Workshop on Hydrologic Ensemble Prediction Experiment (HEPEX)

Perspective of Users and their Anticipation

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{Representing WMO's interests }

Users' Perspectives

- **First order User Groups are Forecasters – by & large they are Governmental Agencies , their anticipation would be minimizing the '*present'* uncertainties that is associated with available tools**
- **Spreading the right message would be easier with a carefully chosen '*test bed*' case**
- **Propagating and Disseminating could be Role of International Organisations & NGOs**

WMO's Hydrology and Water Resources Programme (30)

- Revisions and amendments include:
  - making specific reference to an increased collaboration between NMSs and NHSs, **in particular, in the provision of timely and accurate hydrological forecasts;**
  - **strengthening the need for enhanced training in hydrology**; and
  - emphasizing the **importance of sharing the information on water resources** among countries.
- Importance of HEPEX for **NHS**

WMO’s programme recognizes that

- Available global water resources are both diminishing and deteriorating.
- Water is essential for life, for domestic purposes irrigation and provision of hydroelectric power.
- Promote best practices and tools for water-resources monitoring and assessment to provide the forecasts needed to plan water storage, agricultural activities and urban development.
- ICID’s own interest in this aspect resulted in initiating a CPSP Project (Netherlands support)

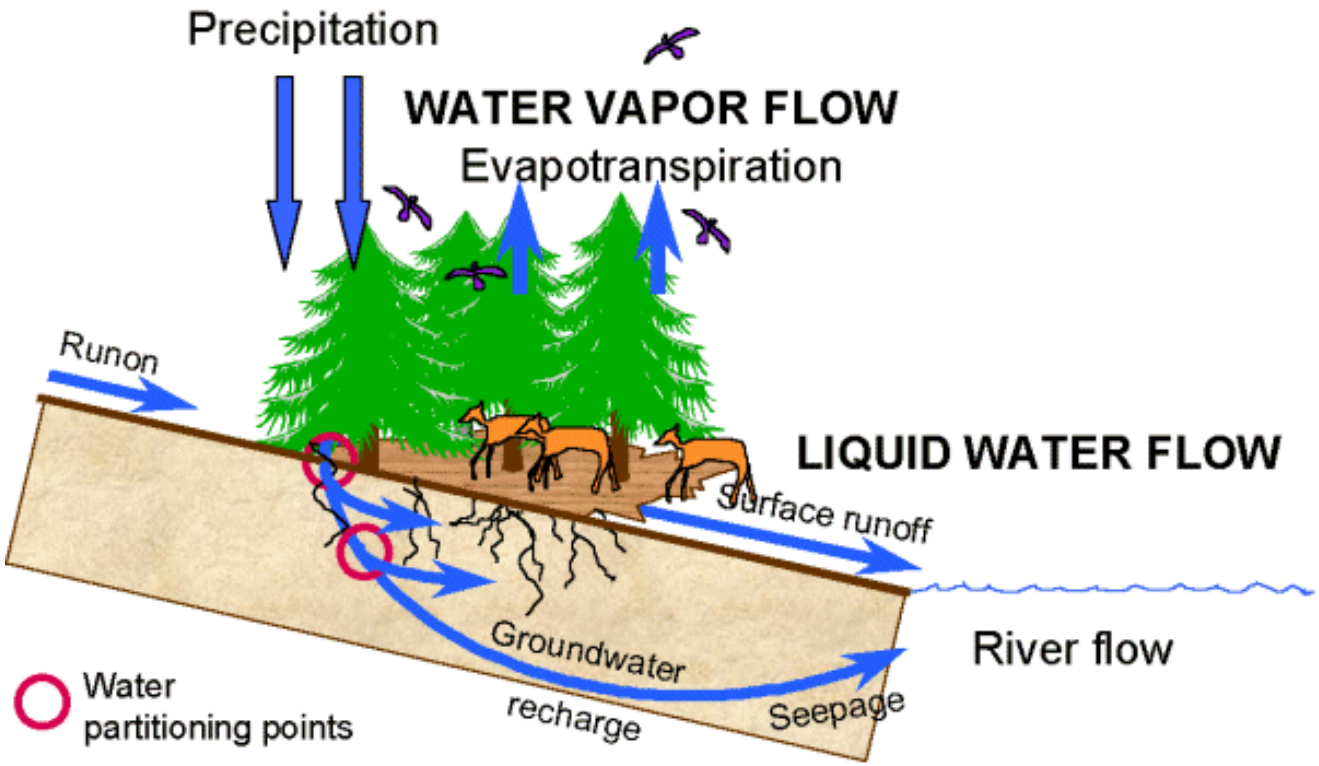
WMO's CHy

- CHy represents the 187 members of NHS
- OPACHE {Open Panels of CHy Expert}'s has a mandate to include Hydrological Forecasting and Prediction. (*it is likely that a Representative from HEPEX Group is invited to join the CHy*)
- WMO has continuing interest on HEPEX Project; this, as a part of the overall commitments to implement new technologies;
- WMO looks forward for a Report on this 2nd workshop. This is crucial as it will be circulated to relevant members of AWG members; thus it goes over to a larger community of User Groups

Challenges beyond …

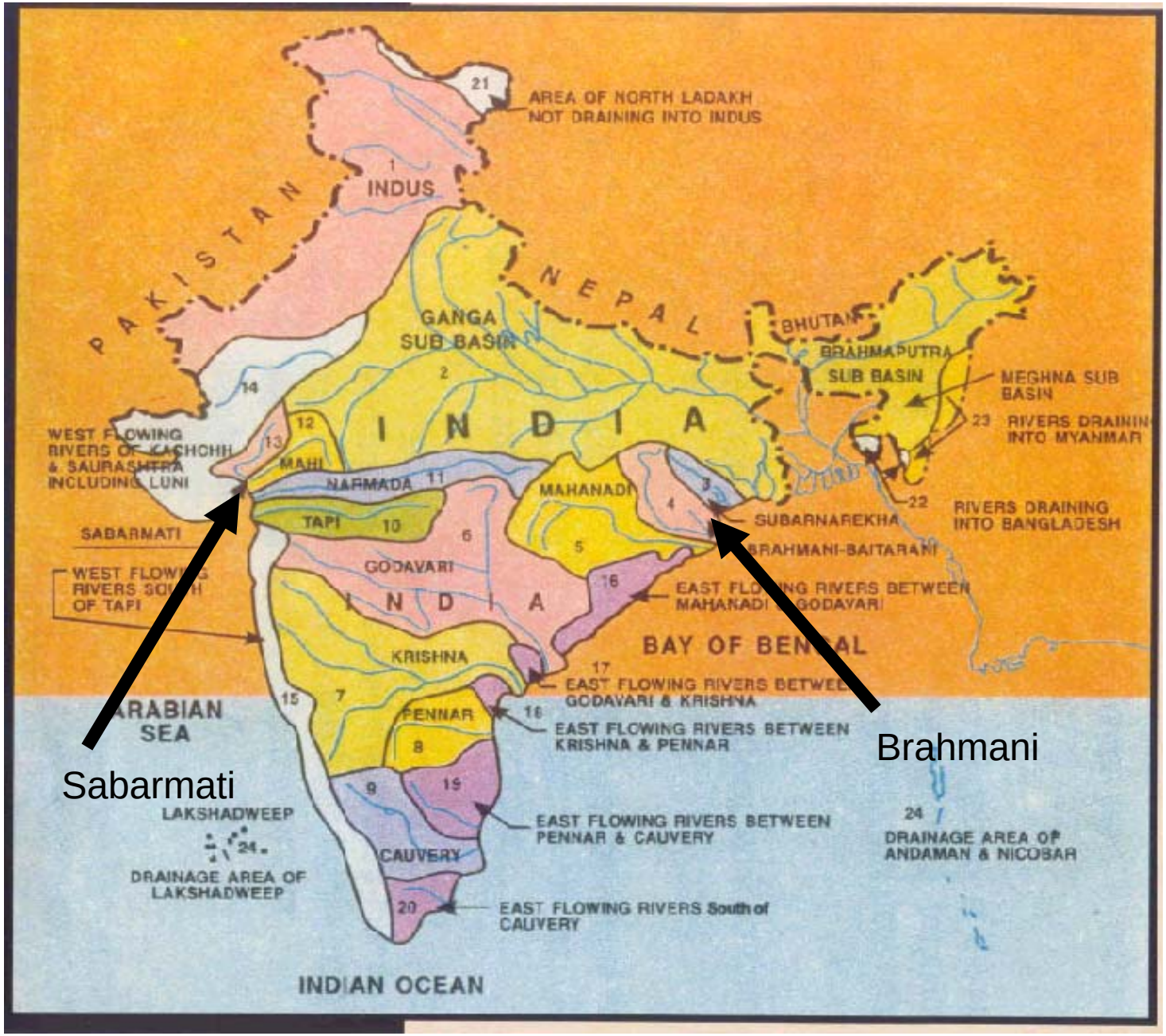
- Operational Forecasters and Users have to factor externalities; Stream flow changes due to dynamic land use and water abstraction
- Rigourous Land Use modeling, soil moisture accounting to be factored in any integrated holistic basin model; meaningful stream flow assessments should integrate SW plus GW
- Resource accounting and management could be done differently with such an approach
  - Impacts of large scale Watershed Management measures in certain basins around the globe
  - Abstractions of Ground water (large scales), their impact of surface flow (test cases ….)
  - Sustainability issues are better addressed

Soil Atmosphere Vegetation Transfers: Green and blue water flows



ICID case studies: *Some aspects affecting Stream flow predictions*

- Dynamics of the basins' land and water resource usages : the interaction of Ground and Surface flows is seen to affect long range flow patterns
  - Example case: Sabarmati, Brahmani in India, Jiadong, Qiantongjiang, China
- Upscaling to country levels as a tool for Country Policy Support


21
AREA OF NORTH LADAKH
NOT DRAINING INTO INDUS
1
INDUS
PAKISTAN
NEPAL
BHUTAN
GANGA
SUB BASIN
2
BRAHMAPUTRA
SUB BASIN
MEGHNA SUB
BASIN
23
RIVERS DRAINING
INTO MYANMAR
I N D I A
14
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MAHI
NARMADA
11
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22
RIVERS DRAINING
INTO BANGLADESH
SUBARNAREKHA
BRAHMANI-BAITARANI
TAPI
10
6
5
GODAVARI
I N D I A
16
EAST FLOWING RIVERS BETWEEN
MAHANADI & GODAVARI
BAY OF BENGAL
KRISHNA
17
EAST FLOWING RIVERS BETWEEN
GODAVARI & KRISHNA
15
7
PENNAR
18
EAST FLOWING RIVERS BETWEEN
KRISHNA & PENNAR
8
9
19
EAST FLOWING RIVERS BETWEEN
PENNAR & CAUVERY
24
DRAINAGE AREA OF
ANDAMAN & NICOBAR
LAKSHADWEEP
24
DRAINAGE AREA OF
LAKSHADWEEP
CAUVERY
20
EAST FLOWING RIVERS South of
CAUVERY
INDIAN OCEAN
Sabarmati
Brahmani

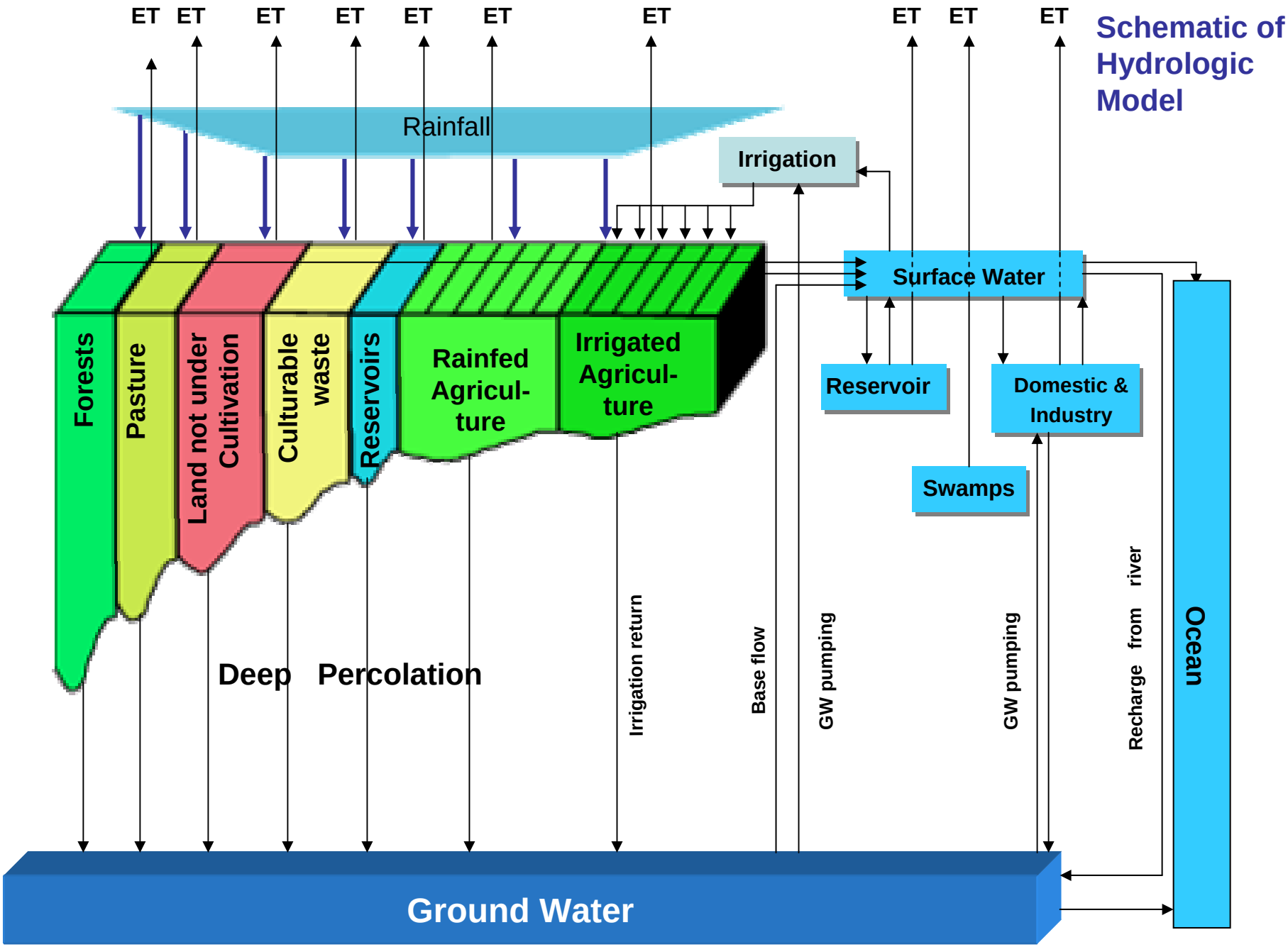


Figure 4 Schematic of Hydrologic Model

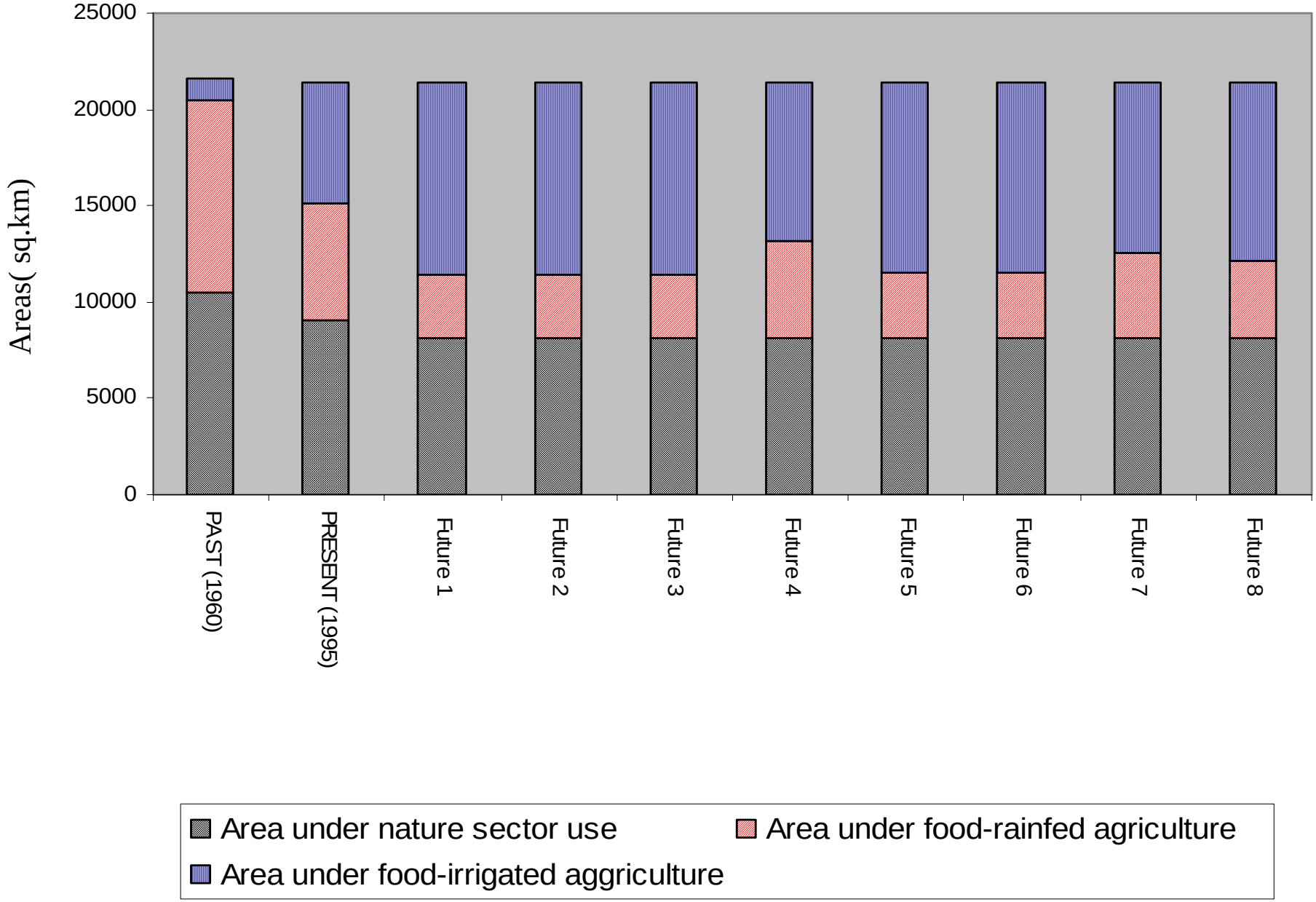
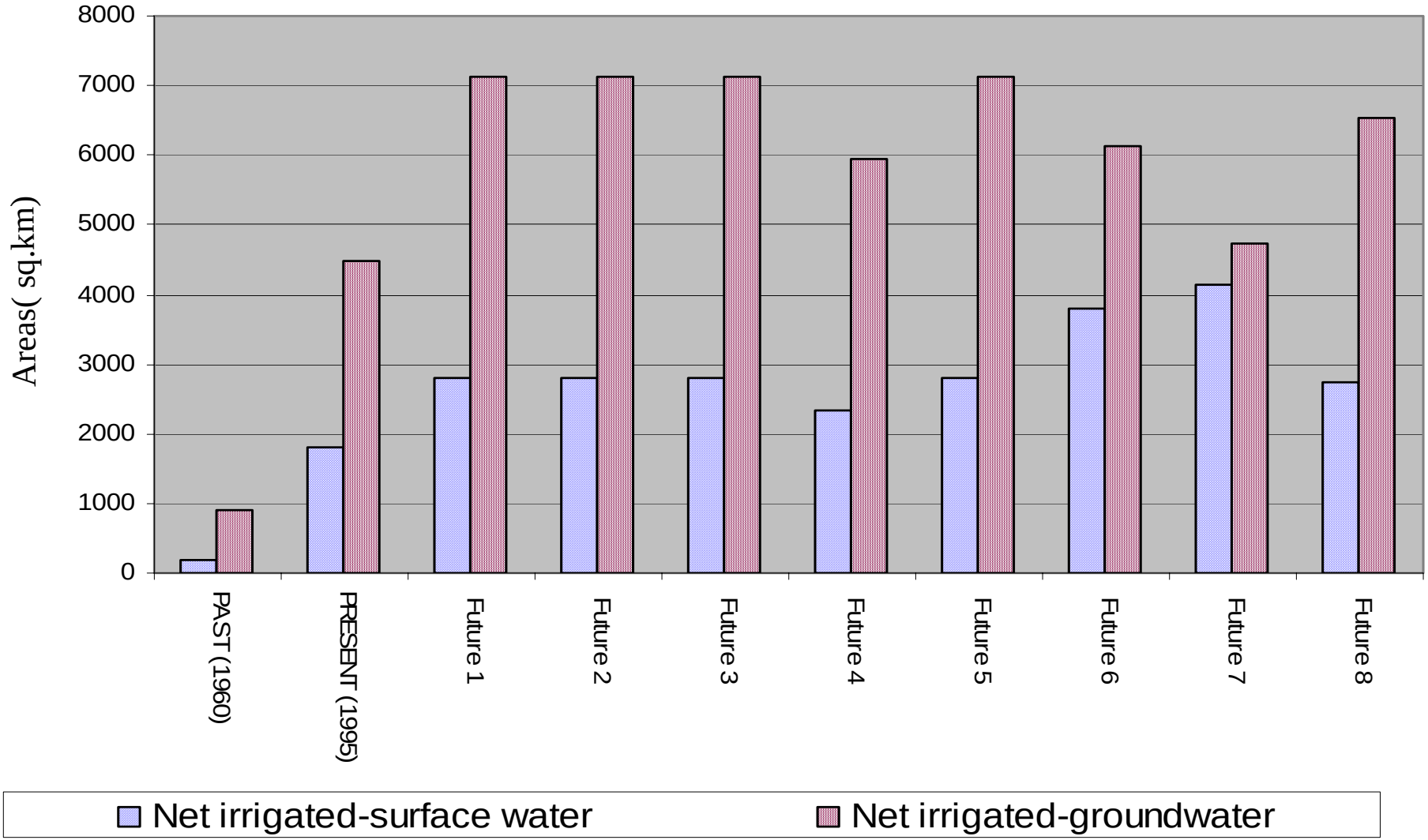
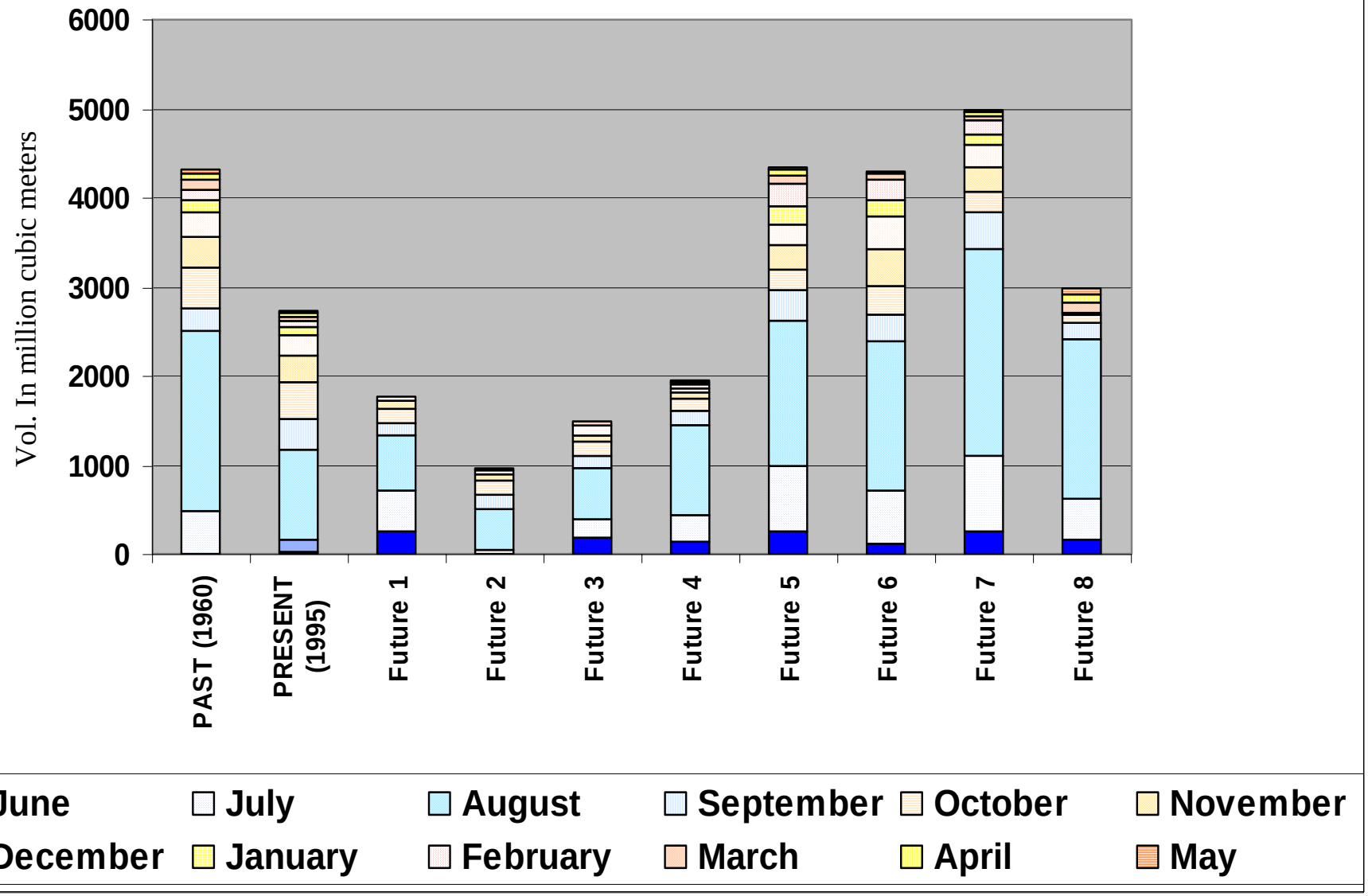


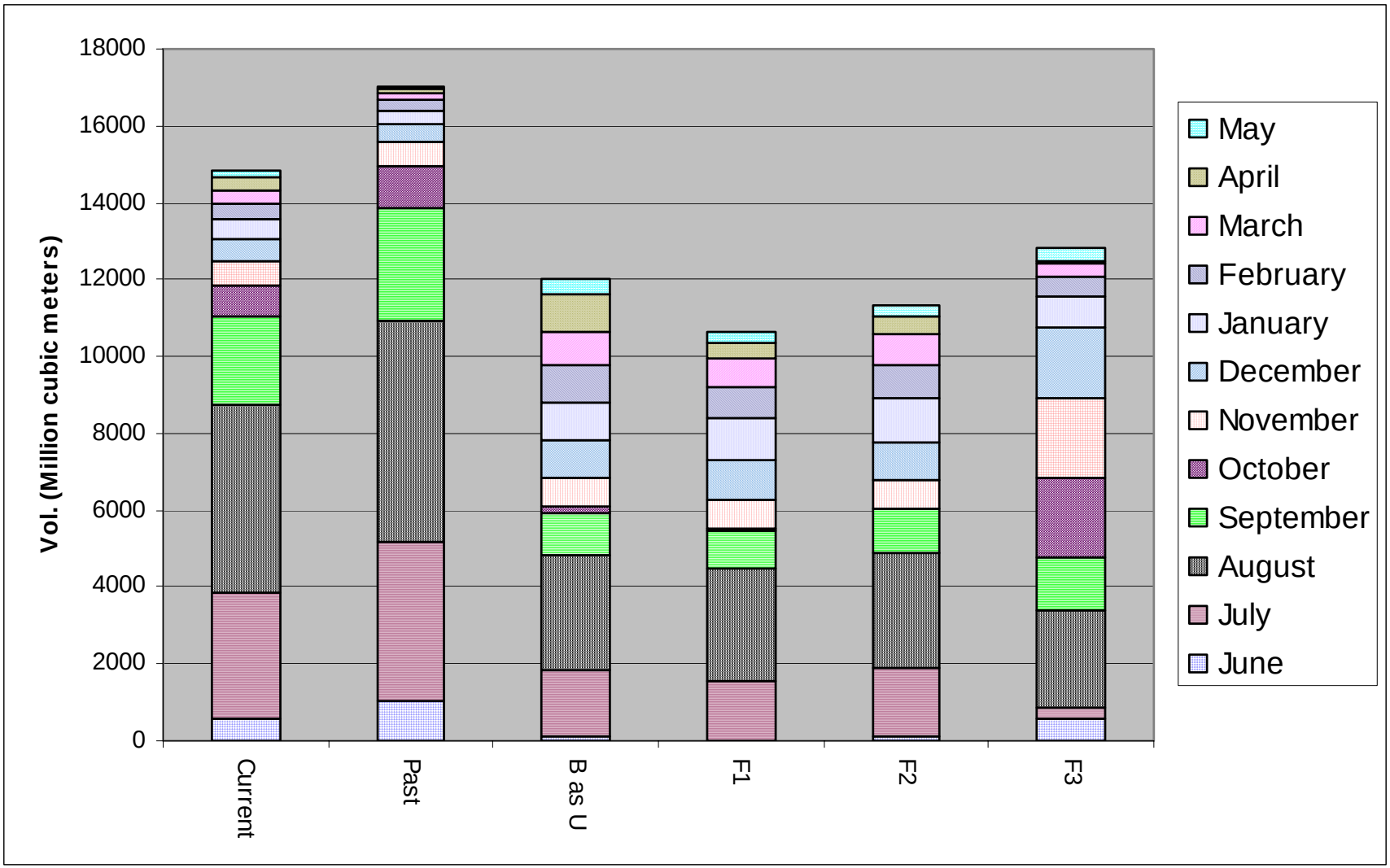
Figure Distribution of net land area in Sabarmati Basin



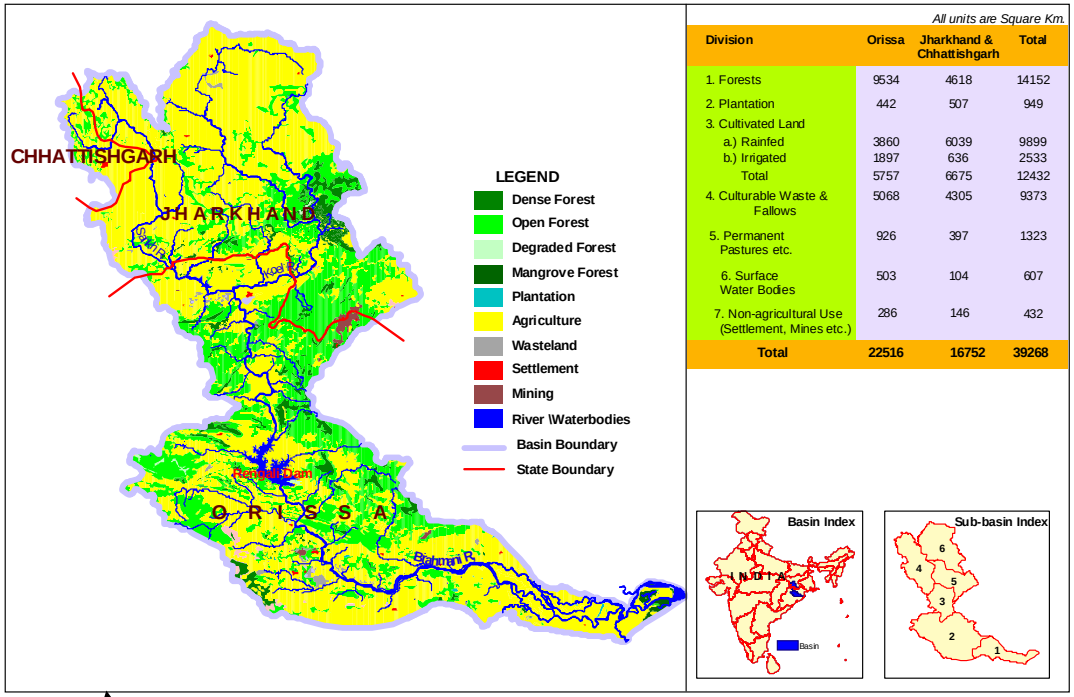
Net irrigated area by source in Sabarmati Basin



SABARMATI : RIVER FLOWS _ FUTURE SCENARIO

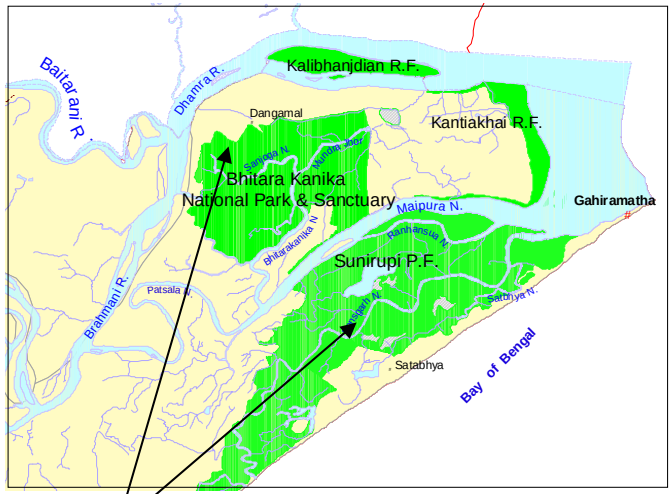


Sabarmati Basin- Anticipated Stream Flows Forecast for future Scenarios



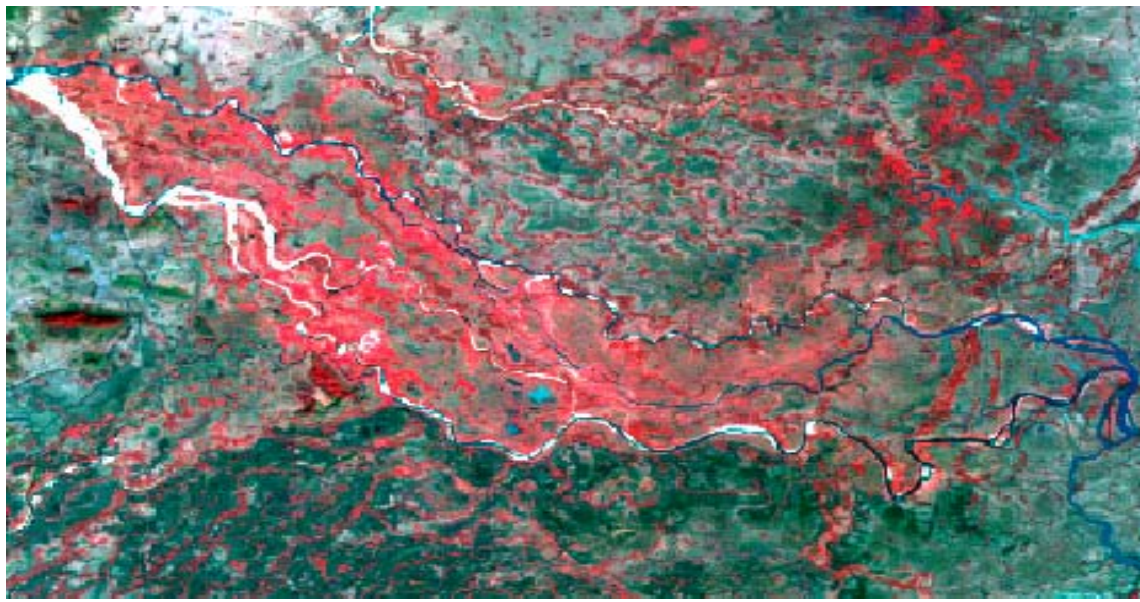
All units are Square Km.

Division	Orissa	Jharkhand & Chhattishgarh	Total
1. Forests	9534	4618	14152
2. Plantation	442	507	949
3. Cultivated Land			
a.) Rainfed	3860	6039	9899
b.) Irrigated	1897	636	2533
Total	5757	6675	12432
4. Culturable Waste & Fallows	5068	4305	9373
5. Permanent Pastures etc.	926	397	1323
6. Surface Water Bodies	503	104	607
7. Non-agricultural Use (Settlement, Mines etc.)	286	146	432
Total	**22516**	**16752**	**39268**



Mangroves in Estuarine areas

<u>INDIA Case Study:</u>
Brahmani Basin / land Use:
Satellite Imagery of Flood Plains in Delta



<u>Stream Flow Prediction for Nature Sector Demands: Changing Land and Water Use</u>

ICID's Vision 2025 ; Issues on Global Food Security

- droughts , flood events - mitigation needs
- Impacts due to climate change
- Enhanced requirements for eco systems, safety, water quality and environment
- hazardous and endocrine substances
- food production under competing Global market conditions and subsidies and food security goals?
  - Long, medium and short range predictions

Summing Up - Users' anticipations

- **Short Range forecasts**:
  - Flash floods and disasters, Landslides, Lake-burst, avalanche,.
  - Flash Flood forecast in upper catchments of Himalayas where there are significant developments
- **Medium Range (a few crucial months that matter for inflows)**
  - In Monsoon climates, both an early prediction of seasonal rainfall and progressive updates on its behaviour
  - Interaction with Operational Groups (of systems of Reservoirs) linking the above
- **Very Long Range** (how long the long is? Climate Change? Land use Changes? SW and GW interactions
  - Need for creation of carry over storages in reservoirs beyond a drought year(s), where planned storage is available; thus reserving watersupply for a possible succeeding drought year?
  - Dynamics of extraneous factors on eco systems ?
- **Where could HEPEX help significantly? Short and Medium?& even beyond on long range forecasts on water availabilty?**