No. 105, ORIGINAL

In The

Supreme Court of the United States

STATE OF KANSAS,

Plaintiff,

v.

STATE OF COLORADO,

Defendant,

and

UNITED STATES OF AMERICA,

Defendant-Intervenor.

ARTHUR L. LITTLEWORTH, Special Master
THIRD REPORT

August 2000

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APPENDIX VOLUME

SECTION VIII
SECONDARY ECONOMIC DAMAGES

The Kansas claim includes secondary or indirect losses to the economy of the state as a whole. These are damages that result from the direct impacts of depletions of usable Stateline flows, namely, crop losses and increased pumping costs within the ditch service areas, and additional regional pumping costs caused by lower groundwater levels. If any change is made in these direct impacts, the secondary damages will also be affected. Kansas estimates its secondary economic losses at $3,793,486. Kan. Exh. 1092, Table D6. This amount includes both historic and projected future damages, each brought to a 1998 dollar value, and includes prejudgment interest for the historic period of 1950-94.

Colorado does not have an estimate of secondary damages. While Professor Wichelns acknowledges that "there may have been some secondary economic effects" due to depletions of surface supply, he believes they would have been "very, very small." RT Vol. 193 at 81. In his opinion, there is no method to estimate such effects accurately, and they should not be addressed. *Id.* at 97.

Kansas employed two specialist experts to assist in calculating secondary damages, Professor Joel R. Hamilton and Dr. M. Henry Robison. Both hold impressive credentials.[17] Colorado chose not to engage a separate

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[17] Hamilton's qualifications are found in Kan. Exh. 938. He is a Professor of Agricultural Economics and Statistics at the University of Idaho; has international experience in China, Sri Lanka, Pakistan, India, Eastern Europe, and Australia. He

expert for secondary damages, and Professor Wichelns who was Colorado's chief economic expert on all other issues had only limited experience with input-output models. Rather, Colorado chose to rely primarily on vigorous cross-examinations of Professor Hamilton and Dr. Robison, and upon a legal objection made to all of Kansas' expert testimony on secondary economic impacts,

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testified for the State of New Mexico on secondary economic damages in *Texas v. New Mexico.* He has written numerous peer reviewed articles on secondary economic impacts, many of which involve the kinds of issues present in this case. Most recently, as Chair of the Independent Economic Analysis Board of the Northwest Power Planning Council, he provided technical review and oversight of the economic studies on proposals to "breach" four dams on the lower Snake River. These studies are being conducted by the U.S. Army Corps of Engineers as part of a potential salmon recovery project. Breaching the dams would essentially eliminate water storage, and reduce the water supplies for agriculture and hydro power. RT Vol. 206 at 33-34. The input-output model being used to assess secondary economic impacts from these proposals is IMPLAN, the same model used by Kansas experts in this case, and the model looks 100 years into the future. Kan. Exh. 1084; RT Vol. 206 at 35-36, 72-73.

Dr. Robison is President of Economic Modeling Specialists, Inc. His qualifications appear in Kan. Exh. 961. He is the person who constructed the regional IMPLAN model used in this case to assess secondary economic impacts in Kansas. He has constructed hundreds of IMPLAN models for the U.S. Forest Service and for the Department of Commerce, and currently has a major assignment for the Federal Highway Administration. He has also assessed secondary economic impacts, using IMPLAN, for the States of Idaho, Utah, Colorado and New Mexico, and for many cities and regional governmental agencies. His writings in peer reviewed journals address many of the issues involved in this case.

based upon the standards in *Daubert* and *Kumho Tire Co.*[18] The Colorado objection was overruled by written Order dated May 1, 2000, and included as Exhibit 8 in the Appendix.

In assessing secondary impacts to the economy of Kansas as a whole, the Kansas experts used an input-output form of analysis that is generally recognized in the field of economics. Specifically, they employed an input-output model known as IMPLAN. This is a national level model originally developed by the U.S. Forest Service and now maintained by the Department of Commerce. Kan. Exh. 892, Section D at 5; RT Vol. 186 at 57, 61-62. It has now been coupled with county level economic data made commercially available by the Minnesota IMPLAN Group, located at the University of Minnesota. Kan. Exh. 962, RT Vol. 186 at 59. Dr. Robison, personally, has constructed hundreds of IMPLAN models to assess secondary economic impacts for various departments of the federal government, for several states, and for numerous local agencies. RT Vol. 186 at 50-52; Kan. Exh. 961. IMPLAN is the "most widely used" model for assessing secondary economic impacts. RT Vol. 185 at 80; RT Vol. 186 at 26. More information on input-output modeling appears in my Order on Colorado's *Daubert* motion, included as Exhibit 8 in the Appendix.

Dr. Robison constructed the model used by Kansas in this case. It traces the ripple effects of the depletions

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[18] *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 125 L.Ed.2d 469, 113 S.Ct. 2786 (1993); *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. ___, 143 L.Ed.2d 238, 119 S.Ct. 1167 (1999).

within the ditch service areas, and upon the adjacent region, throughout the statewide economy. Some of these impacts are regarded as "gains" while some are "losses." Increased pumping expenses and less net farm income within the ditch service areas are adverse to one sector of the economy, but advantageous to the segment that profits from increased well pumping.[19] The model determines the net effects, and in this case calculates, overall, net losses to the Kansas economy. Kan. Exh. 892, Section D at 9-12; RT Vol. 206 at 16-17. A summary of the gains and losses appears in Kan. Exh. 1092, Table D6.

It is ironic that professional economists treat the economic activity associated with the additional use of groundwater, that is, with a permanent exhaustion of a natural resource, as an economic "gain" which is to be offset against an acknowledged "loss" of net farm income. Nonetheless, this appears to be an accepted practice, and in this case represents a conservative approach to Kansas' damages.

Secondary economic impacts are also affected by a concept known among economists as "opportunity costs."[20] This term refers to the "next best alternative employment of a resource," and is a method for reducing

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[19] Dr. Robison testified, "It's the old irony with economists. Even a tornado benefits windowpane sellers. And there's no doubt that if you deprive the Kansas economy of water, you'll benefit pump dealers." RT Vol. 186 at 120.

[20] This is slightly different from the use of the term in connection with prejudgment interest, where it relates to the investment opportunities of funds which a person should have had.

gross secondary impacts to the net gains or losses affecting an economy. RT Vol. 185 at 131, 144. In this case, the Kansas experts determined that opportunity costs offset all but 20 percent of the secondary impacts. That is, 80 percent of secondary impacts were assumed to represent factors moving to or from the next best opportunities elsewhere in the economy. Kan. Exh. 892, Section D at 7. Only 20 percent of the total secondary impacts were counted as net gains or losses. *Id.*; RT Vol. 185 at 124. Some economists have argued that this is "too restrictive," and that a larger percentage should be used to determine net secondary impacts. Kan. Exh. 947; RT Vol. 185 at 116-18.

On cross-examination, however, Colorado suggested that the 20 percent factor should be lower, or at least that it was not proven with reasonable certainty. Colorado offered no figure of its own. While the 20 percent factor is based upon the analyst's judgment, there is ample evidence to support its use. RT Vol. 206 at 88. The seminal work on the subject is a book by Haveman and Krutilla evaluating opportunity costs for the kinds of resources used in water projects. Kan. Exh. 949; RT Vol. 185 at 105. Their study involved some 100 projects in all parts of the country. RT Vol. 185 at 105-108. Opportunity costs ranged from 69 to 94 percent; that is, net secondary impacts fell between 6 and 31 percent. Kan. Exh. 949, Table 21; RT Vol. 185 at 147. Support for 20 percent can also be found in *Texas v. New Mexico*, where experts for both states used 20 percent (RT Vol. 185 at 120; RT Vol. 206 at 24); the Colorado-Big Thompson project, 20 percent (RT Vol. 185 at 131); the State of Washington study in regard to a prohibition on grass seed burning, low of 20 percent (Kan. Exh.

1085; RT Vol. 186 at 33); Bergmann and Boussard international study in France, 10-20 percent (Kan. Exh. 1004; RT 206 at 9-10); Bureau of Land Management Study on making additional land available for agricultural irrigation, 10-20 percent (Kan. Exh. 944; RT Vol. 185 at 96).

In the final analysis, Colorado argues that the Kansas evidence on secondary economic impacts is not sufficiently reliable or certain to support a damages award. Colo. Closing Br. at 102. It is true that the Kansas damage claim is an estimate, and involves the judgment of its experts. But the law does not require that scientific testimony be known "to a certainty." *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 125 L.Ed.2d 469, 113 S.Ct. 2786 (1993). Although "good grounds" must support an expert's testimony, the process followed is also important. *Id.* at 590. Here, the Kansas experts used a methodology, and a specific input-output model, that have been "widely adopted and widely accepted" for measuring secondary economic impacts, and constitute the "most reliable" approach that can be used. RT Vol. 186 at 26; RT Vol. 187 at 50; RT Vol. 206 at 10-11; Kan. Exh. 1010. The Kansas experts testified that the results provide a "reasonable estimate" of secondary impacts and a "reasonable quantification" of damages. RT Vol. 206 at 16, 38; RT Vol. 187 at 50-52. The very input-output model, and the very people, used by Kansas to assess secondary impacts here are currently being used extensively by the federal government for the same purpose. The approach of the Kansas experts was conservative and professional. We can anticipate that their testimony will be carefully examined in the profession because of the time span over which the input-output analysis has been used. However,

there is now evidence the Corps of Engineers is using IMPLAN to look ahead 100 years. Kan. Exh. 1084; RT Vol. 206 at 35-36, 72-73. And current models are much more accurate than those used even ten years ago. RT Vol. 187 at 37.

A. Conclusion.

I find that the weight of the evidence supports the Kansas claim for secondary economic damages. They may have to be recalculated, depending upon any revisions to the underlying damages, but the methodology used by the Kansas experts should be employed in making any such final damage estimates.

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APPENDIX (EXHIBITS 1-9)

August 2000

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APPENDIX

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APPENDIX – Exhibit 8

Order dated May 1, 2000 re Objection to
Expert Testimony
(*Daubert* Motion)

IN THE SUPREME COURT OF THE UNITED STATES

STATE OF KANSAS, Plaintiff, v. STATE OF COLORADO, Defendant, UNITED STATES OF AMERICA, Intervenor.	)	No. 105 Original October Term, 1999

ORDER OVERRULING COLORADO'S OBJECTION TO THE ADMISSIBILITY OF EXPERT TESTIMONY REGARDING SECONDARY ECONOMIC DAMAGES

(Filed May 1, 2000)

The Kansas claim for damages includes secondary or indirect economic losses to the Kansas economy resulting from the increased costs of pumping and crop production losses. Kansas employed two widely recognized experts, Professor Joel R. Hamilton and Dr. M. Henry Robison, to estimate these secondary economic damages. At the conclusion of the cross-examination of these experts, Colorado made an objection to the admissibility of all testimony concerning the analysis of secondary economic impacts. RT Vol. 187 at 54. The objection was based upon the argument that the testimony and exhibits of the Kansas experts did not meet the tests for expert testimony set forth in the *Daubert* and *Kumho Tire Co.* cases.[1] Colorado

[1] *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 113 S.Ct. 2786, 125 L.Ed.2d 469 (1993); *Kumho Tire Co., Ltd. v.*

filed a written brief in support of its objection, and Kansas was given the opportunity to reply. Colorado also renewed its "gatekeeper" objection to keep Professor Hamilton off the stand when he returned to testify on rebuttal. RT Vol. 206 at 7. That objection was overruled, and the testimony and evidence on secondary economic damages was completed. However, the basic Colorado objection, in essence a motion to strike, was taken under submission. RT Vol. 206 at 6.

Rule 702 of the Federal Rules of Evidence provides:

> "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise."

In the *Daubert* case, the U.S. Supreme Court addressed the admissibility of scientific expert testimony under this Rule. The case involved the use of a prescription drug, Bendectin, taken during pregnancy, and the allegation that it had caused serious birth defects. A summary judgment was granted on behalf of the defendant drug company based upon a vast body of epidemiological data concerning the drug. The plaintiff's expert testimony, which relied upon animal-cell and live animal studies, and chemical structure analyses, was ruled inadmissible. Relying upon *Frye*,[2] the trial court found that these

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Carmichael, 526 U.S. ___, 119 S.Ct. 1167, 143 L.Ed.2d at 238 (1999).

[2] *Frye v. United States*, 54 App. DC 46, 293 F. 1013 (1923).

studies were not "generally accepted" by the scientific community as being reliable.

The Supreme Court recognized that the "general acceptance" test had been the dominant standard for some 70 years since the *Frye* case, but nonetheless sharp divisions existed among the courts. The Court noted that the *Frye* decision predated Rule 702, and held that the general acceptance test, as the exclusive standard for admissibility of expert scientific testimony, was incompatible with the Federal Rules. The Rules, said the Court, assign to the trial judge "the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand." 509 U.S. at 597. The Court emphasized that the Rule 702 inquiry is a "flexible one." *Id.* at 594.

The Court also discussed specific factors such as testing, peer review, error rates, and general acceptability in the scientific community, which might prove helpful in determining the admissibility of a particular scientific "theory or technique." *Id.* at 593-94. These factors are nicely summarized in the *Kumho Tire* case,[3] but the Court makes it clear that they "may or may not be pertinent in assessing reliability." 143 L.Ed. 2d at 251. They can neither be ruled out, nor ruled in, since "Too much depends upon the particular circumstances of the particular case at issue." *Id.* at 252. The objective of the *Daubert* gatekeeping obligation, said the Court, is "to enforce the reliability and relevancy of expert testimony," and in this inquiry

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[3] *Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S.___, 143 L.Ed. 2d 238, 119 S.Ct. 1167.

the trial court "must have considerable leeway." *Id.* at 252.

The *Kumho Tire* case involved the blowout of a tire, claimed to be defective by design or manufacture, which resulted in the death of a passenger. While the plaintiff's expert testimony was more technical than scientific the Court held that the *Daubert* ruling applies not only to scientific expert testimony, but to "all expert testimony." *Id.* at 250. In the case at hand, the Colorado objection relates to the testimony of one expert qualified in the area of "agricultural economics," and the other in the area of "economic modeling." RT Vol. 185 at 66; RT Vol. 186 at 55. Clearly they are both subject to the principles in the *Daubert* and *Kumho Tire* cases.

The secondary impacts to the Kansas economy as a whole were estimated through a process known as an input-output analysis. This process traces the ripple effects of the depletions within the ditch service areas, and the lowered groundwater levels in the adjacent region, throughout the statewide economy. The study of secondary economic impacts as part of the discipline of economics dates back to the mid-eighteenth century in France. RT Vol. 185 at 68. However, it was not until the 1930s that the concepts were more rigidly specified and converted to a mathematical rigor by Professor Leontief at Harvard University. *Id.* at 69. He received a Nobel Prize for his work. *Id.* The use of input-output computer models came into common usage after World War II. *Id.* at 71. The methodology, that is, the mathematics, of these models is formalized in a textbook by Miller and Blair, now considered the "bible" for input-output analysts. RT

Vol. 185 at 72-73; RT Vol. 186 at 78; Kan. Exh. 953. Beginning in the 1970s, with the rapid development of computer power, it became possible to construct input-output models for regions based on data collected and assembled by the federal government and others. RT Vol. 185 at 74; RT Vol. 186 at 59-60. The regional model constructed and used by the Kansas experts in this case to compute secondary economic damages applies accepted Miller and Blair principles. RT Vol. 185 at 72-73.

The Kansas regional model was constructed by Dr. Robison. It begins with the use of an input-output modeling system known as IMPLAN. This is a framework which uses national level coefficients, and from that starting point IMPLAN can calculate an appropriate region-specific, input-output model. RT Vol. 185 at 81. IMPLAN was developed in the early 1980s by the U.S. Forest Service for use in land management impact planning and analysis. Kan. Exh. 892, Section D at 5. However, the IMPLAN model is now maintained by the U.S. Department of Commerce, Bureau of Economic Analysis. RT Vol. 186 at 57, 61-62. It is a model that includes extensive survey data for the entire United States economy, covering more than 500 sectors of economic detail. It shows who sells to whom, and who buys from whom. In essence, the input-output model is a very elaborate double-entry accounting system. The sales to various sectors across a row have to balance with purchases from each sector down the column. RT Vol. 186 at 57-58.

In 1987 a private corporation, the Minnesota IMPLAN Group, located at the University of Minnesota, began work on regional IMPLAN data and software. Kan. Exh. 962; RT Vol. 186 at 59. The group now maintains data

at the county level, including statistics on employment, income, dividends, interest, rents, transfer payments, earnings, and other kinds of information that are needed to build a model, and these data have been privatized. RT Vol. 186 at 59-60. More than 125 significant studies and research projects have used IMPLAN software and these regional data since they have become commercially available. *Id.* at 60. The Kansas input-output model developed by Dr. Robison takes the national model, couples it with region-specific information, and converts the national model into a regional input-output model for the State of Kansas. *Id.* at 62.

In 1996-97, the U.S. Department of Commerce, Economic Development Administration, assessed the economic impact of 175 of its recent public works projects. Dr. Robison was hired to do the economic modeling for this study, in association with Princeton and Rutgers Universities. He constructed 175 different IMPLAN models to conduct the work. RT Vol. 186 at 50. Dr. Robison is now working with the Economic Development Administration on a new study that will involve constructing between 800 and 900 county-level IMPLAN models. *Id.* at 51. In 1997 Dr. Robison worked for the Colorado Department of Transportation to build about 10 IMPLAN models for different subregions of the Colorado economy. *Id.* at 51-52. The record discloses many more examples of input-output modeling, but perhaps it is sufficient here merely to note that there was no challenge to the testimony that IMPLAN is the "most widely used" model for assessing secondary economic impacts. RT Vol. 185 at 80; RT Vol. 186 at 26. Numerous peer reviewed journal articles, a number of which were authored by

Professor Hamilton and Dr. Robison, also support the broad acceptance and reliability of imput-output modeling. Kan. Exhs. 938, 961.

There can be no doubt that evidence resulting from an input-output model analysis, and from IMPLAN in particular, meet the admissibility standards of *Daubert* and *Kumho Tire*. Colorado itself acknowledges that "input-output modeling rests upon a foundation which is generally recognized in the field of economics." Colo. Objection at 3. The Colorado position, however, is based upon a more discreet objection to IMPLAN, that is, whether it is sufficiently reliable to calculate secondary economic impacts going backwards for a period of 45 years, and forward for 50 years. This issue depends upon the use of "multipliers" within the modeling system.

Multipliers are computed from the input-output model and are used to show the effects of changes in an economy. RT Vol. 185 at 75. They translate the ripple effects of a primary impact on the economy into resulting impacts on various sectors of the economy. *Id.* The input-output model constructed by Kansas experts in this case is a snapshot of the Kansas economy in 1995. RT Vol. 186 at 74. The issue raised by Colorado is whether the multiplier relationships existing in 1995 are sufficiently stable to permit the model to be used for other years. Colorado raises the question, but has offered no evidence that IMPLAN cannot be used in this fashion. Dr. Robison's review of the literature indicates that the input-output coefficient tables are relatively stable and may be used for years. RT Vol. 186 at 77-79, 84-93. Dr. Robison cited examples of input-output models being used to look ahead 20 years and back almost that period of time. *Id.* at 92-97. If

the multipliers were not stable, they would be "going down" in Dr. Robison's opinion, and that would mean that the Kansas approach underestimates secondary economic impacts. *Id.* at 99. This testimony was given as part of Kansas' case in chief, and it was at the conclusion of Dr. Robison's cross-examination that Colorado made its *Daubert* objection.

In response, as part of its rebuttal case, Kansas produced evidence that the IMPLAN model is currently being used by the United States Corps of Engineers to look ahead 100 years. Kan. Exh. 1084; RT Vol. 206 at 35-36, 72-73. The study, dated November 1999, considers a series of alternatives for salmon recovery. These include the "breaching" of four dams on the lower Snake River which would essentially eliminate water storage, reducing the water supply available to agriculture and for hydro power. RT Vol. 206 at 33-34. Professor Hamilton, as chair of the Independent Economic Analysis Board of the Northwest Power Planning Council, provided technical review and oversight of these economic impact studies. This latest use of the IMPLAN model effectively responds to Colorado's argument that the Kansas evidence on secondary economic impacts is inadmissible when used over the time periods involved in this case.

Colorado also objects to the 20 percent limitation on the IMPLAN results imposed by the Kansas experts in order to limit secondary impacts to their net effect on the Kansas economy. However, that step is outside of the IMPLAN product. It is a judgment decision made by the input-output analyst, and is not part of the model nor the standards affecting its admissibility. RT Vol. 206 at 84-86.

The Colorado objection to the admissibility of expert testimony regarding secondary economic damages is hereby overruled. This Order applies to the admissibility and not to the weight of the testimony.

DATED: May 1, 2000.

/s/ Arthur L. Littleworth
ARTHUR L. LITTLEWORTH
Special Master

PROOF OF SERVICE BY MAIL

STATE OF CALIFORNIA, COUNTY OF RIVERSIDE

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years and not a party to the within entitled action; my business address is Best, Best & Krieger, 3750 University Avenue, 400 Mission Square, Riverside, California 92502.

I am readily familiar with Best, Best & Krieger's practice for collecting and processing correspondence for mailing with the United States Postal Service. Under that practice, all correspondence is deposited with the United States Postal Service the same day it is collected and processed in the ordinary course of business.

On May 1, 2000, I served the within **ORDER OVERRULING COLORADO'S OBJECTION TO THE ADMISSIBILITY OF EXPERT TESTIMONY REGARDING SECONDARY ECONOMIC DAMAGES** by placing a copy of the document in a separate envelope for each addressee named below and addressed to each such addressee as follows:

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On May 1, 2000, at the office of Best, Best & Krieger, 3750 University Avenue, 400 Mission Square, Riverside, California 92502, I sealed and placed each envelope for collection and deposit by Best, Best & Krieger in the United States Postal Service, following ordinary business practices.

I declare under penalty of perjury under the laws of the State of California, that the foregoing is true and correct.

Executed on May 1, 2000, at Riverside, California.

/s/ Sandra L. Simmons
Sandra L. Simmons