Cornell Program *in* Infrastructure Policy

EDUCATING THE NEXT GENERATION OF INFRASTRUCTURE LEADERS

The Road Ahead: Renewing New York's Highway Infrastructure

The Empire Center

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Main Takeaways

- *1. Major problems of transportation infrastructure **funding**; similar challenges across U.S. states and many countries*
- *2. Road pricing (**per unit; variable**) is best solution to infrastructure problems, but politically difficult to implement*
- *3. Pricing releases enormous embedded, latent value in infra, **public permanent fund** approach encourages road pricing*
- *4. Public-private partnership leases are the best way to implement permanent fund approach*
- *5. This concept represents a new model in ownership forms: **asset public-ization** (better recognize citizen's property rights in infrastructure)*

Key Insight: Funding versus Financing of Infrastructure

- Funding and financing are often conflated!
- Funding refers to the ultimate source of the dollars: **comes from either user fee revenue or broader tax revenue**
- Financing can come from many sources once funding is in place (bonds, equity investment, TIFIA, etc.)!
- U.S. has a **funding problem**; **not a financing problem!**

Current fuel tax funding system is unsustainable

Four main reasons:

- **Declining annual Vehicle Miles Traveled (VMT)**
  - U.S. annual VMT rose for decades after WW2 through recessions and downturns
  - U.S. annual VMT peaked in 2005; has declined by 7 percent since

  - **Increasing efficiency of vehicles that use gas a diesel**
  - Pres. Bush increased CAFÉ to 35MPG my 2020; Pres. Obama to 39MPG by 2016
  - Mary Peters: "Policy at war with Itself!"

Reasons for fuel tax unsustainability:

- **More vehicles using non-fossil fuels**
  - Federal subsidies for electric cars; hybrids
  - Popularity of Tesla, for example
  - Development of hydrogen powered vehicles
- **Federal and most state gas taxes not inflation-indexed**
  - Federal gas tax 18.3 cents per gallon
  - Last increased in 1993
  - Purchasing power of revenue declined by over 1/3 since then

Wide agreement among economists on best solution

- **Variable per-unit road prices** (congestion prices) in form of a vehicle-miles traveled charge; (Vickery 1969; 1992; Walters 1961); mileage-based user fees (MBUFs)
- **Demand side and Supply side effects**: MBUF creates facility-specific revenue to guide investment, expand, and maintain (prevent "white elephants")
- Currently can price new capacity (e.g. new HOT lanes on DC beltway; HOV to HOT conversions)
- Can **price road use like any utility**; separate payment from fuel source!
- Challenge is in overcoming resistance to pricing existing capacity in a system-wide manner

Proposals to overcome political resistance to road pricing

- Use of the toll revenue is key to acceptance of new tolls (Small 1983; 1992)

- Some existing proposals:

  - Use a portion of new toll revenue for tax rebates and tax reductions in tolled region (Small 1992)

  - Give net revenues generated by congestion prices to jurisdictions (e.g. cities) through which newly tolled roads pass (King, Manville, and Shoup 2007)

Problem with current suggested approaches

- ***Ignores existing ownership*** of infrastructure assets (and thus residual claimancy; who owns revenue generated?)
- Infrastructure asset owners (citizens) have a **claim** to the value created by pricing (consider analogy to steel)

Distribution of value created by pricing should recognize citizen's implicit ownership right

"Public-ization" of infrastructure assets: better recognizing existing rights of citizen-owners

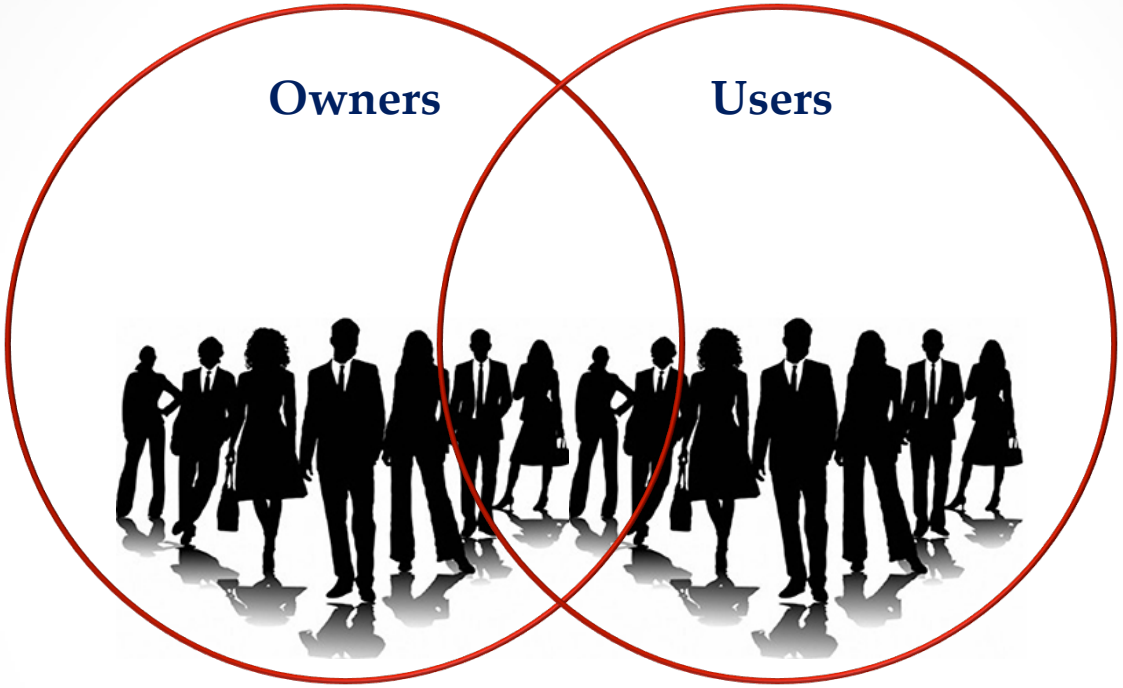
Our approach:

- Recognize that road pricing releases value embedded in the asset (see graphs)
- The IP3 generates (large) up-front payments that monetize that value through PPP leases or concessions
- Bidding takes place on basis of *largest upfront concession payment offered*
- Use concession proceeds to create a state-level public permanent fund to preserve forever value released by road pricing

Our approach (continued)

- Use the majority (say 70%) of up-front PPP concession lease payments of newly priced roads to capitalize the Fund
- Pay annual dividend forever to all citizen-owners of the transportation facility
- Use remaining (30%)to expand system and develop alternatives ("ribbon cutting" provides political grease/will)
- Re-concession road after initial concession ends (creates an "in-exhaustible resource"!)
- Recognizes citizen-owners claim to the **value created by pricing**

Infrastructure Owners vs. Infrastructure Users



Citizen-owners of jurisdiction

Customers of transportation infrastructure in jurisdiction

The Public Permanent Fund

- Examples of Permanent Fund model (GASB Rule 24, 1999):
  - Alaska, Alberta, Texas, Norway, Wyoming (?)
  - Proceeds from natural resource leases invested in perpetuity in diversified portfolio
  - Alaska: Income used to fund annual dividend payment to every Alaskan (even kids!) ($1,884.00 in 2014; direct deposit on Nov. 20th!):
    - Creates guaranteed "mincome"
    - Creates **true** citizen stake-holdership in infrastructure

Alaska Permanent Fund Structure

- Fund created in 1976 in Article 9, Section 15 of the Alaska State Constitution to protect resource wealth for future generations (separated from state budget!)

- 25 percent of oil lease revenue must go into Permanent Fund

- Legislature created the Alaska Permanent Fund Corporation (APFC) to manage investments in 1980

- APF grew from $**734,000 in 1977** to **$42.1 billion as of August 2012!**

Capitalizing the Public Permanent Fund via Road Pricing

* Consider the price paid by motorists for road services (e.g. driving car on New Jersey Turnpike)

Let $\bar{P}$ = current (minimal) price paid by motorist for road services per mile: wear and tear, gas, time, etc., without pricing

$\bar{P}$ does not change with demand conditions, which vary widely

Figure 1. Market for Road Services: New Jersey Turnpike at 4 AM.

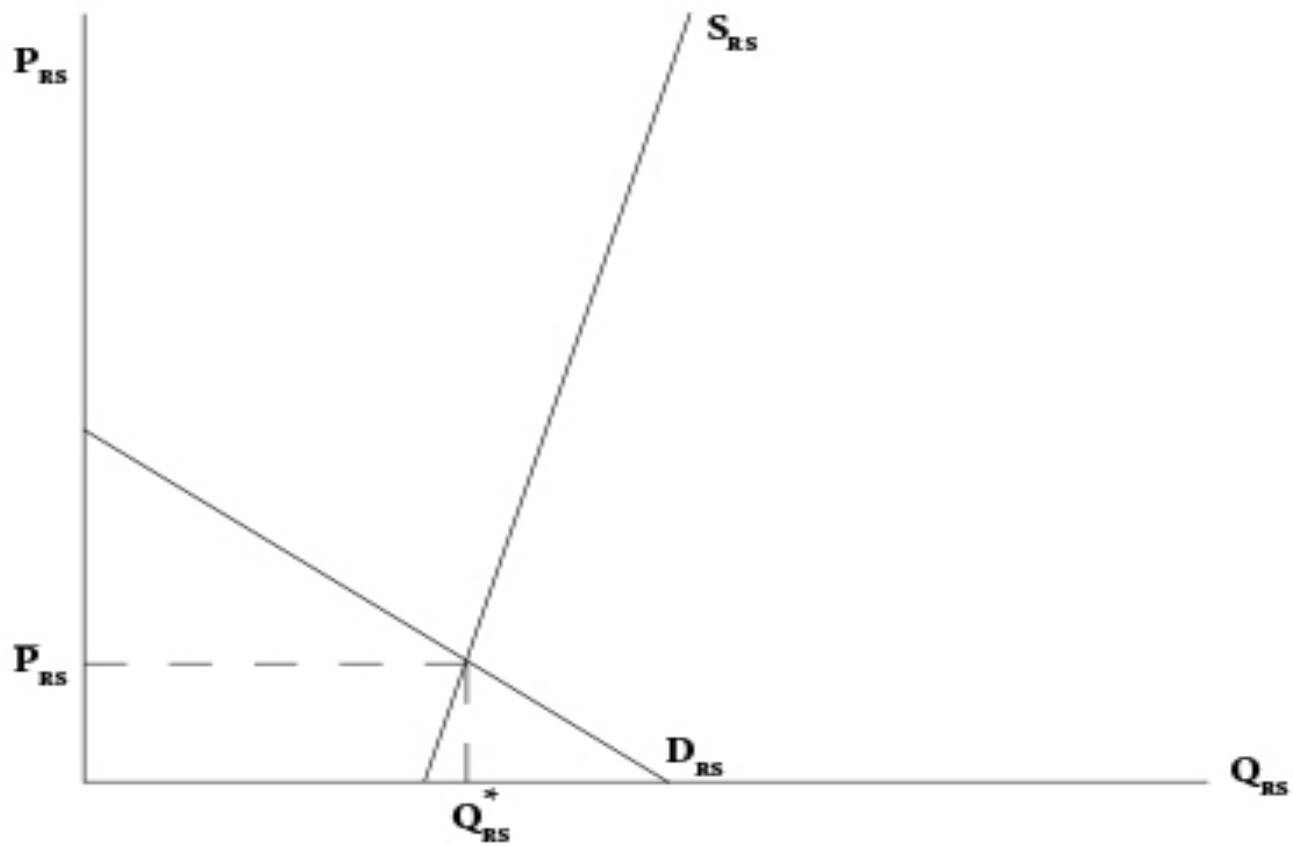


Figure 2. Market for Road Services: New Jersey Turnpike at 8 AM.

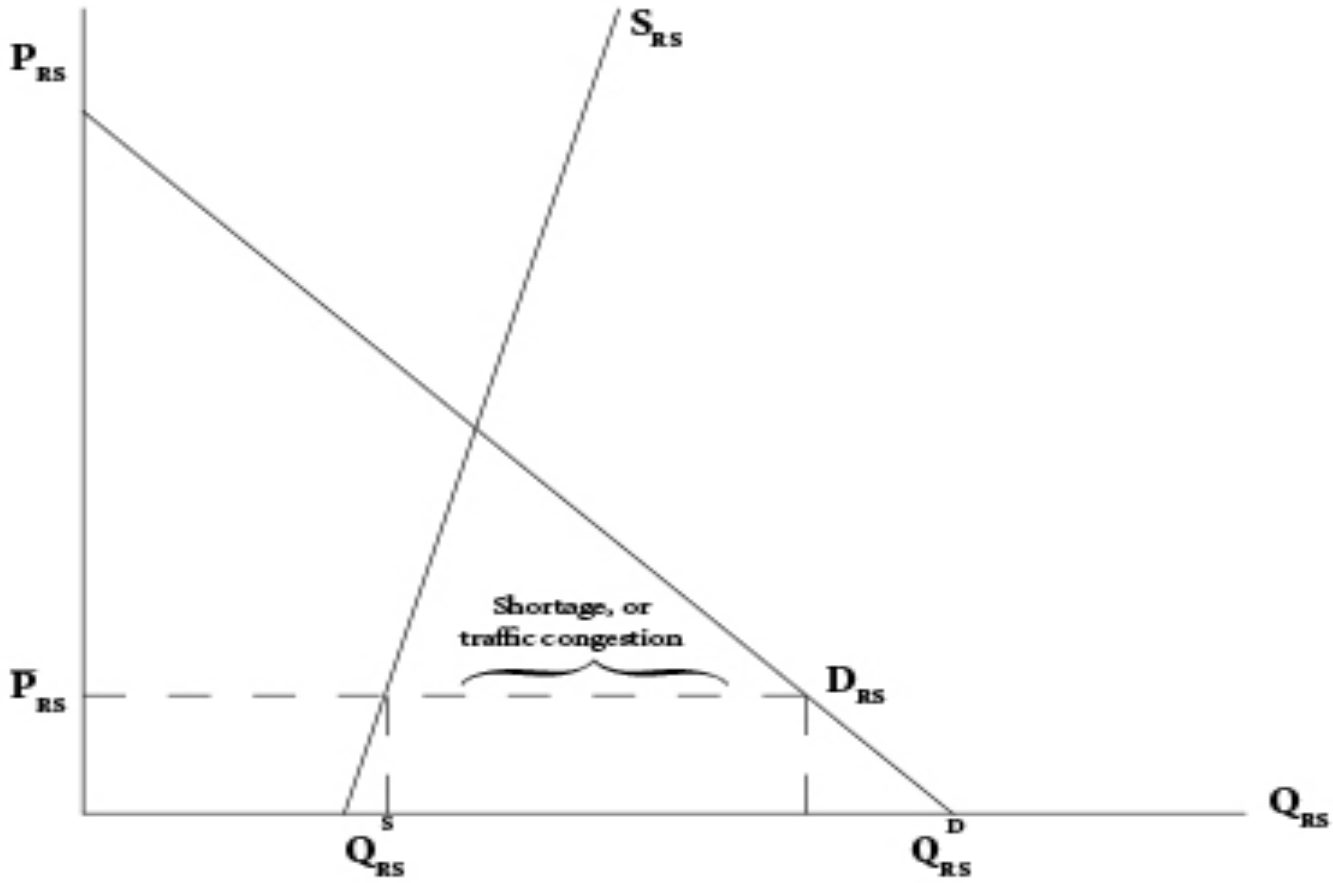
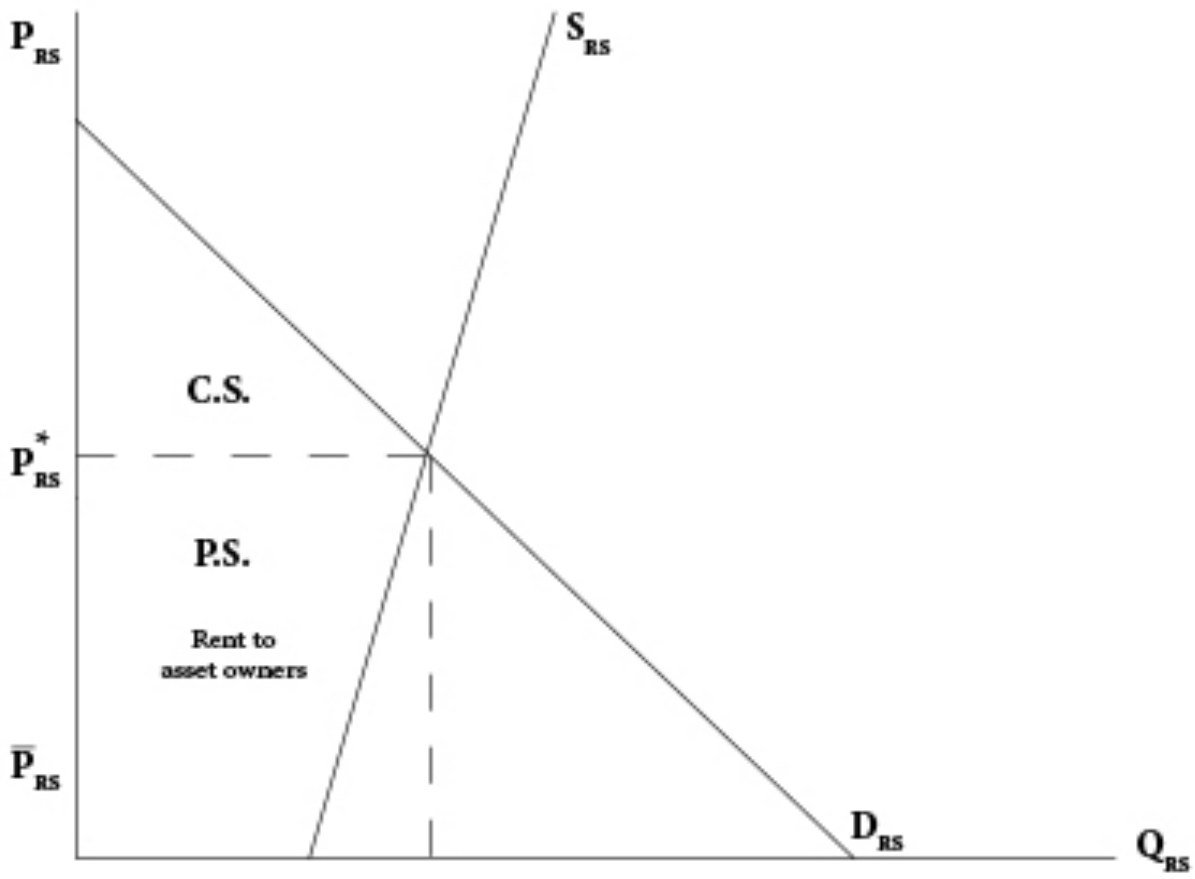


Figure 3. Rents from Congestion Pricing: New Jersey Turnpike at 8 AM.



Insight #1:

- Pricing of an existing un-priced (i.e. “free”(!) public asset releases value that is embedded in that asset

- The latent value can be realized immediately through up-front concession lease payments

Large PPP Lease Payments have been realized

- U.S. Brownfield PPPs have raised large upfront concession fees:
  - $3.8 billion **lease** of 157-mile Indiana Toll Road (ITR) in 2006
  - $1.83 billion **lease** of 8-mile Chicago Skyway March 2004
  - $12.8 billion **bid** (in BFO) for lease of 360-mile Pennsylvania Turnpike in May 2008 (not completed)

Past and Proposed Use of Proceeds

- Indiana Toll Road: Proceeds used for state-wide 10-Year Major Moves transportation program
- Chicago Skyway: Proceeds used to retire Skyway debt and City debt; various other uses
- Pennsylvania Turnpike: Proceeds would have been placed in state pension fund, with income used for transportation projects throughout the state (closest to IP3 concept!)

Consider the "grand bargain"

IP3 asset public-ization offers:

1. Motorists (customers) accept dynamic VMT pricing of existing networks (in exchange for gas tax elimination)
2. Motorists receive consumer surplus from pricing (i.e. better traffic flows)
3. Citizen-owners receive an annual dividend and stake in permanent fund
4. Motorists receive upgraded roads and alternatives
5. Politicians receive "ribbon cutting ceremonies"
6. Investors (public pension funds) receive opportunity to invest in infra leases

The Benefits of an IP3:

- Reduces political resistance to pricing/ congestion pricing
- Preserves public value released by road pricing In perpetuity in a public form
- Provides citizens with a real stake in transportation assets
- Enhances equity by distributing dividends in perpetuity

IP3 Benefits (con't)

- Facilitates additional investment in transportation infrastructure through private sector participation

Insight #2:

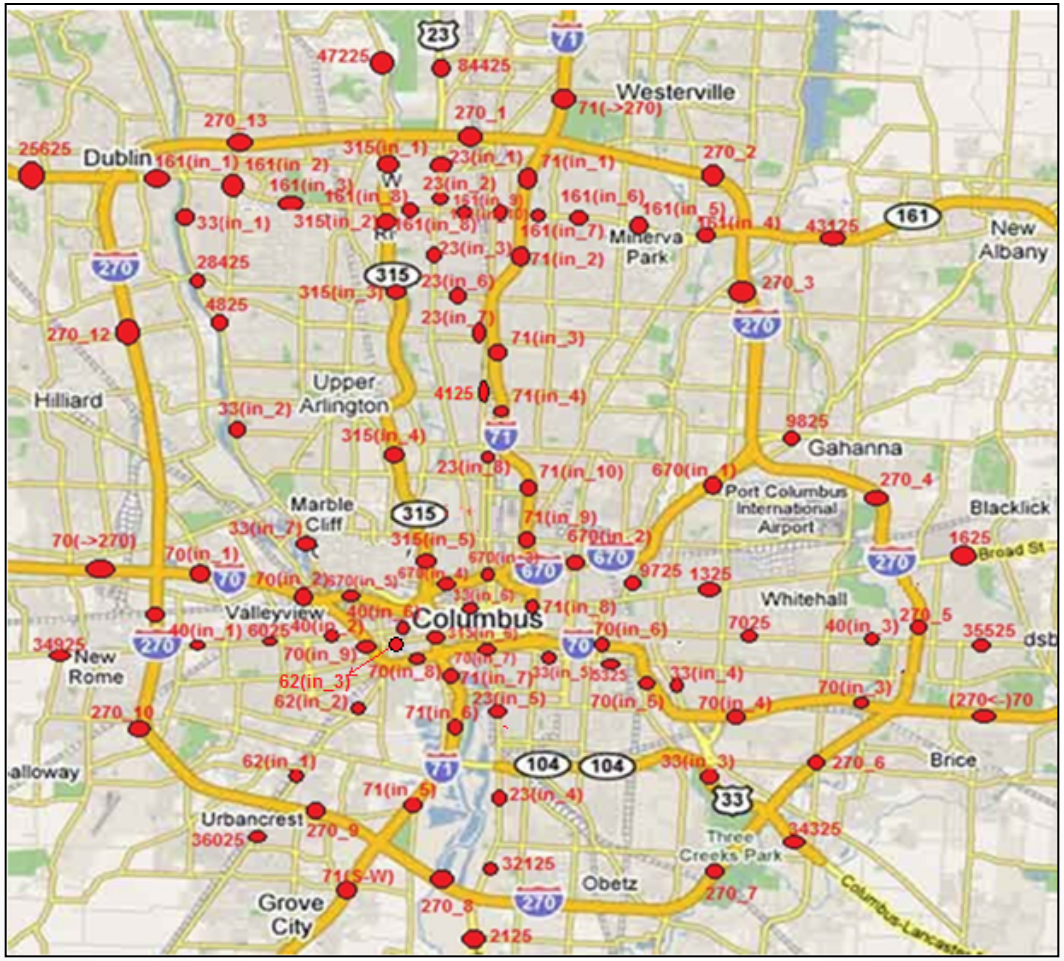
- ***The value released by pricing an un-priced asset can be used to encourage acceptance of that pricing by the public!***

Insight #3

Capitalizing a public permanent fund using PPP concession lease revenue generates a permanent minimum household income that:

- **Mitigates effects of recessions**
- **Reduces income inequality**
- **Clarifies citizen-stakeholdership in infrastructure**

Model uses traffic data from Columbus



Financial Model (2010 – 2015/20/25/30/40/50)

inputs
estimates

Peak/off-peak **toll rates**, **(2010)**. Scenarios (cars):
-Low: $0.05/$0.15 per mile (value-added tolling)
-Medium = Avg(Low,High)
-High: $0.31/0.37 per mile (Dulles Greenway rates)

Price Elasticity over time (Singapore study)

Traffic **demand** in Columbus (**2010** raw traffic data)

Long-term **inflation** forecast

Toll rates over time*

Demand forecast (Columbus Traffic) over time*

Revenue forecast over time*

Profit forecast over time*

Cost Assumptions

Operation **Costs (2010)**
-Construction/ Maintenance
-Administrative
-Capital

Costs Inflation factor over time

Operation Costs forecast over time*

Projected NPV
Multiple scenarios according to:
- Concession length = 5, 10… 40 years
- Toll rate = low, medium, high
- Discount rate = risk-free + low(6%) or high (8%) risk premium

*over time = 2010 – 2015/20/…/50 (concession length scenarios

Investment Model

Projected NPV scenarios

Expected Investment fund ROR over time

Number of dividend beneficiaries (households)

60% of concession placed in investment fund, paying annual dividends
Two investment approaches:

Alaska Permanent Fund approach:
- Permanent fund with Protected principal
- Only investment proceeds are used for fund expenses and dividend payments
- Principal and dividends are both perpetual and **increasing**

"Declining Principal" approach:
- Use up both principal and investment proceeds for expenses and dividends
- Deplete principal by end of concession
- **Constant** dividends

Range of Annual Dividends per Household		
Year:	10-year concession	40-year concession
1	$ 265	$ 438
20	$ 510	$ 885
40	$ 1130	$ 1958
…	perpetual …	perpetual …

Range of Annual Dividends per Household *	
10-year concession	40-year concession
$ 1034	$ 971

**Households receive this amount every year for the duration of the concession.*

A = Free flow

B = Reasonably free flow

C = Stable flow

D = Approaching unstable flow

E = Unstable flow

F = Forced or breakdown flow

LOS Model (based on Highway Capacity Manual algorithm)

Traffic volume
hourly count
(Columbus, OH)
over time

Road Parameters:
Section length/ width/, road category, # lanes, # cars equivalent for trucks, Free=flow speed etc.

Highway Capacity Manual (HCM) **algorithm** for calculating Peak Capacity

Road capacity

Calculated hourly for each road section (Columbus, OH)

V/C ratios

Average travel speed

Calculated hourly for each road section over time

LOS grade
Calculated hourly for each road section over time

Table of Hourly LOS grades (over time)
Road 33, Columbus OH

Time of day	pre-toll 2010	2011
0:00	A	A
1:00	A	A
2:00	A	A
3:00	A	A
4:00	A	A
5:00	A	A
6:00	B	A
7:00	F	D
8:00	F	C
9:00	C	B
10:00	B	A
11:00	C	A
12:00	C	B
13:00	C	B
14:00	B	A
15:00	B	A
16:00	C	A
17:00	E	A
18:00	C	A
19:00	A	A
20:00	A	A
21:00	A	A
22:00	A	A
23:00	A	A

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