



Provisional Framework: Incorporating Inflation into DOI Cost Estimates and Decision Processes

The U.S. Department of the Interior (DOI) is currently managing transformative levels of investment concurrent with volatile prices for goods, services, and labor. Offices and program areas need to account for inflation in budgeting, planning, and policy decisions, especially when historical costs may not serve as an accurate proxy. To help address this challenge, the following provisional inflation framework may be used to:

- Develop more accurate project cost estimates;
- Inform decisions between otherwise equally competing activities;
- Inform timing of activity start, including deferring to future periods under strong price acceleration; and
- Validate budget estimates.

We illustrate the framework with three real-world examples from the Department. This framework identifies which economic indicators may be most relevant to select DOI investments but is not a how-to guide. Users should consult their financial and economic experts for assistance with calculations. Further, this contribution demonstrates a prototype for developing a standard set of economic indicators to help DOI consistently forecast accelerating, stabilizing, or decelerating cost trends that can be developed in the near future. As discussed in the Suggested Next Steps, we view the provisional status of this document as being sufficient for ongoing use and possibly subject to future change.

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Inflation is defined as a general increase in the overall price of goods and services in an economy over time (Federal Reserve 2016). While prices may increase for certain products or in individual sectors in a given period (e.g., gasoline prices during summer months) such price increases are not the same as inflation. Economists closely monitor inflation since it reduces the buying power of consumers and other currency users over time. For example, a U.S. dollar received in January 2023 would only buy the equivalent of 56 cents worth of goods and services in January 2000. Equivalently, a bundle of goods and services that cost one dollar in January 2000 would cost \$1.77 in January 2023.¹ When comparing prices across time, economists must adjust for these differences.

Despite its negative effects on buying power, inflation at a certain level is considered necessary for an economy to

grow. Indeed, the Federal Reserve targets an annual rate of inflation of two percent for the United States' economy with the aim of balancing economic growth against predictability and stability for users of the dollar. However, inflation that is too rapid can outpace income growth resulting in currency users being able to afford substantially fewer goods and services. The United States has been experiencing a period of relatively high inflation since 2021, and as of January 2023 the annual rate of inflation as measured by the Consumer Price Index for All Urban Consumers (CPI-U) was 6.4 percent (BLS, 2023). In contrast, from 2008 to 2020 inflation only averaged around 1.7 percent annually.

In this current period of high inflation, some sectors of the economy have experienced price increases that outpace the general rate of inflation. This includes some sectors that

¹ CPI Inflation Calculator published by the Bureau of Labor of Statistics: https://www.bls.gov/data/inflation_calculator.htm

may be relevant to the Department. For example, consider a project that involves building and repairing visitor facilities on lands managed by the National Park Service. The project requires budgeting for items such as machinery and equipment, and construction materials. In 2021, the price level in these two cost categories, as measured by the Producer Price Index (PPI), increased 9.1 percent and 27.3 percent, respectively. These indicators suggest that the planners should be mindful of how inflation can variably affect their project's cost categories to ensure that a shortfall in funding does not occur.

Provisional Inflation Framework

To help address the challenge of properly and accurately accounting for inflation in project planning, budgetary, and policy decisions, we recommend decision makers and practitioners across the Department use approaches that are tailored to the specific needs at hand. The provisional inflation framework (Table 1) provides core guidance on how that can be done in a more standardized way for the Department.

The framework consists of three components. First, practitioners should recognize the primary types of analyses for which inflation adjustments may be needed. Next, the framework steps down to more specific examples of how and when adjustments may be needed. These are linked to the last component, lists of relevant indicators that should be evaluated for their appropriate use (see Appendix A for further description).

Importantly, decision makers have flexibility in directing the use of the framework and practitioners retain discretion over which indicators to select depending on the activity or type of analysis. It also does not specify which of the relevant indicators must be chosen or imply that users must choose from the exact list of indicators provided for each analysis type. Furthermore, this framework does not specify how calculations using these indicators must be carried out. Users should still consult their financial and economic experts for assistance with selecting indicators and using them in calculations.

Applying the Framework

Next, we illustrate how the inflation adjustment framework can be applied in three real-world scenarios: (1) Project

Planning/Cost Estimation; (2) Program and Project Management; and (3) Budget Validation.

1. Project Planning/Cost Estimation: Refined Approach

In many cases, using the top-line BLS price indices (e.g., CPI-U or PPI) as a general measure of inflation is the most expedient way to make annual cost updates. However, there are some situations where a more detailed approach is desired. Consider a case where bureau practitioners are responsible for approving and implementing a proposed restoration project. They are concerned that the rapid rise in costs observed from late FY 2021 through FY 2022 would result in an underestimate of the project costs last updated in May 2021. This could readily lead to a funding shortfall, further exacerbated by the fact that inflation in certain sectors relevant to their project was thought to be higher than the general inflation rate of top-line indices. While using the top-line BLS price indices (e.g., CPI-U or PPI) as a general measure of inflation is the most expedient way to make annual cost updates, a more detailed approach may be appropriate.

In response to concerns about inflation, the team constructed a weighted average composite based on specific sector-level PPIs published by the BLS to better estimate the increases in the costs of the restoration project (Table 2). The project will consist of engineering and constructing new habitat predominantly using heavy construction machinery and equipment, with some small amounts of manual labor. Using this information, the team first used best professional judgment to classify project costs into discrete categories (column 1). The team then selected the PPIs that best matched each of the defined cost categories and calculated the average change in each PPI from September 2021 to May 2022 (column 2). The weights used for the composite were estimated based on the proportion of total project costs from each cost category observed for similar restoration projects in previous years (column 4). Finally, the composite total was calculated by first multiplying the price change by the proportion of the cost (i.e., columns 3 and 4), then summing across all categories.

Table 1. Provisional Inflation Framework Provides Relevant Indicator Given Type of Analysis and Associated Applications

Analysis Type	Applications for Economic Indicator	Relevant Indicator*
Budgeting	OMB Circular A-11, “Preparation, Submission, and Execution of the Budget,” must be followed. “OMB policy permits <i>consideration</i> of price changes for goods and services as a factor in developing estimates.” ² In general, flexibility is provided to use the following indicators in sensitivity and scenario analysis to inform decisions, as long as the justification is presented with the President’s budget assumptions.	CPI-U, GDP-IDP, GDP Price Index, PCE
	<ul style="list-style-type: none"> • When a measure of general inflation is required: <ul style="list-style-type: none"> ○ To inflate costs from past years into present dollars ○ To deflate costs from the current year into past dollars ○ For forecasting future inflation/cost increases 	
	<ul style="list-style-type: none"> • When industry-, product-, or service-specific measures of changes in prices are needed: <ul style="list-style-type: none"> ○ To inflate costs from past years into present dollars ○ To deflate costs from the current year into past dollars ○ For forecasting future inflation/cost increases 	PPI, CPI-U (for consumer goods/services), CES, ECI
Contracting	<ul style="list-style-type: none"> • For general adjustments to payments 	CPI-U, GDP-IDP, GDP Price Index, PCE, CES, ECI CCI, CCT if contract is primarily for construction
Cost Estimation	<ul style="list-style-type: none"> • When a measure of general inflation is required: <ul style="list-style-type: none"> ○ To inflate costs from past years into present dollars ○ To deflate costs from the current year into past dollars ○ For forecasting future inflation/cost increases 	CPI-U, GDP-IDP, GDP Price Index, PCE
	<ul style="list-style-type: none"> • When industry-, product-, or service-specific measures of changes in prices are needed: <ul style="list-style-type: none"> ○ To inflate costs from past years into present dollars ○ To deflate costs from the current year into past dollars ○ For forecasting future inflation/cost increases 	PPI, CPI-U (for consumer goods and services), CES, ECI
	<ul style="list-style-type: none"> • When a measure for construction-specific costs is needed: <ul style="list-style-type: none"> ○ To inflate costs from past years into present dollars ○ To deflate costs from the current year into past dollars ○ For forecasting future inflation/cost increases 	CCI, CCT
Trend Forecasting		CPI-U

* This provisional inflation framework provides decision makers and practitioners a structured approach to select the most appropriate inflation indicator for their use. An overview of the various indicators listed here is provided in Appendix A.

² See page 2 of Section 31(c) (2022), <https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf>.

Table 2. Example of Approach to Refine Cost Estimates by Calculating a Weighted Average Composite of Sector-Level Inflation Indicators

Project Cost Category*	PPI Data Series**	% Change in Prices from Sept 2021–May 2022	Weights: Category Proportion of Total Project Cost	Weighted change (%)
Gasoline	WPU0571	53.8	0.35	18.8
Construction Equipment & Machinery	WPU112	8.6	0.25	2.2
Lumber & Wood	WPU08	22.5	0.05	1.1
Engineering	WPU4532	5.1	0.10	0.5
Construction	WPU80	14.4	0.15	2.2
Farm Products	WPU01	33.9	0.10	3.4
Weighted-Average Composite:			1.00	28.2

*To reduce uncertainty in a CPI-U or PPI-adjusted cost estimate for planning and implementation purposes, this example illustrates how refinements can include proportions of spending in sectors that may be more or less affected by inflation.

**Data are not seasonally adjusted.

The resulting composite showed that project costs could be adjusted upward by approximately 28.2 percent. This tailored estimate is 4.3 times higher than if the adjustment had been made only on CPI-U, which increased by only 6.6 percent during the same time period. Translated into dollars, this would put the cost of a \$100,000 project at approximately \$128,000 under the refined inflation estimate, yet only \$106,600 under CPI-U. (Other alternative composites were constructed based on different estimated weights for each cost category. For example, gasoline was given a higher weighting in these alternatives based on past observations about fuel consumption. These alternative composites resulted in suggested adjustment values of more than 30 percent.) Based on these calculations, the practitioners chose to use the composite presented above to adjust the restoration project costs to produce a more detailed estimate than one based on just the CPI-U.

2. Program and Project Management

As the Great American Outdoors Act (GAOA) enters its fourth year, the GAOA Program Management Office and Bureau project managers are trying to anticipate how near-term inflation pressures may:

- Impact the cost of projects (and number of projects put forth) relative to history;
- Make some types of deferred maintenance projects more cost effective than others; and
- Make deferring projects to future years more cost effective than performing in the present year.

These questions cannot be definitively addressed. However, the economic indicators capture the trends in costs (e.g., inputs, labor) and demand of government construction that underly these GAOA questions (Table 3). As such, DOI stakeholders can use these real time economic indicators, alongside historical DOI construction trends, to inform evidence-based GAOA project decisions.

The recommended indicator (Table 3) is the BLS PPI for “construction, government”; labor, inputs, and federal spending (i.e., demand) serve as secondary indicators. Combined, these indicators help illustrate the direction of construction inflation and, in contrast to the macroeconomic index recommended by the Office of Management and Budget (OMB), offer more sector-specific precision. Specifically, with these economic indicators GAOA decision makers may be better informed to address the three questions presented above. That is, economic trends indicate that government construction costs have accelerated dramatically and neither the primary nor secondary indicators suggest a near-term signal of deceleration. As such, GAOA planners should:

- Anticipate that the cost to perform GAOA’s deferred maintenance construction activities will remain at elevated levels; and
- Recognize there is no clear advantage to defer projects until future years, as many trends seen in 2022 are likely to persist in the near term.

and balance to DOI submitted budgets. Those include a suggested primary indicator for overall housing costs, as well as trends in underlying contributors such as labor, supply chain, and demand that influence housing costs in the near-term (Table 4). The trends in Table 4 indicate that:

- DOI budgets should account for accelerated housing costs relative to past years; and
- Housing costs may dampen in the near-term as a result of mortgage rate pressures on demand, but high costs are likely to persist due to continuing uncertainties around labor and supply chains.

3. Budget Validation

During the FY23 budget process, Congress asked the DOI Office of Budget to validate increases in housing costs within the Office of Wildland Fire budget. To address this question, the Office of Policy Analysis (PPA) identified several economic influences on housing costs as a check

Table 3. Illustration of Approach for Programs and Project Managers to Describe Year-Over-Year Change in Economic Trends Impacting Government Construction Costs

Project Cost Category	Data Series in BLS or USASpending.gov	Metric	Year-to-Year Change				Projection Near-Term
			2019	2020	2021	2022*	
Construction, Government	WPSFD432	BLS PPI (\$)	5%	2%	4%	14%	Levels flatten ³
Job Openings, Construction	JTU2300000000000000JOL	BLS (# people)	19%	-25%	37%	23%	Ongoing Shortages ⁴
Inputs to Construction	WPUIP2300001	BLS PPI (\$)	-1%	0%	20%	17%	Uncertainty ⁵
Federal Spending, Construction	USASpending, NAICS 23	Obligated (\$)	64%	27%	–	–	Increases ⁶

Table 4. Illustration of Economic Trends Impacting Housing Costs Useful for Budget Analyses

Project Cost Category	Data Series in BLS or FRED	Metric	Year-to-Year Change				Projection Near-Term
			2019	2020	2021	2022*	
Price of Housing	CPIHOSSL	BLS CPI (\$)	3%	2%	3%	7%	–
Job Openings, Construction	JTU2300000000000000JOL	BLS (# people)	19%	-25%	37%	23%	Ongoing Shortages ⁷
Inputs to Construction	WPUIP2300001	BLS PPI (\$)	-1%	-1%	17%	17%	Uncertainty ⁸
30-year Fixed Mortgage Rate	MORTGAGE30US	St Louis FRED	4%	3%	3%	5%	Pull down demand ⁹

³ CBRE 2022 US Construction Cost Trends, July 2022. <https://www.cbre.com/insights/books/2022-us-construction-cost-trends>

⁴ CBRE 2022 US Construction Cost Trends, July 2022. <https://www.cbre.com/insights/books/2022-us-construction-cost-trends>

⁵ Uncertainty in global supply chains related to COVID-19 impacts in China and geopolitical instability in Ukraine.

⁶ Increased demand from Bipartisan Infrastructure Law and Inflation Reduction Act

⁷ CBRE 2022 US Construction Cost Trends, July 2022. <https://www.cbre.com/insights/books/2022-us-construction-cost-trends>

⁸ Uncertainty in global supply chains related to COVID-19 impacts in China and geopolitical instability in Ukraine.

⁹ Industry forecast.

Suggested Next Steps

Beyond the specific provisional inflation framework presented herein, PPA believes this approach can eventually serve as a prototype for the adoption of a suite of standard economic indicators across the Department. With a standard set of economic indicators that correlate to the goals, investments, and activities, decision makers can help ensure the effective, efficient, and equitable implementation of our work. Indeed, this is a key opportunity for evidence-based decision making.

As part of the rollout process and to ensure that this framework will be useful to other offices situated in Policy, Management, and Budget (PMB), PPA recommends discussions to further understand the following:

- The extent to which PMB offices find this provisional inflation framework informative for activity-level decision making.
- How PMB offices might utilize this framework (e.g., for informing decisions between multiple activities, validating budget trends, or developing cost estimates).
- At which times of the fiscal year or at what points in the activity-planning process this information would be most useful.
- Which activities experience high inflation pressures and would benefit most from additional guidance.

Depending on the responses, PPA could pilot this concept beginning with PMB offices and programs. We recommend developing a shared approach within PMB that adopts best practices on the use of economic indicators, while also providing flexibility to individual offices and programs in how they approach specific applications. This includes an emphasis on coproduction of knowledge (e.g., Beier et al. 2017), that is, understanding the needs of various users within PMB offices and programs, and how they may use the provisional inflation framework presented here.

Establishing dialogue with users around key questions would allow the provisional inflation framework to evolve from a prototype into a standardized approach to economic indicators. This approach may be expected to encourage

standardization while also meeting the specific needs of PMB offices and programs.

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Appendix A: Available Economic Indicators for Incorporating Inflation

There are several options available to DOI planners, budget, and policy staff when identifying an economic indicator that can inform how inflation may impact a DOI activity. While macroeconomic indicators of inflation are the simplest to apply, a better approximation may be needed for a specific DOI activity. This may be the case if the activity intersects with one or more economic sectors where costs are known to be rising more rapidly or experiencing greater levels of volatility than the wider economy. For example, restoration projects or infrastructure repairs require the purchase of construction materials and equipment. This cost category experienced very rapid levels of cost increases in FY 2021 and FY 2022 compared to previous years (ABC 2022). In these instances, sector-specific economic indicators (Table A1) may be more appropriate to apply.

Table A1. Summary of Economic Indicators Relevant to DOI Interests

Indicator Name	Brief Description
Consumer Price Index, All Urban Consumers (CPI-U)	<ul style="list-style-type: none"> • A macroeconomic or top-line measure of inflation produced by the U.S. Bureau of Labor Statistics (BLS). It measures the average change over time in prices paid by urban consumers for a market basket of consumer goods and services. • In addition to the top-line measure of inflation, some sector-level indicators are available for eight major categories of consumer expenditures: food and beverages, housing, apparel, transportation, medical care, recreation, education and communication, and other goods and services. • The CPI-U series is updated and released monthly.
Current Employment Statistics (CES)	<ul style="list-style-type: none"> • The CES program is a national survey conducted by the BLS, which provides employment, hours, and earnings estimates based on payroll records of business establishments. • The data are published for both private and government sectors and are available for nonfarm industries. CES data are available at both the macroeconomic as well as the sector-level. • The CES survey is updated and released monthly.
Employment Cost Index (ECI)	<ul style="list-style-type: none"> • The ECI is an economic indicator published by the BLS that measures the change in hourly labor cost to employers, independent of the influence of employment shifts among occupations and industry categories. It includes not only wages and salaries but also employer costs for employee benefits and represents nearly all employees in the civilian (non-Federal) economy. • The ECI is updated and published quarterly.
Gross Domestic Price Index	<ul style="list-style-type: none"> • A macroeconomic or top-line measure of inflation produced by the U.S. Bureau of Economic Analysis (BEA). • Unlike the CPI-U, this series is updated and released quarterly.
Gross Domestic Price – Implicit Price Deflator (GDP-IDP)	<ul style="list-style-type: none"> • Another macroeconomic or top-line measure of inflation produced by the BEA similar to the Gross Domestic Price Index. However, the two indices are calculated differently. • Also available quarterly.

Indicator Name	Brief Description
Personal Consumption Expenditures (PCE)	<ul style="list-style-type: none"> • A top-line measure of the prices that people living in the United States, or those buying on their behalf, pay for goods and services, also produced by the BEA. • Also available quarterly.
Producer Price Index (PPI)	<ul style="list-style-type: none"> • The PPI is a family of sector-level indicators produced by BLS that measures the average change over time in selling prices received by domestic producers of goods and services. This distinguishes it from the CPI-U and PCE, which measure price changes from the perspective of the consumer. • About 10,000 PPIs are available for the output of nearly all industries in the goods-producing sectors of the U.S. economy.
Construction Cost Trends (CCT)	<ul style="list-style-type: none"> • The CCT is published quarterly by the Bureau of Reclamation (Reclamation). The trends, consisting of multiple indices, were developed by Reclamation to track construction relevant to the primary types of projects being constructed by the organization. All of the various cost indices consist of two elements: contractor labor and equipment costs and contractor supplied materials and equipment. Indices are divided into three major categories: construction, land, and other indicators.
Construction Cost Index (CCI)	<ul style="list-style-type: none"> • The CCI is a proprietary index published by CBRE (Global Commercial Real Estate Services). This index is the sum of three major construction cost components: materials, labor, and margins.