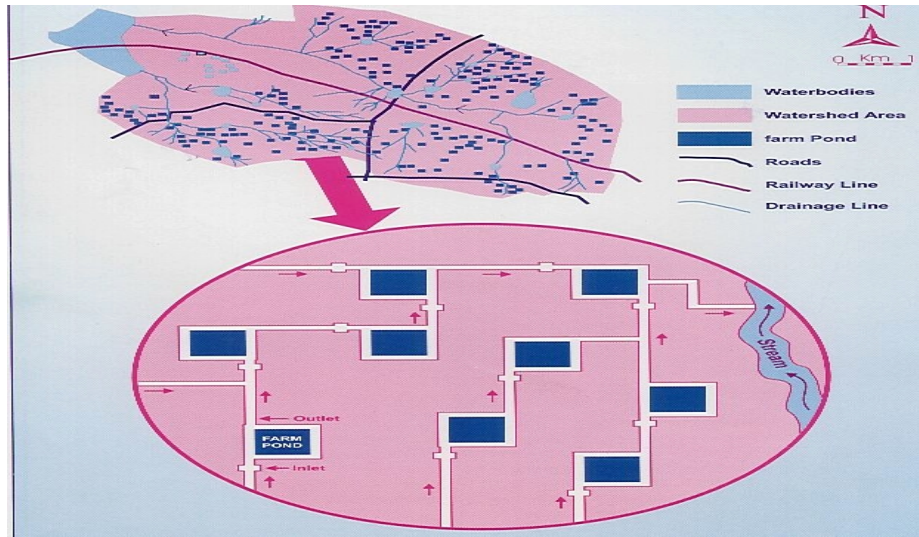
- Watershed Development
- Soil and Water Conservation
- Water Resource Management
- Food and Environmental Security
- Sustainable Livelihood



RECHARGING OF GROUND WATER



SOIL AND WATER CONSERVATION THROUGH FARM PONDS



Farm pond networking



Farm pond

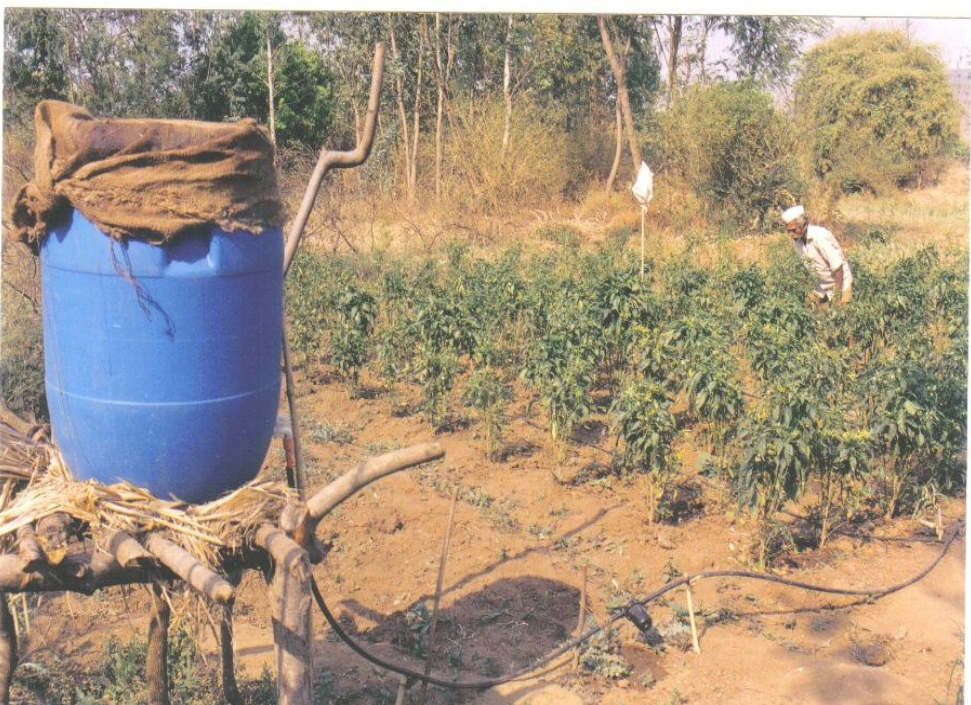


Recharging of bore well



Revival of rivulet

EFFICIENT USE OF WATER



IMPACT OF WATERSHED DEVELOPMENT

Surashettikoppa,
Dharwad, Karnataka:

Transformation in 8 years





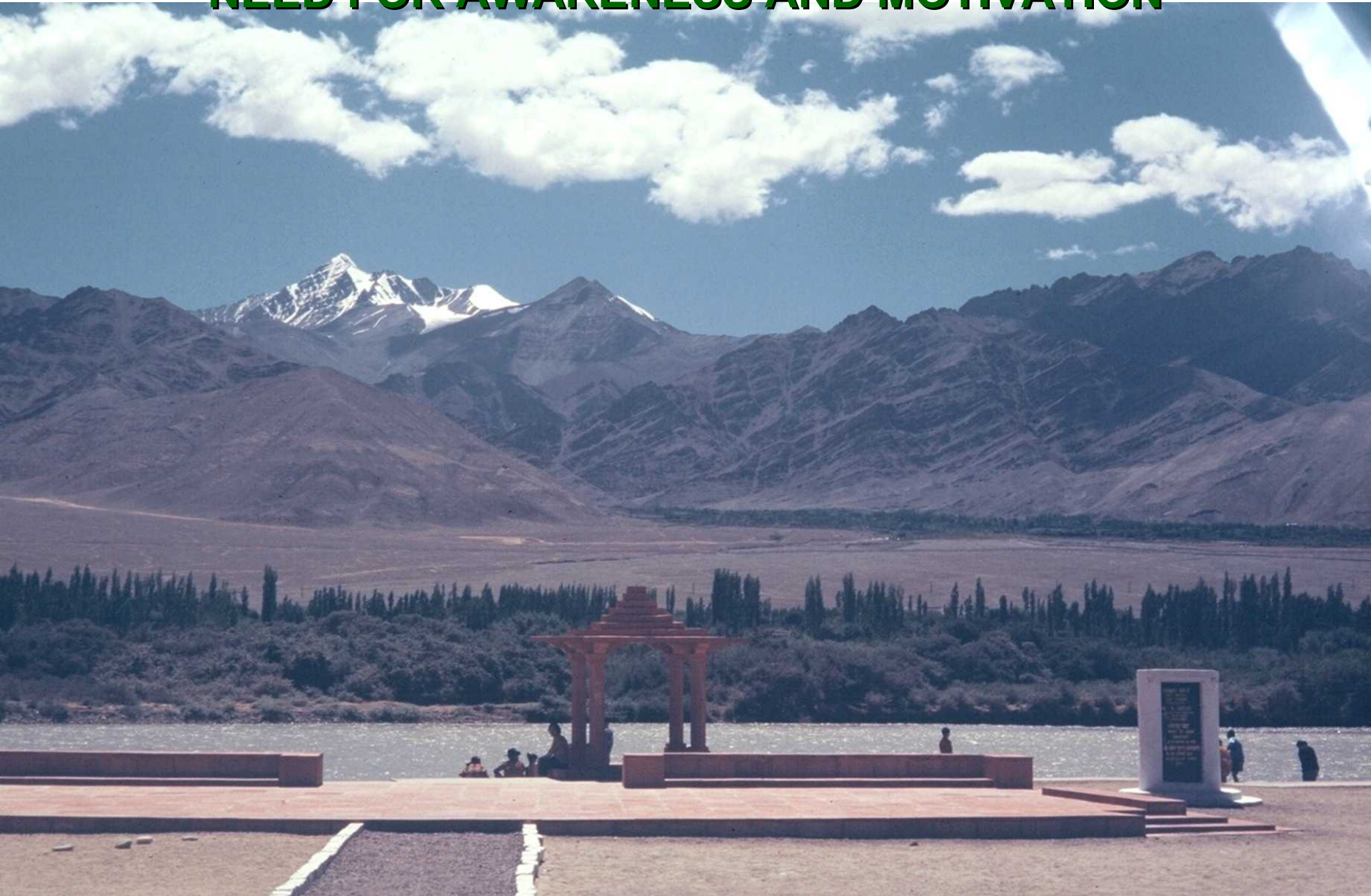


STATUS OF OUR RIVERS

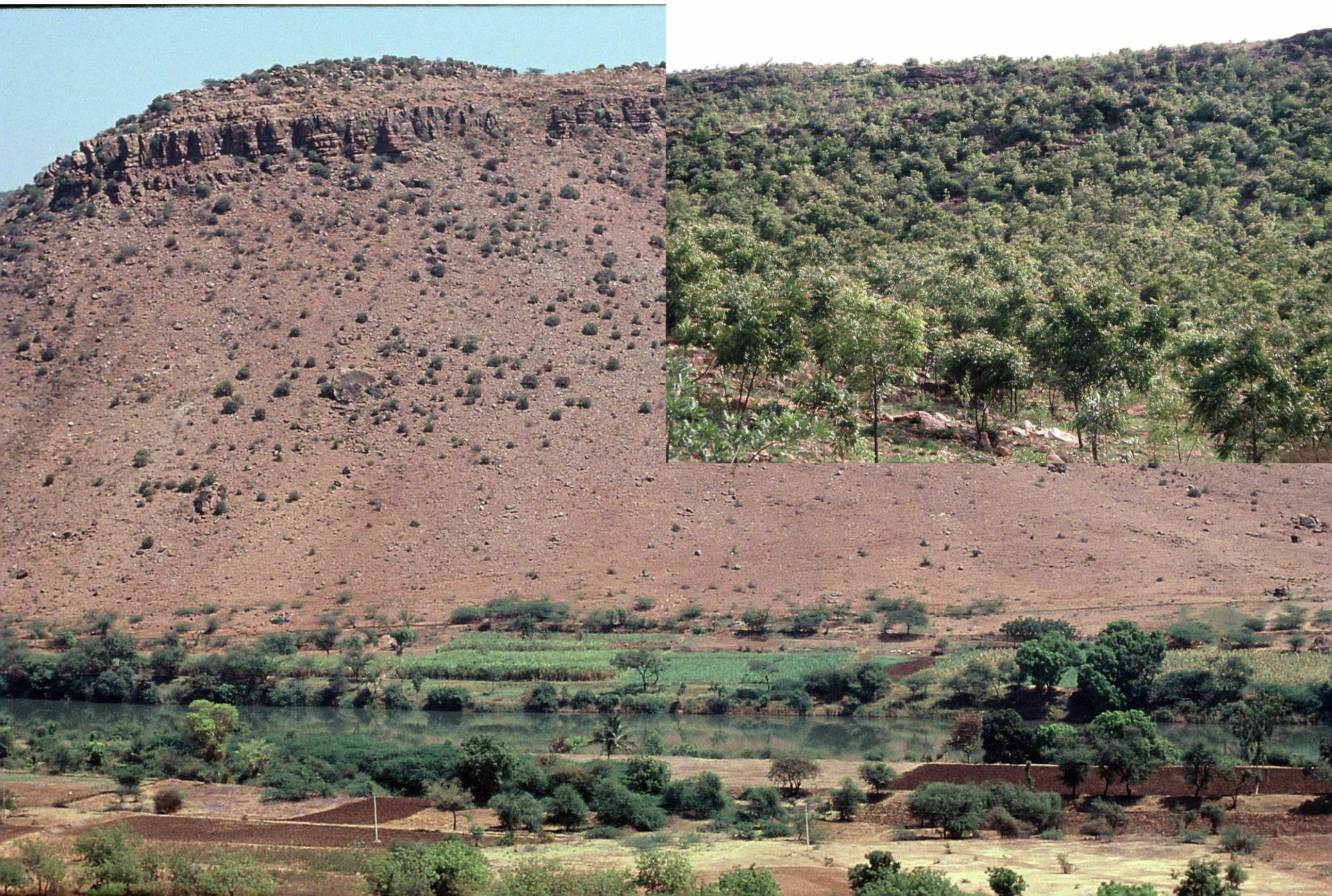
Need tree cover on river banks



UNTAPPED OPPORTUNITIES: NEED FOR AWARENESS AND MOTIVATION



NEGLECTED NATURAL RESOURCES



DEVELOPMENT OF ORCHARDS ON DRY LANDS



TREE BASED FARMING

- Support to poor to develop orchard on 0.4 ha degraded land to earn sustainable livelihood
- Drought tolerant fruit crops, food crops in interspace, fodder and fuel species on borders ensure sustainable livelihood
- Conservation of nature, while generating sustainable livelihood
- Benefitted 0.2 million Tribal families



SODIC LAND DEVELOPMENT



Land remaining fallow for decades



Bumper harvest



People's participation

RAVINE LAND DEVELOPMENT



Control of soil



Check dam



Vegetative cover



Sharing of water

Livestock Development

- A.I. at doorsteps spread over 60,000 villages
- Support Activities: Nutrition, Forage Production, Health Care, Milk marketing
- Training and Advisory Services



Impact

- Shift from large unproductive herd to small herd of high yielding cattle
- Food and nutritional security
- Over 4 million families availing services of which 60-70% are out of poverty



KEY POLICY INTERVENTIONS NEEDED

- Water conservation through development of watersheds and river basins, increase in storage capacity and linking of rivers;
- Effective water use through improved irrigation systems, water efficient crops and recycling of waste water;
- Prevention of water pollution by banning the discharge of untreated sewage and effluent in river, judicious use of agro-chemicals and regulation on over-exploitation of ground water;
- Water resources management and distribution through PPP, metered water supply, pricing of water for sustainability;
- Awareness and orientation of water users for conservation of water and change in lifestyle.

Need a shift from 'business as usual' approach to out of the box solution approach to tide over the water crisis

