THE UNIVERSITY OF MELBOURNE

MELBOURNE SCHOOL OF GRADUATE RESEARCH

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An Assessment of Anthropogenic Impacts on a Hydrological System using SWAT Model

Rajesh Nune
Biju George
Andrew W Western

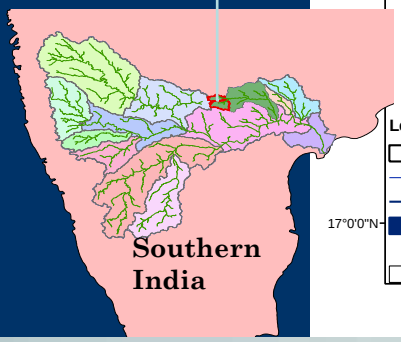
Outline

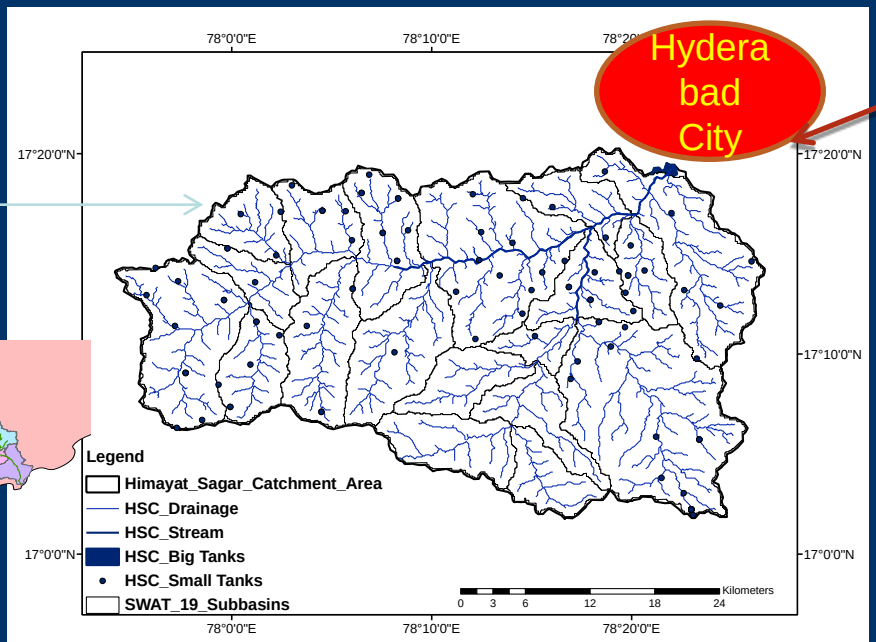
- Introduction – Study Area
- Statement of the Problem
- Catchment Characteristics
- SWAT modeling
- Preliminary Results
- Conclusions

Aim:
This study aims to quantify the historic and future impacts of major anthropogenic changes on the hydrology of the upper Musi catchment, India.
Objectives:

Anthropogenic Impacts: Effects, those that are derived from human activities.
Ex: Hydrological structures (Farm dams, Check dams, etc.), Groundwater extractions, Land use change, etc.,

Study Area: Himayat Sagar Catchment





Hydera bad City

Himayat Sagar Reservoir : 1340 km²

Inflows:

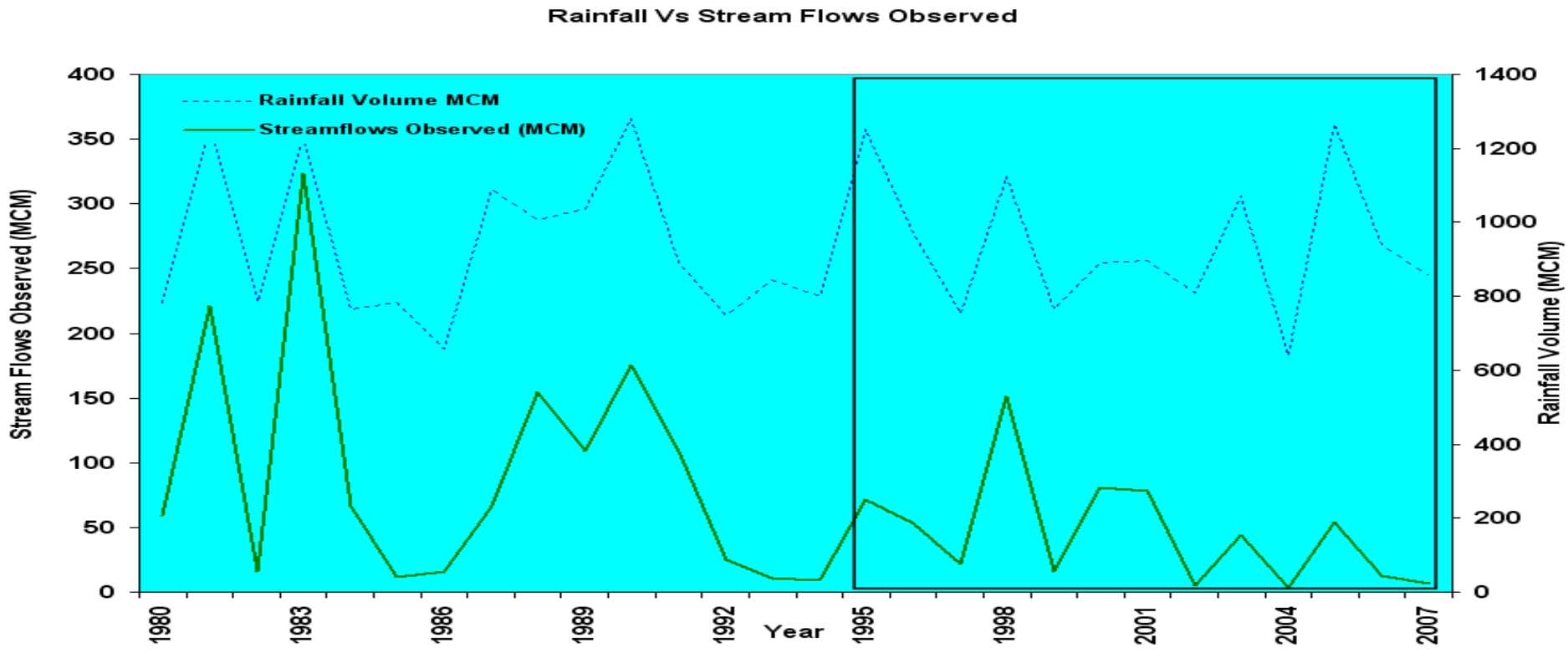
AAI = 69 GL

1980-89 = 100 GL

1990-99 = 64 GL

2000-09 = 43 GL

Statement of the Problem

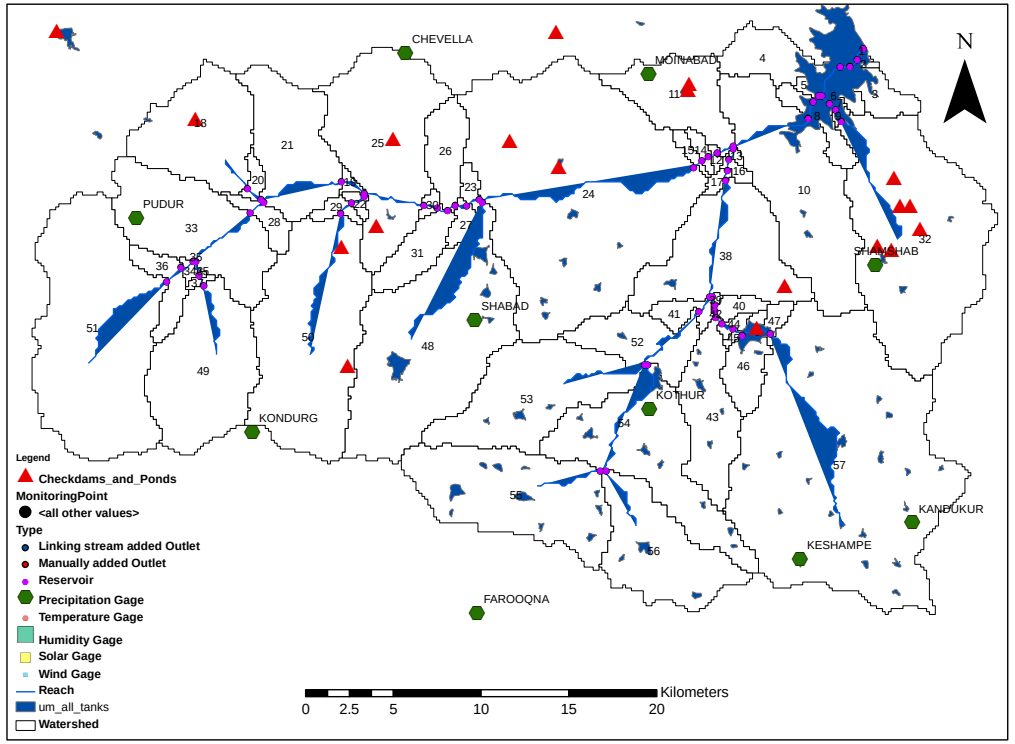


Anthropogenic Impacts:

Effects, those that are derived from human activities.

Ex: **Hydrological structures (Farm dams, Check dams, etc.),**
Groundwater extractions,
Land use change, etc.,

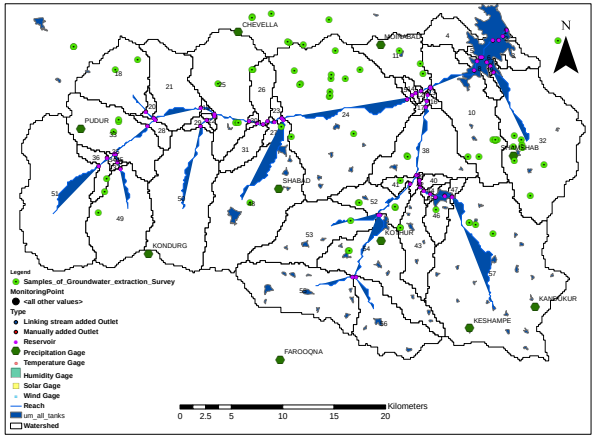
Catchment Characteristics



Data collected for 25 different types of hydrological structures (storages and usage)

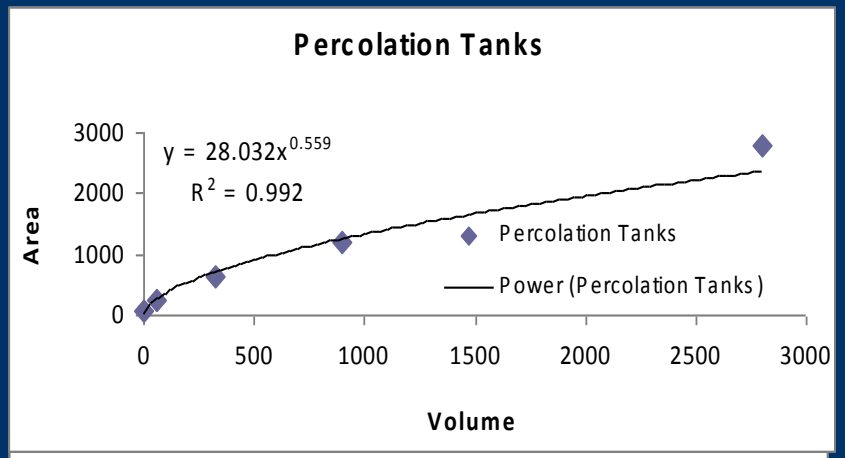
Catchment Characteristics

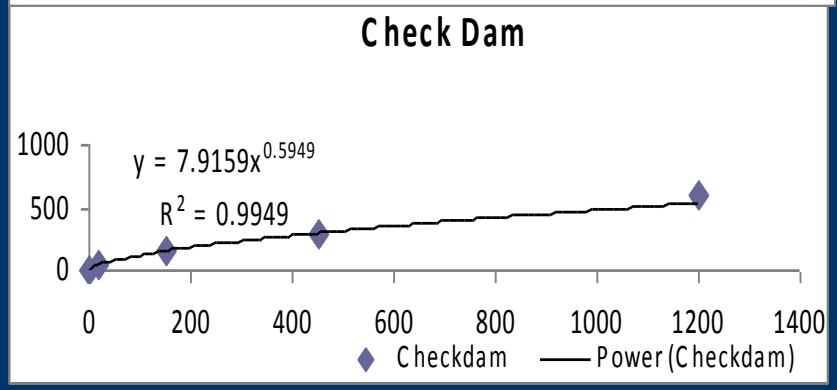
Groundwater extraction survey points (60)

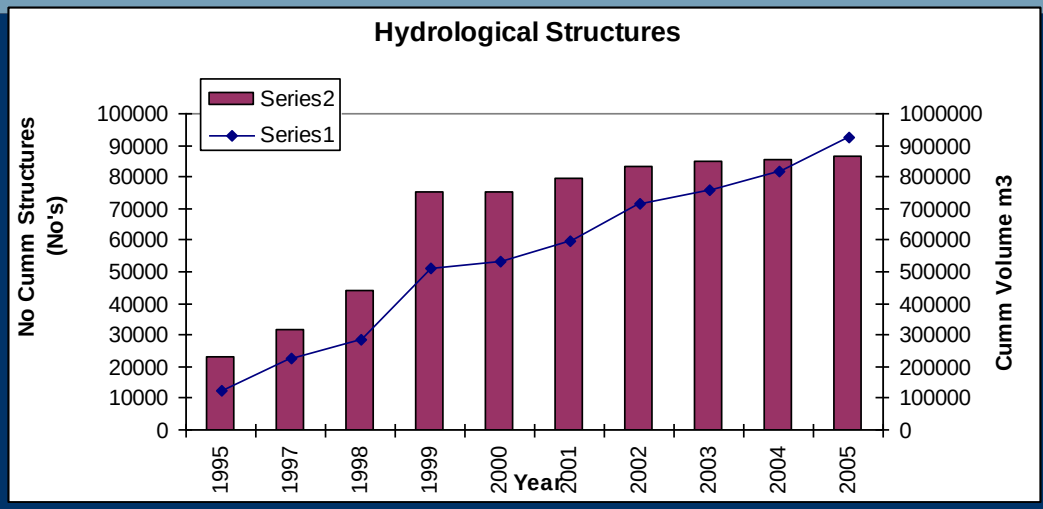


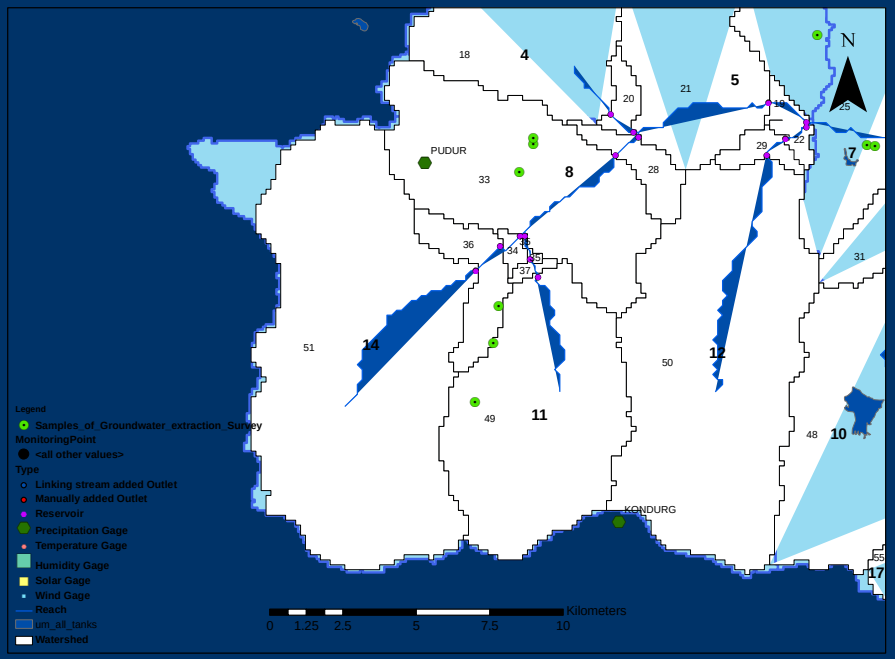
- Every 2 Acre Has One bore at least (Irrigated Land)
- Each Bore well is pumping 600 hrs (Per year)
- ~ 121 MCM are pumping from GW (93 mm, 12.5% Rf)

Modelling Hydrological Structures - Reservoirs





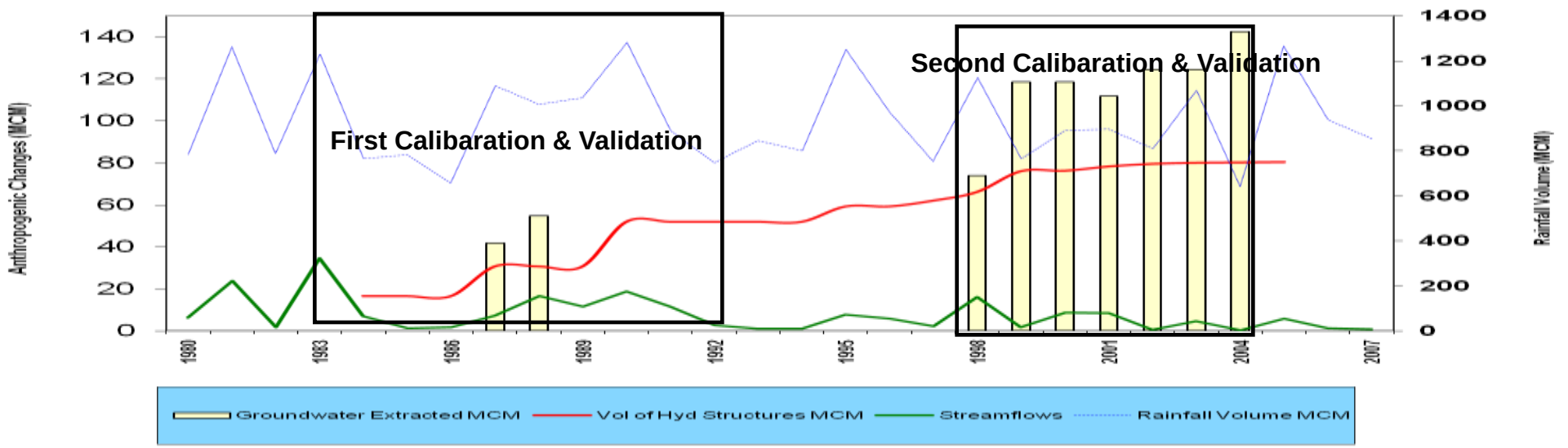




- 25% of runoff Volume is stopped by Structures (25 GL)

- 100 % of recharge is pumping back to Irrigation (121 GL)

Modelling : Land use Land cover & Groundwater Extractions



First Set:

Warm up Period: 1980 - 1982
Calibration Period: 1983 – 1987
Validation Period: 1988 – 2009

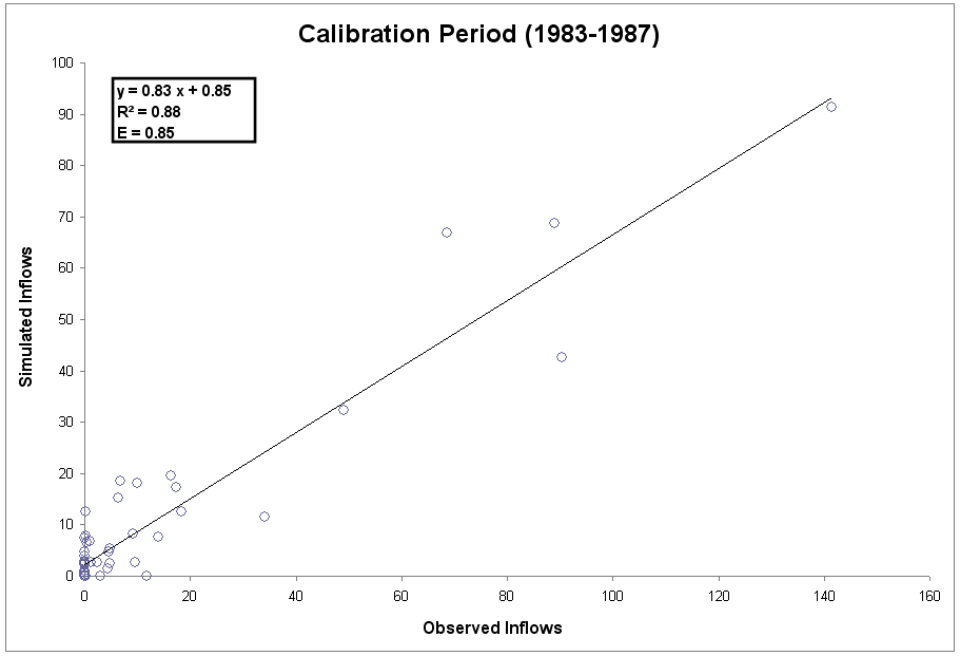
Land use Area :Ave (1986)
Hydrological Structures: 1995-2005
GW Extractions: Ave (2000 – 2005)

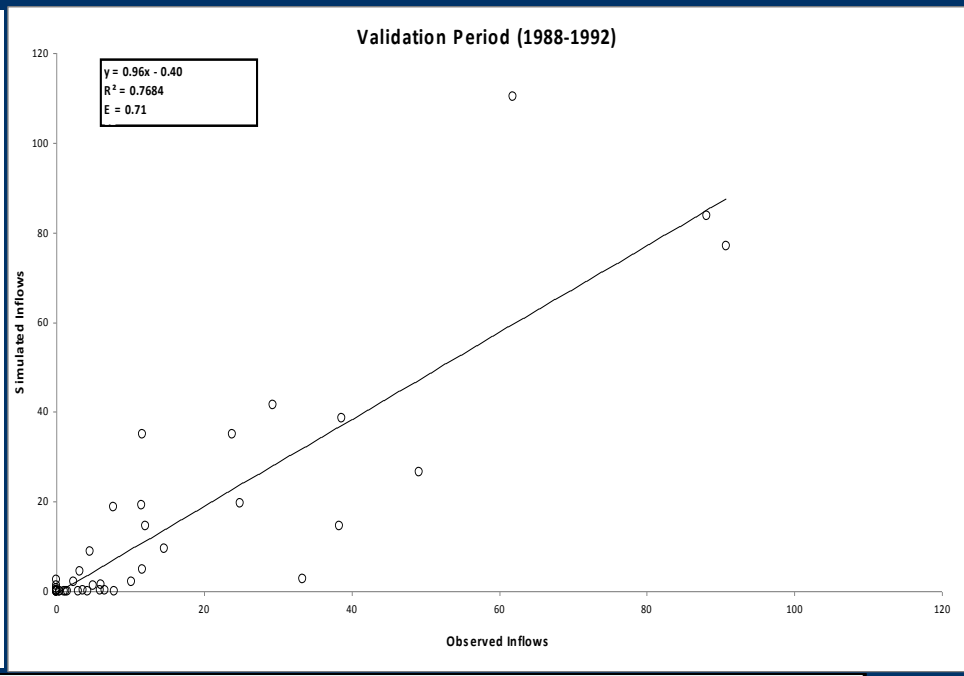
Second Set:

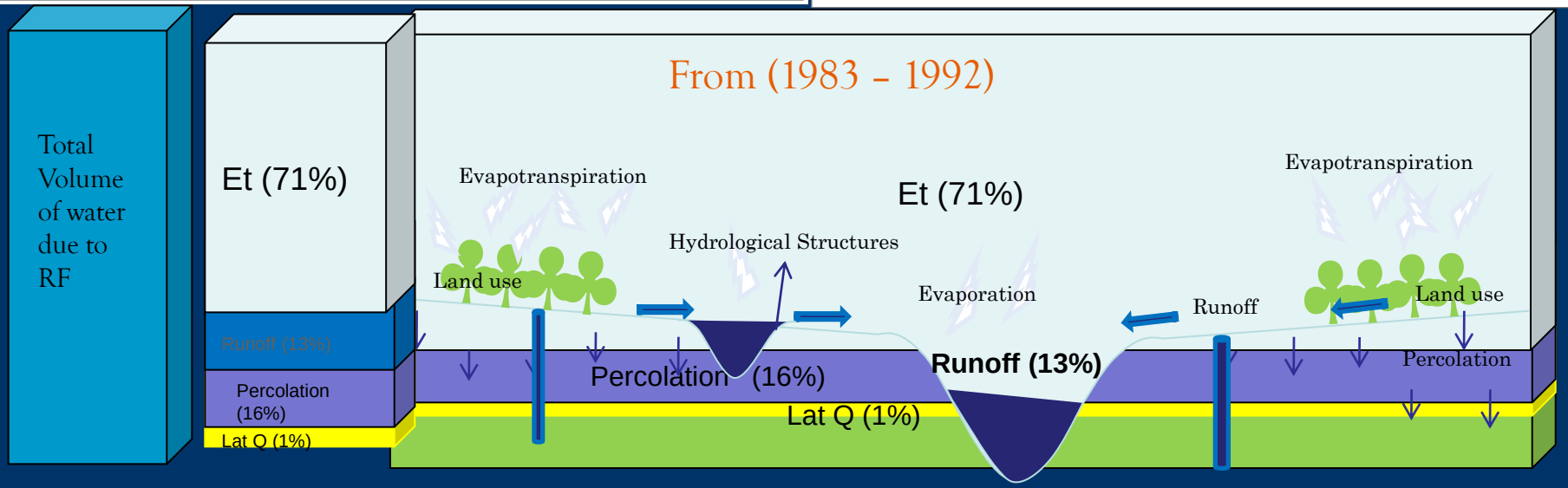
Warm up Period: 1997 - 1999
Calibration Period: 2000 – 2005
Validation Period: 1995 – 2000

Land use Area :Ave (2000-2002)
Hydrological Structures: 1995-2005
GW Extractions: Ave (2000 – 2005)

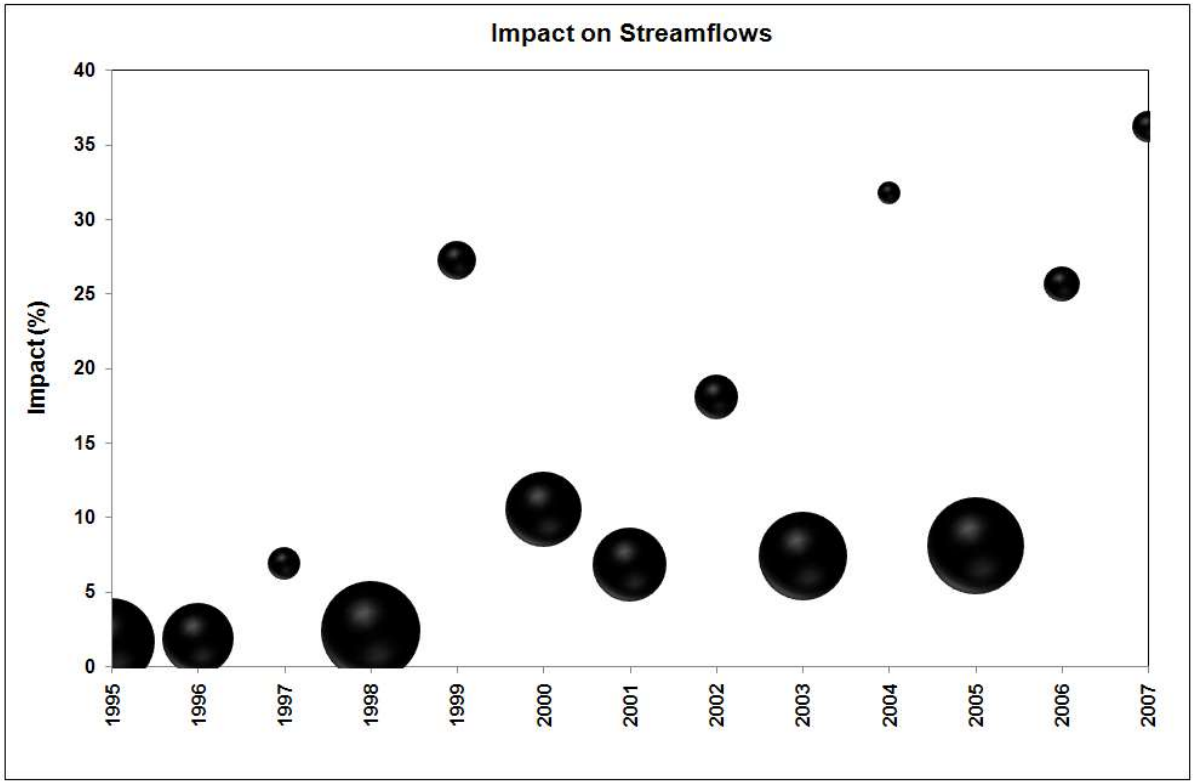
First Set


Calibration Period (1983-1987)
y = 0.83 x + 0.85
R² = 0.88
E = 0.85
Simulated Inflows
Observed Inflows


Validation Period (1988-1992)
y = 0.96x - 0.40
R² = 0.7684
E = 0.71
Simulated Inflows
Observed Inflows


From (1983 - 1992)
Total Volume of water due to RF
Et (71%)
Runoff (13%)
Percolation (16%)
Lat Q (1%)
Evapotranspiration
Land use
Hydrological Structures
Et (71%)
Evaporation
Runoff
Runoff (13%)
Percolation (16%)
Lat Q (1%)
Evapotranspiration
Land use
Percolation

Results



Analysis of residuals : 1995-2005

Wet Year: 6-8%
Normal Year: 8-25%
Dry Year : 27-36%

Conclusion

- The results to date clearly show that the impacts of Anthropogenic changes on streamflows are significantly greater during dry years.
- Model calibration for the second set of period
- Separating the individual effects of these changes and
- Quantifying the relative impacts of these changes on catchment hydrology.

Thank You