

# Multi-Year Capital Development Projects: Recent Insights From Oil Pipeline Impact Evaluations

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## Introduction

Owing to the Great Recession and subsequent private and public capital development initiatives, great emphasis has been placed in recent years on the sum and timing of job creation. And this was especially true between 2010 and 2014 as states one-by-one righted themselves from their respective contractions. Quite prominently and earlier on, projects associated with the American Recovery and Reinvestment Act (ARRA), for example, included a wide array of capital and safety net spending over several years. Measuring and reporting those impacts at the state and regional levels often involved analytic deftness in order to properly inform the public and lawmakers about the timing and value of economic change at the state or the sub-state levels. In Iowa, for example, we carefully modeled state ARRA receipts by category (capital spending, extended unemployment assistance, direct aid to state and local government, and expanded medical care for low income children) to demonstrate to policy makers and citizens the value of the “stimulus” to the state’s economy and the duration of those impacts.

Done and presented properly, these job-creation estimates received wide media coverage. They offered an opportunity for the state’s regional economists to highlight the tangible consequences of decline, as was occurring during the economic downturn, and publicly-funded countercyclical projects designed to put some people back to work and keep others working.

During the worst of the economic downturn there was also a domestic energy boom in the U.S. Rapid expansion in the nation’s corn ethanol sector continued through 2010. There were large investments in wind energy in several states. And owing to the U.S. shale oil and natural gas booms in the Mountain West, Texas, and North Dakota, as well as in the Marcellus Shale areas of Pennsylvania and Ohio, coupled with rapidly developing oil field growth in Canada, several intrastate and interstate natural gas and crude oil pipeline projects were deployed that affected Midwestern and Plains state economies.

This short impact modeling review looks at recent pipeline deployments. The construction effects of these large, but of typically short duration, projects created bursts of economic activity along the proposed routes. They also have had some political salience because of their short-term, but nonetheless important job creating consequences, which is a preoccupation for government officials. They have salience, too, because of environmental concerns and land-owner resistance to the use of eminent domain to secure pipeline right-of-way access. This paper, though, looks at the economic impact evaluations.

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Many of the pipeline projects were not of an interstate nature and involved linking either natural gas or shale oil wells to central collection points. These were the kinds of projects found in Texas, North Dakota, Ohio and Pennsylvania during their boom periods, and those pipeline construction activities blended seamlessly with the deployment of other well-drilling and well services infrastructure in the regions. Others, however, were hundreds of miles long, and crossed many political boundaries. The massive Alberta tar sands development in Canada led to the first set of Keystone pipelines to bring that crude oil to refineries in Illinois, Oklahoma, and ultimately to the Gulf of Mexico. Three of the four planned pipeline phases were completed between 2010 and 2014, and those first three lines were comparatively uncontroversial.

More politically contentious, however, was the Keystone XL pipeline project (Phase 4), which would have traversed Montana, South Dakota, and Nebraska. Little attention was paid to the overall economic worth of the earlier Keystone projects. The first economic impact study of the Keystone XL phase received much attention as it promised, according to the Perryman Group who did the analysis, U.S. impacts totaling “\$9.605 billion in output and 118,935 person-years of employment.”<sup>1</sup> Approval of the pipeline was immediately linked on its job creation potential, especially during the fledgling recovery, and the robust job creation estimates became part of presidential campaign rhetoric in the 2011-2012 election cycle.

The Perryman economic impact findings were quickly assailed by analysts as much too high.<sup>2</sup> Such robust outcomes, albeit temporary, would have been noticed, for example, during Keystone Phase 1, the first major pipeline from Canada down to a terminus in Nebraska that had just been completed. Eventually, upon review and having conducted its own estimation, the U.S. State Department concluded that the Keystone XL pipeline “would [nationally] support approximately 42,100 jobs (direct, indirect, and induced) over its duration, and approximately \$2 billion in earnings throughout the United States.”<sup>3</sup> The job estimates by the State Department were nearly two-thirds lower than the first Keystone XL study. And as we now know, President Obama and the U.S. State Department did not approve that project, its short-term job creation gains notwithstanding. The difference between the State Department’s estimates and the Perryman Group’s were very large, and it underscored the magnitude

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<sup>1</sup> These figures come from the web page of the Perryman Group who did the original impact study for Keystone XL, however links to the original study no longer work. <https://www.perrymangroup.com/special-reports/classics-from-the-archives/keystone-xl-impact-study/>

<sup>2</sup> See, for example, Wald, Ellen R. Pipe Dreams: How Many Jobs Will Be Created By Keystone XL? Forbes, May 10, 2013. <http://www.forbes.com/sites/energysource/2013/05/10/pipe-dreams-how-many-jobs-will-be-created-by-keystone-xl/#191d930d660c>

See, too, Levi, Michael. Would the Keystone XL Oil Pipeline Create 250,000 Jobs? Council on Foreign Relations, October 27, 2011. <http://blogs.cfr.org/levi/2011/10/27/keystone-oil-jobs/>

<sup>3</sup> United States Department of State Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, Executive Summary, January 2014. <https://keystonepipeline-xl.state.gov/documents/organization/221135.pdf>

of impact variability that is often demonstrated in these kinds of undertakings when publicly-conducted analysis is compared to privately prepared studies.<sup>4</sup>

In 2014, a different private consultancy working for an oil industry services firm reported that a new proposed pipeline designed to bring North Dakota crude from the booming Bakken region to a refinery in Illinois would generate “33,000 job-years of work,” and it would boost labor income by \$1.9 billion and total output by \$5 billion in the four affected states of North Dakota, South Dakota, Iowa, and Illinois.<sup>5</sup> These numbers were based on summing the effects of the individual states through which the project traversed as opposed to using a national model to gauge impacts. However, much like the case with the State Department review and summary, closer inspection revealed significant flaws in both analytic methods and the manner by which the results were presented to the public. This paper discusses those flaws in light of the project’s presentation of the economic impacts to the state of Iowa in seeking and ultimately receiving regulatory approval for the pipeline.

## Background

To move oil from the booming Bakken play in western North Dakota, a company called Energy Transfer Partners proposed and is ultimately now building a 1,681 mile 30 inch diameter pipeline diagonally across North Dakota, South Dakota, Iowa, and Illinois (see Figure 1). It is called the Dakota Access Pipeline. The company applied for regulatory approval in 2014 in all states affected, and as part of that regulatory approval, the company submitted the project’s purported economic impact as part of the supporting material for that approval.

Constructing 343 Iowa pipeline miles of that the project would, the study reported,

- boost Iowa employment by nearly 7,263 job-years,
- generate a \$390 million increase in labor income, and
- add nearly \$1.04 billion in total, multiplied-through industrial output

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<sup>4</sup> Readers are also directed to a harsh and point by point critique of the Perryman study by the Global Labor Institute at Cornell University. Their analysis, *Pipe Dreams? Jobs Gained, Jobs Lost by the Construction of Keystone XL*, 2011, ILR School, Cornell University, found that the likely short term construction jobs created by Keystone XL would range from 50 percent to 80 percent fewer than those estimated by the Perryman study. [http://www.ilr.cornell.edu/sites/ilr.cornell.edu/files/GLI\\_keystoneXL\\_Reportpdf.pdf](http://www.ilr.cornell.edu/sites/ilr.cornell.edu/files/GLI_keystoneXL_Reportpdf.pdf)

<sup>5</sup>Siegelman, Harvey, Mike Lippman, and Dan Otto. *An Assessment of the Economic and Fiscal Impacts of the Dakota Access Pipeline in North Dakota, South Dakota, Iowa and Illinois*. Strategic Economics Group. November, 2014. <http://www.economicsgroup.com/reports/DAPL%20Report.pdf>. Note, the posted study has been heavily edited from its original posting to remove a multitude of typographical and layout errors.

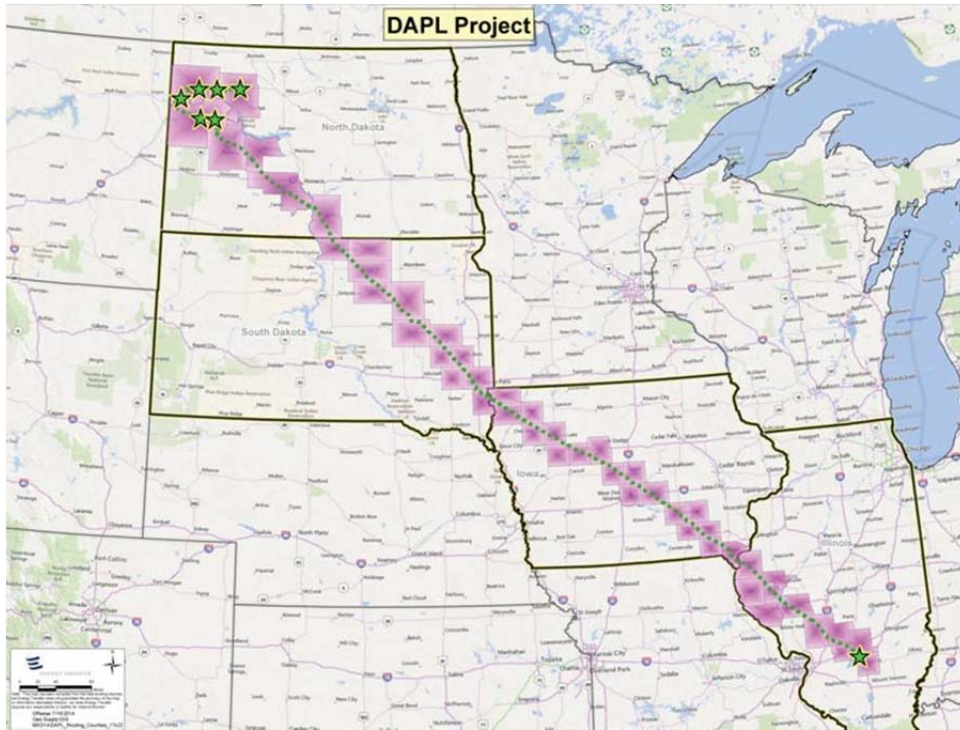


Figure 1

Close reading of the document, however, revealed serious methodological and assumption errors in the impact analysis of the several states and, for this review, Iowa. Those errors in both analysis and in presentation led to inflated claims of in-state job growth and labor incomes. Those errors also over-linked the project to the Iowa economy.

The consulting firm used IMPLAN for its analysis. The estimation errors, however, had little to do with the modeling system they utilized. What follows are three critiques of the study approach to presenting or estimating the impacts.

### Issue 1: Reporting impacts in “job-years”

The use of “job-years” has become rampant in recent years among private economic impact consultants and among advocacy groups. And as has already been demonstrated, the State Department also reported their revised Keystone XL estimates that way.

The need for reporting economic impact information in a job-years format originally arose in instances where, for a comparatively short period of time, there are many, many jobs involved in an activity. Major sporting events, music festivals, seasonal occurrences like a state fair all can generate a high demand for labor for a temporary period. To properly describe that labor demand, input-output accounting takes all of that labor and labor income and translates it into full-year job equivalences appropriate to the industries being evaluated. For example, 500 vendor jobs working during two weeks of the Iowa State Fair might be reduced to the equivalent of 20 persons were those jobs counted on an

annualized basis. This kind of translation standardizes many jobs over a short duration to the annual input output accounting framework.

Disturbingly, however, practitioners measuring multi-year projects, like construction projects, have taken to entering the total construction for all years of a project and then producing job-year estimates “as if” the project were only occurring during one year. This practice is distorting and disregards the annualized foundation to economic impact reporting. I contend that it is used primarily to boost the appearance of job impacts to naïve reviewers.

There is no acceptable justification for compressing multi-year values into a single job-years summary.

If, as in the case of the Bakken Pipeline, the project in Iowa was to take more than one year, then a prudent and non-distorting presentation would report those job (and labor income) impacts in the years in which they occurred – year 1, year 2, etc. In the Iowa study, the authors could have simply divided the totals by two and therefore declared the project would support  $7,623 / 2 = 3,811$  jobs annually rather than publishing the larger number.<sup>6</sup> As construction projects like these always contain highly detailed descriptions of the kind and sequence of activity involved, the analysts could have made their results sensitive to the actual activity taking place during specific months or quarters and then, from project start to finish, summarized those values on an annualized basis.

For example, in a recent study of a new hydroelectric facility in Iowa, we clearly summarized the total economic impacts for the region during the actual years of activity.<sup>7</sup> This is to be preferred for planning purposes rather than the more distorting summing of all values into a job-years total because it helps communities and planners understand the nature (direct, indirect, and induced), magnitude, and duration of the job impacts.

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<sup>6</sup> The study authors also claimed their results represented full-time equivalencies, however, they reported their findings as they would come out of IMPLAN, and IMPLAN does not report FTE values, they produce full-year values. From IMPLAN supporting documents we are told that “... one cannot tell from the data the number of hours worked to the proportion that is full or part-time.” This is more of a minor issue, but it is also a common error among users of IMPLAN to assert the output represents FTE job values.

<sup>7</sup> See Swenson, David. The Regional Economic Impact of the Red Rock Hydroelectric Project, Department of Economics, Iowa State University, August 2011.

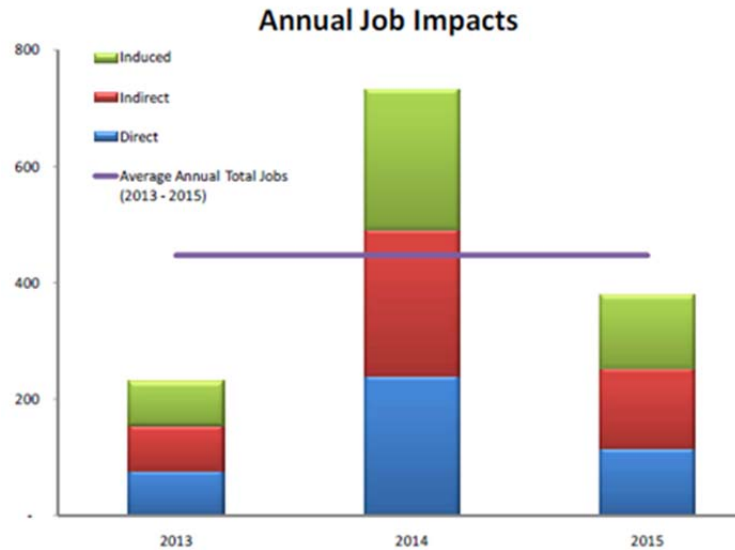


Figure 2: Hydroelectric Dam Job Impacts by Year and Type

## Issue 2: Assuming the project would link to durable goods manufacturers in the affected states

Because pipelines are quite atypical of conventional construction projects, separate inputs into the construction project were run individually through the IMPLAN model. Doing this allows the modeler to quickly over-ride IMPLAN’s default assumptions and tailor input demands to the region’s supply capacity. This is called a “bill of goods” or an “analysis by parts” approach. For this review, only two specifications are critiqued: the regional supply of durable manufactured inputs (pipe, valves, etc.) and the regional demand for construction inputs, which is summarized in the next section.

This pipeline requires 30 inch diameter pipe, pumps, valves, joints, and a range of other high-quality manufactured inputs. The modelers in this study, however, assumed without justification that these steel products, machines, valves, and other fittings would be purchased from suppliers within the states. Using default values from their IMPLAN model, Figure 3 shows that for Iowa, the project would buy 9.4 percent of steel products and 9.6 percent of valves and fittings from state suppliers.

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	Sector	Industry Sales	Employment	Ei	P	O	Local Purchase Percentage
▶	29 Support activities for oil and gas operations ▾	\$32,390,000.00	218	...	...	...	22.27 %
	36 Construction of other new nonresidential stru... ▾	\$533,870,000.00	3,528	...	...	...	99.91 %
	171 Steel product manufacturing from purchase... ▾	\$219,870,000.00	286	...	...	...	9.38 %
	198 Valve and fittings other than plumbing manu... ▾	\$59,980,000.00	111	...	...	...	9.60 %

Figure 3

This, significantly inflated the economic impacts even though the local purchase percentages appear quite low. The inputs into pipeline manufacturing are highly specialized and certified by the American Petroleum Institute (API). The IMPLAN sector shocked by the analysts includes water pipes, drain pipes, sewer pipes, exhaust pipes, electrical conduit, and even steel fence posts. The API maintains a directory of all of its certified manufacturers, and the only certified pipeline manufacturer in Iowa produces 4.5 to 8.625 inch pipe, not the 30 inch pipe required for the pipeline. As the project would not be buying those goods from Iowa firms, those values should have been assumed to be zero. Linking to those sectors in the modeling process boosted the total job estimates by 16 percent owing to their robust jobs multipliers.<sup>8</sup>

*[Note: as the economic impact consulting firm was defending its methods and results before the Iowa Utilities Board, the pipeline company was busy stockpiling long-ago manufactured pipe in a rural Iowa county. None of the pipe was manufactured in any of the states to be traversed by the pipeline.]*



Figure 4

### **Issue 3: Assumed that nearly all of the construction would be purchased from the state economy**

The greatest amount of impact distortion in the research involved its assumptions about the construction industry. As Figure 5 demonstrates, the analysts allowed for a nearly 100 percent local purchase percentage of construction firm activity, yet the authors offered no justification for assuming Iowa's construction sectors could, in fact, assume a project of this size. A quick scan of Bureau of Labor Statistics data for Iowa revealed it had 34 oil and pipeline construction firms with a combined payroll employment of 245 persons – 7.2 workers per firm. Those firms typically lay new gas lines for

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<sup>8</sup> The jobs multiplier for steel pipe (steel products manufactured from purchased steel) was 3.25 and the valve and fittings sector multiplier was 2.66.

residential or commercial developments, not large diameter interstate lines. The study, however, assumed roughly 1,764 annual jobs (or 3,528 on a job-years basis) in pipeline-related construction would be needed annually. And that demand was run through the IMPLAN model assuming nearly all of the jobs would come from Iowa firms.

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Sector	Industry Sales	Employment	Ei	P	E	O	Local Purchase Percentage
			Ci	In	Y	D	
29 Support activities for oil and gas operations	\$32,390,000.00	218	...	...	...	...	22.27 %
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Figure 5

A cursory evaluation of the Iowa economy or of credible studies done on previous pipeline projects should have raised a red flag. The consultants failed to understand that there is no civil engineering prominence in this category in Iowa. One would assume that firms that had handled major pipeline projects in the recent past would be the likely major contractors, not Iowa firms that were small or otherwise not specialized in this manner. Had the analysts taken note of the U.S. State Department’s economic impact study of the Keystone XL pipeline they would have discovered disappointingly low projections for state level impacts. The State Department’s questioning of TransCanada yielded this admission as to within state labor demand from the first Keystone project:

Because of the specialized nature of the work, Keystone estimates that only approximately 10 percent of the construction workforce would be hired from the four proposed Project area states.<sup>9</sup>

Even more guidance might have been gleaned from the Keystone XL review process in South Dakota where its Public Utilities Commission asked TransCanada (the Keystone XL construction company) the number of jobs that had been supported in that state during the construction of Keystone Phase 1. For the South Dakota portion of that project, TransCanada revealed that

... it employed a total of 2,580 workers in South Dakota, but only 282 workers (11%) of the workers were residents of the state. This included 20 workers in supervision, 3 welders, 32 truck drivers, 27 equipment operators, 110 laborers, and 90 construction managers, surveyors or inspectors.<sup>10</sup>

<sup>9</sup> United States Department of State Bureau of Oceans and International Environmental and Scientific Affairs, Final Supplemental Environmental Impact Statement for the Keystone XL Project, January 2014. p. 4-10-2

<sup>10</sup> Cornell Global Relations Institute, p. 9



Within weeks of issuing the Iowa report, however, Energy Transport Partners began to back-peddle on the construction impacts reported in the study. Principles in the firm were quoted in the Des Moines Register as assuring Iowa unions that “at least half of the workers for the Iowa section of the pipeline” would come from Iowa construction unions. And early in 2016, “two union contractors [had] been hired ... to build the pipeline in Iowa,”<sup>11</sup> both of which were from Wisconsin, a state the pipeline does not run through. Those major contractors would need a range of operating engineers for heavy machinery and skilled welders, pipefitters, and a fraction of those jobs would go to in-state labor, but a substantial fraction would not. The analysts made no attempt to address this important point.

## **Conclusion:**

Large capital project economic impact studies are often problematical, as has been shown with the Bakken pipeline study for Iowa and with the previous and controversial Keystone XL project. The analysts did not attempt to properly annualize the impacts, they over-attributed critical component supply linkages to the state economies, and they assumed state construction industries would handle nearly all of the pipeline activity. To their credit, they did attribute the impacts, however mis-specified, to the individual affected states using state models instead of assuming national economic impacts.

Construction of the pipeline, considering all concerns listed will yield Iowa annualized economic impacts that will likely be half if not less than those reported by the consulting firm.

What are the lessons to be learned?

First, this reviewer has conducted construction-related economic impacts associated with wind energy, hydroelectric power, solar energy, as well as a range of civil and other large private and public construction projects. Done properly, these analyses require extra scrutiny when the project clearly does not reflect the normal values that are in an IMPLAN model. One must use a “bill of goods” or what is also known as an “analysis by parts” approach, which means separating out the impacts of the actual construction activity from the supplies needed to construct the project and then summing the individual components. Or, one must specify a construction sector within IMPLAN that in fact reflects the production functions for the enterprise that needs to be measured. The point is that large, atypical capital projects require analytic care and extraordinary model specificity. Because of the large dollar value of the projects, over-attributing labor or some other critical input, as was demonstrated in this review, can have profound multiplied-through effects.

Second, there is no justification for reporting multi-year projects “as if” they occurred in one year. All impacts should be reported for the years in which they occur, and multiyear values, especially job values, should not be added to some grand total. How hard this practice is to quell can be demonstrated from the following example: I conducted a comprehensive assessment of different deployment strategies for Iowa’s wind energy industry recently, and in so doing being very careful to report the construction job impacts plus accumulating operational job impacts for the actual years in which they would occur under each separate scenario. Many months later, an umbrella wind energy

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<sup>11</sup> Petroski, William. Greenlight Likely for Dakota Access Pipeline, Des Moines Register, 1 June 2016.

advocacy group took the 15 years of separate numbers that I carefully segregated and reported, summed them, and reported that total in job-years, notwithstanding my strident admonishment to not do so. It is a problem rampant among consultants, industry groups, and advocacy groups. It needs to be confronted at every instance.

Third, IMPLAN is stupid. It doesn't know, for example, whether the pipe manufacturing sector in your economy does or does not make petroleum pipe versus exhaust pipes for automobiles. Analysts have an obligation to smarten up their modeling efforts with good investigation of the likelihood of state-supplied inputs. In this case that involved both the durable manufactured goods and the construction linkages, which amounted to huge errors in the estimates.

Fourth, analysts, in my opinion, have both an opportunity and an obligation to use economic impact models to teach clients and citizens about their regional economies. Replicating closely other flawed studies is not an effort in public education. But by properly specifying a modeling effort and reporting the findings, analysts provide a public service and help local and state policy makers and industry properly plan for and adapt to change. They also help citizens and policy makers temper their expectations regarding capital development and the worth of increasingly large, but ultimately often labor-stingy projects.

Finally, there will be continued opportunities to evaluate pipelines, wind energy, solar projects, and transmission line undertakings in the near future. These projects usually do not align well with the default sectors in the modern IMPLAN structure, notwithstanding the addition of several more construction sectors in the latest version. If one has the opportunity or obligation to do these kinds of studies, carefully scrutinize other studies and reviews of those studies try very hard to not make the same kinds of indefensible economic impact declarations as the analysts did in the Iowa pipeline project.