

# Presentation

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**WORLD**  
in Stockholm,  
August 16–22, 2009 **WATER**  
**WEEK**

# Securing India's Water Future 2050



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Going against the flow: A critical analysis of inter-state virtual water trade in the context of India's National River Linking Program

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# Key Points...

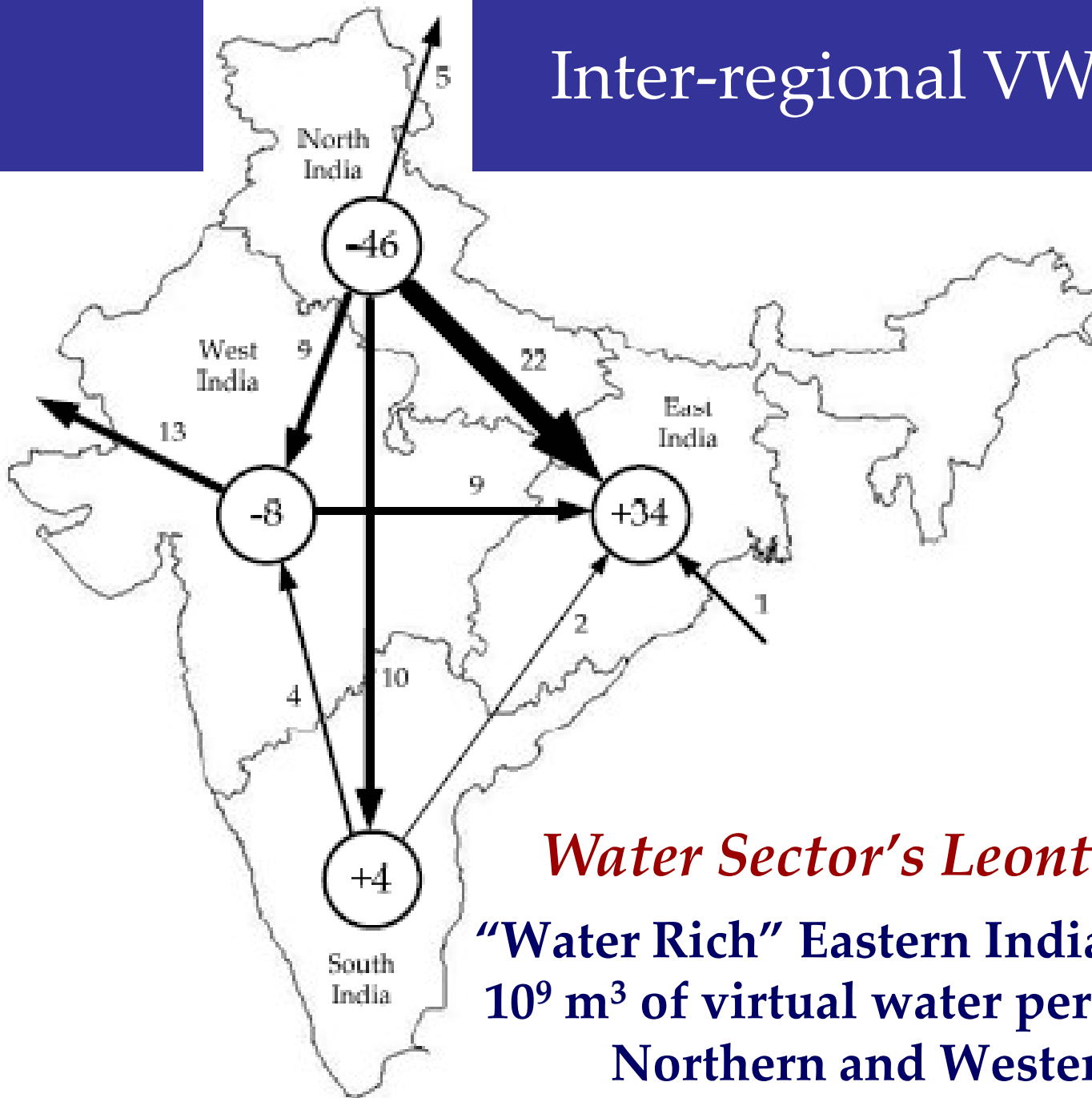
1. Applying VW trade concept within countries
  - » Avoiding the *food self-sufficiency* debate!
  - » Interstate VW trade in India: *The Leontief Paradox*
2. Trade theories and VW trade
  - » *Beyond Factor Endowments*
  - » *Doubtful Water Centrality of trade*
3. Scarcity and Abundance: Physical vs. Economic
4. VW trade as an alternative to physical water transfers, *specifically in the Indian context*

# VW Trade within Nations

## □ The Food Self-Sufficiency Doctrine

- » *Strategic self-sufficiency in foodgrains*
- » *Arguments against self-sufficiency not entertained*
- » *Unlikely to change in the short-medium run*
- » *Prime motive behind grand inter-basin transfer plans – National River Linking Project*

# Inter-regional VW Flows...



*Water Sector's Leontief Paradox!*

**“Water Rich” Eastern India imports  $34 \times 10^9 \text{ m}^3$  of virtual water per annum from Northern and Western India**

# Key Points...

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2. **Trade theories and VW trade**
  - » *Beyond Factor Endowments*
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# Determinants of Trade...

## □ Differences in

» ~~Resource/Factor Endowments~~

*Water*

» Technological Abilities

*Endowments*

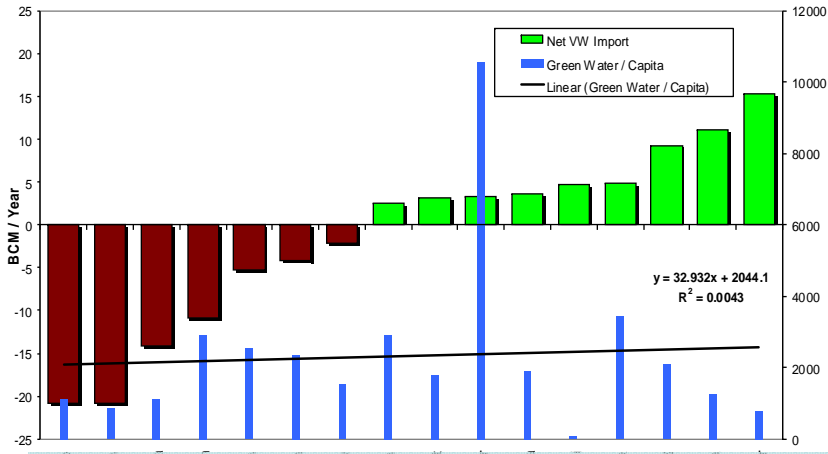
» Demand

» Scale (Economies of)

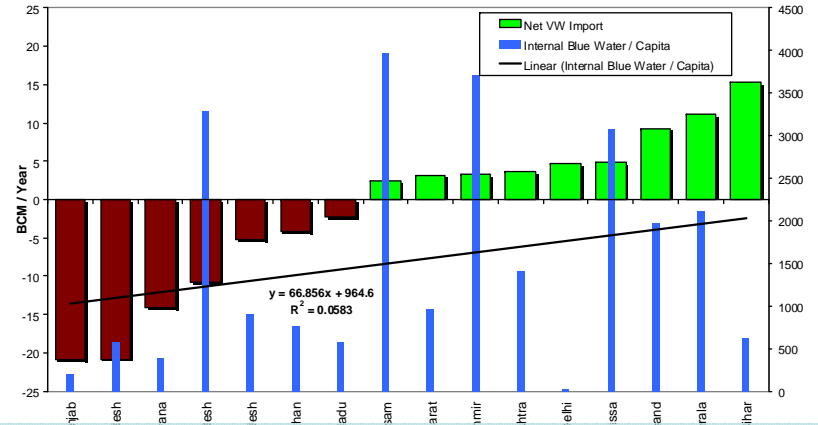
» Public Policy

# Does Water really Matter...?

Annual State-wise Net VW Import (1997-2001) and Per Capita Green Water

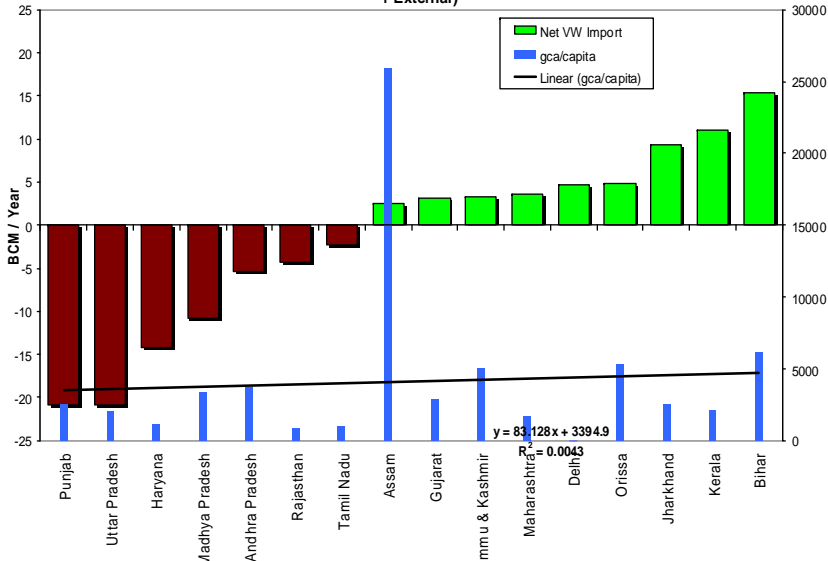


Annual State-wise Net VW Import (1997-2001) and Per Capita Internal Blue Water

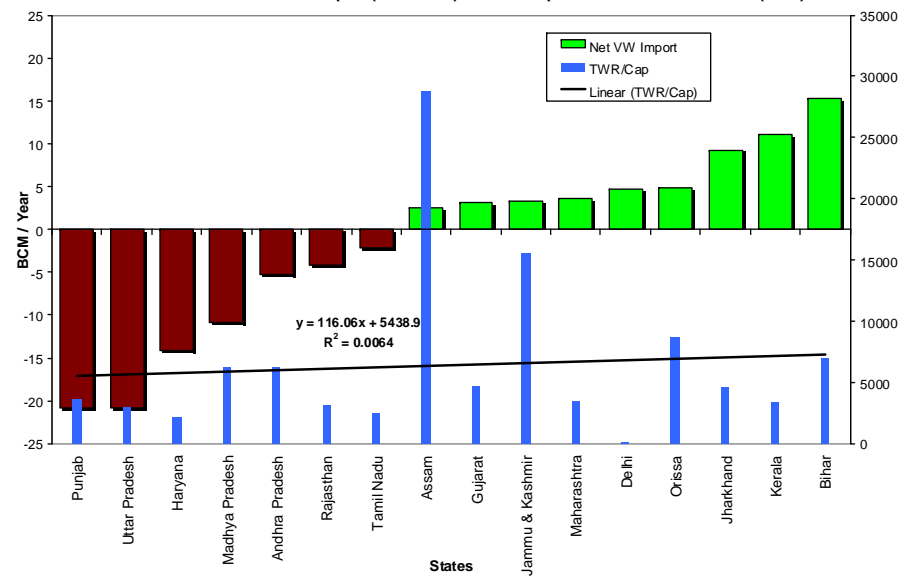


*If not Water, then What...?*

Annual State-wise Net VW Import (1997-2001) and Per Capita Blue Water Resources (Internal + External)

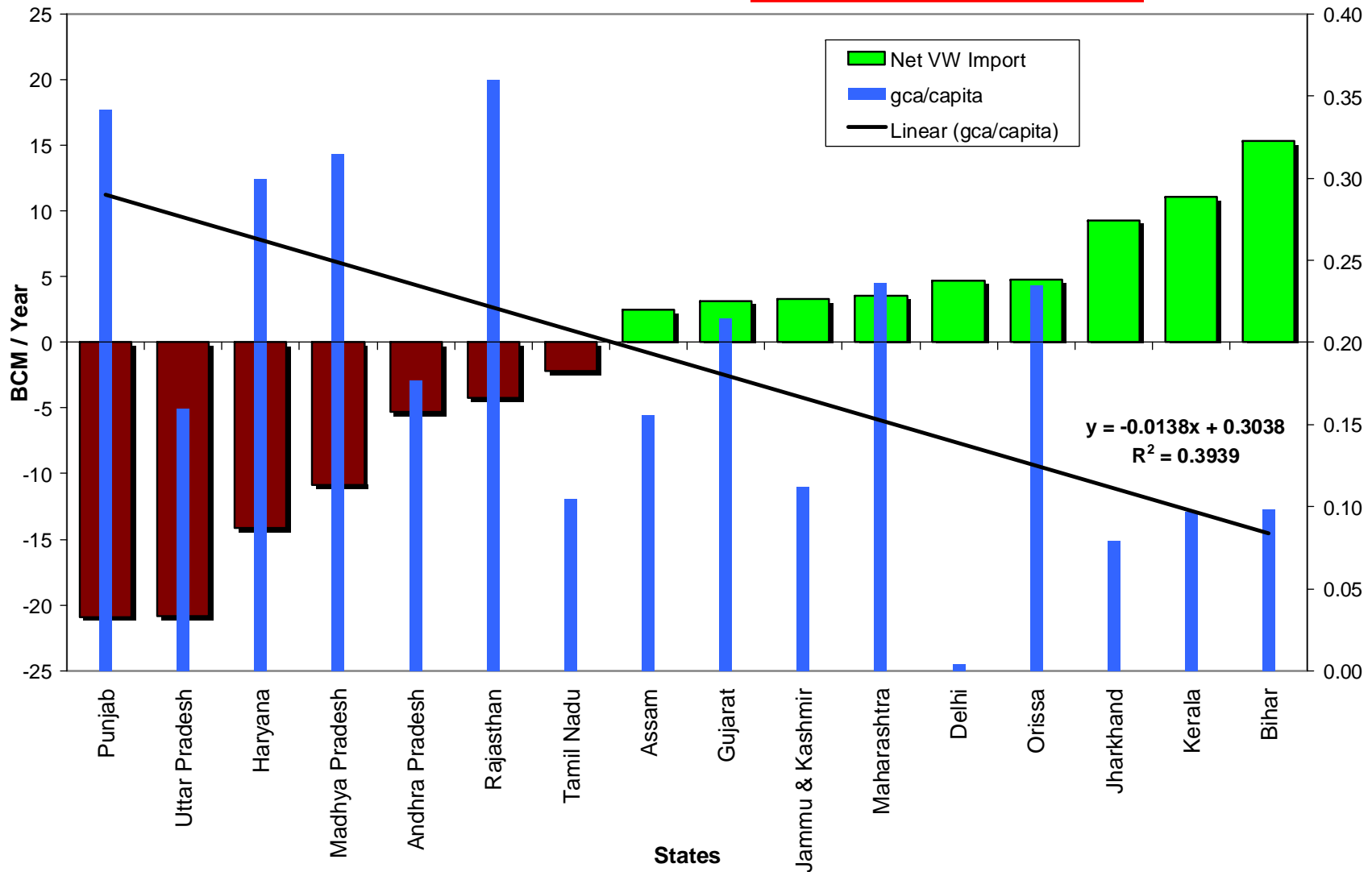


Annual State-wise Net VW Import (1997-2001) and Per Capita Total Water Resources (TWR)



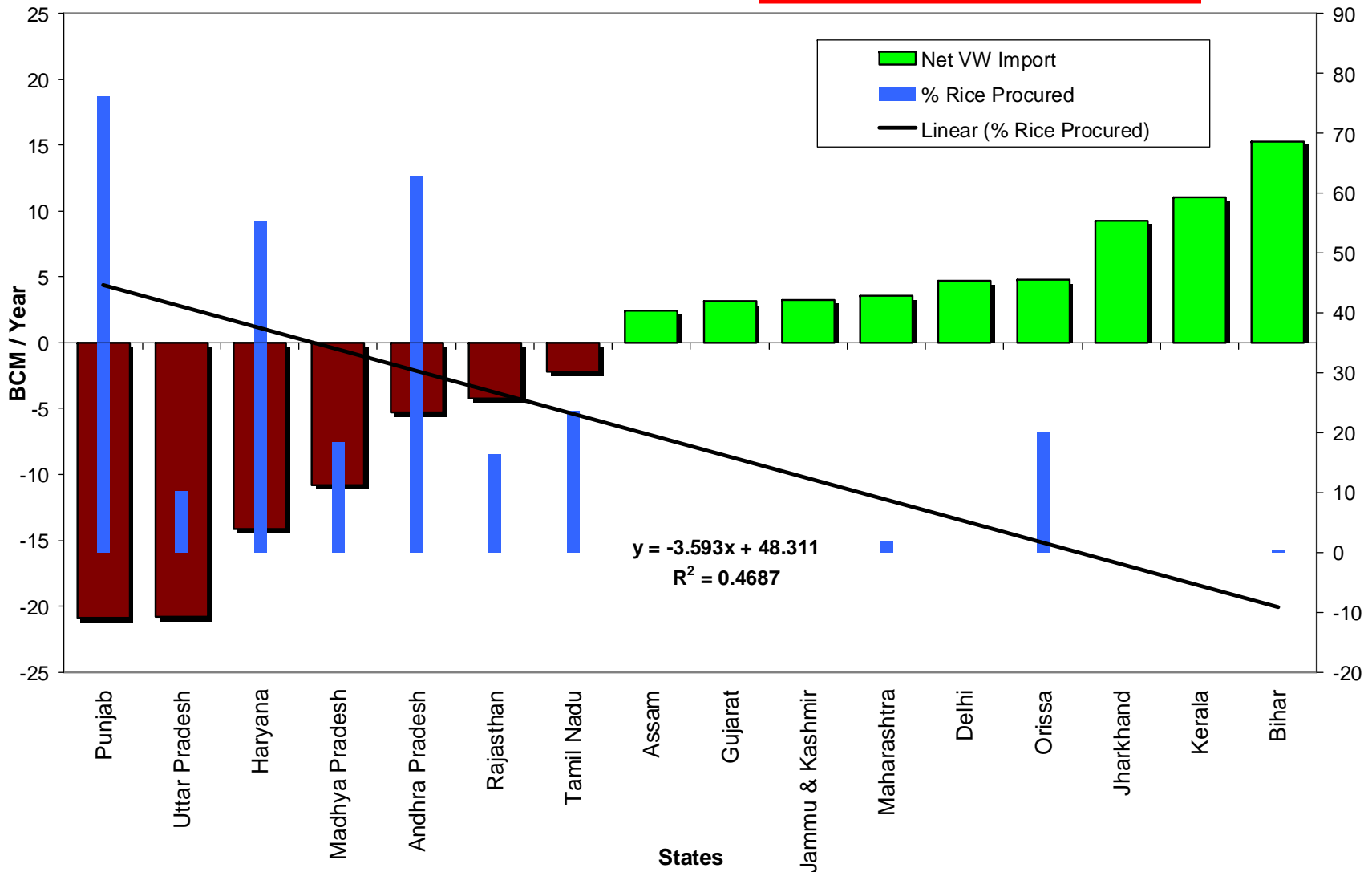
# Does Water really Matter...?

Annual State-wise Net VW Import (1997-2001) and Per Capita Gross Cropped Area (GCA)



# Proportion of Rice Procured

Annual State-wise Net VW Import (1997-2001) and Percentage of Rice Procured by FCI



# Determinants of Trade...

## □ Differences in

- » Resource/Factor Endowments
- » Technological Abilities
- » Demand
- » Scale (Economies of)
- » Public Policy

*It is important to look beyond water endowments in order to understand the quantum and direction of virtual water trade*

# Key Points...

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# Which Scarcity Matters...?

## □ Punjab is *water-scarce*

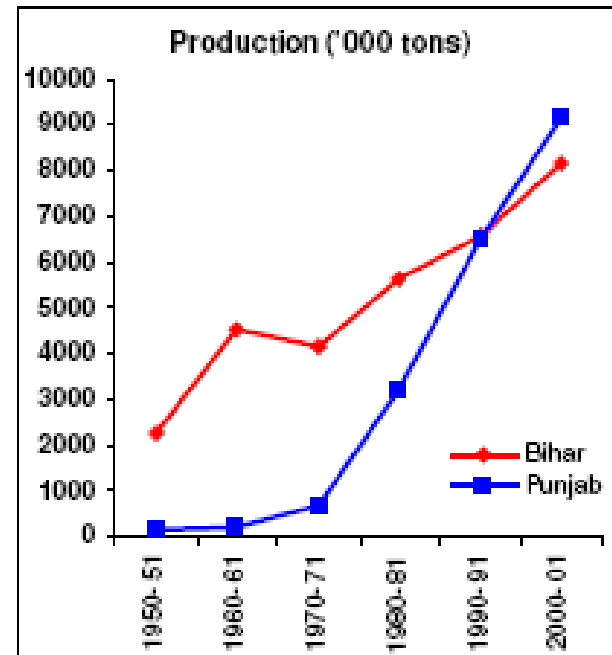
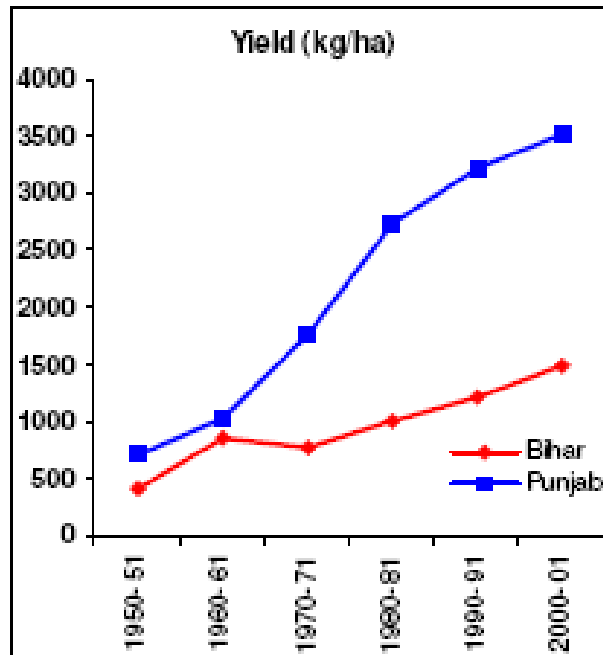
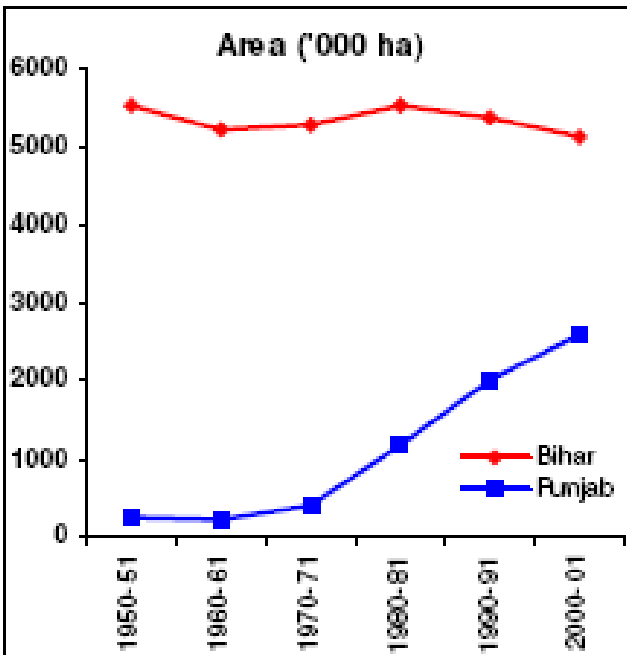
- » BUT *farmers in Punjab don't face water scarcity*
- » *They get free power and free recharge from return flows of cheap canal irrigation; they also get minimum support price for their produce*

## □ Bihar is *water-abundant*

- » BUT *farmers in Bihar under-irrigate their crops*
- » *They need to buy pumps and expensive diesel to irrigate and often sell their produce much below market price*

*Public Policy creates a mismatch between  
Physical and Economic Scarcity*

# Rice, over the decades...

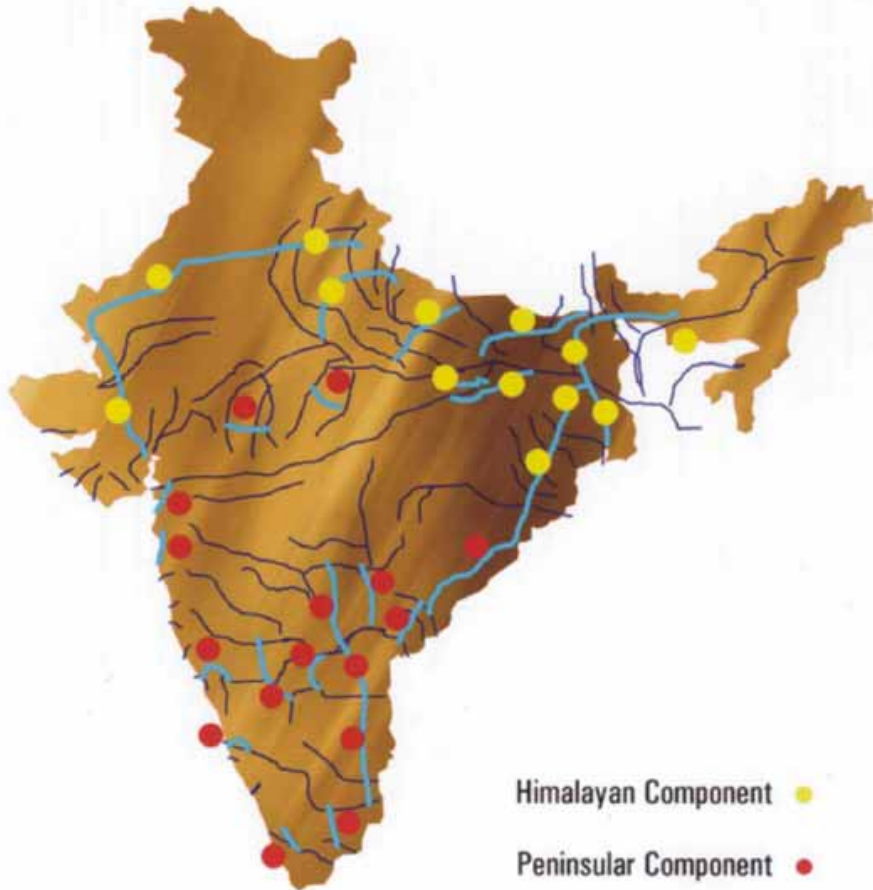


*State-level water scarcity (or abundance) does not get reflected in crop choice decisions of individual farmers*

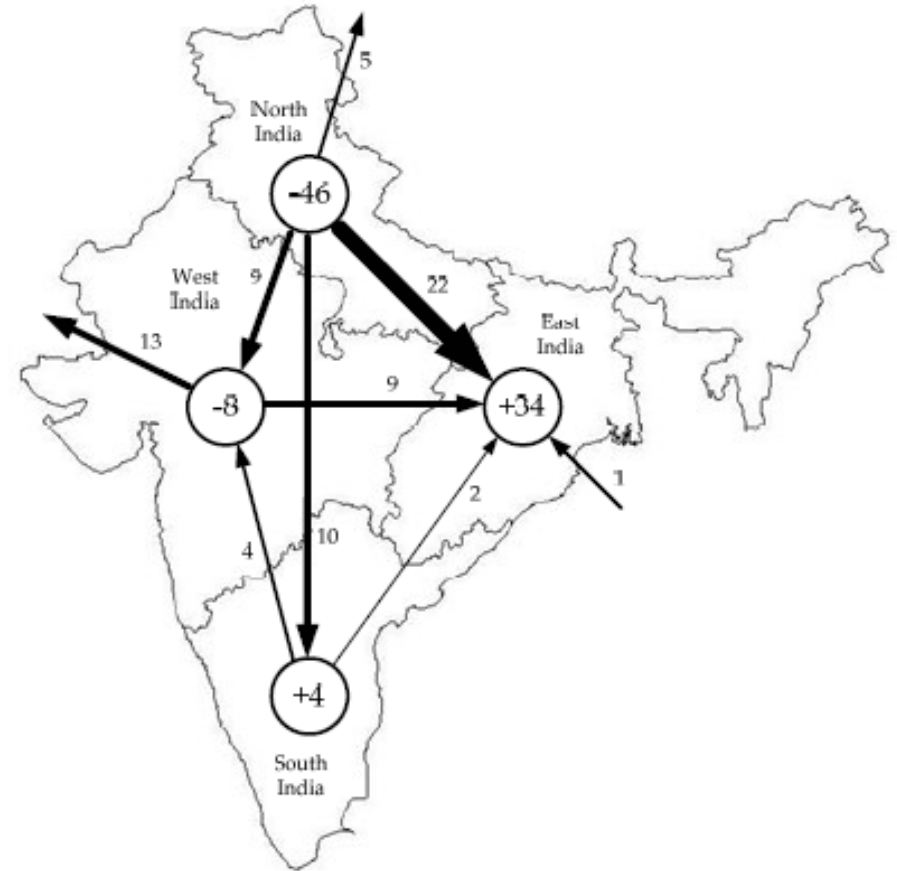
# Key Points...

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# Physical vs. Virtual Water Transfer



- $178 \times 10^9 \text{ m}^3 \text{ p.a.}$
- Water Abundant TO Water Scarce



- $106 \times 10^9 \text{ m}^3 \text{ p.a.}$
- Water Scarce TO Water Abundant!!

# Implications for NRLP...

- *Virtual and Physical transfers must complement, not contradict, each other...*
  - » *Reconcile physical water transfers and virtual water trade*
  - » *Focus on improving the productivity of Eastern India's agriculture through changes in food policy, energy policy and input market policy*
  - » *Inter-basin transfers may still be needed but to a lesser extent and for entirely different reasons...*

# Conclusions

1. VW trade concepts equally valid and useful within countries, at the regional and sub-regional level
2. Non-water factor endowments and other determinants of trade need to be taken into account while formulating a VW strategy
3. Focus on economic, and not physical, water scarcity and abundance
4. VW trade can complement inter-basin water transfers, if understood and used correctly

