Reallocation of Río San Juan Water by Monterrey City, Mexico

Implications for Agriculture and Basin Water Sharing

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Scarcity: Conflict or Cooperation?

- Urban growth accelerating in regions with over-allocated water resources
- Existing use--generally agriculture--has connotations of being residual (Molle):
  - "low value/ productivity"
  - "lion's share"
- Environmental water use declines

Integrated River Basin Management

- Is IRBM (an IWRM stepchild) a viable, appropriate decision-making domain?
  - Spatially defined, hydrologically delineated
- The river basin offers only partial explanatory value, management promise
  - Inter-basin transfer
  - Return flows to agriculture, also may be inter-basin
  - The result is the "human water cycle"

The Human Water Cycle: Rural-Urban-Rural Water Loop

- **Transfer of water from agriculture to cities**
  - Move conflict to cooperation - negotiated settlements
  - Water rights, property regime, economic issues
- **Urban use, enhanced quality of life**
  - Urban amenity value of water
  - Millennium Development Goals in LDCs
- **Agricultural end use of wastewater/ effluent**
  - Re-tool agriculture to adapt to water quality and timing
  - Public health risk (consumers and producers)

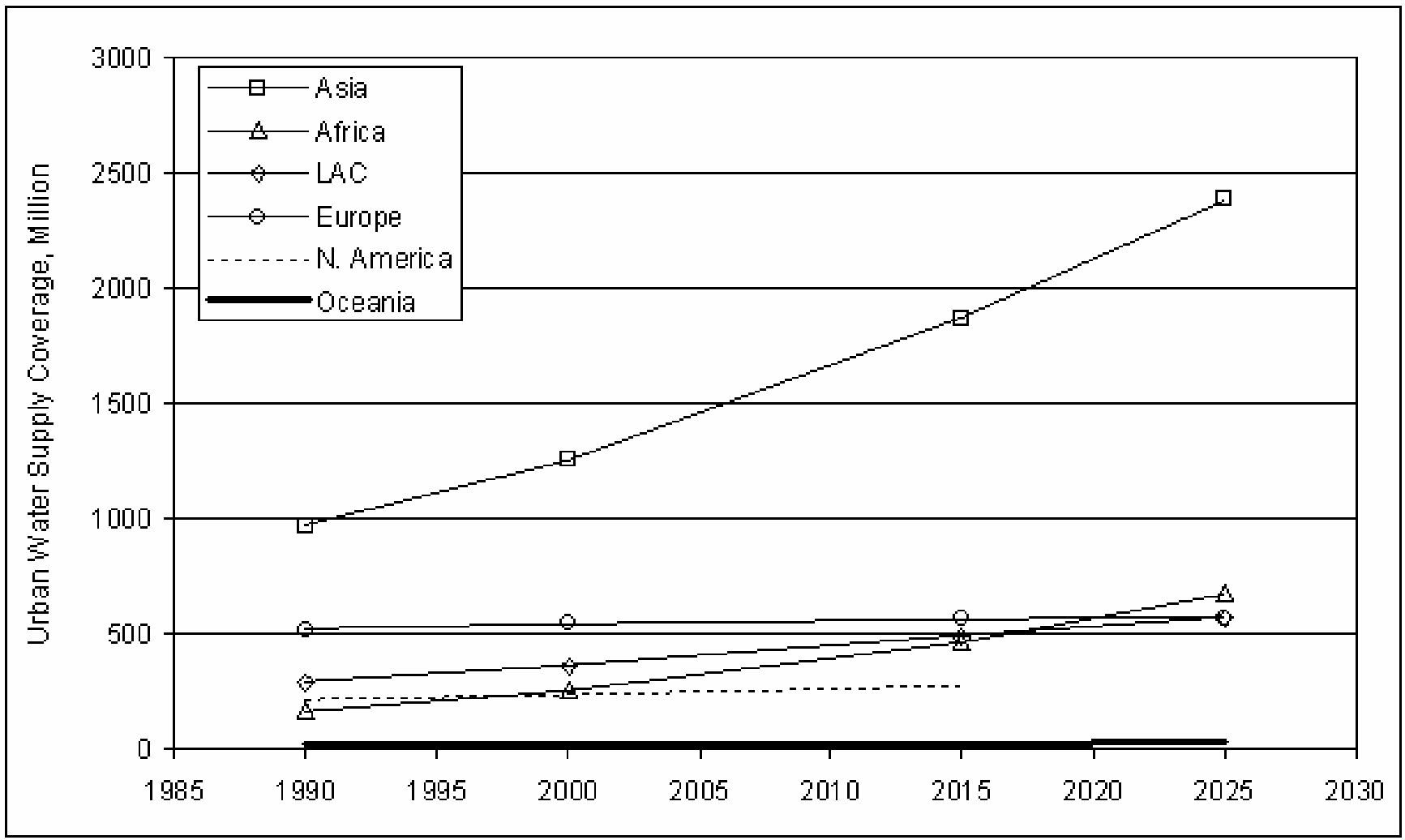
Human Water Cycle Typology

Rural source	**Urban use**	**Rural return, use**
Production irrigated ag.	Multiple (w/ urban sprawl on ag.). Wastewater 	Wastewater mixed source for informal urban & peri-urban agriculture
Small-scale "rural" water	Multiple use. Wastewater 	Wastewater primary source for production irrigated agriculture
Production irrigated agriculture	Multiple use. Effluent 	Same ag. users as source water (i.e., water swap with treatment). **e.g. Monterrey, Mex. – Bajo Rio San Juan**

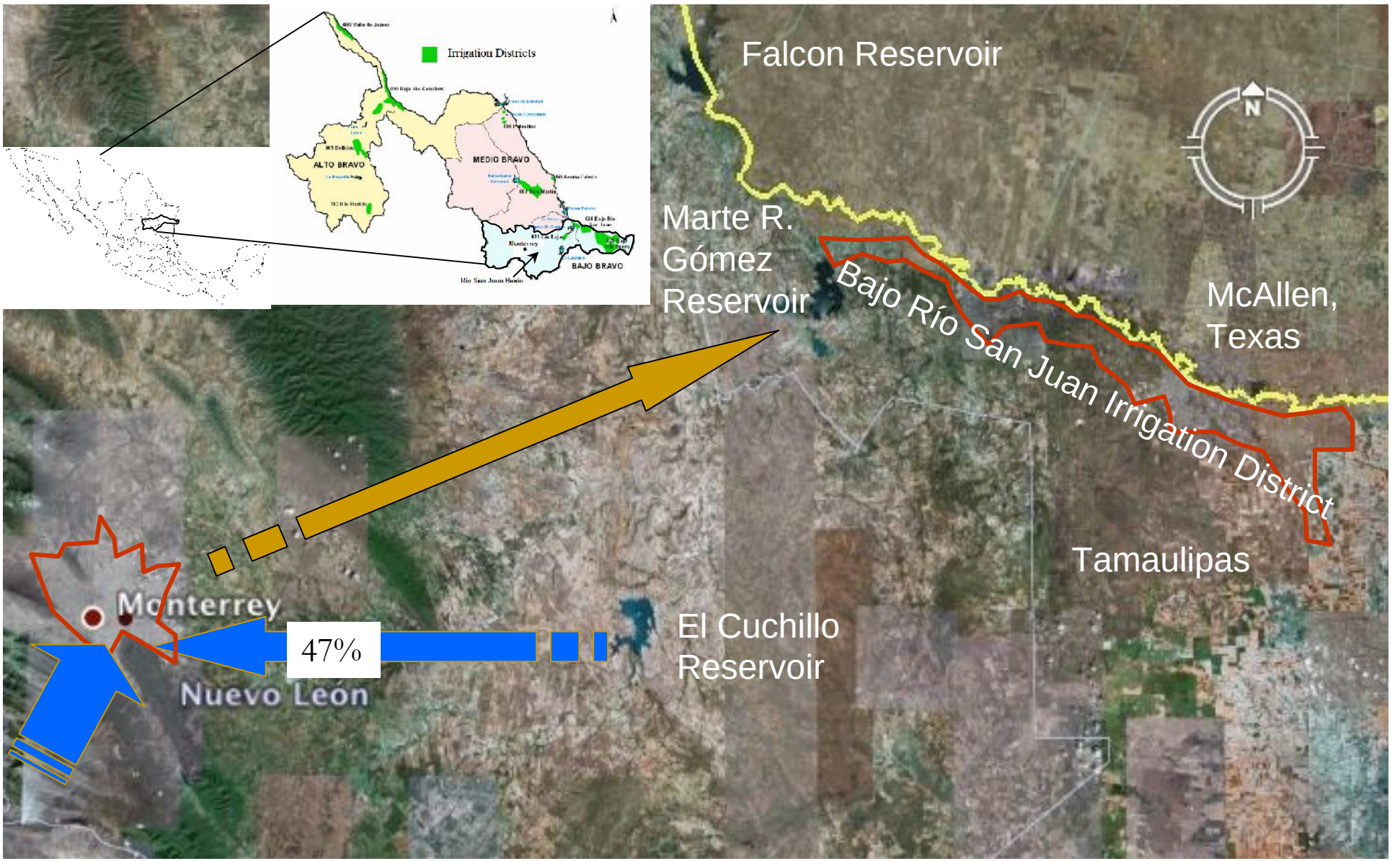
Context - Sobering Demographics

- 880 million additional population by 2015, virtually all in developing countries.
- After 2015, all worldwide growth in population will take place in developing country cities.

Urban Water Supply Growth

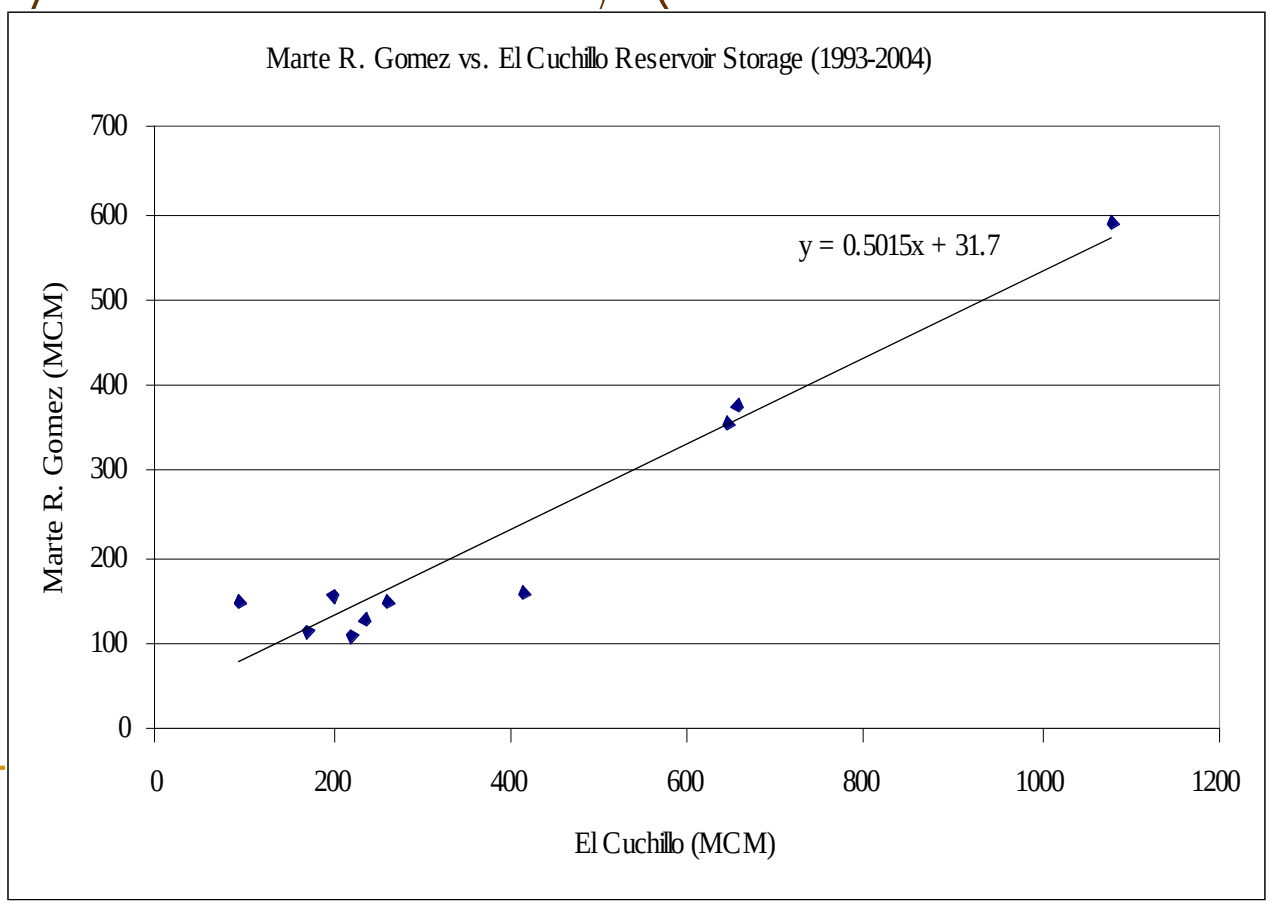


Bajo Río San Juan-Monterrey Transfer



El Cuchillo

- Constructed in 1993
- Supplies 5 m^3/s to Monterrey (to be increased to 10 m^3/s)
- MR Gómez reservoir impacts



Negotiated Settlement

- 9 Oct. 1989 – Monterrey, federal and Nuevo León governments agree to finance and construct El Cuchillo dam
- 6 Sept. 1990 –Tamaulipas, federal and Nuevo León governments agree to "rationalize" water use, preserve multiple uses of BRSJ irrigation water
- Meet treaty obligations with the U.S.

Effluent – the Bargaining Chip

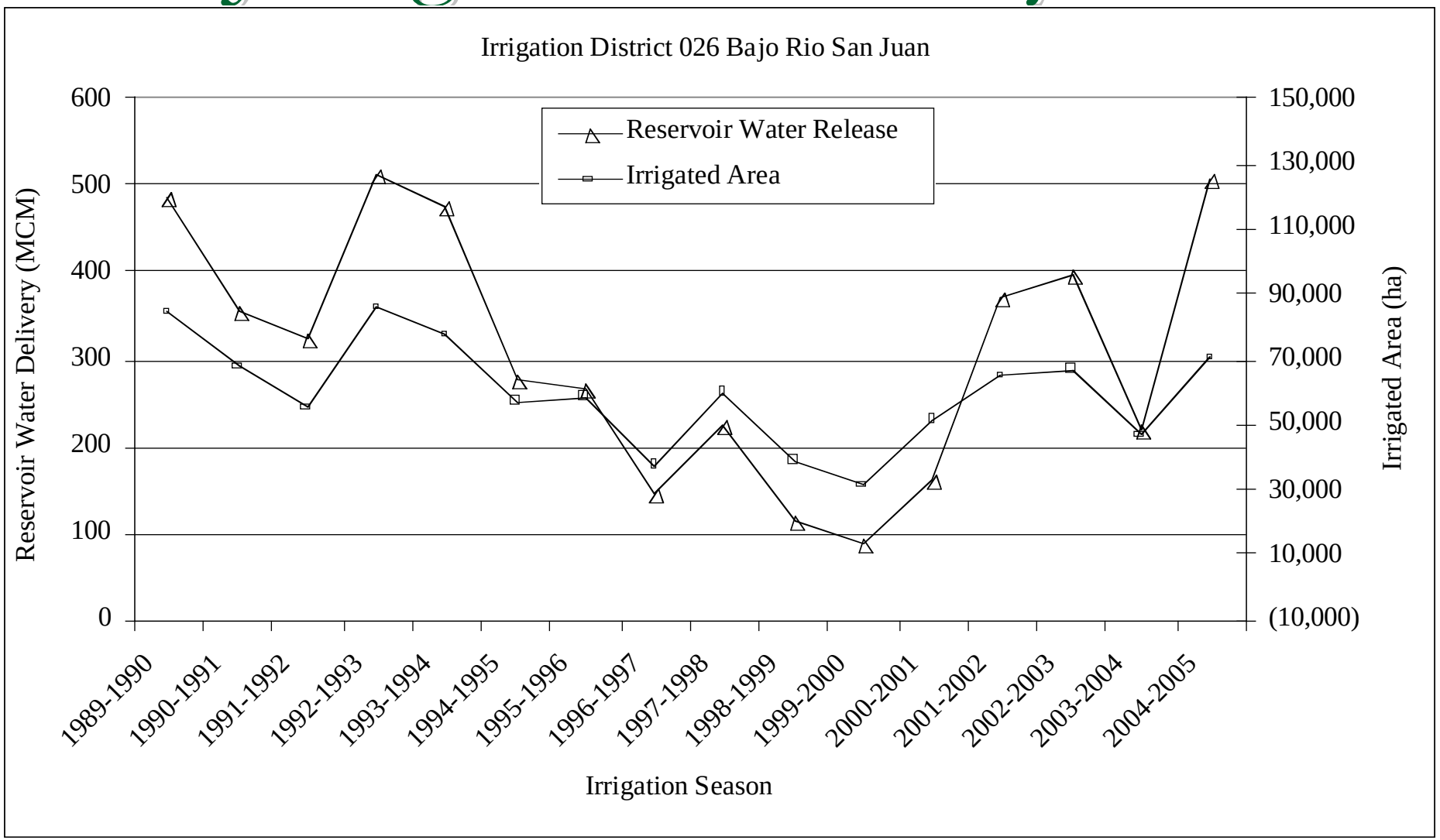
- Federal CNA allocates 189 MCM of effluent from Monterrey to BRSJ irrigators
- Nuevo León assumes responsibility and cost of treatment in compliance with federal standards
- Relocation of downstream Tamaulipas urban water demand from BRSJ irrigation canal

BRSJ - Variable Capacity to Adapt, eg., Irrigation Water Productivity

Year	Total Production (Ton)	Total Gross Volume Used (Thousand m^3)	Total Net Volume Used (Thousand m^3)	Gross Water Productivity (Ton/Thousand m^3)	Net Water Productivity (Ton/Thousand m^3)
95-96	202,131.86	263,331.00	146,743.00	0.77	1.38
96-97	101,029.00	146,811.00	78,927.00	0.69	1.28
97 - 98	175,891.00	222,875.00	128,059.00	0.79	1.37
98 - 99	84,614.00	114,272.00	64,089.00	0.74	1.32
99 - 00	90,555.00	110,100.00	64,201.00	0.82	1.41
00 - 01	6,609.00	160,499.00	83,283.00	0.04	0.08
01 - 02	250,578.00	383,171.00	219,372.00	0.65	1.14
02 - 03	281,786.20	395,429.90	213,457.40	0.71	1.32
03 - 04	394,543.58	217,267.50	110,089.20	1.82	3.58

Growing upstream demand and capture of wastewater; will need to pipe it 100+ km.

BRSJ Irrigation Efficiency



Treaty deliveries to the U.S. not met in all cases; significant water use tightening in San Juan (Conchos, and Bravo/Grande) basins.

Conflict to Cooperation

- Urban growth, legal priority to water = increasing competition with agriculture
- Decision-making inevitably moves beyond the river basin (spatial domain) to organizational and political domains
- The human water cycle presents the threat of conflict, but also opportunities for cooperation

Policy Implications

- Need coherent legal, institutional frameworks
- Coordination of multiple government agencies
- Flexible application of the 'polluter pays' principle
- Public awareness campaigns for farmers and urban water users

Thank you.

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