

Infrastructure Management
Homework #3
Spring 2004
Due Thursday, March 18 at start of class

Question 1 (15 pts): Use the 'LCCA' software program (program and other files available for download from the course home page) demonstrated in class to do the following problem.

- a) Download the 3 files for "Exercise 2" (available on course home page under 'LCCA examples'). Recall that you should 'open' the Probabilistic file as project-level inputs first, then load the 2 alternatives separately.
- b) Considering only the 'Deterministic' model, how sensitive is the choice between the 2 alternatives to independent changes of (-10%, -5%, 0, 5%, 10%) in the following parameters for each alternative?
 - Value(s) of user time
 - Discount Rate
 - Work Zone capacity (vphpl)
- c) How surprising are your results from (b)?
- d) Repeat part (b) with the 'Probabilistic' model (recall you need to run simulations first – I suggest 1000 iterations).
- e) Assume this tool was able to support LCCA of residential and commercial buildings. How could you incorporate resource/energy costs of operation in the tool to make better decisions?

Question 2 (25 pts): It is likely in the next year that the federal government will allow states to increase the maximum weight of truck tractor-trailer rigs permitted on U.S. highways. Expect western, Mountain and southern states, where truck runs tend to be longer, to raise their maximum truck weight to around 97,000 pounds. That will greatly enhance shipping productivity for U.S. firms and will yield significant annual savings.

Allowing trucks to carry larger loads would help lawmakers head off a thorny political problem: With over-the-road commerce growing 3% to 4% a year, keeping the current federal cap on truck weights would put about 8 million additional trucks on the road by 2013. Fewer trucks on the road will mean fewer collisions involving trucks and automobiles.

The increase of the weight limit will likely also include a provision to approve pilot tests to pave the way for construction of truck-only toll roads next to existing interstate highways. The plan calls for reserved lanes to be built and operated with funding from private revenue bonds and tolls averaging 40¢ to 80¢ per mile traveled. Roth says that it would give fleet operators the option to divert their most productive trucks to less-congested toll lanes for faster, higher-margin freight runs that could more than cover the additional costs of the tolls. Moreover, "about 70% of highway accidents are caused by actions of car drivers, and so a separation [of trucks and cars] is attractive for safety reasons," he adds.

It is not expected that roads would deteriorate more from the heavier trucks, as they would have

more axles and have weight distributed more evenly.

[Source: <http://www.aset-safety.org/media/media.html>]

Questions

A) In purely economic terms, estimate how much each of the states may be 'willing to pay' per year to build truck-only toll roads, if the lifetime of the roads is 30 years? Compared to the costs of building roads, does it make sense for any of the states? Which ones? Does the decision change when considering urban vs. rural roads?

B) Comment on your results, and whether you would recommend pursuing truck-only roads. Are there other freight/transportation options to improve roadway safety by better managing freight movements?

Helpful Data Sources

The Commodity Flow Survey (CFS) - <http://www.bts.gov/ntda/cfs/cfs97od.html>

Transtats database (shipments of goods by truck) - <http://www.bts.gov/transtu/ts1/ts1.htm>

Number of "lane-miles" of roads in each state - <http://www.fhwa.dot.gov/ohim/hs01/hm43.htm>

Costs of Highway Construction - http://www.wsdot.wa.gov/biz/construction/I-C_Const_Cost.pdf