Chile Provial 2002

Herramientas de Planificacion para la Conservacion Vial

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World Bank
November 7, 2002

Topics

- Highway Development and Management Model (HDM-4)
- Private sector involvement, concessions
- Desing, build, finance and operate (DBFO) contracts
- The World Bank toolkit for public private partnership in highways

The HDM-4 Model

- Analytical tool for engineering and economic assessment of
  - road investments and maintenance
  - transport pricing and regulation

- More reliable relationships on road deterioration, the effects of maintenance activities, and vehicle operation and user costs

Limitations of HDM-III

- Outdated vehicle and tire technology in the VOC studies
- HDM-III does not consider:
  - Traffic congestion (prior to 1995)
  - Rigid pavements
  - Many types of flexible pavements
  - Pavement texture and skid resistance
  - Freeze-thaw conditions
  - Traffic safety
  - Environmental impacts
- Software for DOS environment

HDM-4 International Collaboration

HDM-4 Technical Improvements

- Pavements
  - Wider range of flexible pavements
  - Rigid pavements
  - More maintenance types; Drainage effects
  - Freezing climate effects
- Road Users
  - New vehicle types; Non-motorized traffic
  - Congestion effects; Accidents
  - Emissions & Energy consumption

HDM-4 Software Improvements

- Windows Environment
  - Easier to use
  - Different levels of input data
- Three Application Modules
  - Project Evaluation
  - Network Program Evaluation
  - Network Strategic Planning Evaluation
- Better interface with Pavement Management Systems

Road Agency Alternatives

- 4 cm overlay every 8 years
- 6 cm overlay every 15 years
- reseal the road and postpone the overlay
- reconstruct the road when IRI = 8 m/km
- do nothing

- grading every 180 days
- upgrade unpaved road to a paved standard

Evaluation of Alternatives

- Economic evaluation
- Technical evaluation
- Financial evaluation
- Commercial evaluation
- Social evaluation
- Environmental evaluation

Transport Benefits

- Reduce vehicle operating cost
- Savings in time of passengers and cargo
- Reduction of accidents

- Stimulate regional development
- Increase the comfort and convenience
- Better national integration
- National security
- Greater self-sufficiency
- Equal distribution of income
- Prestige of the country

Pavement Management Approaches

- **Condition-responsive/financial approach**
  physical standards are set in relation to perceived technical requirements and budget received

- **Crisis-oriented approach**
  highway facilities are operated with little or no maintenance until obstructive failure occurs

- **Technical-economic efficiency approach**
  functional and technical standards are selected to minimize total road transport costs to society

Total Society Costs

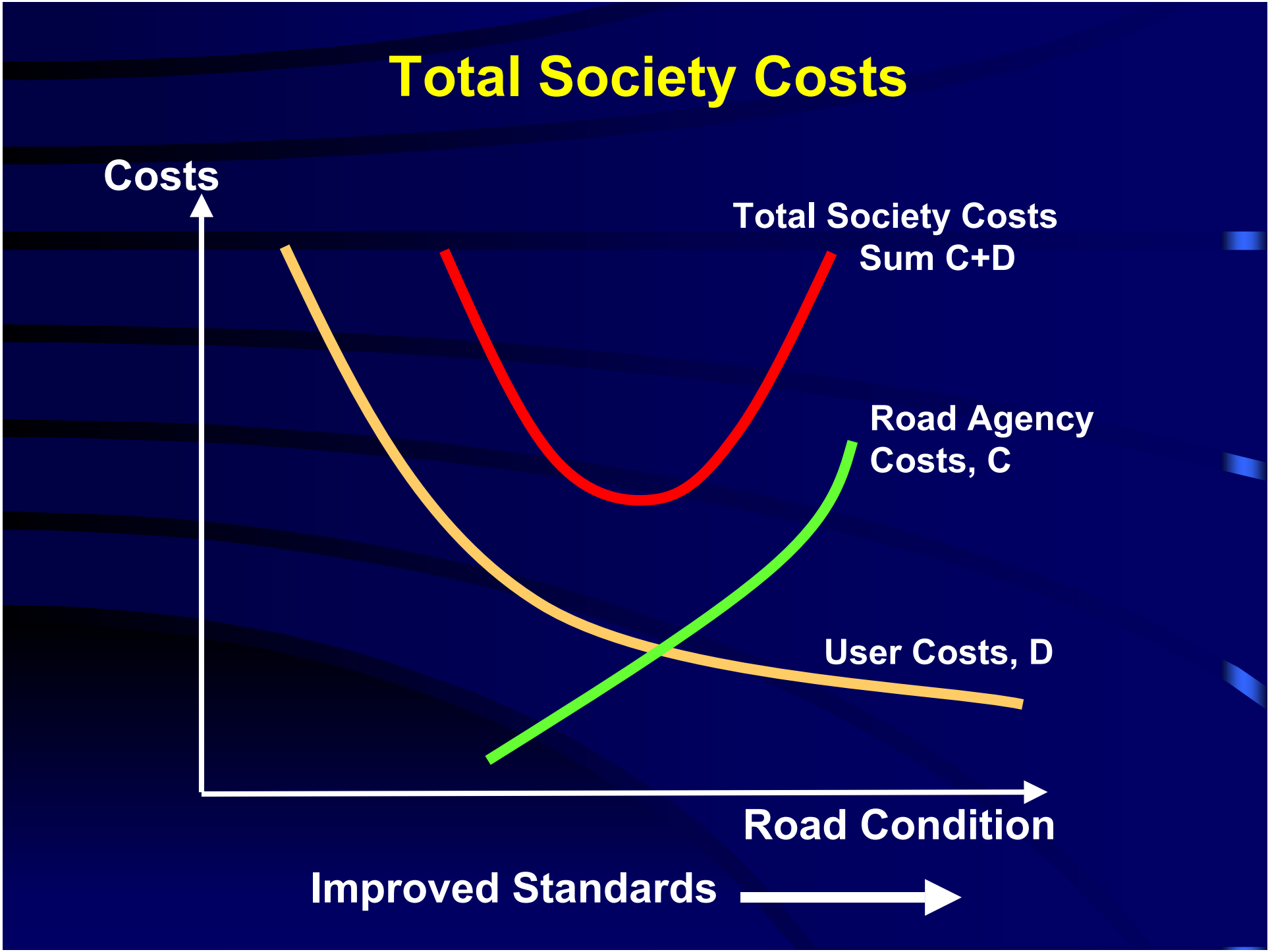
= ROAD AGENCY COSTS

- Construction
- Maintenance

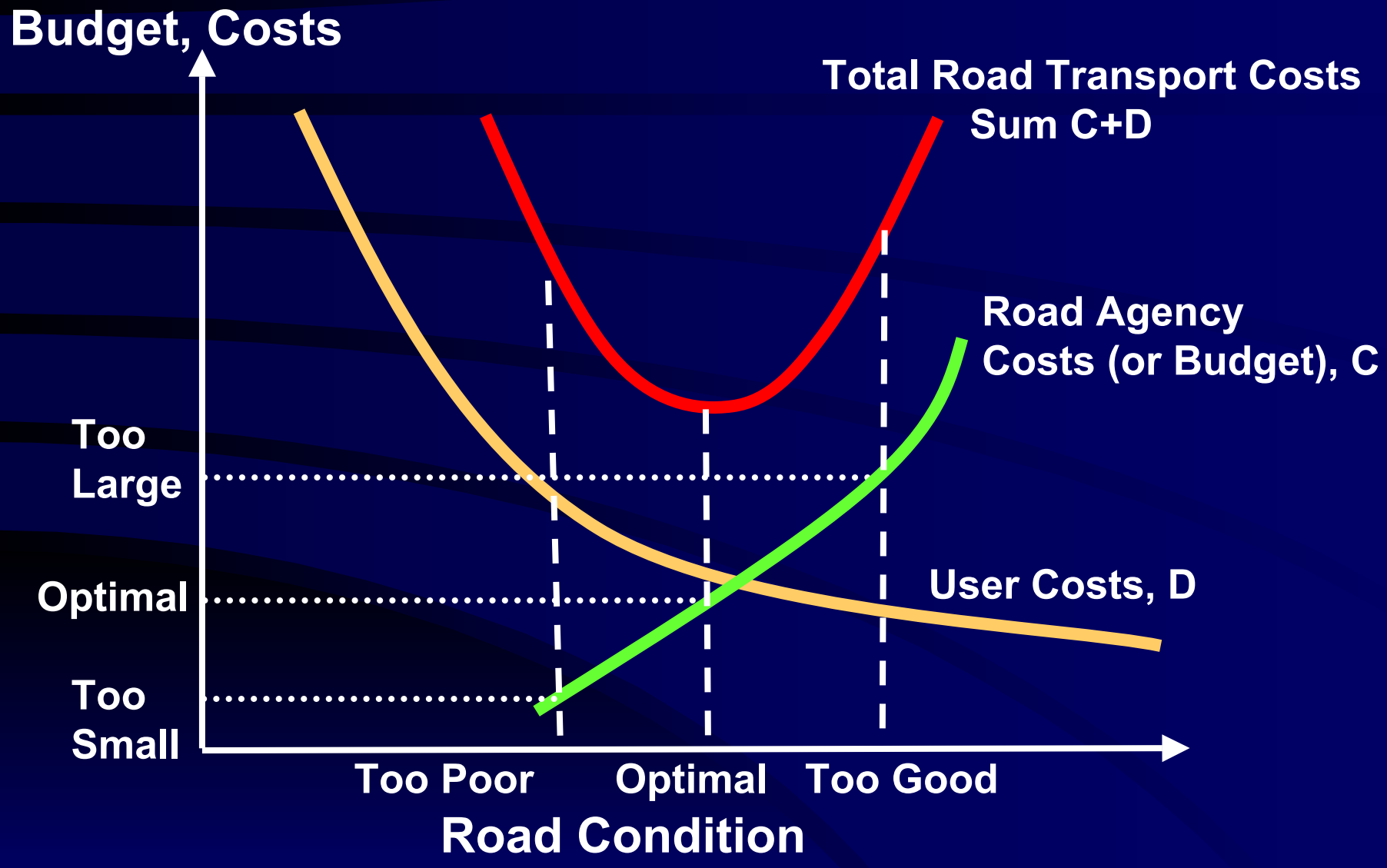
+ ROAD USER COSTS

- Vehicle operation
- Passenger and cargo time
- Accidents

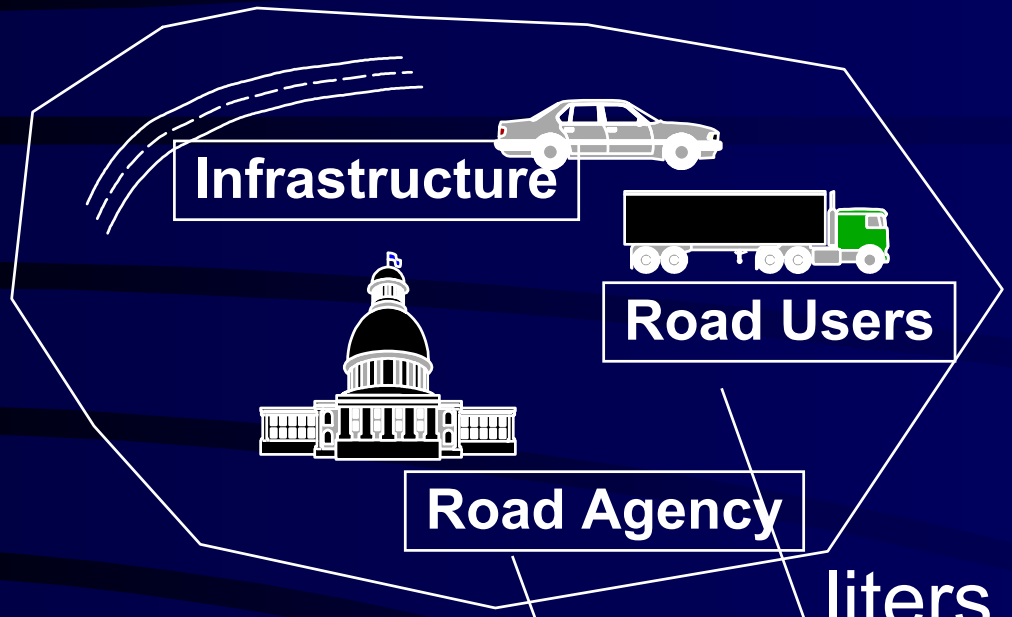
Total Society Costs



Optimization of Road Condition and Budget



Minimizing Consumption of Resources



liters

hours

m3

Consumption
x
Unit Costs
=
Total Society Costs

Financial & Economic Unit Costs

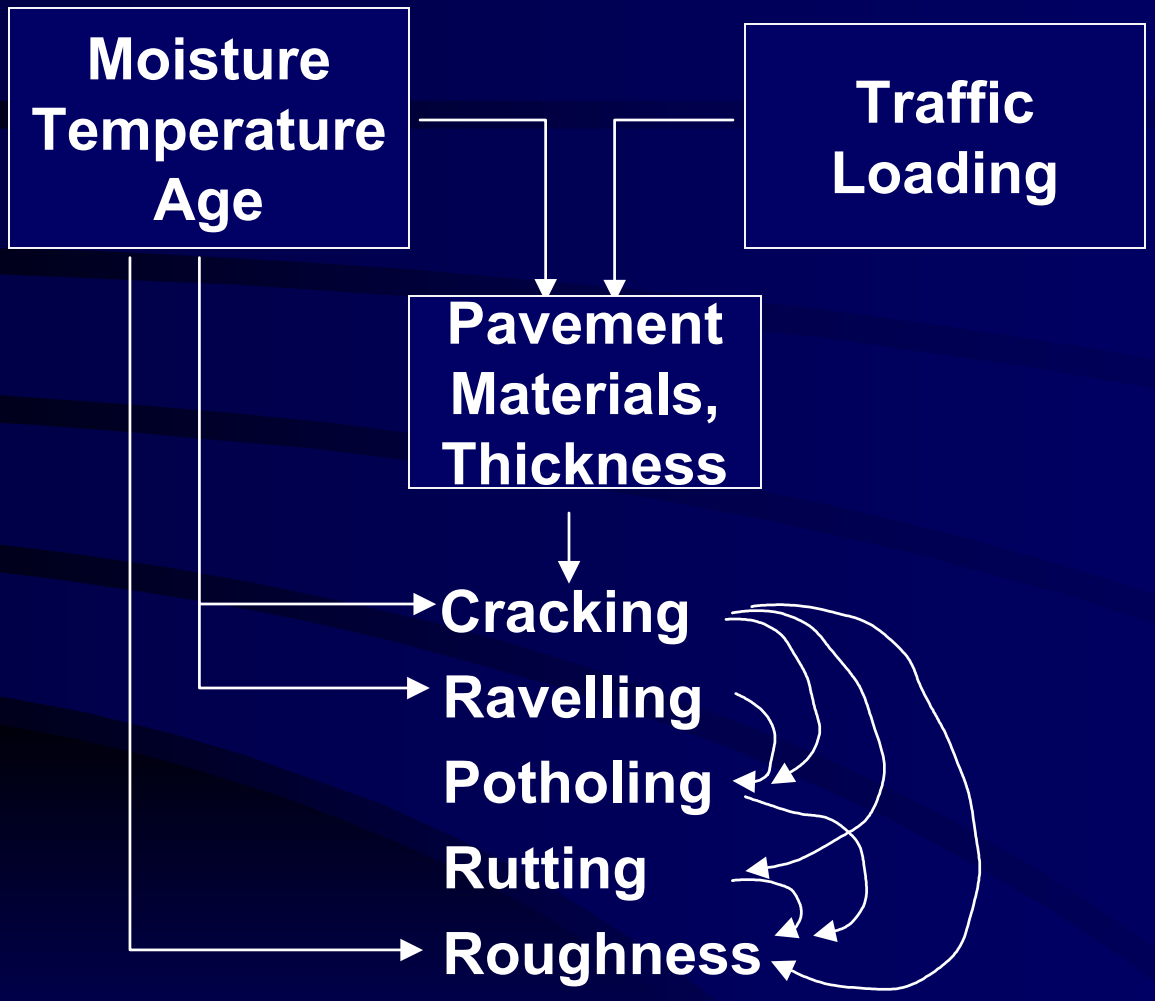
- Financial Prices
  Market Prices

- Economic Prices
  Shadow Prices
  Social Prices

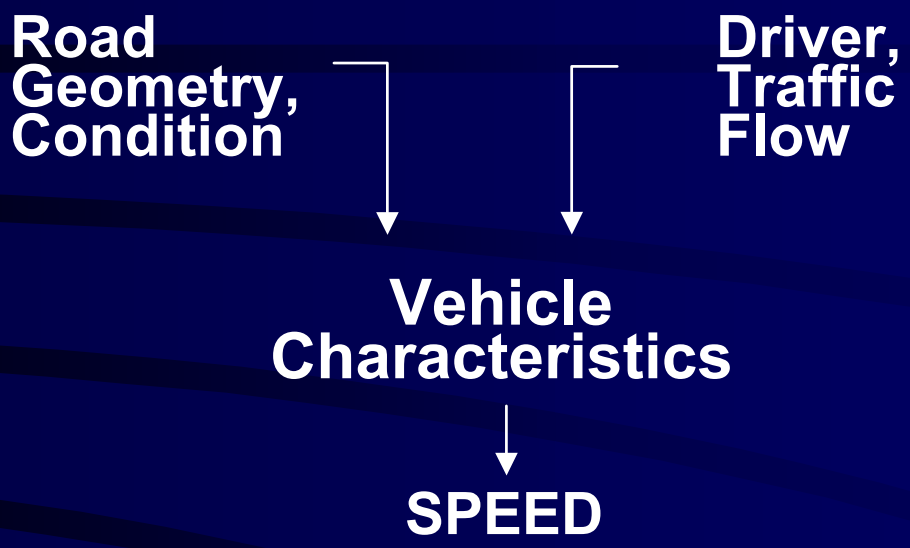
May not reflect the real scarcity value of the inputs

- Taxes
- Subsidies
- Regulations
- Overvaluation of Local Currency

Paved Road Deterioration Model



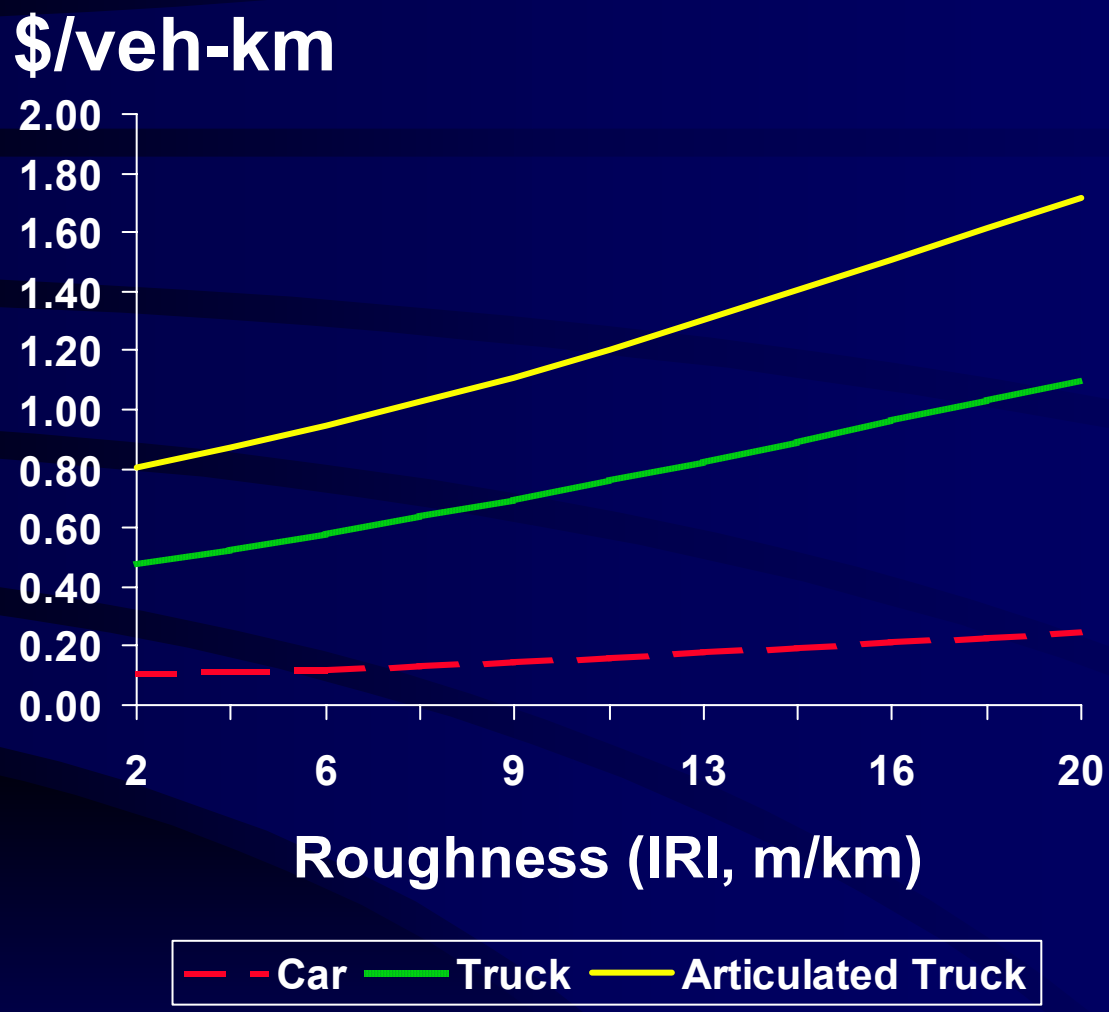
Road User Costs Model



COMSUMPTION

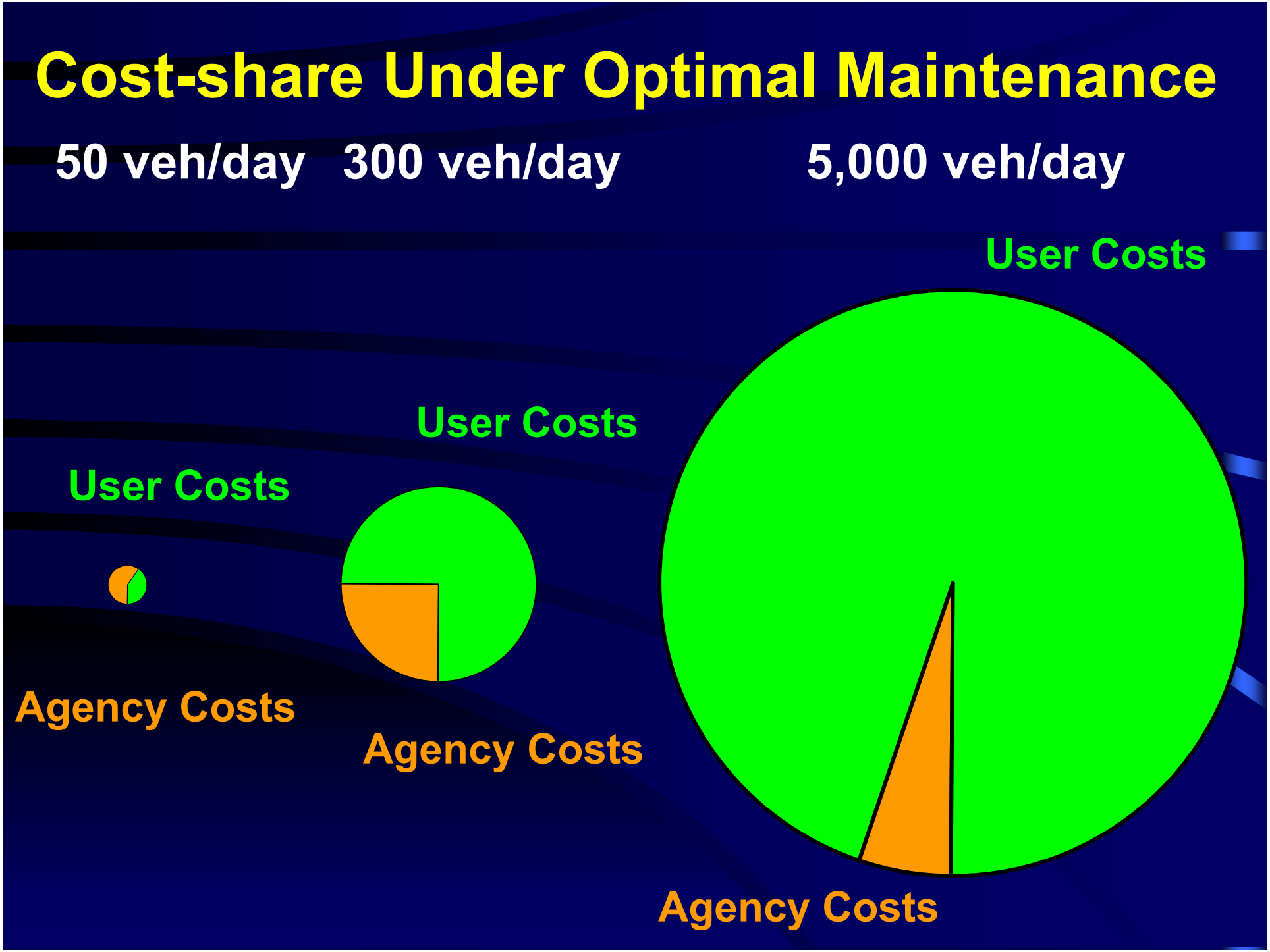
- Fuel & Lubricants
- Tire
- Maintenance Parts & Labor
- Crew Time
- Depreciation & Interest
- Passenger & Cargo Time

Vehicle Operating Costs



Cost-share Under Optimal Maintenance

50 veh/day 300 veh/day 5,000 veh/day



HMD-4 is a tool which

- simulates deterioration and maintenance of paved and unpaved roads (physical condition and quantities), for strategies defined by the user
- simulates road user costs (speed and consumption of physical components)
- determines time-streams of road agency and road user costs, and net benefits
- computes economic indicators

But HMD-4 does not

- perform a network traffic assignment
- internally cost environmental impacts such as air or noise pollution
- address urban conditions (start/stop)
- evaluate cement blocks and cobblestone pavements

Common Uses of HDM-4

Planning and Programming

- Analytical support to justify funding
- Forecasting financial and physical needs for preserving road network
- Optimal maintenance strategies

Technical Applications

- Economic thresholds for road improvements
- Tradeoffs between design and maintenance standards or options
- Simulating type and extent of deterioration

Economic Applications

- Road use cost and damage attribution, in road transport pricing and taxation (e.g., user charges, fuel tax)
- Optimal axle loading and configuration
- Fleet modernization

Examples of HDM-4 Applications

- Project evaluation
- Maintenance needs forecasting
- Network program formulation
- Optimization under budgetary constraints

Project Evaluation

A Gravel Road

Current Policy

- Gravel resurfacing when thickness of gravel is less than 50mm
- Routine maintenance
- Grading every 90 day

Proposed Project

- Upgrade the road to a paved standard
- After the upgrading, routine maintenance, patching 100% of the potholes, and resealing when damaged area > 20%

Network Program Formulation and Optimization

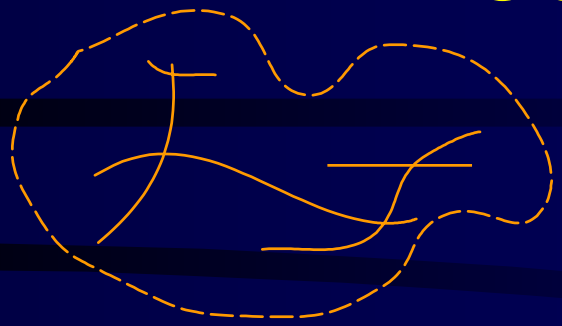
A Road Network

- What are the resources needed to maintain the network?

- How should the agency allocate the resources needed for an optimal maintenance program?

- What maintenance program should be implemented in case of budgetary constraints?

Optimization under Budgetary Constraints



A Road Network

Sections

L			
M			
H			

Strategy without Budget Constraint

Resource Constraints

Optimization Module

Optimal Strategy under Budgetary Constraints

Options for Private Involvement

Option	Ownership	Financing	Mgmt.
Service Contract	Public	Public	Public
Lease	Public	Public	Private
Management Contract	Public	Public	Private
Concession	Public/Private	Private	Private
BOT	Private then Public	Private	Private
BOO	Private	Private	Private

Concession Contract

A contract whereby a public entity grants to a private company or consortium (concessionaire) the right and obligation to provide a public service

Highway Concession Contract

A contract whereby a highway agency grants to a private company or consortium (concessionaire) the right and obligation to provide a highway for public use

Toll Roads

ADVANTAGES

- **Reduce budgetary obstacles to road improvement**
- **Fuller use of the efficiencies of competitive private sector**
- **Facilitate introduction of more efficient charging for road use**

Toll Roads

DISADVANTAGES

- Uneconomic traffic diversion and underuse of sunk investment
- Applicability limited to major roads
- Costs of limited-access design and toll collection

Backup at Toll Plaza

Bay Bridge toll booths, beach-bound traffic

August 1999

Electronic Toll Collection (ETC) can ease congestion

Riverside Freeway, SR 91, CA

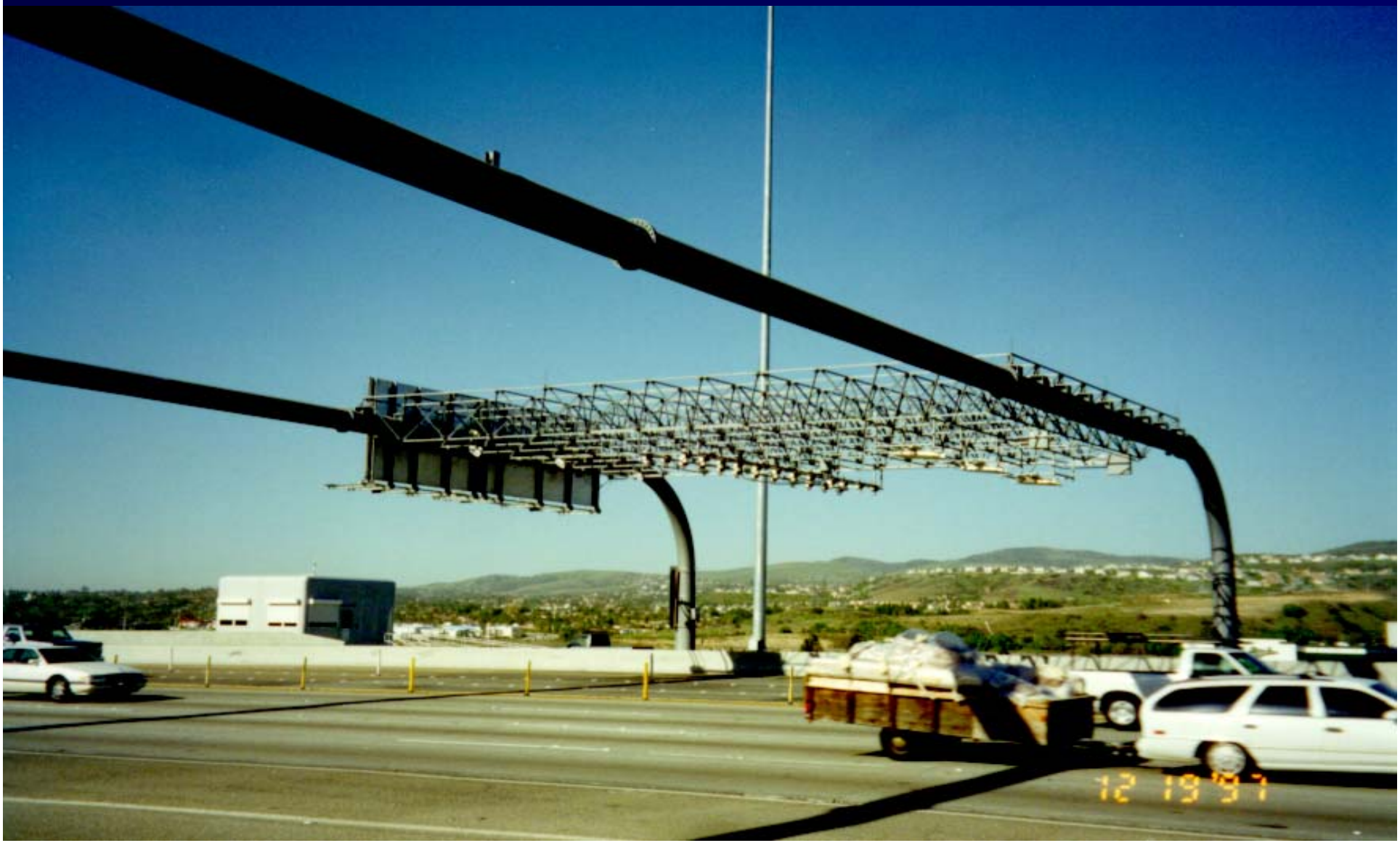
SR 91 Express Lanes, CA

- First fully automated toll road, 16-km long, opened on December 27, 1995
- Serves commuters on Riverside Freeway (SR 91), Orange County, south of Los Angeles
- Developer and operator: California Private Transportation Company
- Achieved cash flow break-even in mid-1998 (can pay operating and debt expenses from revenues)

SR 91 Express Toll Lanes, CA

SR 91 Express Toll Lanes

FasTrak toll collection system: overhead antennas and transponder (no tollbooths)



Windshield-mounted Transponder

FasTrak Transponder

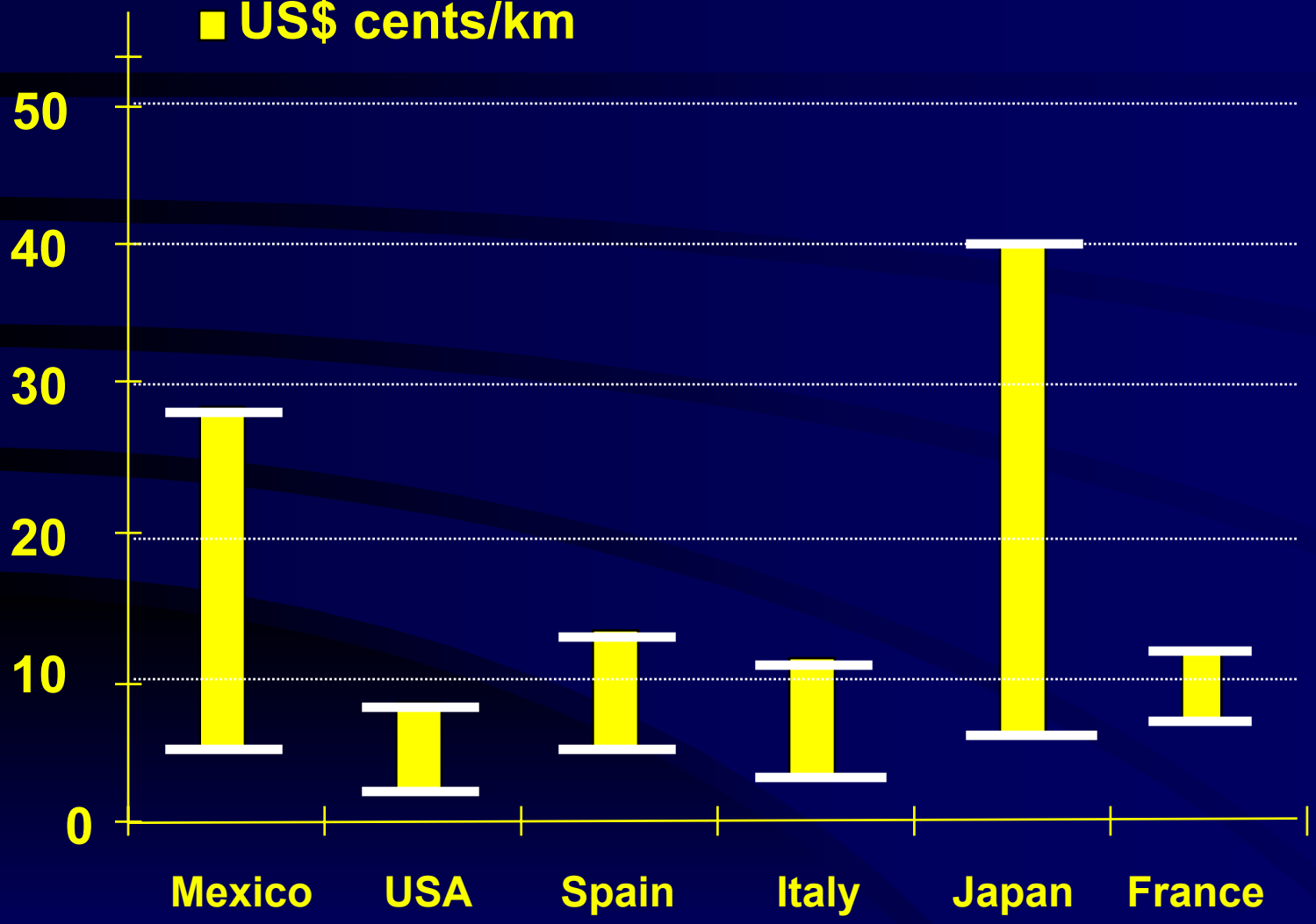
Dulles Greenway Public-Private Partnership

- A 24-km, $300 million, four-lane road from Dulles Airport to Leesburg, VA
- Opened for traffic in September 1995, 12,000 vpd (forecast 34,000 vpd)
- In 1996, toll rates reduced from $1.75 to $1, traffic increased to 20,000 vpd
- The concessionaire, Toll Road Investment Partners, has refinanced

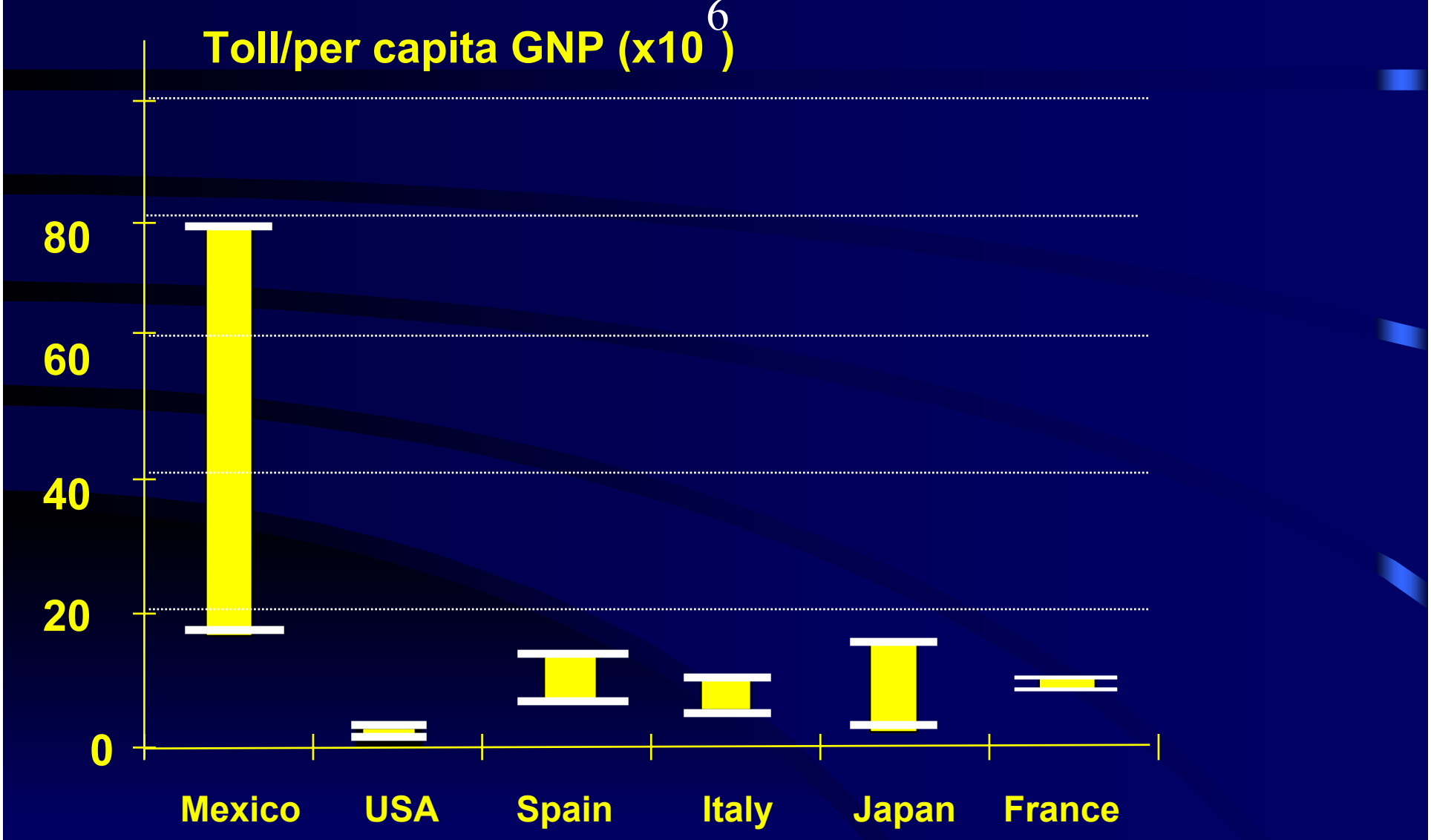
Dulles Greenway

Dulles Greenway Toll Rates

Typical Car Tolls



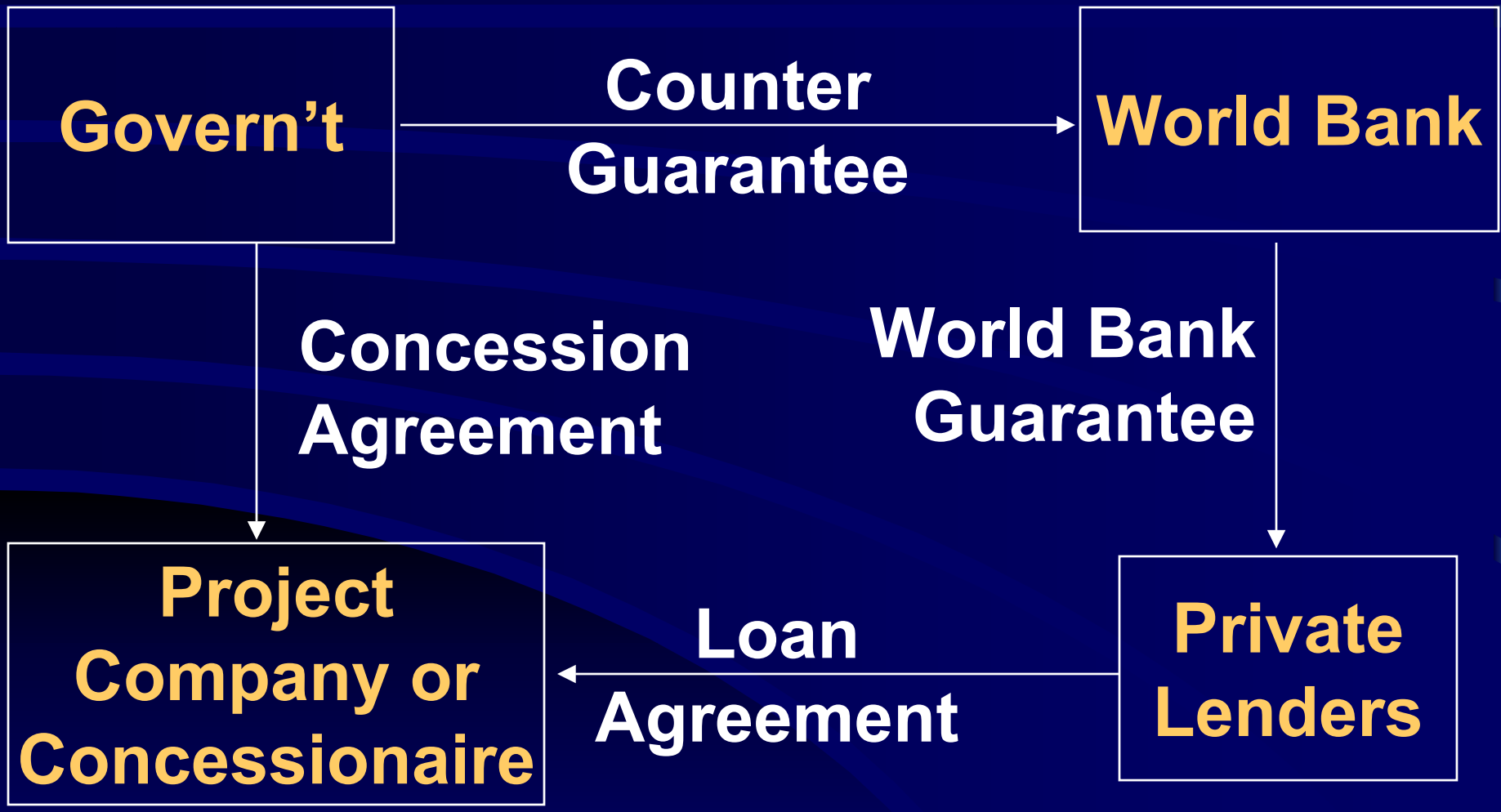
Typical Car Tolls Normalized by per capita GNP



What is a World Bank Guarantee?

An irrevocable commitment to a third party that has loaned funds to a borrower in a World Bank member country that the World Bank will repay the guaranteed portion of the obligation if, under specified conditions, the borrower does not.

World Bank Partial Risk Guarantee Structure



Guarantees and Sub-National Projects

Federal Government

Counter Guarantee

WB Guarantee

Private Lenders

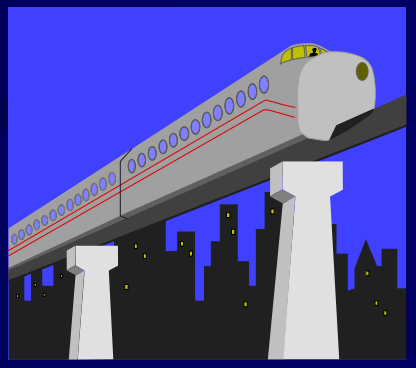
Legal Framework

Buys Guarantee

Loan Agreement

Provincial Government

Concession



Project Company

Risk Allocation

- Government: Expropriation, currency inconvertibility and nontransferability (political risks)
- Investor: construction costs, demand, exchange and interest rates (commercial risks)

Typical Financial Benefit of Partial Risk Guarantees

- Reduce cost of private sector borrowing from LIBOR + 900 to LIBOR + 200

Recognized Rating Agencies

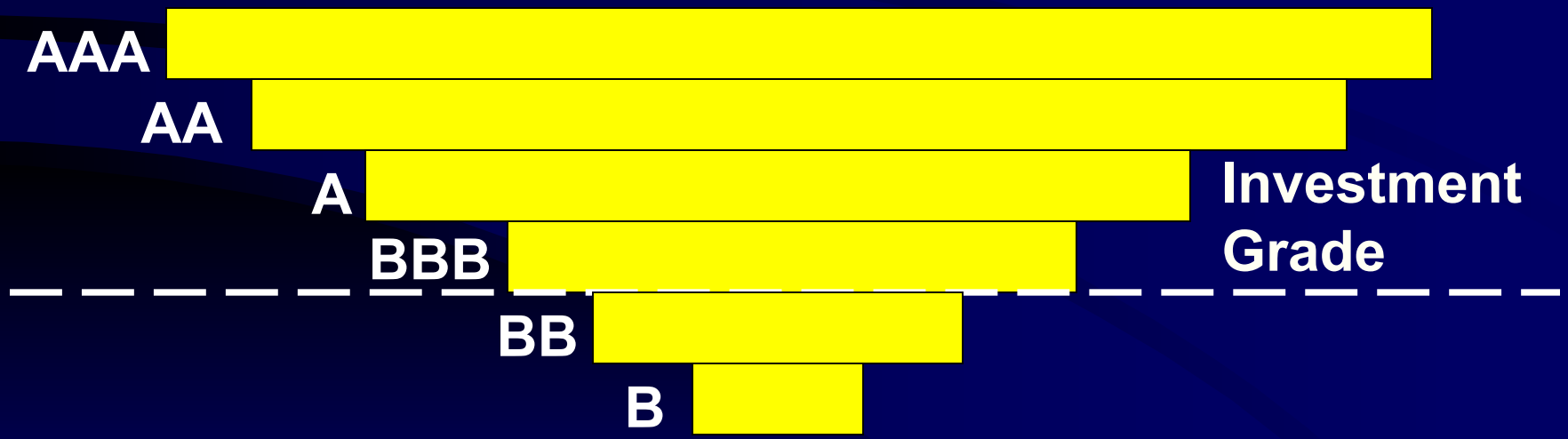
- Standard & Poor's, Moody's, and Fitch
- Main function: assessing the odds of a company or country not paying its debts

Some Standard & Poors Long-term Ratings of Obligations

- AAA: highest, obligor's capacity to meet its financial commitment is extremely strong; AA, very strong; A, strong; BBB, adequate
- BB, B, CCC and CC: significant speculative characteristics
- C: bankruptcy petition filed
- D: in payment default

The Importance of the Credit Rating - Accessing the Investor Pool

The higher the rating, the larger the pool of investors and the longer the achievable maturity



Credit Ratings for Selected Countries

Source: Standard & Poor's (2002)

Country Ratings Are Available on the Internet. Examples:

www.standardandpoors.com

www.fitchibca.com

Use of Credit Ratings

- Many loan agreements and issues of debt securities now include ratings triggers: if there is a downgrade, the interest rate is increased, or sometimes the debt must be repaid immediately
- …but ratings can never be a substitute for independent analysis and due diligence

The Economist, May 18, 2002
pages 69-70

Design, Build, Finance and Operate (DBFO)

- Launched by the Highways Agency (HA) in 1994
- Road program of about $2 billion
- Private sector bears most of design, build, finance and operating risks
- HA payments linked to traffic

DBFO Objectives

- maximize benefit to road users
- transfer appropriate risks to private sector
- promote innovation: technical, operational, financial, commercial
- minimize public sector contribution

Role of Highways Agency

- Specification of the road services
- Selection of DBFO company
- Performance monitoring
- Road to be handed back to HA after 30 years with a specified life expectancy

Claims Avoided by DBFO

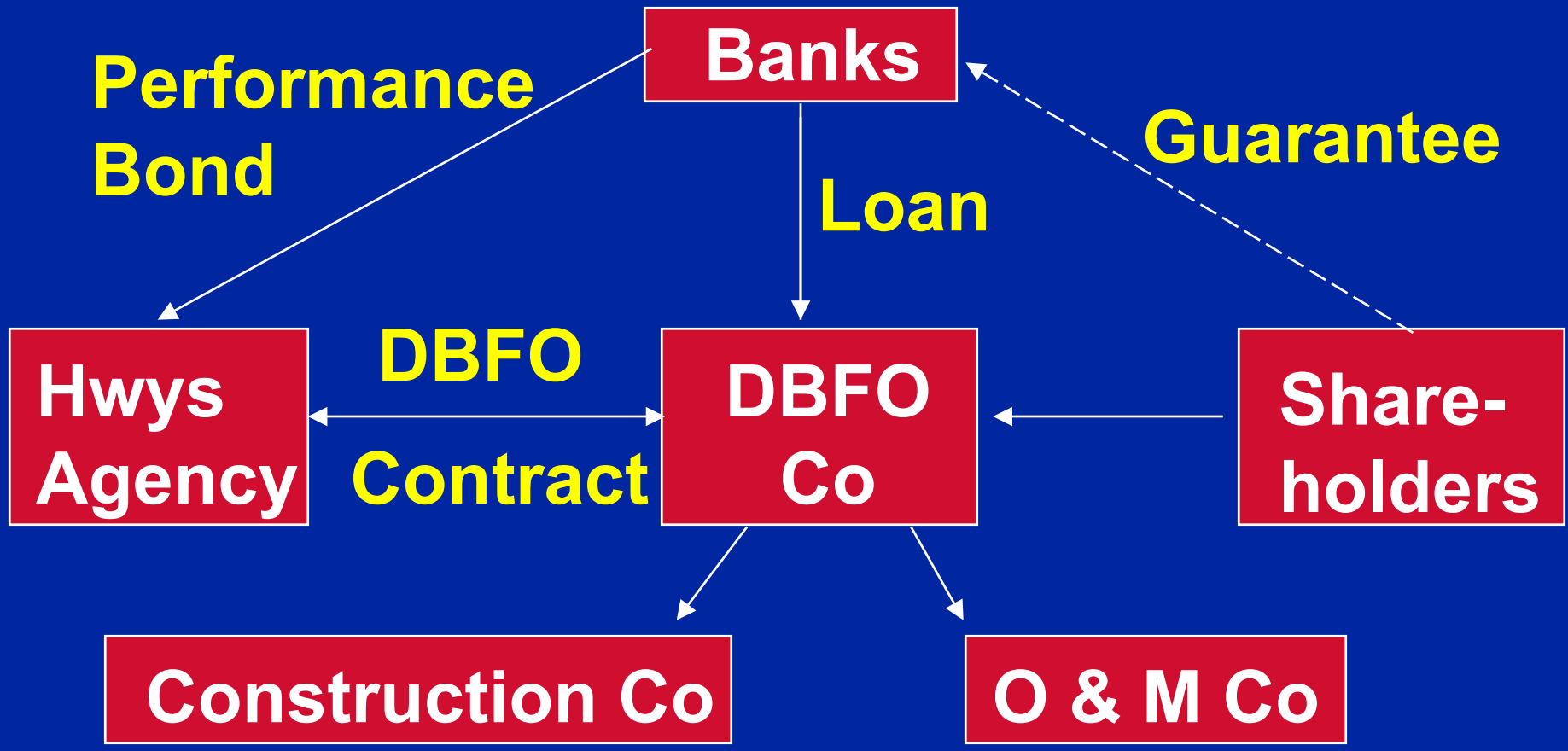
- unforeseen ground conditions
- measurement variations

  - UK: average increase of 28% between price tender and out-turn price;
  - Average cost saving of 15% (first 8 contracts)

The DBFO Contract

- Special purpose vehicle company: DBFO Co
- Outlines design for the project
- Specifies construction requirements
- Gives date for completion of construction
- Specifies operational sevices

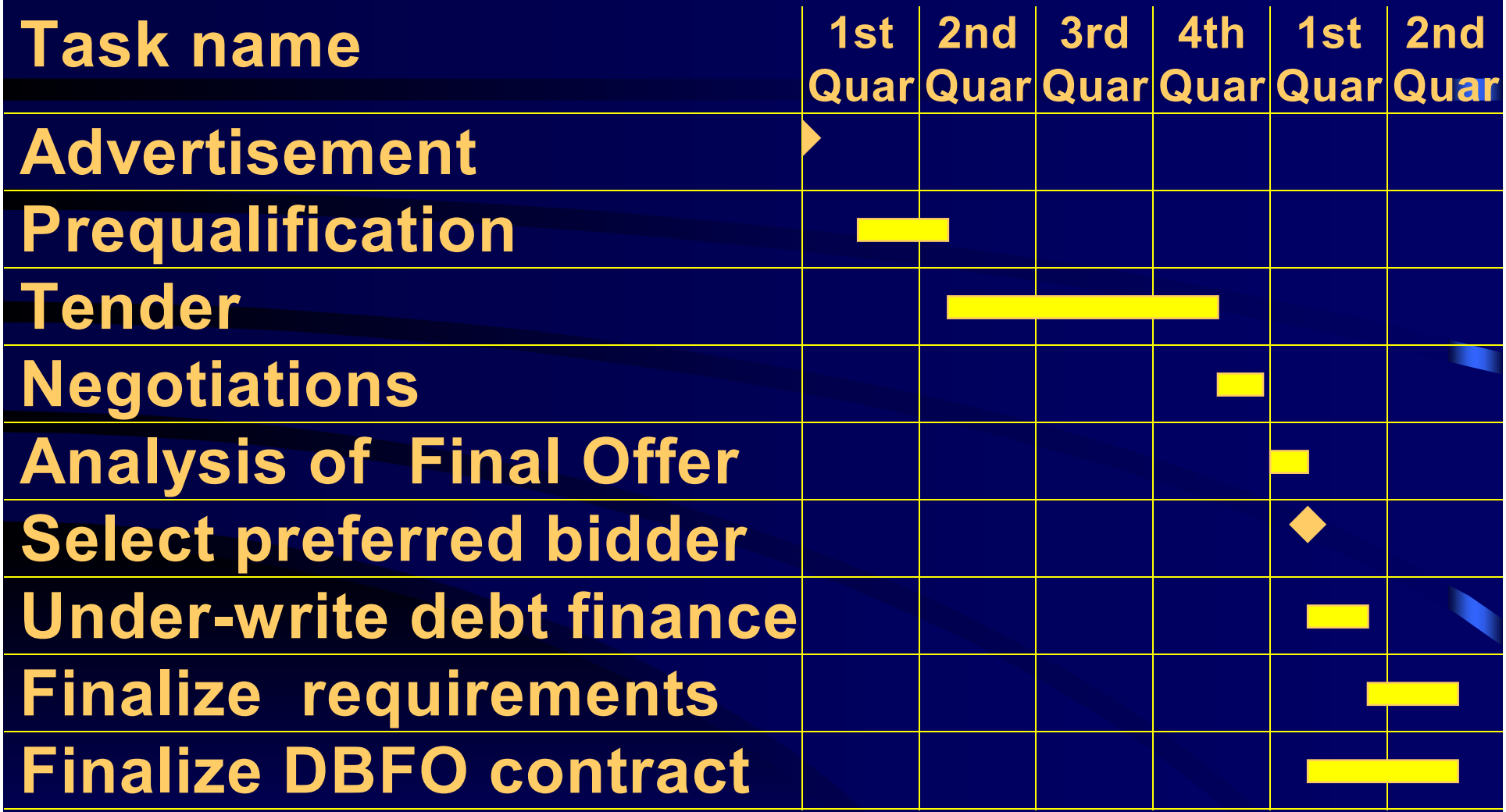
DBFO Contractual Structure



Payment Mechanisms

- Shadow toll: payment for road use made by HA, rather than by road users
- Bids include payment rates for short (up to 5.2 m) and long (>5.2 m) vehicles; length is a proxy for weight
- Safety performance payments and lane closure charges

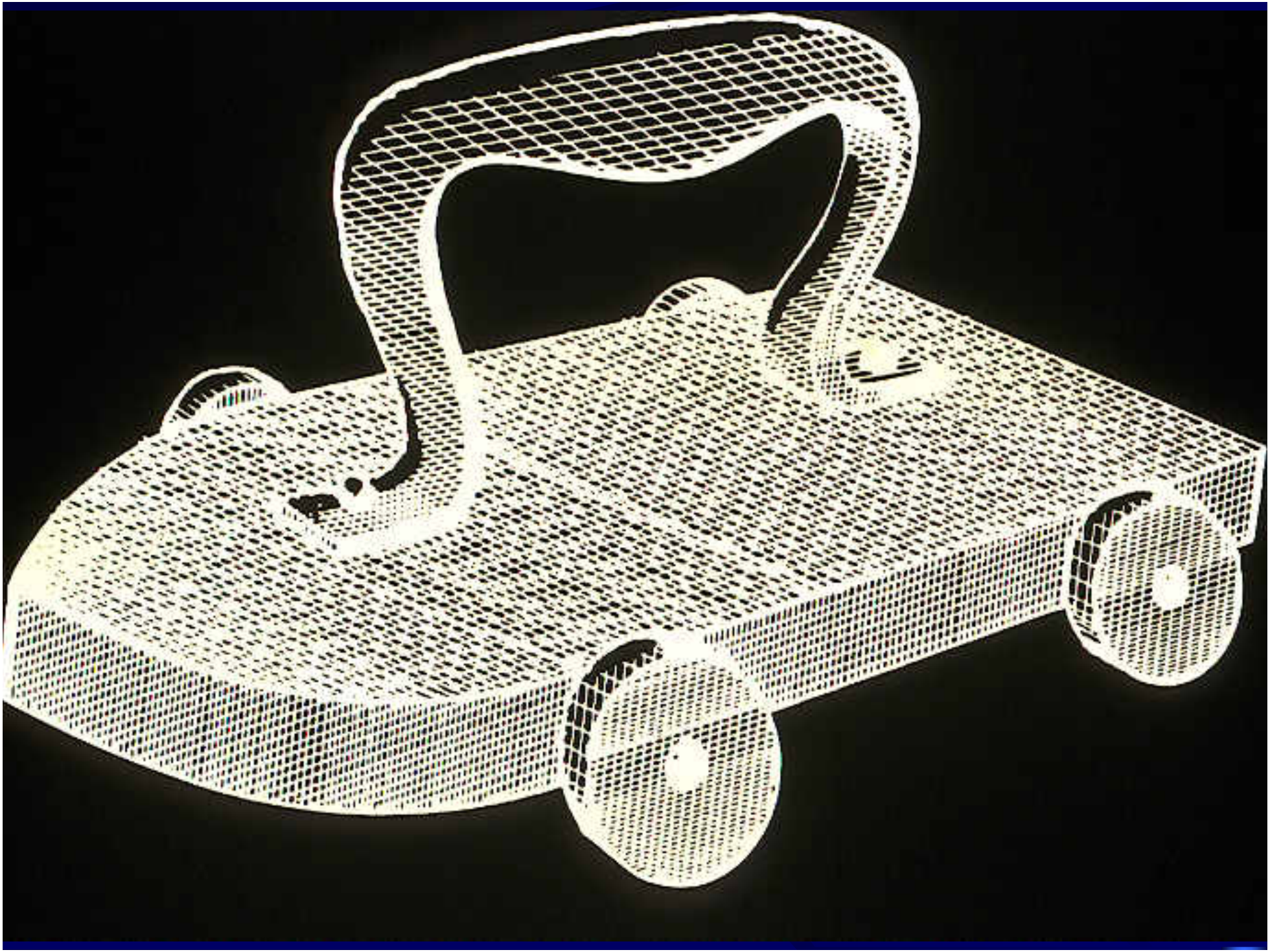
Stages in a typical DBFO contract

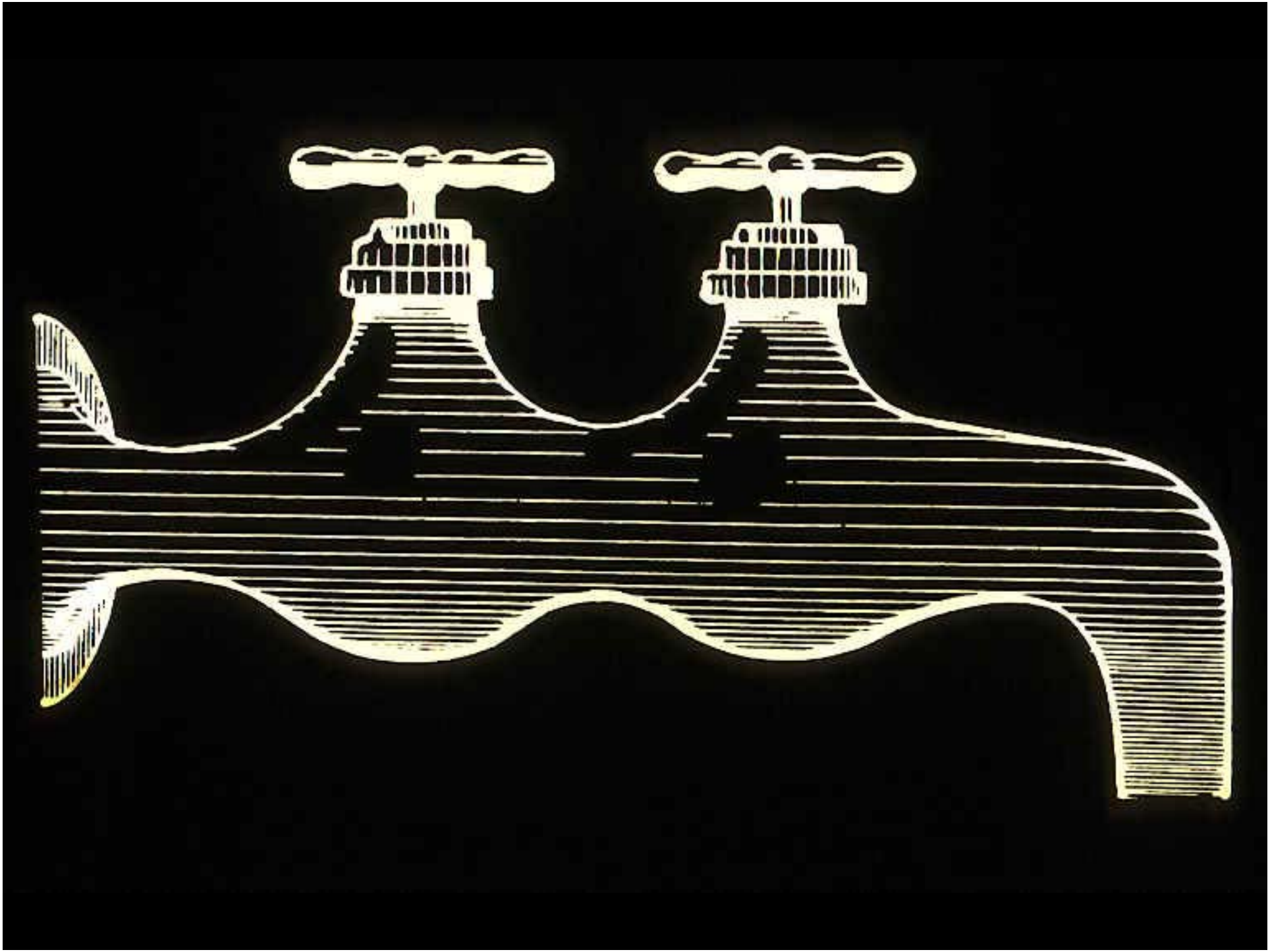


An Assessment of DBFO

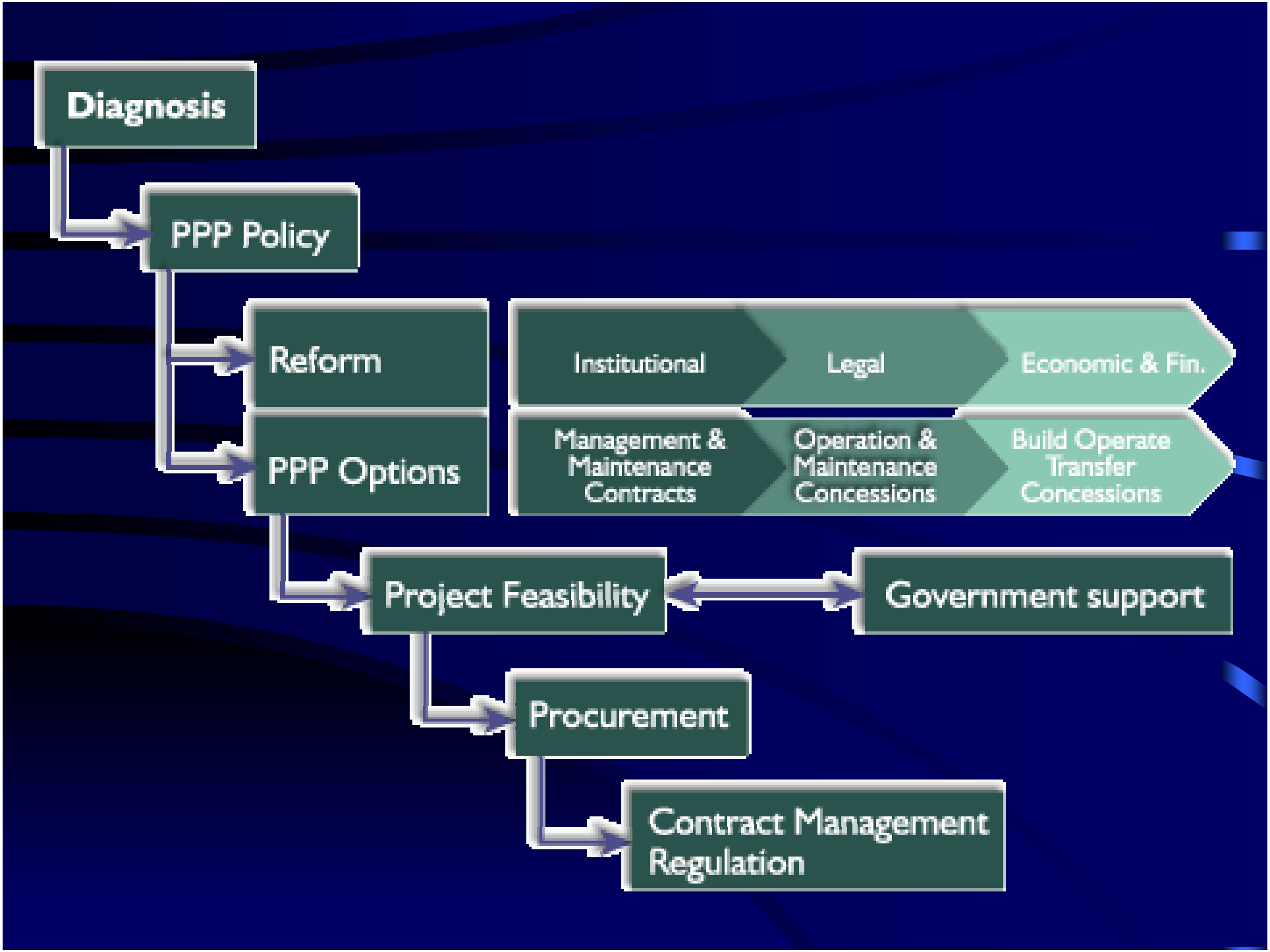
- short term: eases public budget
- long term capacity of the budget is essential
- sophisticated public borrowing
- private sector: lender and investor; public pays through “shadow tolls”
- eliminates toll acceptance risk (avoidance rate)

Some rare objects...





The World Bank Tool Kit for Public Private Partnership in Highways


Diagnosis
PPP Policy
Reform
PPP Options
Institutional
Legal
Economic & Fin.
Management & Maintenance Contracts
Operation & Maintenance Concessions
Build Operate Transfer Concessions
Project Feasibility
Government support
Procurement
Contract Management Regulation

World Bank Toolkit for PPP in Highways

- Helps policy makers and practitioners to develop Public-Private Partnerships (PPP) in the highway sector
- a multimedia product available on a CD ROM and Web at http://test.triel.com/bm/

The Toolkit...

- 400 HTML pages and over 5000 pages of reference publications
- a 500 words glossary
- a fiction-based case study and a guided financial simulation tool (numeric, graphic)

Toolkit Modules

- Overview and Diagnostics
- Project Characteristics
- Public Sector Functions
- Laws, Rules and Contracts
- Implementation

Public Private Partnerships

Low → High

Extent of private sector participation

Management Contracts: A contract by which a private company is entrusted with tasks such as traffic counting, axle-load weighing, and traffic management, including surveillance, stand-by services for accidents, toll collection.

Concessions: An arrangement under which a public entity, owner of the road, delegates to a private entity (concessionaire) the responsibility for providing a specified level of service to road users in exchange for the right to collect revenue from those users.

Operation and Maintenance Concessions: The private sector operates and maintains an already existing road, charging tolls to help finance the improved operation and maintenance of the road.

BOT-type of Concessions: The responsibility of the concessionaire is not limited to operation and maintenance, but also comprises an initial construction, upgrading or major road rehabilitation.

World Bank Port Reform Toolkit

- practical institutional designs for increasing private sector involvement without compromising the public interest
- “best international practices” in a manner that is relevant to decision-makers

World Bank Port Reform Toolkit

- mini case studies and illustrations of the decision process
- available from the World Bank web site at: http://www.worldbank.org/html/fpd/transport/ports/toolkit.htm

PPPs are supposed to transfer risk from the public to the private sector, but sometimes failure is not an option

The Railtrack Case

- Railtrack, a quoted company in which shareholders invested at their own risk, was put into administration in October 2001, when insolvency was imminent
- Bail-out: taxpayers will pay shareholders $425 million; government will guarantee $280 million loan from banks

The Economist, 30 March 2002

The near-collapse of Britain's nuclear electricity

- A cash crisis at BRITISH ENERGY sent shares in Britain's privatized nuclear-energy generator into meltdown and reduced the company's credit rating to junk status
- The British government reacted by offering $635m in loan guarantees to help the ailing power generator stave off bankruptcy while it attempts to restructure its finances

The Economist, 7 September 2002

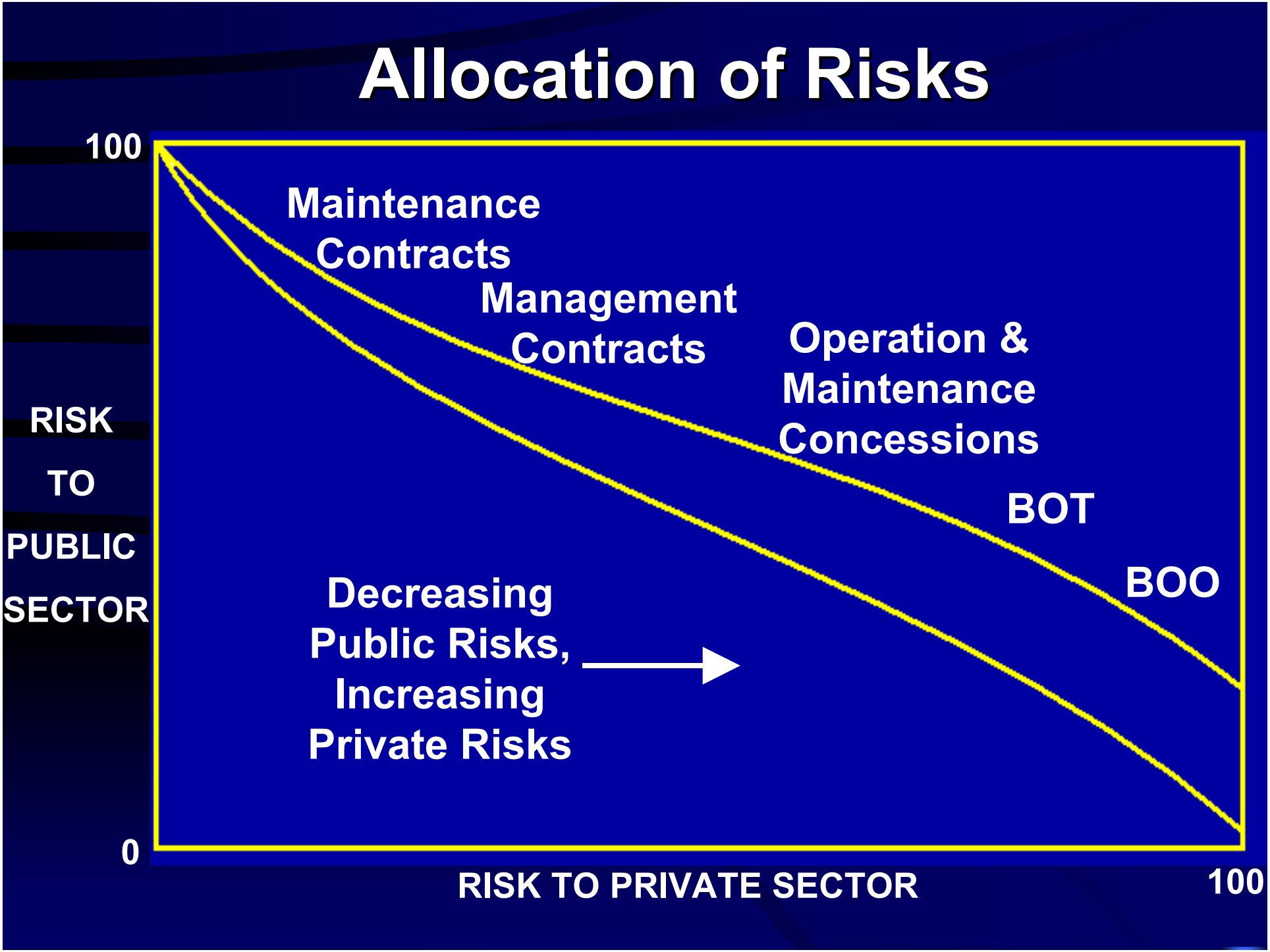
The US west-coast port shutdown

- On Sep 27, 2002, the port operators locked out workers, accusing them of a deliberate slowdown (union control over jobs created by new technology at the ports was a key issue in the dispute)

- A long stoppage in 29 ports would mean a huge supply shock. On Oct 8, 2002, with 200 ships idling off the coast, Pres. Bush ordered the ports to reopen ("the economy was loosing up to $1 billion a day")

The Economist, 12 October 2002

Allocation of Risks




I'm sure glad the hole isn't in our end...

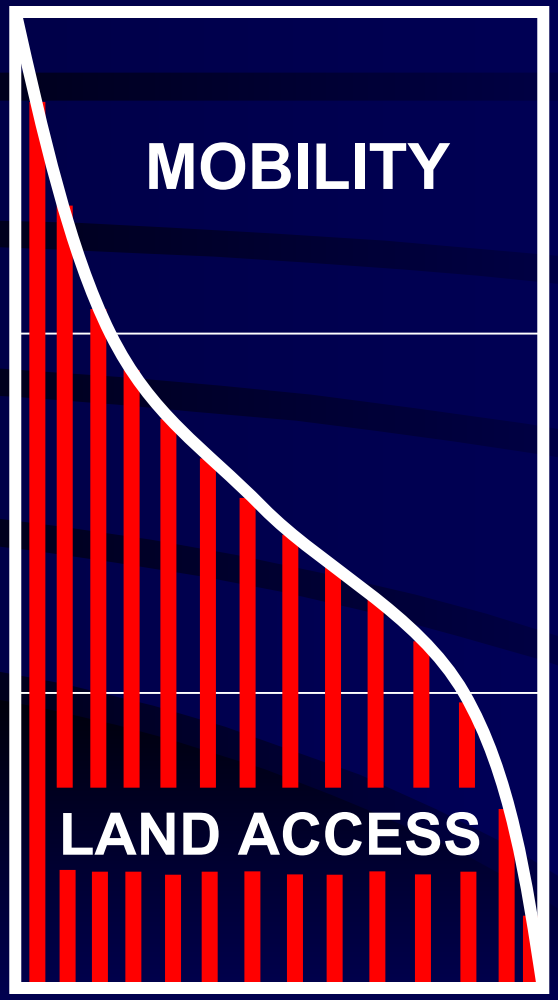
Muchas Gracias!

Georgia O’Keeffe

Ladder to the Moon

1958

Proportion of Service



Arterials

Collectors

Locals

Whether infrastructure causes, or results from, economic development may be debatable, but that they occur together is not