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Interbasin Water Transfers, a Case Study in Mexico

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Interbasin Water Transfers, A Case Study in Mexico

by Ronald G. Cummings
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This slender volume deals with the economic evaluation of a proposed interbasin transfer scheme along approximately 600 miles of Mexico's northwest coastline. The basic goal would be to bring water from flood-plagued regions in the south (which receive some 56" of annual rainfall) to the water-short regions in the north (where average rainfall is only 8 inches). While the successive transfer of flows from one basin to the next would benefit various intermediate sub-regions with potentially irrigable land, the ultimate goal would be to deliver some 325,000 acre-feet of water (of the total of 800,000 to be transferred) to the Costa de Hermosillo irrigation district in the state of Sonora which presently has some 300,000 acres under cultivation. At the present time, this district, which is one of the most modern and productive in the country, depends entirely on groundwater use. Annual withdrawals from the aquifer vary between 650,000 and 970,000 acre-feet, while the recharge is only about 280,000 acre-feet. As a result of these constant overdrafts, the water table is declining (some 88 feet or more between 1953 and 1970), and seawater is intruding at rates of approximately 0.6 miles per year. The proposed water transfer from the south has been received by its proponents as a necessary and desirable "rescue" operation which would guarantee the survival of this fertile and highly productive agricultural region and its urban support structure.

The first two chapters of Cummings' analysis are introductory. The first reviews the rationale of interbasin water transfers and particularly those of so-called "rescue operations," a term coined by Howe and Easter in their path-breaking study,[1] while the second details the physical and economic setting in which the Northwest Transfer Scheme would be built.

The detailed analysis that follows proceeds in three steps: the first establishes the projected benefits and costs of additional (or replacement) irrigation water in the target areas of the transfer scheme on the one hand and its major alternatives (i.e. presently non-irrigated lands closer to the source of water) on the other. A special chapter (by Pierre Crosson) estimates the relevant regional multipliers which then are included in the respective regional benefit calculations.

The next step consists of the development of a linear programming

1. C. & E. HOWE & K. WILLIAMS, INTERBASIN TRANSFERS OF WATER: ECONOMIC ISSUES AND IMPACTS (1971).

model that estimates the net benefits of each potential water recipient zone. These estimates then are used to establish optimum water transfers for each of them in a "representative" year.

Finally, a ground water management optimization model for the Costa de Hermosillo is developed that takes explicit account of increasing pumping costs and the losses resulting from further saltwater intrusion. An interesting detail of the analysis is that it attempts to take explicit account of the income-distributional effects of alternative water allocations. While transfers to Hermosillo would benefit relatively wealthy farmers, newly irrigated land elsewhere would largely benefit the rural poor, since under the 1972 Mexican Water Law landholdings in new irrigation projects are limited to a maximum of 62 acres. However, these small farmers are generally less productive. In one variant of Cummings' maximization model, this expected yield differential is eliminated as a legitimate cost of valid Mexican income distributional policies.

Two major conclusions emerge from the study. The first is that even under the most favorable assumptions water transfers to the Costa cannot be economically justified as long as annual groundwater pumping rates in the Costa are greater than 400,000 acre-feet. The second, derived from the groundwater model, is that pumping rates in the Costa can be maintained at higher rates than that for at least 22-25 years even under the most conservative assumptions about the existing ground water storage. In other words, water transfers to the Costa cannot be justified for at least that period of time.

While Cummings' conclusions were greeted with anything but joy from the politically powerful landholding interests in the Northwest, and while President Echeverria himself announced the beginning of construction of the overall transfer scheme at a cost of over 1.5 billion dollars,[2] recent government planning documents clearly indicate that Cummings' message has been clearly understood: water transfers to Hermosillo are not expected to begin until the years 1990-1995.[3]

While this must give great satisfaction to the author, the value of his analysis well transcends that of a limited, albeit interesting and successful case study. What is more important, and what makes this study worthwhile to read even for those who have little or no interest in Mexican water developments is the approach used, the methodology developed and the systematic and deliberate use of

2. As reported in El Sol De Mexico, Dec. 4, 1973, p. 1.

3. *Plan Nacional Hidraulico 1975. Informe Resumen*, Mexico 1975, Vol. I, pp. 121 & 125.

biased assumptions in order to prove the solidity of the conclusions in the face of uncertain and unreliable data sources.

This study, like studies almost anywhere else, had to be undertaken under severe time and funding constraints. Data sources were poor or non-existing, and the methodology applied had to rely on the use of standard programming tools such as linear optimization models which normally could not be considered to be appropriate in evaluations where economics of scale are rather significant. These shortcomings were overcome, however, by deliberately assuming those values, and constraining model solutions in such a way that the outcome would systematically favor the Hermosillo water transfer. When, in spite of these systematic biases, the outcome of the analysis showed the transfer to be uneconomic, there could be little doubt about the validity of this conclusion, even though the actual numerical results themselves were subject to question. What makes this analysis even more valuable is the great care with which various assumptions are stated, how they are justified, and how it is shown what likely effect they would have. Given this exceptional clarity it is not difficult at all to remove some of them if one does not agree with them, or to replace doubtful data sources with better ones if they become available.

It is this careful development of methodology and reasoning that make this study so valuable to the general, non-Mexico-oriented reader. While not all of these assumptions can really be accepted as valid—one wonders, for example, why the author relies on arbitrary acreage limitations for the more valuable crops (wheat and cotton) in order to show diminishing returns to scale in each region even though wheat, for example, faces an unlimited market at government-guaranteed prices[4]—these details are really of secondary importance, and, most importantly, they would not change the validity of the conclusions.

This reviewer, for one, would wish that the publisher would produce a low-cost reprint of this hardcover volume, so that it could be used and adopted for classroom use wherever serious attempts are made to teach the art and pitfalls of real-world project analysis.

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4. It would have been much simpler, and more convincing to assume increasing production costs because of non-uniform land resources.

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