



# **Framework for Assessing the Return on Investment from High-Speed and Intercity Rail Projects**



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## EXECUTIVE SUMMARY

### Background

Intercity passenger rail demand in the United States has shown an unprecedented surge in the new millennium. Amtrak, the primary intercity rail service provider in the country, reported an annual ridership of more than 31 million in 2016, which is 1.5 times what it was in 2000. To accommodate increasing rail passenger demand and to meet the rising expectations of riders for quality rail travel experience, active efforts to develop new high-speed and intercity passenger rail (HS&IPR) services are now underway. Prominent examples include the California, Texas, Midwest, Florida, and North Carolina to Virginia initiatives.

While there is continuing interest in HS&IPR projects, there are also wide disparities in how project investment benefits are measured. A number of prior studies have looked at the public benefits of HS&IPR projects from varying angles, such as the benefit-cost ratio, the economic impact, or the social impact of a project. However, there is a lack of consensus among these studies as to what benefit and cost elements to consider. As a result, much remains unclear or unknown about the true returns on investment in HS&IPR projects. Without a systematic methodology, the decision-making aspect associated with high-speed and intercity rail could be deemed subjective.

A reason for the difficulty measuring benefits of HS&IPR investments is that these projects and systems have broad economic, social and environmental impacts that vary in both geographical scale (including local, regional, state, and ultimately national effects) and temporal scale (including short, intermediate, and long term effects). While HS&IPR systems are extensively in operation worldwide, HS&IPR in the United States is a relatively untested mode associated with potentially high levels of public investment, which means that proposed projects must demonstrate a broad spectrum of benefits and returns to meet intense public and political scrutiny. A review of experience with projects proposed to date indicates that while certain types of benefits of HS&IPR have been evaluated and documented, many of the effects have been unreported and/or under-reported, leading overall to an underestimation of the potential significance of this mode nationwide. This report was prepared to assist project sponsors in providing a more complete understanding of the effects of HS&IPR projects with respect to return on investment – geographically and temporally. To fully capture the range of effects, the methodological approach proposed calls for a blending of methods and perspectives.

The foundation of this report, and its core motivation, is to provide a framework for assessing what is commonly referred to as the public “return on investment” (ROI) associated with HS&IPR projects. It seeks to go beyond the confines of classic “benefit cost analysis”, which focuses on travel time and cost efficiency impacts, to also considering the full range of local community effects, regional connectivity and global competitiveness effects, and broader consideration of the public’s desire to meet and exceed longer term environmental, economic and mobility goals for future generations. The reason for this approach is simple – much of our public policy recognizes the multi-faceted nature of benefits – including transformative and distributional effects – that occur at different spatial scales (national, regional and local), affect various subgroups of the population, and occur at different times. This calls for a framework that can represent the business case for HS&IPR investment by portraying the diverse value of benefits from multiple perspectives.

# Report Overview

The report reviews 47 prior studies that have assessed benefits, costs, economic impacts and/or social impacts of HS&IPR proposals. The review shows consensus that HS&IPR can have broad societal benefits that go far beyond time and cost for users. There is, however, a lack of consistency regarding coverage of alternative travel modes, breadth of study areas and time periods, and the set of wider societal benefits that are covered.

Drawing from the review of prior studies, the report identifies a large set of individual impact and benefit factors that can be applicable for HS&IPR projects. For each one, it defines impact metrics and describes how information and tools can be applied to measure or estimate the impact. It then lays out a framework for classifying and portraying benefits from public policy perspectives relevant for constructing a “business case” for HS&IPR. The practical application of this approach is illustrated via case studies that draw on actual data from prior studies.

## The Range of “Benefits” of HS&IPR

Based on the review of prior studies, it is clear that what is perceived to be a “benefit” of transportation investments can vary, depending on the viewpoint of particular stakeholders or constituencies. Table 1 provides examples of how the public policy talking points or dominant benefit issues vary as seen from different spatial perspectives and by different constituencies. In many cases, benefits seen from one perspective are not necessarily seen from another perspective. However, HS&IPR typically depends on getting buy-in and support from local communities, from state legislatures and governors, and from federal agencies. For that reason, there is a need to recognize the perspectives of these various groups when considering the viability and benefit of HS&IPR investments.

TABLE 1. PERSPECTIVES OF HS&IPR EVALUATIONS

| PERSPECTIVE      | CONSTITUENCY                                                 | PUBLIC POLICY TALKING POINTS (DOMINANT BENEFIT ISSUES)                                                                                                                                                                                                                                                   |
|------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National Benefit | U.S.<br>(taxpayers, residents and business)                  | HS&IPR saves time, expense and improves safety for travelers. It also enhances national productivity and hence GDP. In some cases, it can alleviate the need for investments in aviation and highway systems. It can also reduce greenhouse gas emissions and increase independence from imported fuels. |
| Regional Benefit | State (tax-payers, residents and business)                   | HS&IPR enhances efficiency of the state’s highway, rail and aviation facilities. It also effectively enlarges labor and business markets (which create agglomeration benefits), leading to more economic activity and tax base growth over time.                                                         |
| Local Benefit    | Station area, city or metro (taxpayers, residents, business) | HS&IPR supports growth (of jobs, income & investment) in areas around HSR stations, particularly downtown business districts. Visitors may also dwell longer and spend more money in the city if entering downtown rather than at an outlying airport.                                                   |
| Owner/ Operator  | Public and private owner & operators                         | HS&IPR generates revenues and expenses for rail facility owners and operators. Fares reduce the net expense. Services operators who use and/ or maintain air and road facilities may also see changes in use affecting their operating net revenues and costs.                                           |

## Traditional Approaches to Estimating ROI and Their Limitations

This report provides an integrated approach to summarize benefit and cost elements involved in conventional benefit-cost analysis (BCA), economic impact analysis (EIA), and social impact analysis (SIA).

BCA is a measure of the efficiency of investment. It focuses on comparing the aggregate benefits and costs incurred in the lifetime of a project and depicting them in terms of a net present value. It counts total effects and does not track transfers among areas or groups, or cumulative outcomes over time. However, investment in HS&IPR is not just a summation of direct monetary benefits and costs, it assumes an important social context and thus warrants consideration of a broader range of benefits beyond BCA, such as broader economic and social impacts of the investment that are also of public policy interest.

EIA is the analysis of impact of a project on the economy and is not a substitute for BCA but rather is a complement to it. Effects on economic development over time, including job generation and income increases, are commonly seen as strategic public policy goals. The extent to which an HS&IPR project leads to outcomes that help achieve these goals may be cited to justify the investment.

SIA refers to the measurement of environmental and other social impacts that are also of public interest. While it is derived from social welfare concepts embodied in benefit-cost analysis, it differs from it by counting desired distributional impacts (e.g., helping economically distressed communities and regions), very long-term impacts (e.g., enhancing land use and the environment for future generations), and quality of life impacts (e.g., making more livable cities with greater mobility and lifestyle options). Thus, SIA provides a means of assessing how a project affects the achievement of long-term public planning or policy objectives that are outside of the efficiency accountability perspective of classic BCA.

Besides distributional and long-term impacts, impacts on facility owners and service operators can also make a difference for public decision-making. This perspective is particularly important insofar as factors such as cash flow and fare recovery may affect net public sector spending requirements and the viability of privately provided services.

## Impact Elements That Are Relevant for Benefit Assessment

The report lays out a wide range of potential impacts associated with HS&IPR, which may be considered a benefit from some perspectives. The elements covered by this guide are shown in Table 2. Each can be measured in quantitative terms and assigned a monetary value. The quantitative and monetizable feature is necessary for them to be considered in an ROI framework. The list is not exhaustive; there may be other types of impacts that can only be assessed in qualitative terms, and they may also be relevant for decision-makers even though they cannot be included in an ROI metric. For each of the elements listed, the report provides guidance on how to collect applicable information to estimate and measure it.

**TABLE 2. SIGNIFICANCE OF BENEFIT CATEGORIES TO DIFFERENT EVALUATION PERSPECTIVES**

| 1. Travel Benefits                                  | National | Regional | Local | Owner/<br>Operator |
|-----------------------------------------------------|----------|----------|-------|--------------------|
| A. Travel Time                                      | XX       | X        | X     |                    |
| B. Travel Cost                                      | XX       | X        | X     |                    |
| C. Reliability                                      | XX       | X        | X     |                    |
| D. Consumer Surplus from Induced New Travel         | XX       |          |       |                    |
| 2. Broader Societal Benefits                        | National | Regional | Local | Owner/<br>Operator |
| A. Safety Impact                                    | XX       | X        | X     | X                  |
| B. Noise Impact                                     | X        | X        | XX    |                    |
| C1. Reduction in Greenhouse Gas (CO2)               | XX       |          |       |                    |
| C2. Emissions Reduction for Other Pollutants        | XX       | XX       | XX    |                    |
| D. Energy Resources: Oil Import Reduction           | XX       |          |       |                    |
| E. Accessibility Benefits (agglomeration economies) |          | XX       | X     |                    |
| 3. Other (Local, Government, Operator) Impacts      | National | Regional | Local | Owner/<br>Operator |
| A. Station Area Land Development                    |          |          | XX    |                    |
| B. Regional Economic Development                    |          |          | XX    |                    |
| C. Government Revenues from Taxes                   |          | X        | XX    | XX                 |
| D1. Service Operator and Facility Owner Costs       |          |          |       | XX                 |
| D2. Service Operator and Facility Owner Revenues    |          |          |       | XX                 |

**Note:** XX = largest effect seen; X = lesser effect seen

For each impact element in Table 2, the spatial scale at which it tends to be largest and most widely recognized is denoted by “XX.” Other spatial scales at which it is commonly recognized but tends to be seen of lesser value is denoted by “X.” For instance, travel time savings from an interstate route is greatest when viewed at a national scale representing benefits for all travelers and may be of lesser magnitude when viewed only from the perspective of one state’s residents. On the other hand, station area development benefits tend to be greatest when viewed from a local perspective, with diminished value when seen from a state or national perspective. While these exact patterns do not always apply to all studies in all cases, the basic point is that the same elements may be seen to have different value at different spatial scales.

## Recommended Framework Features

Ultimately, every major public investment should have a convincing case that it provides sufficient benefits to justify the expenditure of funds – i.e., a positive societal return on investment.

Traditional benefit-cost analysis is one way of measuring ROI, but it captures a limited and restrictive set of benefits. The “business case” for public investments can also draw from information on social, environmental and economic benefits deemed desirable from a public policy viewpoint – including short-term or long-term benefits accruing to different parties, in different locations at different geographic scales. The recommended framework for HS&IPR allows recognition of the full set of potential benefits, while also recognizing a need to carefully track the incidence of benefits among different groups, at different locations occurring at different times. Accordingly, there are three key features of the recommended framework: (1) the classification of effects, (2) the form of benefit measurement to be used, and (3) the format for benefit and cost reporting.

The classification of effects distinguishes travel benefits from broader societal goal achievement and regional economic impacts. It also distinguishes the scale or incidence of impacts between national, regional, local and owner/operator effects – all of which may be of broader public policy interest.

The form of benefit measurement includes two distinct formats:

- **Benefit and cost streams, and their present values**, are most applicable for recurring effects that continue year after year. These include effects on travel time savings, cost or expense savings, safety gains and productivity gains. The net present value of these recurring streams can be calculated as part of a benefit-cost analysis.
- **Outcome benefit measures** are most applicable for cumulative effects that evolve over time. These include effects on the environment and energy use, as well as regional land development and economic development. These benefits are often expressed in terms of outcomes achieved as of a future year (not discounted, as would occur in benefit-cost analysis). They are typically calculated from economic impact and environmental impact reports.

The format for benefit and cost reporting should enumerate all classes of effects shown in Table 2, and then only those deemed relevant for a given stakeholder perspective should be selected and totaled. This approach allows for transparency about the selected perspective, and what is counted. It also enables readers to recognize and consider other perspectives that also may be of interest.

Two examples of the value of this format are: (1) Fare recovery: Some agencies may adopt a society-wide perspective that does not count fare revenues as a benefit because both fares paid by riders and public subsidies from taxpayers are money spent by society. However, other agencies may view fare revenues as a user cost that reduces government outlays. (2) Strategic goal achievement: Some communities may view economic competitiveness, community livability and land use as important “goal achievement” effects that should be counted as future benefits ... even while some federal agencies may choose to see shifts in public and private investment among areas as merely spatial transfers.

The recommended reporting framework allows for flexibility regarding which effects are considered in benefit totals, since that will depend on the selected perspective. It also calls for all effects to be identified and measured in either outcome or present value terms. This preserves the ability of audiences to see transfer and cumulative effects as factors of public policy interest that ultimately may also be counted as benefits. In some cases, different benefits may accrue to different constituencies, and yet all may be important to consider or count from a public policy perspective. The full report provides two examples of how this multifaceted framework can be applied for assessing HS&IPR investments.

## Conclusion

There are a several ways to view and measure the benefits of high-speed and intercity passenger rail projects and systems. However, to get a complete picture of rail project or system benefits (and costs), it is critical to recognize that there are effects on different parties that also occur at different spatial scales (spanning local, regional and national views). To capture these effects, it is necessary to draw from a combination of analysis methods including benefit-cost, economic impact, and social impact. The recommended reporting framework provides a means for bringing together results of these different methods and perspectives. Only by carefully combining the results can an agency and the public get the full picture of the financial and economic potential of intercity or high-speed rail systems. The accompanying case studies demonstrate this point by showing how the full story is broader than the results of any single method or perspective.



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