1.011 Project Evaluation  
CEE Projects & Accessibility:  
Case Studies  
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1. Chesapeake Bay Bridge  
2. BART  
3. Transcontinental Railroad

Benefits of Improved Access
- Reduced transport costs for existing users
  - Lower transport expense ($ saved)
  - Less travel time (hrs saved x value of time)
  - Fewer accidents ($, injuries, fatalities avoided)
- Increased demand for transportation
  - Additional consumer surplus (difference between value of trip and cost of trip)
- Changes in economic geography
  - Increased land values and development potential
  - More location options for time and $ constraints
  - More options for trade (spatial price equilibrium)

Chesapeake Bay Bridge & Tunnel

Overview
- Construct 17.6 mile bridge & tunnel to cross mouth of Chesapeake Bay and connect Norfolk VA and tip of Delmarva Peninsula

Motivation
- Seasonal access to excellent beaches
- Alternate to I-95 for interstate traffic (shorter, less congested route between VA and Delaware)

Financing
- Raise construction funds through bonds
- Pay principal & interest from tolls

Background: Chesapeake Bay Bridge-Tunnel
- 1920s - various private ferry services
- 1930 - Chesapeake Bay Ferry Commission
  - Issued bonds to buy out private ferry companies
  - Established regular shuttle service
- 1955 - Lucius Kellam, member of the Commission pushed for permanent crossing
  - VA General Assembly approved concept, authorized study of bridges and tunnels
  - US Navy would not accept a bridge; 17.6 mile tunnel deemed too expensive; selected a combination
- 1960 - Commission became "Chesapeake Bay Bridge-Tunnel Commission"

Financing: Chesapeake Bay Bridge-Tunnel
- $200 million raised from sale of bonds to build bridge
  - Three levels, with increasing interest rates
  - Annual financing costs approx. $13 million (30 years at 5%)
- Substantial tolls possible because of markets served ($10/auto, $60/truck)
  - Tolls averaged $20 million per year and were immediately able to cover bond interest payments
- Expansion also financed through tolls
  - Parallel Crossing - will eventually create a second two-lane bridge
  - Parallel Tunnels - after Parallel Crossing is completed

Chesapeake Bay Bridge-Tunnel: Issues
- Threat to private ferry operators
  - Legislature created Commission with authority first to operate the ferry service and then to become the bridge commission
- Naval security - required more expensive approach
- Disruption of the Bay's ecosystem
  - The islands built for the tunnel exits became bird sanctuaries
- Capacity
  - The 2-lane facility is congested during peak periods
  - Pace of expansion is balanced against ability to finance through tolls
Bay Area Rapid Transit System

- Overview
  - Construct 81 mile automated rail transit system with 37 stations in four counties around San Francisco and a 3.8 mile tube under Oakland Bay
- Motivation
  - Relieve traffic congestion and reduce dependence upon auto
  - Provide transit option for commuting
- Financing
  - Local taxes to finance construction
  - Fares to cover a portion of operating cost
  - Local taxes to cover operating deficit
  - Federal funds for expansion

BART: Selected Milestones

- 1946 - formation of committee to look at traffic problems
- 1957 - report of Bay Area Rapid Transit Commission recommending "total development plan" before transit decision
- Early 1960s: State legislature formed 5-county BART district; public narrowly approved financing
- 1964 - testing & design began
- 1966 - construction began
- Mid-1972 - operations begun
- 1991 - major capital improvement campaign

BART: Issues

- Financing with tax money: one county backed out of project because of tax issue
- Inflation: inflation was 3% at time of planning, but 7% at time of construction
- Market: (affluent) suburban commuters or (poorer) urban dwellers
- Expansion: how to finance what most agreed was necessary and desirable expansion to the airport (finally begun in 1991 with federal funds)
- Automation: how much automation is needed?
- Engineering: Golden Gate Bridge could not carry trains, so Marin County was out

BART: Financing Problems

- Costs totaled $1.7 billion (which would require over $110 million/year to repay over 30 years @ 5%)
- Fares for the system would only cover $30-40 million, leaving a substantial operating deficit (for 132,000 daily passengers in the first few years after system opened in 1972 - barely half of projections)
- Area-wide sales tax of 0.5% was added to cover construction overruns and operating deficits (approx. $50 million/year)
- System cannot generate profits and therefore needs state or federal support for capital projects
- Benefits to local economies translate to support only through a political process - but the benefits are real!

BART: Early Benefits

- Traffic diverted from the Oakland Bay Bridge
  - 4,000 fewer vehicles/day when tube opened
  - But, traffic returned to pre-BART levels in less than two years
- Approx. 2,000 new trips on BART across the Bay
- BART market share of about 30% for commuting trips in relevant corridors and 20% for all trips
- Expansion of metropolitan area

Transcontinental Railroad

- Overview
  - Construction of railroad linking Omaha, NE and Sacramento, CA
- Dramatic reduction in transport time and cost
- Motivation
  - Connect California to the rest of the country
  - Open the west for development
- Financing
  - Federal payments for construction work
  - Federal donations of land to operating companies
Transcontinental Railroad: Selected Milestones

- 1819 - first mention of idea (given technology, the idea for a project is not a great leap!)
- 1836 - Asa Whitney's proposal and advocacy
- 1849 - RR convention studied merits of routes, recommended St. Louis - San Francisco
- 1850s - Congress couldn't decide which route (via New Orleans, St. Louis, or Chicago-Omaha)
- 1853 - Gadsden purchase - for best rail route in SW
- 1856 - surveys of routes completed
- 1862 - in midst of war, N route was only possibility! And, congress now could act.
- 1869 - first trip

Trans. RR: Financing

- Congress paid for construction
  - $48,000 per mile in mountains
  - $12,000 per mile in plains
- Land grants:
  - The railroads were given a 200-ft right-of-way
  - Alternate 10-mile by 10-mile sections were given to the railroads (worth $2 billion - once they were accessible!)
  - The government kept the rest of the land
- Contractors (UP and CP RRs) could raise funds based upon these federal grants
- Reduced rates for government goods: these lasted until 1930s - a major benefit

Trans. Railroad: Selected Issues

- Manpower
  - Midst of Civil War!
  - Used 20,000 Chinese on Central Pacific route
  - Used 10,000 Mormons and many foreigners (mostly Irish) on UP route
- Corruption
  - Vast sums attract brilliant, but unscrupulous financiers
  - Difficult to verify that funds were used to pay for construction; many scandals
- Conflicts with indians
- Quality vs. cost of construction
  - Rickety bridges, tight curves, and steep grades

Comparison of the Projects

<table>
<thead>
<tr>
<th></th>
<th>CBBT</th>
<th>BART</th>
<th>TCRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financing</td>
<td>Simple</td>
<td>Complex</td>
<td>Innovative</td>
</tr>
<tr>
<td>Benefits</td>
<td>Access</td>
<td>Congestion reduction</td>
<td>Security Connectivity Development</td>
</tr>
<tr>
<td>Public Role</td>
<td>Authority</td>
<td>Authority Funds</td>
<td>Authority Funds Development User</td>
</tr>
</tbody>
</table>