

4.8 Socio-Economic Impacts of Not Meeting Water Needs

Section 357.7(4) of the rules for implementing Senate Bill 1 require that the social and economic impact of not meeting regional water supply needs be evaluated by the Regional Water Planning Groups. The Texas Water Development Board is required to provide technical assistance, upon request, to complete the evaluations. The Brazos G Regional Water Planning Group submitted a request to TWDB for assistance. TWDB evaluated each unmet water need, using data that connected water use with the economy and the population of the region.¹ The purpose of this element of Senate Bill 1 planning is to give the regions an estimate of the potential costs of not acting to meet anticipated needs in each water user group, or conversely, the potential benefit to be gained from devising a strategy to meet a particular need. Collectively, the summation of all the impacts gives the region a view of the ultimate magnitude of the impacts caused by not meeting all of the entire list of needs. These summations should be considered a worst-case scenario for the region, since the likelihood of not meeting the entire list of needs is very small.

Each water user group with a need was evaluated in terms of direct and indirect economic and social impact on the region resulting from the shortage. Economic variables chosen by TWDB for this analysis include gross economic output (sales and business gross income), employment (number of jobs) and personal income (wages, salaries and proprietors net receipts). The effects of shortages on population and school enrollments are the social variables of the analysis. Declining populations indicate a deprecation of social services in most, but not every case, while declining school enrollment indicates loss of younger cohorts of the population and possibilities of strains on the tax bases, when combined with economic losses.

Summary of Results

Table 4-83 summarizes the relationship of projected water shortages to employment, population, and income in the region for the 2000 to 2050 time period. Total water demand in the region is projected to increase from 726,080 acft in 2000 to 948,190 acft in 2030, and continuing to increase to 1,034,599 acft in 2050. Under extreme supply limitations and with no management strategies in place, water shortages would amount to 57,859 acft in 2000, rising to 151,735 acft in 2030 and to 209,639 acft by 2050.

As shown in Table 4-83, unmet water needs of the region amount to about 13.5 percent of the forecasted demand by 2020, rising to 17.5 percent of demand in 2040 and 20.3 percent in 2050. This means that by 2050 the region would be able to supply only 80 percent of projected needs unless supply development or other water management strategies are implemented.

Economic Growth Limitations

The difference between expected future growth, unrestricted by water shortage, and expected growth restricted by unmet water needs provides the measure of impact.

Employment

Left entirely unmet, projected shortages in 2010 result in 93,000 fewer jobs than would be expected in unrestricted development (without water needs) by 2010. The gap between unrestricted and restricted job growth grows to 253,000 by 2030, and to 440,000 jobs that the restricted economy could not create by 2050.

Population

The forecasted population growth of the region would be economically restricted by curtailed potential job creation. This in turn causes both an outmigration of some current population and an expected curtailment of future population growth. Compared to the baseline growth in population, the region could expect 199,000 fewer people in 2010, growing to 545,000 fewer in 2030 and 947,000 fewer in 2050. The expected 2050 population under the severe shortage conditions would be 31 percent lower than projected in the region's most likely growth forecast.

Income

The potential loss of economic development in the region amounts to about 13 percent less income to people in 2010, with the gap growing to 27 percent less than expected in 2030. By 2050 the region would have 38 percent less income than is currently projected assuming no water restrictions.

¹ A printout of the socio-economic impact estimates of projected unmet water demands is available on request from the Brazos River Authority or HDR Engineering.

Table 4-83.
Estimated Effects of Water Shortages on
Employment, Population, and Income

Water			
Decade	Projected Demand (acft)	Projected Water Shortage (acft)	Percent Shortage
2000	726,080	(57,859)	8.0%
2010	832,642	(85,978)	10.3%
2020	904,736	(122,022)	13.5%
2030	948,190	(151,735)	16.0%
2040	990,383	(172,908)	17.5%
2050	1,034,599	(209,639)	20.3%

Employment			
Decade	Baseline Employment (FTE Jobs)	Employment with Water Shortage (FTE Jobs)	Percent Loss
2000	639,962	576,014	10.0%
2010	745,744	652,216	12.5%
2020	841,678	668,075	20.6%
2030	941,341	688,255	26.9%
2040	1,040,899	696,830	33.1%
2050	1,140,250	700,145	38.6%

Population			
Decade	Baseline Population	Population with Water Shortage	Percent Loss
2000	1,672,819	1,537,582	8.1%
2010	2,007,668	1,808,936	9.9%
2020	2,362,341	1,989,902	15.8%
2030	2,639,033	2,094,253	20.6%
2040	2,882,090	2,143,086	25.6%
2050	3,096,910	2,150,092	30.6%

Income			
Decade	Baseline Income (millions, 1999 \$)	Income with Water Shortage (millions, 1999 \$)	Percent Loss
2000	18,109	16,208	10.5%
2010	21,102	18,330	13.1%
2020	23,817	18,811	21.0%
2030	26,637	19,441	27.0%
2040	29,454	19,757	32.9%
2050	32,266	19,902	38.3%

Source: Texas Water Development Board, "Socio-Economic Impacts of Not Meeting Water Needs, Brazos G Regional Water Planning Group (Region G)," August 9, 2000.

Water User Groups with Shortages

The economic and social impact of an unmet water need varies greatly depending on the type of water user group for which the shortage is anticipated. On a per acre-foot basis, the largest impacts will generally result from shortages in manufacturing and municipal uses, while shortages for irrigation will typically result in the smallest impact. Table 4-85 presents the impacts of unmet water needs summarized for each of the six types of water user groups. Table 4-84 summarizes projected impacts of unmet demands before management strategies are in place. Table 4-84 should be used only for measuring the extreme limit of lost potential economic development for the region as a whole, caused by lack of development of new water supplies in the region for those water user groups in need of supply. The data are not a prediction or forecast of water shortages, but show the cumulative effect of simultaneous unmet needs for those with potential shortages.

Water shortages in the Brazos G region are relatively evenly distributed among water user groups until the year 2020, when unmet municipal water needs begin to grow rapidly. In 2010, municipalities have unmet needs of 24,138 acft, or 28 percent of the total unmet needs. The economic impacts of this shortage (34,068 jobs, \$2.3 billion in output, and \$885 million of income) represent approximately 25 to 35 percent of the total impacts. By 2050, unmet municipal needs total 131,021 acft (63 percent of the total) resulting in 329,893 jobs not created, and \$8.9 billion in potential income (more than 70 percent of the total impact).

The impact of not meeting manufacturing needs grows over time. In 2010, manufacturing has unmet needs of 10,489 acft, or 12 percent of the total unmet needs. The economic impacts of this shortage include loss of 56,537 jobs (60 percent of the total employment impact) and \$6 billion in output (69 percent of the total output impact). In 2050, unmet manufacturing needs are 19,777 acft (9 percent of the total) resulting in 106,149 jobs not created and reduction of \$11.4 billion in output (36 percent of the total output impact).

Unmet irrigation needs represent a significant amount of need, but, due to the relatively small value of economic output added per acre-foot, the impacts of not meeting irrigation needs are considerably less. In 2010, irrigation has unmet needs of 26,711 acft, or 21 percent of the total. However, the economic impacts of the shortage represent less than 1 percent of the total economic impact. Unmet irrigation needs decline over the time period of the analysis.

Table 4-84.
Summary of Socio-Economic Impacts of Not Meeting Needs

Category	Decade	Value of Need (acft)	Impact of Need on Employment	Impact of Need on Gross Business Output in 199 U.S. Dollars (millions)	Impact of Need on Population	Impact of Need on School Enrollment	Impact of Need on Income in 1999 U.S. Dollars (millions)	Number of WUGs with Needs
Municipal	2000	(57,859)	63,948	6,372.8	135,237	34,030	1,900.9	72
Manufacturing	2000	(57,859)	63,948	6,372.8	135,237	34,030	1,900.9	72
Steam-Elec.	2000	(57,859)	63,948	6,372.8	135,237	34,030	1,900.9	72
Mining	2000	(57,859)	63,948	6,372.8	135,237	34,030	1,900.9	72
Irrigation	2000	(57,859)	63,948	6,372.8	135,237	34,030	1,900.9	72
Livestock	2000	(57,859)	63,948	6,372.8	135,237	34,030	1,900.9	72
Total		(347,154)	383,688	38,236.8	811,422	204,180	11,405.3	
Municipal	2010	(85,978)	93,528	8,806.7	198,732	50,144	1,772.0	86
Manufacturing	2010	(85,978)	93,528	8,806.7	198,732	50,144	1,772.0	86
Steam-Elec.	2010	(85,978)	93,528	8,806.7	198,732	50,144	1,772.0	86
Mining	2010	(85,978)	93,528	8,806.7	198,732	50,144	1,772.0	86
Irrigation	2010	(85,978)	93,528	8,806.7	198,732	50,144	1,772.0	86
Livestock	2010	(85,978)	93,528	8,806.7	198,732	50,144	1,772.0	86
Total		(515,868)	561,167	52,840.3	1,192,392	300,864	16,632.3	
Municipal	2020	(122,022)	173,604	14,422.5	372,439	94,369	5,005.9	94
Manufacturing	2020	(122,022)	173,604	14,422.5	372,439	94,369	5,005.9	94
Steam-Elec.	2020	(122,022)	173,604	14,422.5	372,439	94,369	5,005.9	94
Mining	2020	(122,022)	173,604	14,422.5	372,439	94,369	5,005.9	94
Irrigation	2020	(122,022)	173,604	14,422.5	372,439	94,369	5,005.9	94
Livestock	2020	(122,022)	173,604	14,422.5	372,439	94,369	5,005.9	94
Total		(732,132)	1,041,622	86,535.3	2,234,634	566,214	30,035.7	
Municipal	2030	(151,735)	253,085	19,864.5	544,780	139,332	7,195.9	99
Manufacturing	2030	(151,735)	253,085	19,864.5	544,780	139,332	7,195.9	99
Steam-Elec.	2030	(151,735)	253,085	19,864.5	544,780	139,332	7,195.9	99
Mining	2030	(151,735)	253,085	19,864.5	544,780	139,332	7,195.9	99
Irrigation	2030	(151,735)	253,085	19,864.5	544,780	139,332	7,195.9	99
Livestock	2030	(151,735)	253,085	19,864.5	544,780	139,332	7,195.9	99
Total		(910,410)	1,518,512	119,187.3	3,268,680	835,992	43,175.2	
Municipal	2040	(172,908)	344,070	25,544.4	739,004	189,034	9,697.0	100
Manufacturing	2040	(172,908)	344,070	25,544.4	739,004	189,034	9,697.0	100
Steam-Elec.	2040	(172,908)	344,070	25,544.4	739,004	189,034	9,697.0	100
Mining	2040	(172,908)	344,070	25,544.4	739,004	189,034	9,697.0	100
Irrigation	2040	(172,908)	344,070	25,544.4	739,004	189,034	9,697.0	100
Livestock	2040	(172,908)	344,070	25,544.4	739,004	189,034	9,697.0	100
Total		(1,037,448)	2,064,417	153,266.4	4,434,024	1,134,204	58,182.0	
Municipal	2050	(209,639)	440,105	31,726.8	946,818	242,668	12,363.4	108
Manufacturing	2050	(209,639)	440,105	31,726.8	946,818	242,668	12,363.4	108
Steam-Elec.	2050	(209,639)	440,105	31,726.8	946,818	242,668	12,363.4	108
Mining	2050	(209,639)	440,105	31,726.8	946,818	242,668	12,363.4	108
Irrigation	2050	(209,639)	440,105	31,726.8	946,818	242,668	12,363.4	108
Livestock	2050	(209,639)	440,105	31,726.8	946,818	242,668	12,363.4	108
Total		(1,257,834)	2,640,631	190,361.1	5,680,908	1,456,008	74,180.3	

Source: Texas Water Development Board, "Socio-Economic Impacts of Not Meeting Water Needs, Brazos G Regional Water Planning Group (Region G)," August 9, 2000.

The region also forecasts unmet needs in steam electric power (with employment impact of less than 3,000 jobs) and in livestock and mining (with employment impact of less than 500 jobs).

Interpretation of the Results

Readers are cautioned that potential estimated social and economic impacts is not a prediction of future water disasters. These estimated impacts simply give regional planners one source of information by which to develop efficient and effective means to meet projected water needs and avoid calamities.

Some clarification is needed to understand the estimated impacts. The following points must be kept in mind when using the results:

- a. Water supplies are calculated on drought-of-record levels. Shortages that show up for the 2000 decade and beyond are considered to be mostly the result of severe dry conditions; this contributes to the apparent abnormally large size of some impacts. This approach to supply analysis results in a worst-case scenario. Historically, most water user groups have at least partially met their needs through management of the remaining supplies, either by conservation, limitations on lower-valued uses such as lawn watering, or finding alternative sources of water. The results in this report assume no applied management strategies and the entirety of the needs is not met in any fashion.
- b. The Municipal water use category includes commercial establishments. The impacts from even small shortages in many such establishments are considerably higher on a per-acre-foot basis than in any other category. Thus, relatively small Municipal shortages can have a very large amount of economic impact, since the analysis assumes a direct relationship between curtailed water use and lost economic production. Since this analysis is intended to provide impacts without assuming any strategies, the normal response of conservation programs is not assumed. The impact data appear to overstate the Municipal category, but the results are consistently measured, since no response to the shortage is assumed that would mitigate loss of critical water used in commercial and residential settings.
- c. The sizes of the projected impacts do not represent reductions from the current levels of economic activity or population. That is, the data are a comparison between a baseline forecast, assuming no water shortages, and a restricted forecast, based on the assumption of future water shortages. In some cases, with severe water shortages the regional economy could actually decline, dropping employment below current levels. For most regions, however, the measurement of impact represents an opportunity cost, or lost potential development that would be foregone in the absence of water management strategies.