NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: Evolving the Practice of Benefit-Cost Analysis

November 21, 2024

11:00 AM – 12:30 PM

PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

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AICP Credit Information

1.5 American Institute of Certified Planners Certification Maintenance Credits

You must attend the entire webinar

Log into the American Planning Association website to claim your credits

Contact AICP, not TRB, with questions

Purpose Statement

This webinar will cover the latest in BCA from the perspective of transportation agencies that require and rely on them and innovative practitioners who develop them. Presenters will discuss best practices, analytical gaps, and approaches to improve its usefulness.

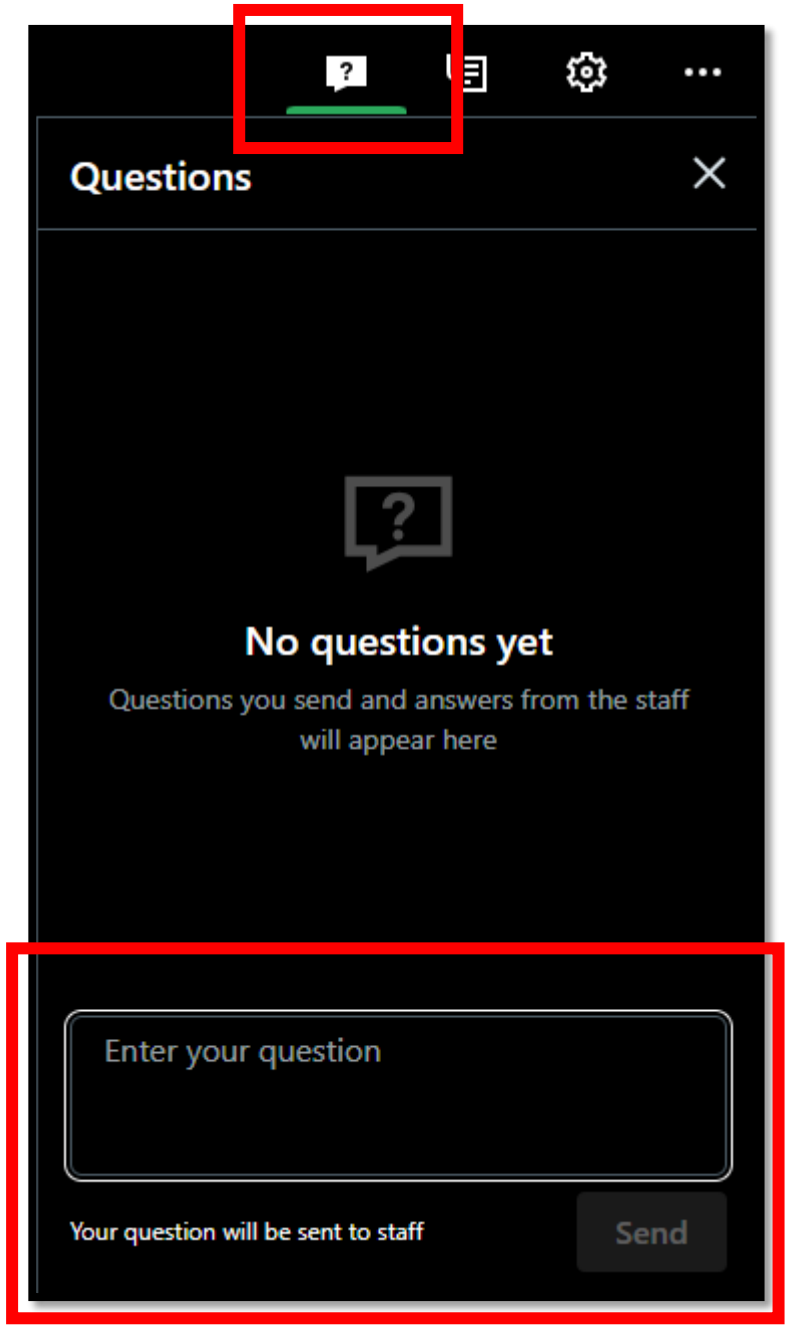
Learning Objectives

At the end of this webinar, you will be able to:

- Describe BCA methods, USDOT requirements and preferences
- Summarize how states and other countries are approaching BCA and the challenges they are trying to overcome in applying BCA
- Identify the latest methods and evolving impact metrics that are being integrated into BCA

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters

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Sarah Windmiller
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Ferrovie dello Stato Italiane

Evolving Benefit-Cost Analysis

- USDOT and other transport agencies regularly (and increasingly) require BCA for discretionary grants
- BCA methods, travel model tools, benefit concepts are best established for ‘traditional’ transportation capacity improvements such as new/expanded highways, rail/transit corridors, ports, etc.
- Increasingly, transportation agencies are exploring a wider-range of projects such as bike trails, electric charging, complete streets, safety and resiliency-focused improvements
    - A wider set of benefit metrics are gradually being developed (e.g., health, reliability, environmental, social/distributional, wider economic benefits) but established and approved guidance is still improving and evolving
- There’s strong interest in supplementing BCAs with related analyses – while encouraged, this is not required and guidelines continue to evolve, examples:
    - Appalachian Regional Commission working with Maryland and North Carolina DOTs to develop accessibility metrics (to jobs, health care, education, freight facilities) to contribute to project prioritization
    - Social equity analysis gaining momentum to estimate demographic characteristics and income groups most likely impacted by benefits and costs

Benefit-Cost Analysis: Past, Present, Future

Glen Weisbrod, Consultant
Senior Advisor, EBP
gweisbrod@gmail.com

TRB Webinar: Evolving the Practice of Benefit-Cost Analysis
November 21, 2024

Agenda

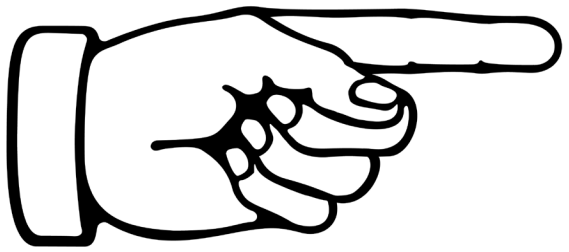
1) **Why** should we care: uses of BCA?

2) **How** has BCA evolved in the *past*?

3) **Where** are the *present* challenges?

4) **What** does this mean for *future* use?

Why Care: Decision support uses of BCA



- Assess proposals, refine plans
- Alternatives analysis
- Prioritization
- Funding decisions
- Examine who bears the costs
- Payback, return on investment (ROI)
- Common metric across benefits types

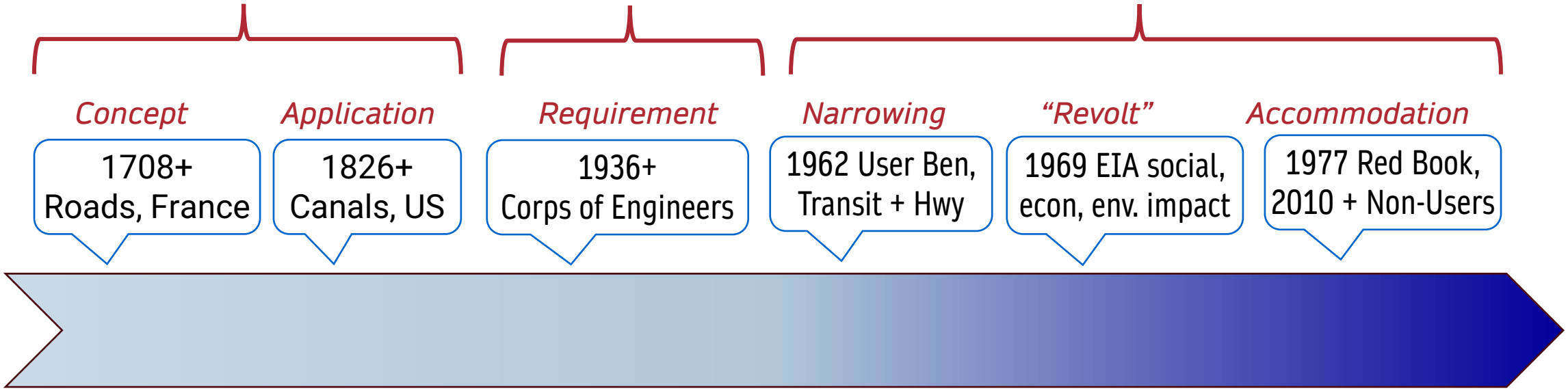
Past Evolution of BCA

Tensions in the movement from more holistic to narrower but more rigorous

Early Studies: Compare Project $ to Transformative Impact on Travel Cost, Trade + Commerce

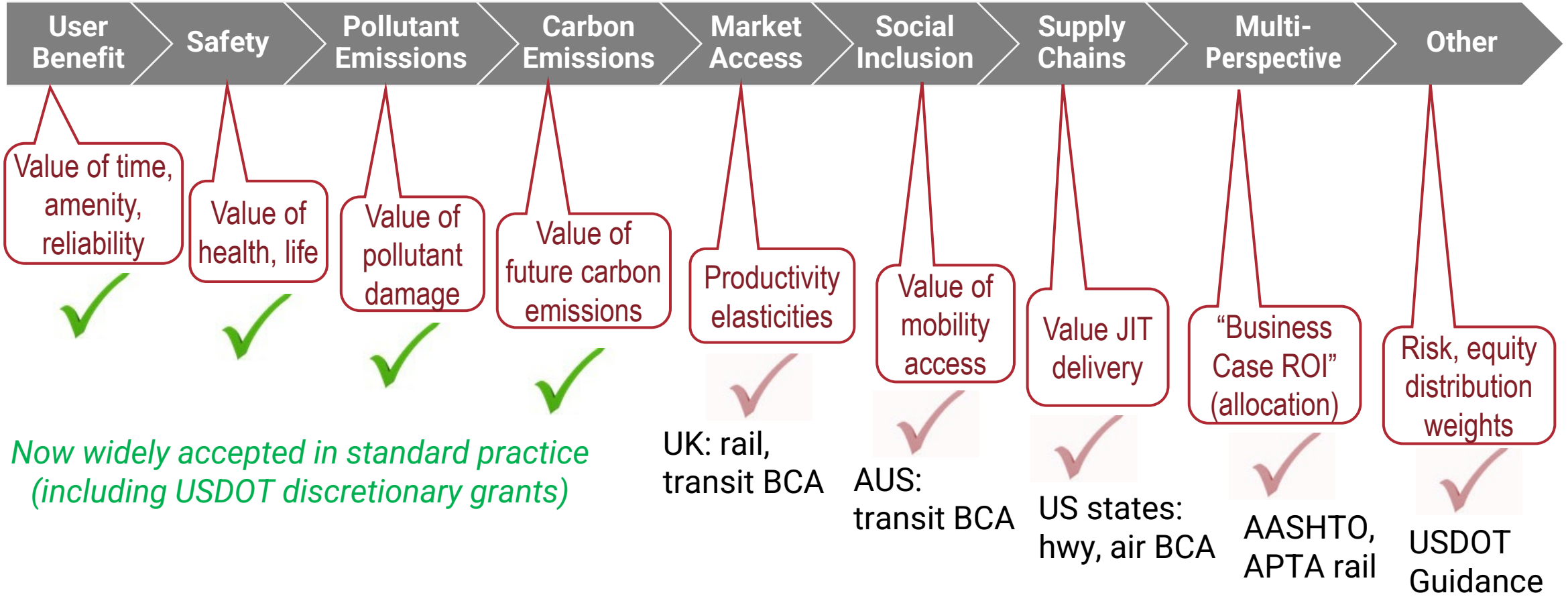
US Legislation: Invest only if "benefits are in excess of estimated cost" (but still recognize commerce, trade)

Rigorous Definitions: Apply Utility Theory for Public Policy Investment based on User Benefit $ and NPV



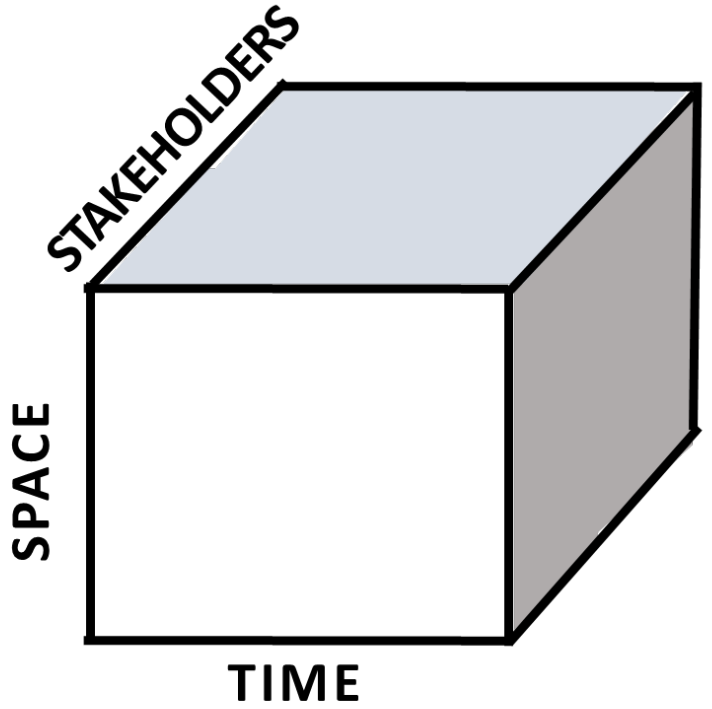
Evolution of Benefit Monetization

Over time, progress is being made, but it depends on research funding



Source of BCA Issues: It “smooshes” together 3 dimensions.

Three-Dimensional Universe of Economic Costs & Benefits: Combined in Benefit Cost Analysis



Present Challenges

Covering all the bases

Transport is a Derived Demand

- User ≠ traveler
- Freight shipper/receiver
- Transit: mobility for current non-traveler

Transport is Spatial

- Wider, non-user benefits
- Environ: pollution
- Social: access, exclusion
- Econ: agglomeration

Time Effects can be Cumulative

- Sustainability: non-reversibility of land, climate (future not discounted)
- Resilience Risk

Perspective Matters

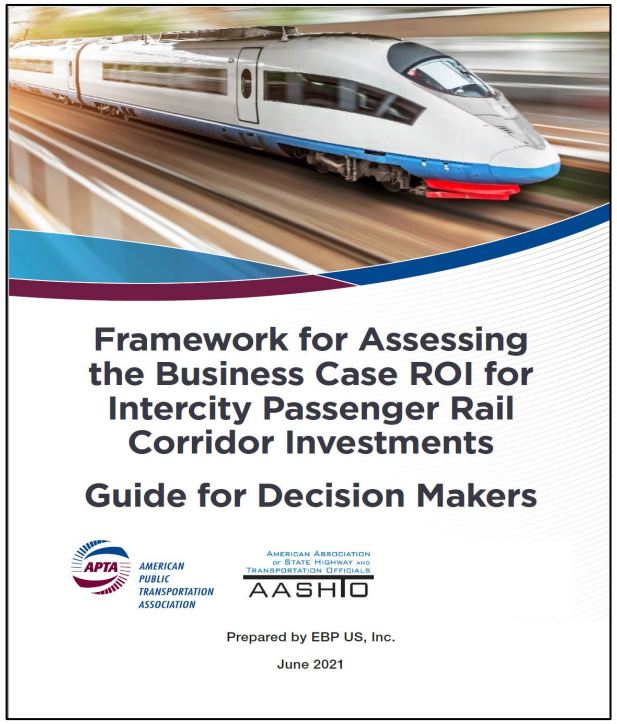
- Costs and benefits allocate and accrue to different levels of govt. and stakeholders

→ ***These additional factors are recognized*** *in funding decisions by having BCA with broader "impact criteria" analysis (USDOT grants), "business case appraisal"(UK, Australia), or "multi-criteria" rating (state DOTs) -- where additional benefit monetization is optional.*

…But then what is the real importance of BCA itself?

Goal: Making BCA Relevant

Accounting efforts for wider (spatial & stakeholder) views are in their infancy



3 volumes, search for "APTA business case ROI"

View	Different forms of benefits
National Benefit	• time, expense, and safety for travelers • productivity • resilience (through investment in other modes) • greenhouse gas emissions
State Benefit	• efficiency & resilience of state's multimodal facilities • labor & business markets, access • growth of economic activity (regional integration)
Local Benefit	• jobs, income, investment • tourism, visitor spending • efficient land development, tax revenue

Need: Matching Costs w/Benefits, and Benefits w/Goals

Ex-post case studies are showing the mismatch and need for benefit matching

Source: AASHTO EconWorks Case Study Database, 160 Highway and Transit Projects. Multiple responses allowed. Safety projects excluded.

Does our benefit measurement match achievement of goals?

Project Investment Objectives (Motivations)	Cases
Improve Travel Time / Bottleneck Reduction	88
Improve Intermodal Access: air/rail/port	67
Improve Labor Market Access	51
Improve Freight Delivery Market Access	46
Facilitate Local Jobs / Site Development	84
Facilitate Tourism	40
Improve Safety (not measured)	*
ALL	160

For further information

USDOT Grant Evaluation Impact and Benefit-Cost Criteria
https://www.transportation.gov/rural/grant-toolkit/maximizing-award-success/evaluation-criteria#project-performance-and-execution

UK Transport Appraisal Guidance (TAG) with Cost Benefit Analysis
https://www.gov.uk/guidance/transport-analysis-guidance-tag

Australia Transport Appraisal Guidance
https://www.atap.gov.au/

AASHTO/APTA Business Case ROI for Interstate Rail
https://www.apta.com/wp-content/uploads/HSIPR-v1-Guide-June2021.pdf

AASHTO EconWorks Database (update report pending early 2025)
https://planningtools.transportation.org/13/econworks.html

Improving project evaluation by recognizing the role of spatial scale & context
https://www.sciencedirect.com/science/article/pii/S0967070X2300272X

Federal Grant Pipeline Screening Tool

Evolving the Practice of Benefit-Cost Analysis

presented to

Transportation Research Board Webinar

presented by

Cambridge Systematics, Inc.

Sarah Windmiller

Texas Department of Transportation

Robin Ayers

November 21, 2024

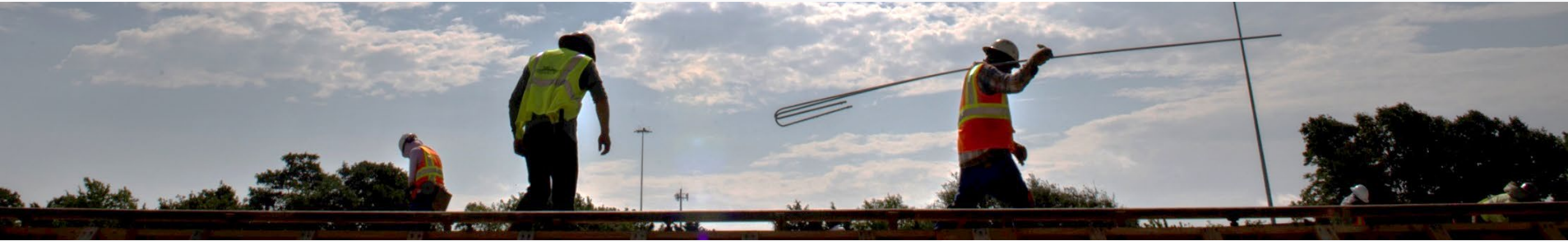
CAMBRIDGE SYSTEMATICS

Think Forward

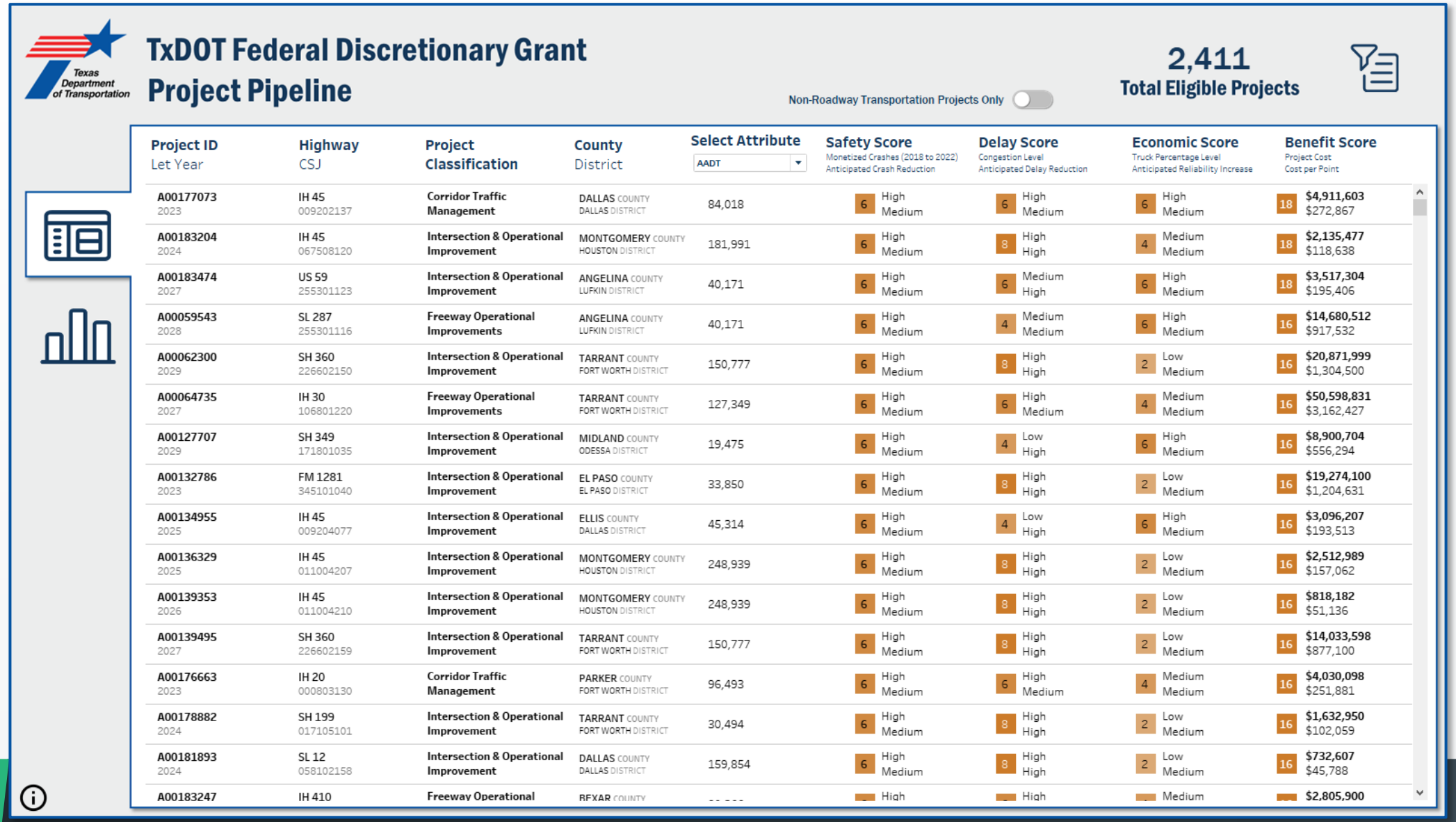
Finding Opportunities for Process Improvements

The Problem

- Many overestimate the competitiveness of projects in the initial stages
- Call for projects can take weeks to select viable projects
- Viable projects often fall below the Federal grant program minimum threshold benefit-cost ratio

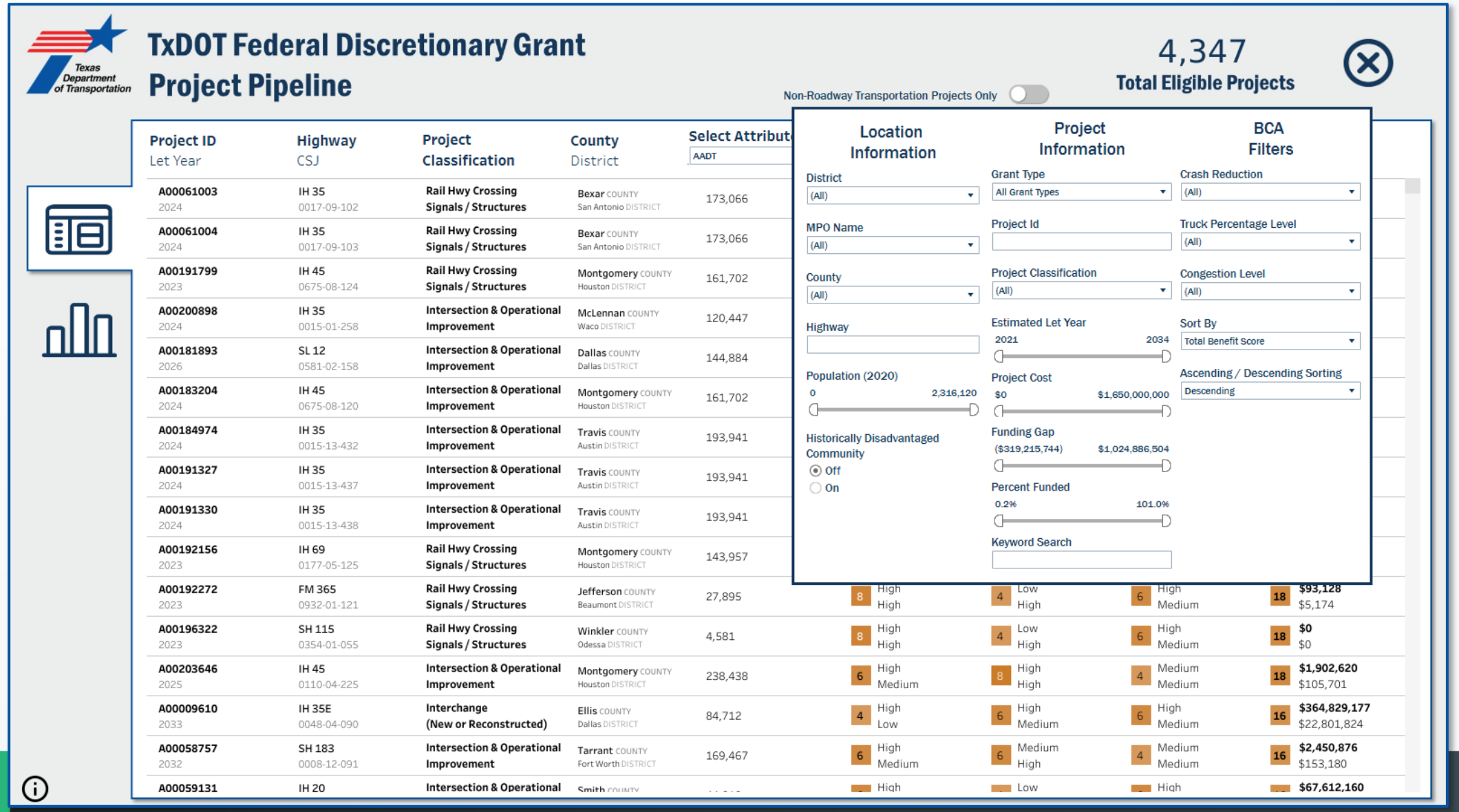


Federal Grant Pipeline Screening Tool



Project ID / Let Year	Highway / CSJ	Project Classification	County / District	Select Attribute: AADT	Safety Score: Monetized Crashes (2018 to 2022) / Anticipated Crash Reduction	Delay Score: Congestion Level / Anticipated Delay Reduction	Economic Score: Truck Percentage Level / Anticipated Reliability Increase	Benefit Score: Project Cost / Cost per Point
A00177073 2023	IH 45 009202137	Corridor Traffic Management	DALLAS COUNTY DALLAS DISTRICT	84,018	6 High Medium	6 High Medium	6 High Medium	18 $4,911,603 $272,867
A00183204 2024	IH 45 067508120	Intersection & Operational Improvement	MONTGOMERY COUNTY HOUSTON DISTRICT	181,991	6 High Medium	8 High High	4 Medium Medium	18 $2,135,477 $118,638
A00183474 2027	US 59 255301123	Intersection & Operational Improvement	ANGELINA COUNTY LUFKIN DISTRICT	40,171	6 High Medium	6 Medium High	6 High Medium	18 $3,517,304 $195,406
A00059543 2028	SL 287 255301116	Freeway Operational Improvements	ANGELINA COUNTY LUFKIN DISTRICT	40,171	6 High Medium	4 Medium Medium	6 High Medium	16 $14,680,512 $917,532
A00062300 2029	SH 360 226602150	Intersection & Operational Improvement	TARRANT COUNTY FORT WORTH DISTRICT	150,777	6 High Medium	8 High High	2 Low Medium	16 $20,871,999 $1,304,500
A00064735 2027	IH 30 106801220	Freeway Operational Improvements	TARRANT COUNTY FORT WORTH DISTRICT	127,349	6 High Medium	6 High Medium	4 Medium Medium	16 $50,598,831 $3,162,427
A00127707 2029	SH 349 171801035	Intersection & Operational Improvement	MIDLAND COUNTY ODESSA DISTRICT	19,475	6 High Medium	4 Low High	6 High Medium	16 $8,900,704 $556,294
A00132786 2023	FM 1281 345101040	Intersection & Operational Improvement	EL PASO COUNTY EL PASO DISTRICT	33,850	6 High Medium	8 High High	2 Low Medium	16 $19,274,100 $1,204,631
A00134955 2025	IH 45 009204077	Intersection & Operational Improvement	ELLIS COUNTY DALLAS DISTRICT	45,314	6 High Medium	4 Low High	6 High Medium	16 $3,096,207 $193,513
A00136329 2025	IH 45 011004207	Intersection & Operational Improvement	MONTGOMERY COUNTY HOUSTON DISTRICT	248,939	6 High Medium	8 High High	2 Low Medium	16 $2,512,989 $157,062
A00139353 2026	IH 45 011004210	Intersection & Operational Improvement	MONTGOMERY COUNTY HOUSTON DISTRICT	248,939	6 High Medium	8 High High	2 Low Medium	16 $818,182 $51,136
A00139495 2027	SH 360 226602159	Intersection & Operational Improvement	TARRANT COUNTY FORT WORTH DISTRICT	150,777	6 High Medium	8 High High	2 Low Medium	16 $14,033,598 $877,100
A00176663 2023	IH 20 000803130	Corridor Traffic Management	PARKER COUNTY FORT WORTH DISTRICT	96,493	6 High Medium	6 High Medium	4 Medium Medium	16 $4,030,098 $251,881
A00178882 2024	SH 199 017105101	Intersection & Operational Improvement	TARRANT COUNTY FORT WORTH DISTRICT	30,494	6 High Medium	8 High High	2 Low Medium	16 $1,632,950 $102,059
A00181893 2024	SL 12 058102158	Intersection & Operational Improvement	DALLAS COUNTY DALLAS DISTRICT	159,854	6 High Medium	8 High High	2 Low Medium	16 $732,607 $45,788
A00183247	IH 410	Freeway Operational	BEXAR COUNTY		6 High	8 High	2 Medium	16 $2,805,900

Federal Grant Pipeline Screening Tool



Indicators of Competitive Grant Projects

Key Contributors of Monetized Benefits

VEHICLE OPERATING COSTS (VOC)	VALUE OF TRAVEL TIME (VOT)	SAFETY	LOGISTICS COSTS
Reduced miles traveled	Reduced travel times	Reduced crashes	Reduced freight delays
Reduced travel times	Reduced delays		Increased freight time reliability

Note: *Some benefits were excluded from the approach based on the low dollar value contribution, including property values, state of good repair, emission reduction and health benefits.*

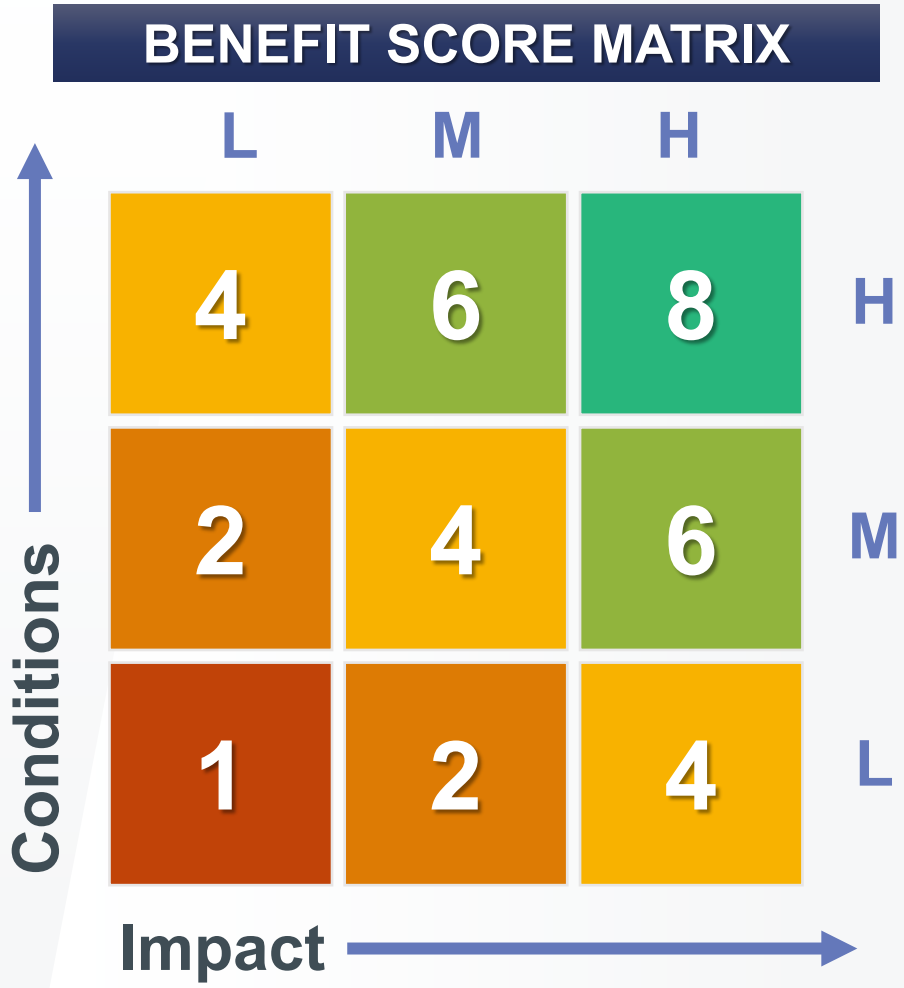
Calculating Relative Rankings

Potential Project Benefits

1. **Current Conditions**: Uses key indicators demonstrating the level of need a project could resolve
2. **Predicted Impact**: Identifies how each project type can impact each "benefit" driver

» Results in scores **High** **Medium** **Low**

» Points assigned based on a combination

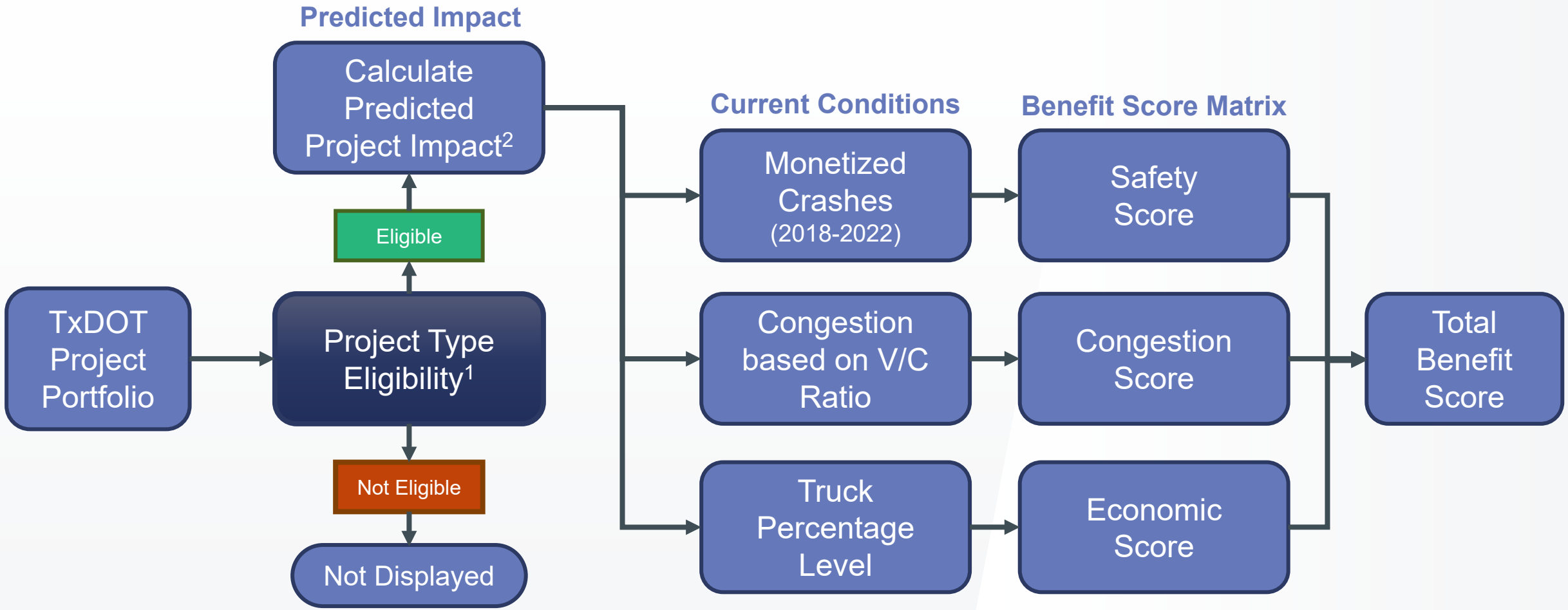


Project Classification by Predicted General Impact

Identifies how well a project classification would impact each “benefit” driver

Project Classification	VMT Reduction	Travel Time Reduction	Delay Reduction	Crash Reduction	Freight Delay Reduction	Freight Reliability Increase	SOGR Impact
Bicycle Infrastructure Improvements	Low	Medium	None	High	None	None	None
Border Crossing Facility	None	High	High	None	High	Medium	None
Bridge Maintenance	None	None	None	None	None	None	High
Convert Non-Freeway To Freeway	None	High	Medium	None	Medium	Medium	None
Corridor Traffic Management	None	High	Medium	Medium	Medium	Medium	None
Ferry Boat	Medium	Medium	None	None	None	None	None
Freeway Operational Improvements	None	High	Medium	Medium	Medium	Medium	None
Interchange (New or Reconstructed)	Low	High	Medium	Low	Medium	Medium	None
Intersection & Operational Imprv	None	Medium	High	Medium	High	Medium	None
New Location Freeway	None	Medium	Medium	None	High	High	None
New Location Non-Freeway	Low	Medium	Medium	None	Medium	Low	None
Pedestrian, Sidewalks & Curb Ramps	None	None	None	High	None	None	High
Rail Hwy Crossing Signals/Structures	Low	High	High	High	High	Medium	None
Rehabilitation of Existing Road	None	None	None	None	Low	Low	High
Safety Improvement Projects	None	None	None	High	None	Low	None
Safety Rest Area	None	None	None	High	None	None	None
State Owned Rail Line	None	None	None	None	Medium	Medium	High
Super-2 Highway	None	None	None	Medium	None	None	None
Transportation Non-Roadway	None	None	None	None	None	None	None
Widen Freeway	None	None	Medium	None	Medium	Medium	None
Widen Non-Freeway	None	None	Medium	None	Medium	Medium	None

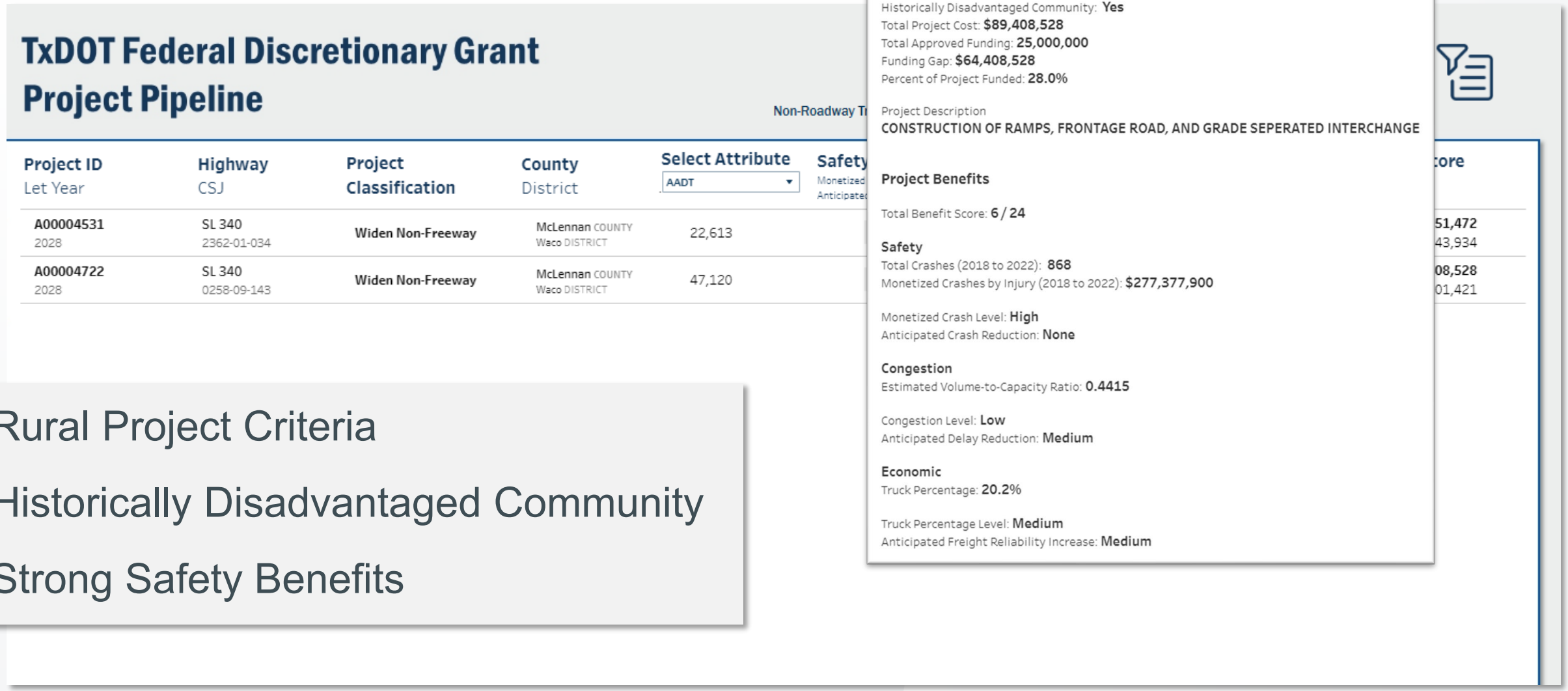
Project Ranking Process



[1] Determines if project is eligible for selected grant. For example, a bicycle project is not applicable for the INFRA grant.

[2] Estimates how well a project type will address various areas. For example, a bicycle project would not have a notable impact on delay

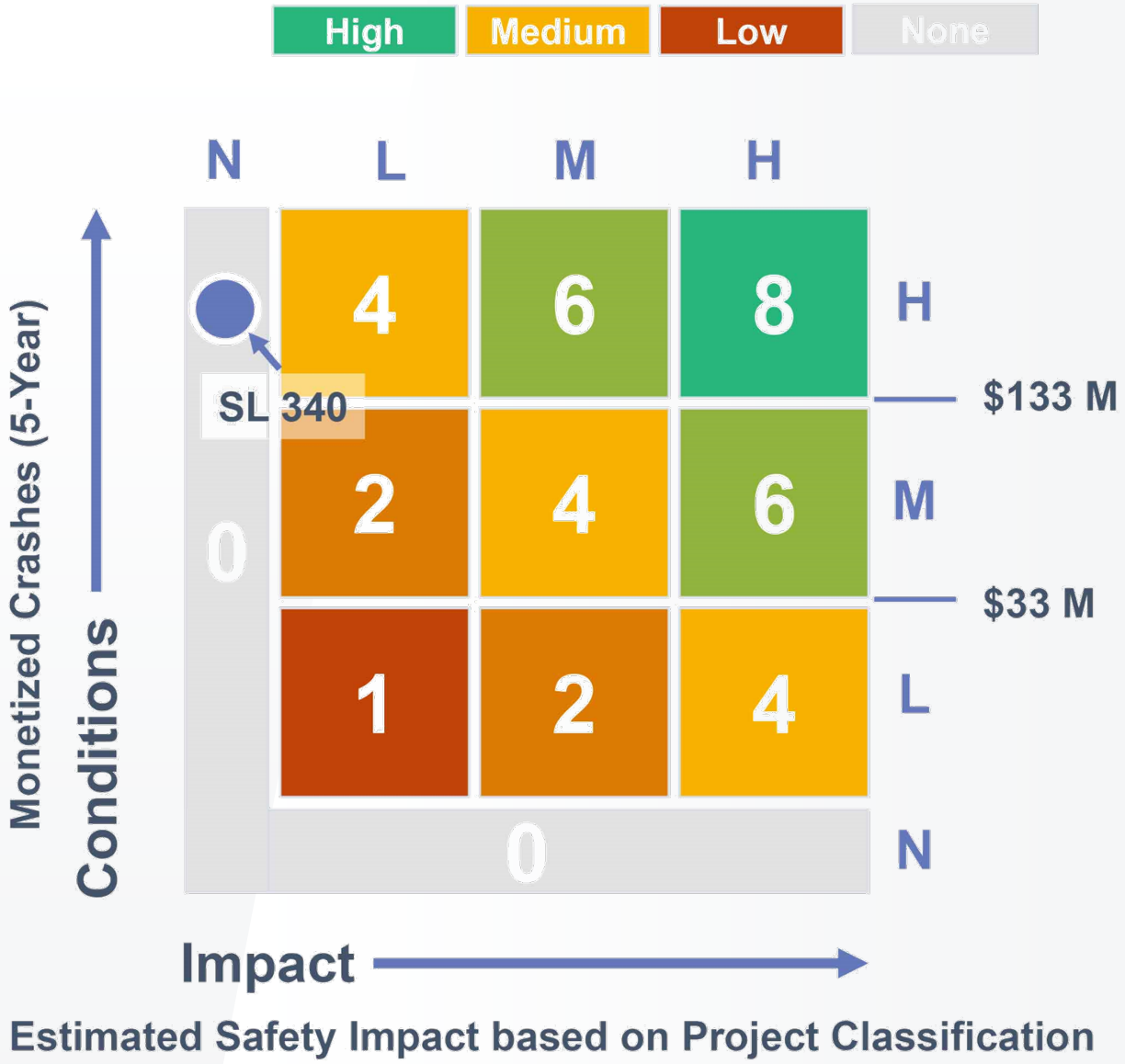
SL 340 Project Example



- Rural Project Criteria
- Historically Disadvantaged Community
- Strong Safety Benefits

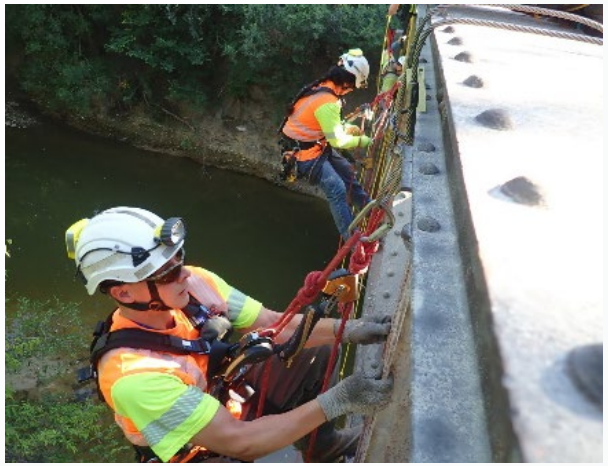
SL 340 Project Example

- Crash conditions along corridor are severe (within top 1/3 of all projects)
- However, roadway widenings demonstrate limited impact on crash reduction
- Need to look deeper at project description
  - *Construction of ramps, frontage road and grade separated interchange*
  - Safety impact is higher than what appears on surface



Federal Grant Pipeline Screening Tool






Thank You

Robin Ayers
Texas Department of Transportation

Sarah Windmiller
Cambridge Systematics

Gruppo FS

The Mobility Leader

Extending BCA in Italy to a wider impact appraisal

Mario Tartaglia, Ferrovie dello Stato Italiane

November 21, 2024

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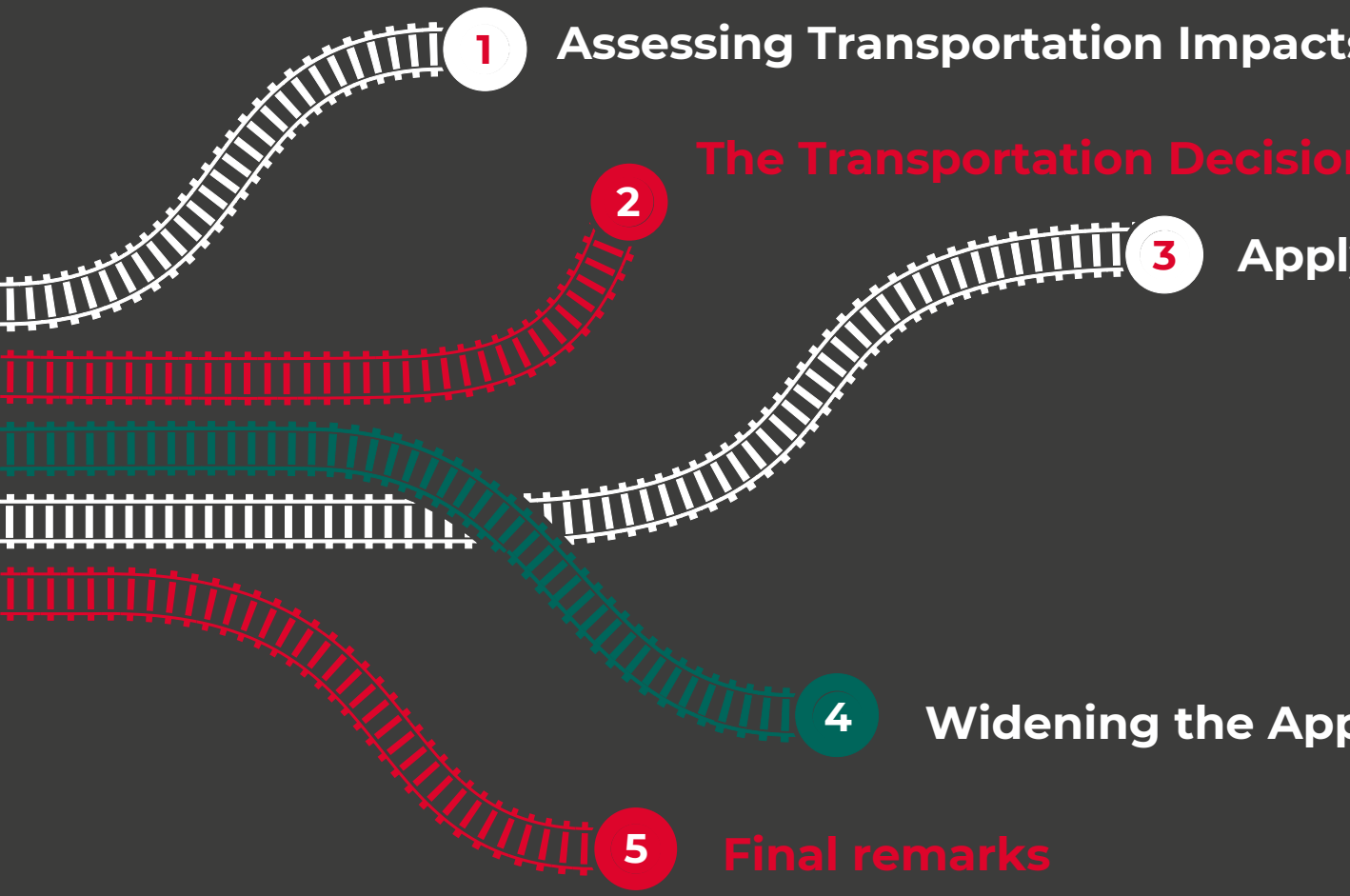


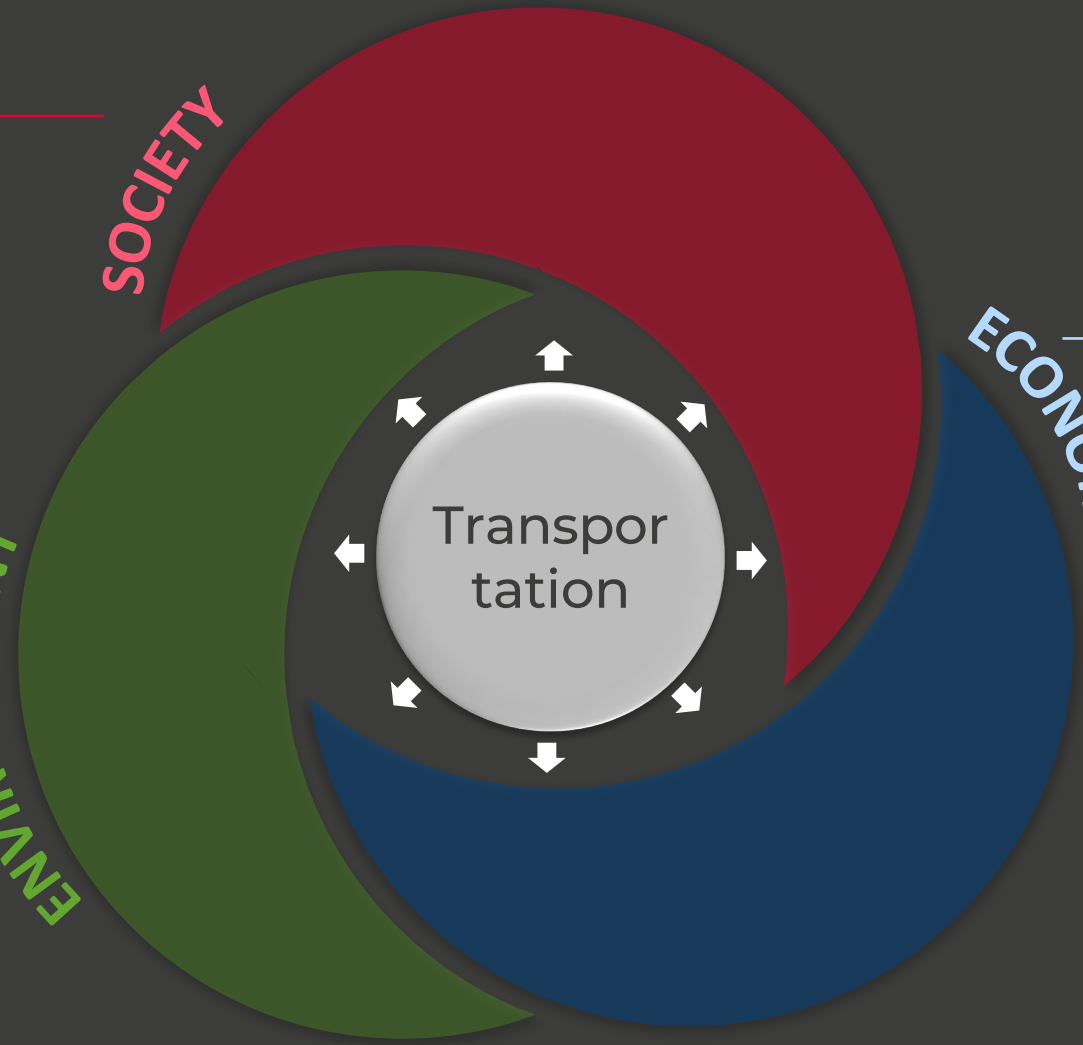
Assessing Transportation Impacts

The impacts of transportation

Transportation systems have effect on the whole ecosystem and its components

Congestion
Equity/Justice
Community severance
Job changes
Health damages
Safety
Air quality
Noise Pollution
(...)

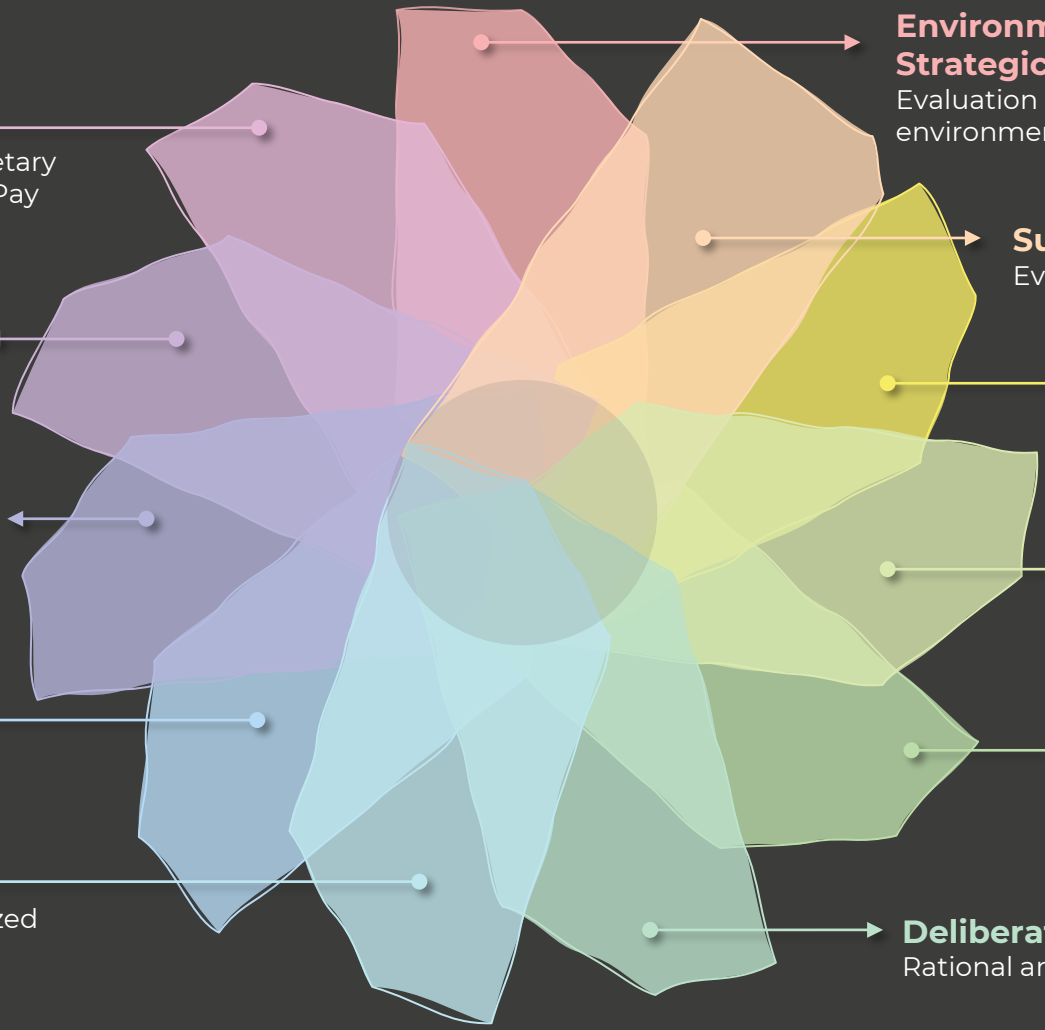
Air quality
Climate Effects
Biodiversity
Habitat
Damage
Resilience
Land use
(...)



GDP
Employment
Energy
Technology
Tourism
Congestion
Externalities
Wider Economic
Effects
(...)

Source: Author's processing

Main methods for assessing transportation impacts



Cost-Benefit Analysis (CBA)
Measure of a project's societal value in monetary terms based on individuals' Willingness-To-Pay from their private income

Cost-Effectiveness Analysis (CEA)
Comparison of different project's relative costs with their related outcomes

Economic Impact Assessment (EIA)
Estimation of the impact of an investment on the general economy (e.g. Input-Output Analysis, CGE)

Wider Economic Impacts (WEI)
Appraisal of economic impacts beyond the CBA usual ones

Multi-Criteria Analysis (MCA)
Appraisal of policy options using normalized and weighted measures of their effects

Environmental Impact Analysis (EIA) and **Strategic Environmental Assessment (SEA)**
Evaluation of the effects significantly affecting the environment

Sustainability Assessment (SA)
Evaluation of sustainability indicators

External Costs Assessment (ECA)
Estimation of main externalities of transport in monetary terms

Territorial Impact Analysis (TIA)
Evaluation of impacts on the whole territory involved by a project

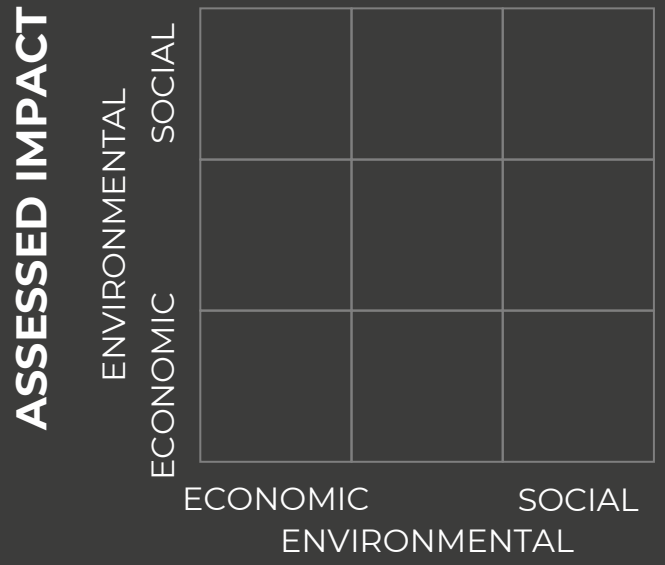
Social Impact Analysis (SIA)
Evaluation of the effects of transport on society and individuals

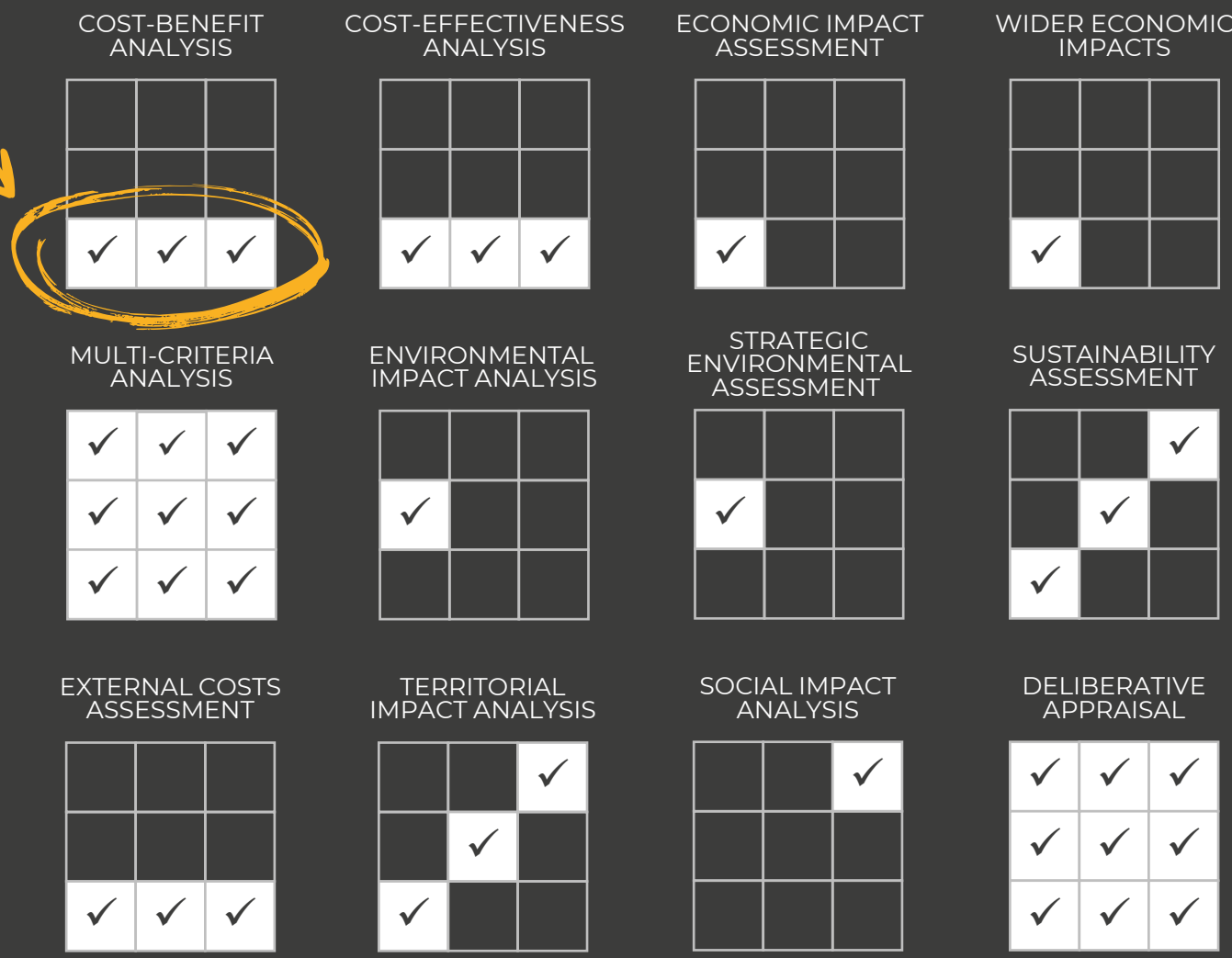
Deliberative Appraisal (DA)
Rational and informed judgment by citizens

Source: Author's Venn diagram processing

Transportation impact assessment scopes vs assessed components

For instance, CBA often takes into account only the economic part of the impact rather than the whole impact measured in economic units

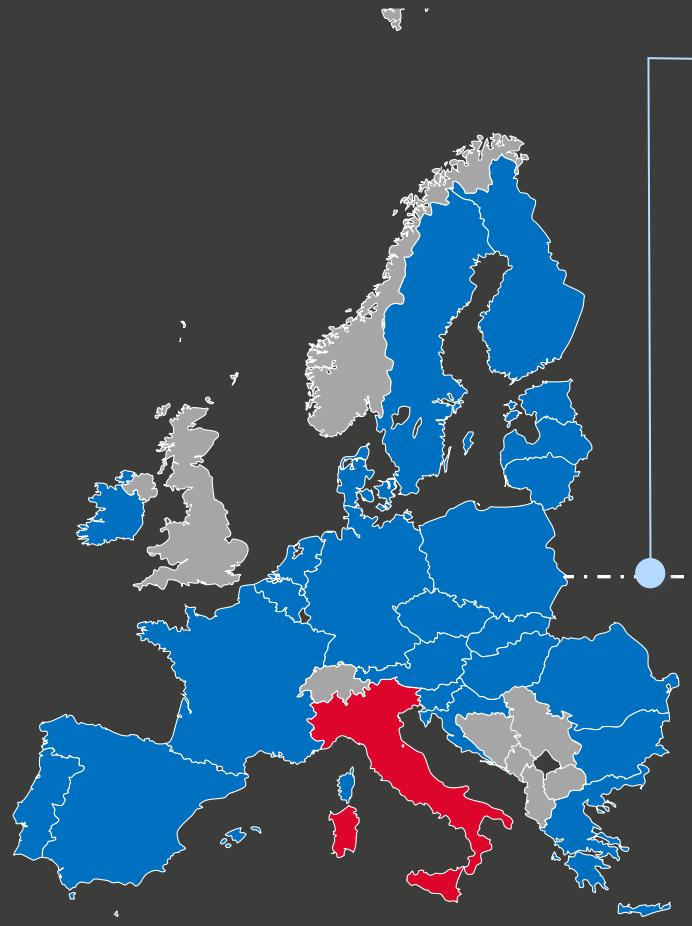




Source: Author's processing

The transportation Decision-Making process in Italy

The regulatory framework in Italy and Europe



2014

Latest version of the EC Guide to Cost-Benefit Analysis of Investment Projects

2019

Handbook on External Costs of Transport

2021

- Sustainability Taxonomy
- Economic Appraisal for regional Policy
- Climate Proofing

2016-2017

- Code of Public Procurement (2016)
- Italian Guidelines for Public Works Appraisal (2017)

2021

- Guidelines for Recovery and Resilience Facility
- Operational Guidelines for Public Works Appraisal for Railways Sector

2022

- Operational Guidelines for Roads, Rapid Transit, Water Works
- Sustainability Scoring System

2023-24

- Code of Public Procurement (2023)
- Transport and logistic Infrastructure Strategy (2024)

Source: Author's processing based on published regulations

The transport planning process in Italy (2016-2023)

PROPOSALS FROM:
- Infrastructure managers
- Local administrations
- Others

1a

1b **TRANSPORT AND LOGISTICS INFASTRUCTURE STRATEGY**

EX-ANTE APPRAISAL

2

3 **TRANSPORT AND LOGISTICS GENERAL PLAN**
Objectives, Strategies and Mobility Scenarios

4 **MULTI-YEAR PLANNING PROGRAM**
Projects
Feasibilty Studies

5 **PROGRAM REALIZATION**
- National Rail Investment Program
- National Roads Investment Program
- Highway Grants
- Airports Investment Program
- Ports Authorities Program
- Regional Transport Plans

6 **EX-POST APPRAISAL**

7 **UPDATING**

Benefit-Cost analysis or wider approaches?

Source: Italian Ministry of Infrastructure and Transport, Guidelines for the evaluation of investments in public works in the sectors of competence of the (Decree No. 300, 16 June 2017)

The transport planning process in Italy (2023 on)

Updates

PROPOSALS FROM:
- Infrastructure managers
- Local administrations
- Others

1a

1b TRANSPORT AND LOGISTICS INFRASTRUCTURE STRATEGY

EX-ANTE APPRAISAL

Feasibility Document of Project Alternatives

2

Benefit-Cost analysis or wider approaches?

3 TRANSPORT AND LOGISTICS GENERAL PLAN
Objectives, Strategies and Mobility Scenarios

Since 2023, Government identifies strategic infrastructures following the FDPA and other criteria

3-4 **TRANSPORT AND LOGISTICS INFRASTRUCTURE STRATEGY**

5 **PROGRAM REALIZATION**

- National Rail Investment Program
- National Roads Investment Program
- Highway Grants
- Airports Investment Program
- Ports Authorities Program
- Regional Transport Plans

6 **EX-POST APPRAISAL**

7 **UPDATING**

Source: Italian Ministry of Infrastructure and Transport, Guidelines for the evaluation of investments in public works in the sectors of competence of the (Decree No. 300, 16 June 2017)

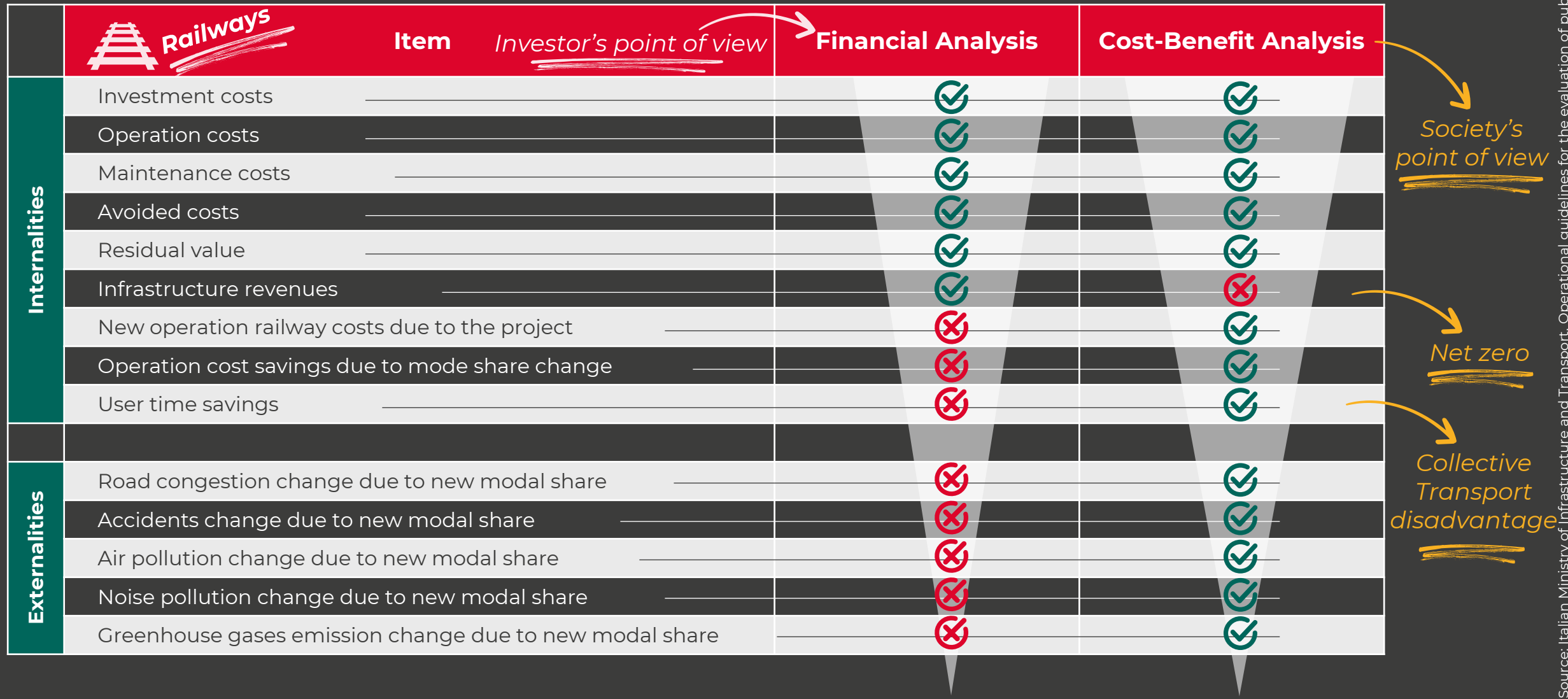
Applying Cost-Benefit Analysis in Italy

Project appraisal application scope according to Italian regulation

Sector	Type	Cost	Assessment
 Railway	All types	< 10 Mln€	Cost-Effectiveness Analysis (CEA)
	All types	> 10 Mln€	Cost-Benefits Analysis (CBA)
	Relevant demand captured	>>>	Local Economy Assessment
 Road	Renewals	Any	Cost-Effectiveness Analysis (CEA)
	Punctual, no service revenues	< 10 Mln€	Cost-Effectiveness Analysis (CEA)
	No service revenues	> 10 Mln€	Cost-Benefits Analysis (CBA) with risk and sensitivity analysis
	With service revenues	Any	Cost-Benefits Analysis (CBA) with risk and sensitivity analysis
 Rapid Transit	New lines or enhancements	< 10 Mln€	Cost-Effectiveness Analysis (CEA)
	New lines or enhancements	> 10 Mln€	Cost-Benefits Analysis (CBA)

Source: Italian Ministry of Infrastructure and Transport, Operational guidelines for the evaluation of public works investments – (1) Railway Sector, (2) Road Sector, (3) Mass Rapid Transit, 2021-2022

Costs-Benefit to be taken into account according to Italian regulation



Source: Italian Ministry of Infrastructure and Transport, Operational guidelines for the evaluation of public works investments – (1) Railway Sector, (2) Road Sector, (3) Mass Rapid Transit, 2021-2022

Cost-Benefit Analysis: some limitations

- ✓ The standard application of Cost-Benefit Analysis (CBA) to an intervention on the transportation system involves the evaluation of direct benefits to transport users, plus some direct external impacts (externalities).
- ✓ However, usually CBA does not capture all the impacts of an intervention (OCDE/ITF, 2017), for instance:
  - ✓ missing some additional wider economic impacts (mainly benefits, e.g, on productivity, connection, labour market);
  - ✓ overlooking the intangible and non-financial outcomes associated with transport investments or changes;
  - ✓ disregarding individual diversity and needs; it thus tend to favor persons who are already mobile and participating in the market (Hananeland Berechman, 2016);
  - ✓ missing to identify and respond to the social implications (Cavallaro et al. 2022);
  - ✓ hindering authorities' ability to adequately assess social implications, impeding a fully informed decision-making and the development of effective side policies (Bruzzone et al., 2023);
  - ✓ missing to incorporate transportation performance reliability (OCDE/ITF, 2017).

Source: Author's processing based on literature

Widening the Appraisal Approach

Issues in improving Cost-Benefit Analysis

- ✓ A first approach for overcoming the limitations the traditional Cost Benefit Analysis (CBA) could be aimed to extend its scope. However, some issues should be taken into account:
  - ✓ Methodological inconsistency could emerge if using different social or economic theories when considering additional impacts
  - ✓ Some intangible impacts, such as the social ones, could not be easily quantified in monetary measures
  - ✓ Including wider economic impacts could result in double counting some contributions to the overall economic effect
- ✓ An alternative approach is to apply complementary appraisal frameworks. In such case, CBA should be considered only one of several evaluation tools, and it could not be easy to build a comprehensive picture for the assessment.

Source: Author's processing based on literature

Assessing environmentally sustainable investments in EU

Regulation (EU) 2020/852 sets a framework aimed to decide whether an economic activity is environmentally sustainable

1 – definition of six climate and environmental objectives

1. Climate change mitigation
2. Climate change adaptation
3. Sustainable use and protection of water and marine resources
4. Transition to a circular economy
5. Pollution prevention and control
6. Protection and restoration of biodiversity and ecosystems

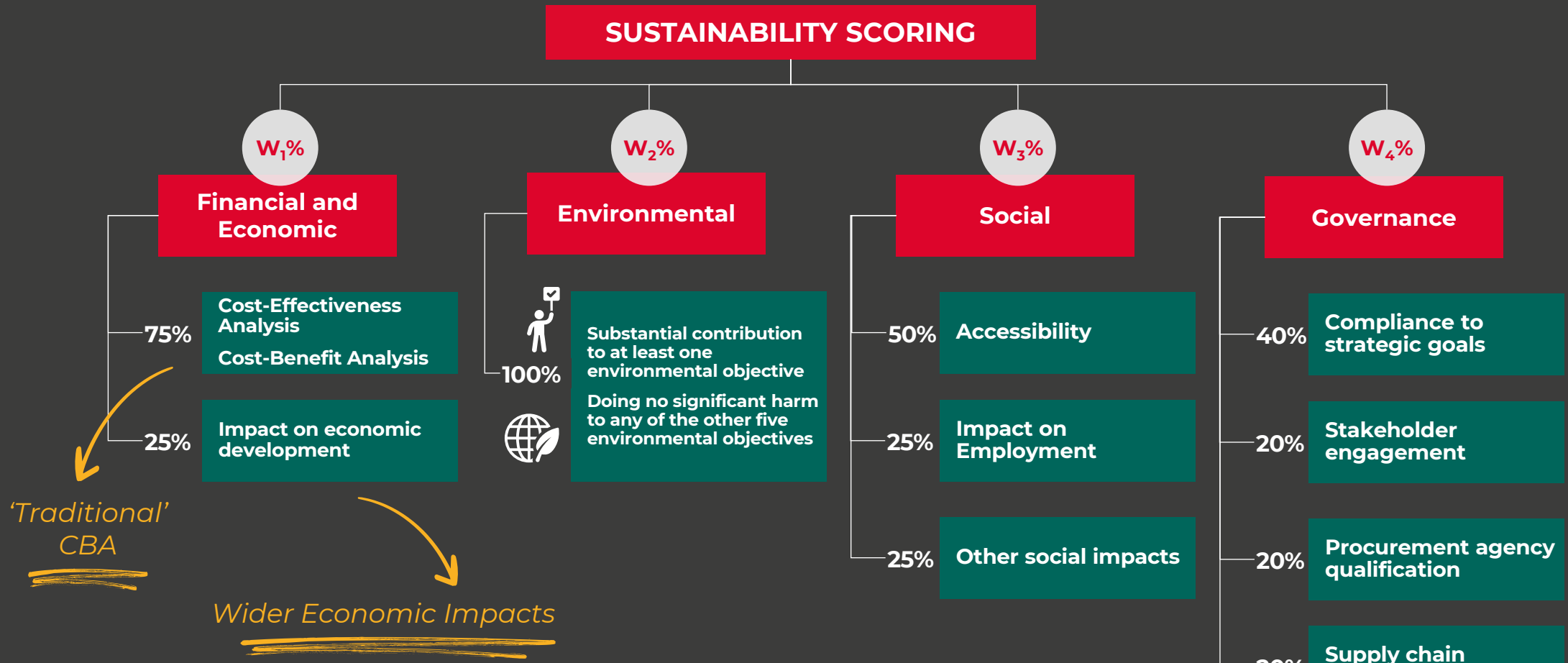
2 - conditions that an economic activity must meet in order to qualify as environmentally sustainable

1. Making a **substantial contribution** to at least one environmental objective
2. Doing **no significant harm** to any of the other five environmental objectives
3. Complying with **minimum safeguards**
4. Complying with the technical screening criteria

Source: https://ec.europa.eu/sustainable-finance-taxonomy/

Sustainability assessment for infrastructures and mobility

The Scoring System included in the Italian regulation



Source: Italian Ministry of Infrastructure and Transport, Operational guidelines for the definition of a multidimensional approach for the evaluation of public works – Scoring model for sustainable infrastructure and mobility, 21 October 2022

Social impact KPIs according to Italian regulation

Indicator	Rail	Road	MRT
Project beneficiaries by socio-demographic composition (No.)	✓	✓	✗
People declaring issues in accessing railway infrastructure (%) in the project area	✓	✗	✗
Commuters for work reason using only private transport (%)	✓	✓	✗
Change in accessibility levels	✓	✓	✗
Removals of physical barriers for accessing infrastructure	✓	✗	✗
Equity in access rules to transport services	✓	✓	✗
Employment generated during the building phase	✓	✓	✗
Employment generated during the operating phase	✓	✓	✗
Initiatives for fostering young and female employment during the building phase	✓	✓	✗
Initiatives for safeguarding worker rights in the whole supply chain during the building phase	✓	✓	✗
Initiatives for workers safety	✓	✓	✗
Measures for mitigating negative impacts on citizens life quality during the building phase	✓	✓	✗
Measures for safeguarding and enhancing public spaces close to building sites	✓	✓	✗
Other social benefits produced by the interventions (on territorial attractivity, social capital)	✓	✓	✗

Source: Italian Ministry of Infrastructure and Transport, Operational guidelines for the evaluation of public works investments – (1) Railway Sector, (2) Road Sector, Mass Rapid Transit, 2021-2022

Final remarks

- ✓ There is a general need for extending the traditional Cost Benefit Analysis (CBA) approach in the order to take into account some additional impacts of transportation on environment, economy, policy, and society.
- ✓ A large literature debate exists about methodological issues in extending CBA to some impact categories. It mainly concerns both double counting risks and reliability of intangible effect economic evaluation.
- ✓ Such issues are faced differently in different countries, with varying willingness to accept the inclusion of wider impacts inclusion.
- ✓ In Italy, following the European Union guidelines, the current regulatory approach is to apply complementary appraisal frameworks.
- ✓ Nevertheless, there is room for methodological progress about extending the traditional CBA range for including broader impacts.

Source: Author's processing based on literature

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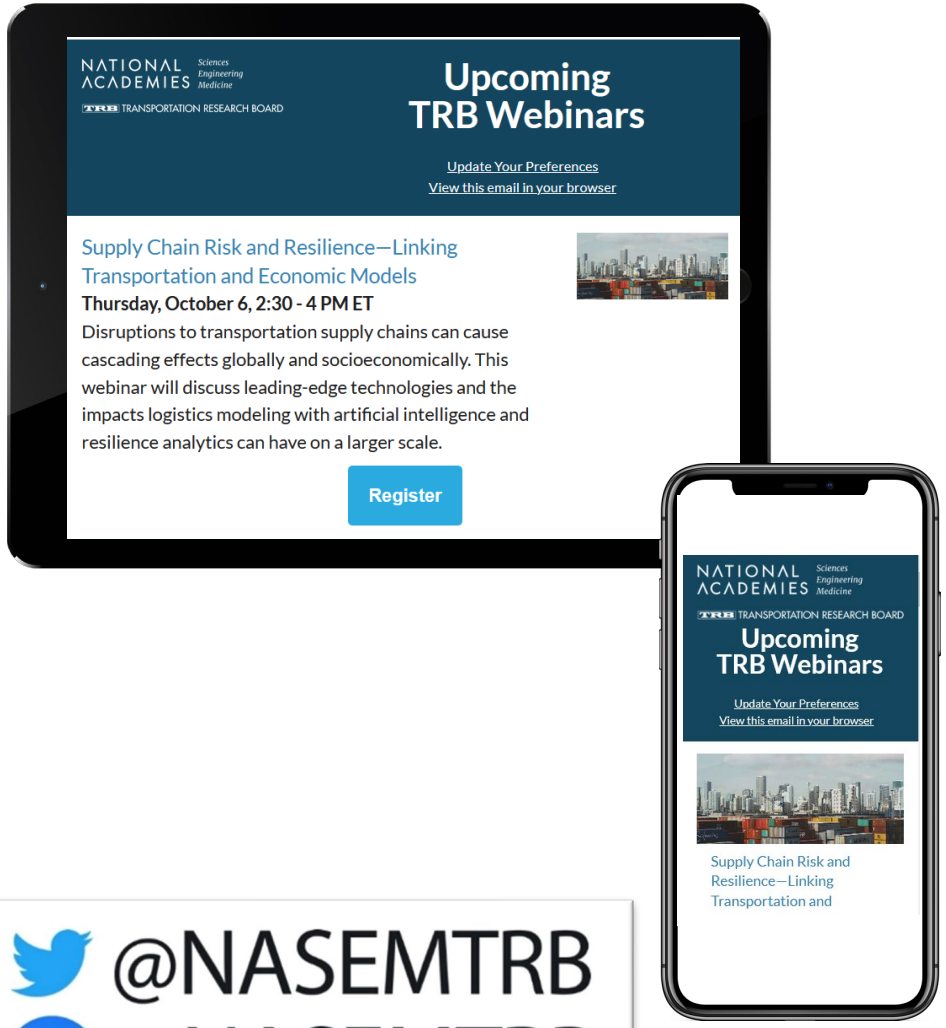

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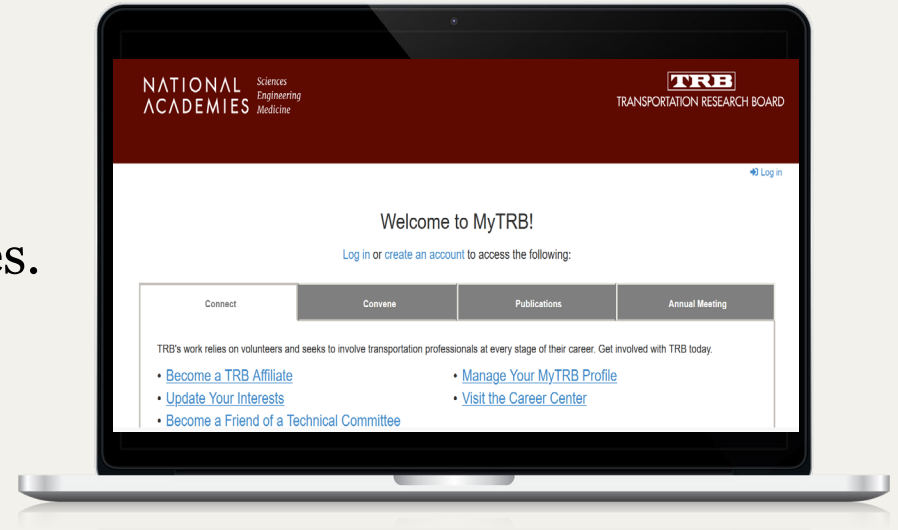

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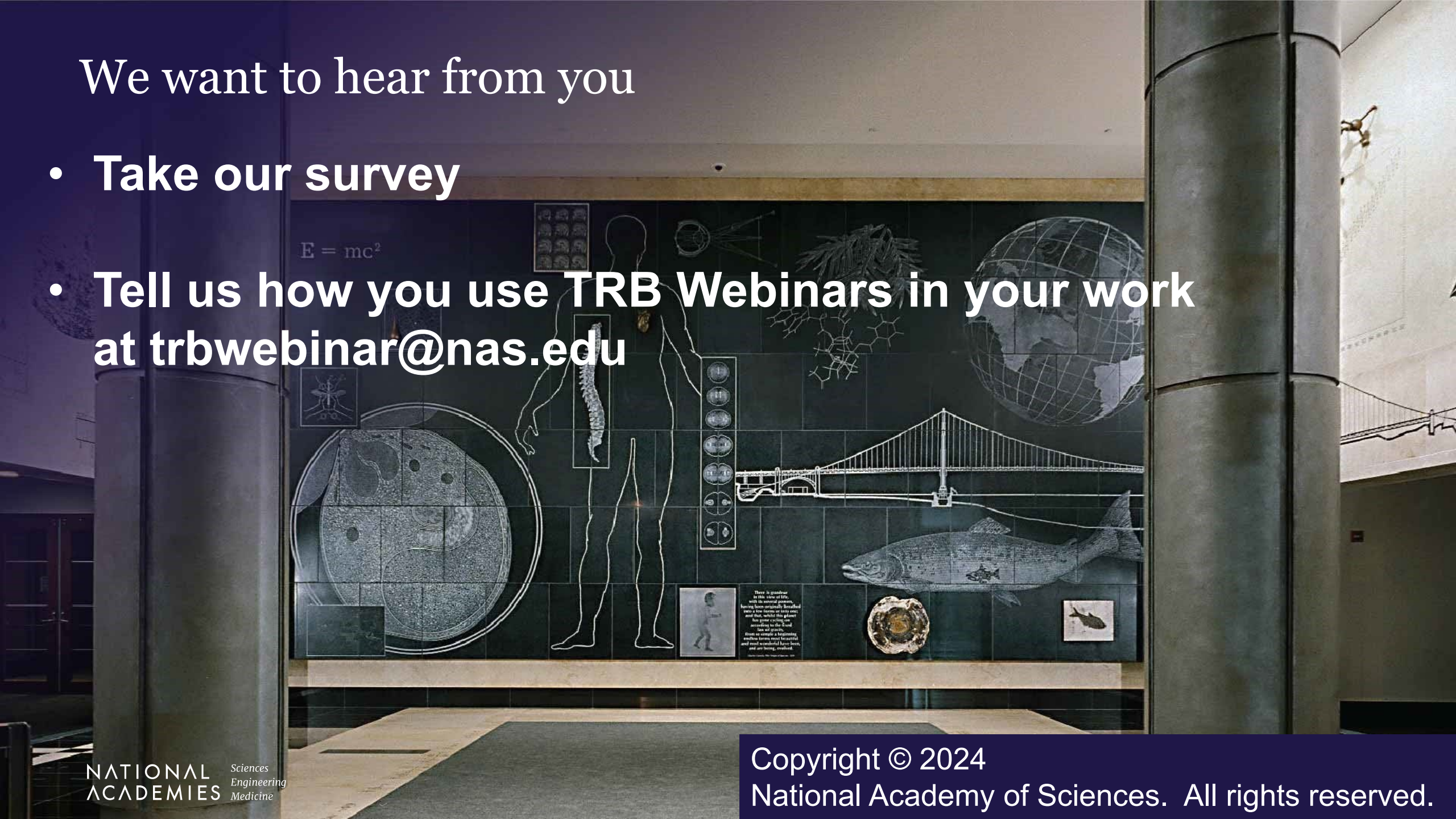

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