Transport policies

Resource allocation

How are resources allocated in transport?

- **Operations.** The privatisation of buses and railways means most transport supply operation decisions are taken by the private sector.
- **Infrastructure** investment decision are normally coordinated by government eg the building of a new bypass, the HS2 London-Birmingham high speed rail link

What are the special characteristics of investment in transport infrastructure?

- Roads are a quasi-public good. State intervention is required to ensure appropriate levels of provision and management of demand
- **Cost.** infrastructure investment is measured in £bn eg HS2 rail estimated cost is £34bn
- **Past under investment** by government. Transport 2010 anticipates £180Bn is needed - half to be raised in the private sector through PFI
- **Delay** There are significant lags in planning, consulting building and opening new infrastructure. HS2 rail link may take 15 years to complete
- **Project life:** infrastructure projects have a working life measured in decades
- **Timing:** Construction costs occur early on. Benefits occur over the project's life eg 60 years
- **Positive externalities** eg new roads open up market and employment opportunities to the benefit of third parties such as local businesses and workers.
- **Regional multiplier effect:** Investment in local transport infrastructure can be an initial stimulus to regional economic development and generate a multiplier effect.
- Infrastructure changes affect the relative cost of travel and so influences modal choices, traffic volumes, patterns of land use, business location and the operation of labour markets.

List the benefits of new transport infrastructure. New roads, runways, etc create:

- **Private benefits:** lower cost of travel or additional revenue earned by firms
- **External benefits** to third parties eg less congestion on alternative transport modes; reduced unemployment, local economic growth and a regional multiplier effect
Cost benefit analysis

What is Cost Benefit Analysis (CBA)? CBA is a decision making tool which compares the social costs and social benefits of a project in order to calculate its net present value.

How do private sector firms evaluate investment projects? Firms usually take only private costs and benefits into account. Any spillover effects on third parties are ignored.

What does a CBA measure? A CBA analysis calculates a present monetary value for a stream of future net social benefits generated over the life of an investment project.

A CBA states a road project has a present net value of £25m. What does this mean? The value today of all future benefits, less costs, over the life of the road (say 60 years) is £25m.

Why does the public sector use CBA? Public sector organisations try to measure the full social impact of a project ie the impact on consumers and producers involved and third parties.

List the steps taken in undertaking a Cost Benefit Analysis

1. **Identify all costs and benefits**: private and external eg costs borne by the supplier (eg construction, operating and maintenance costs) and external costs incurred by non-users eg noise, air and visual pollution congestion, loss of countryside. The benefit to consumers.

2. **Place a monetary value on each cost and benefit**: Economists measure benefits and costs using money as a unit of account. Market prices indicate private costs and benefits. Economists estimate shadow prices to value externalities.

3. **Take account of the timing of costs and benefits**: The costs and benefits of a project last many years. Economists use discounting to establish today's value of future benefits. Eg the present value of £1,000 of net benefit in 25 years' time might be, say, only £250.

4. **Take account of future risk and uncertainty**: ie establish best and worst case scenarios.

5. **Establish the net present value of the project**: This involves adding up the benefits and deducting costs for each year of the life of the project. If benefits exceed costs, net benefits are positive and the project is worth undertaking.

What is discounting? Discounting is a statistical techniques used to establish the present value of a future benefit or cost.

What is net present value? Net present value is the value today of a stream of future benefits or costs over the life of the project, discounted at a given interest rate (the discount rate).

What is a discount rate? A discount rate is the interest rate chosen to establish the current present value of a future stream of costs or benefits.

Why is discounting necessary? The costs and benefits of a project take place over time. Eg a new road can have an impact over 60 years. Discounting brings together all these future costs or benefits into a single present value.

Give an example of how a present value is calculated. The present value (PV) of £100 is found using the equation PV = (B-C)/(1+R)^t where R is the rate of interest eg 6% and t is the time of the net benefit -benefits (B) – costs (C). Eg present value of £100 in

- 10 years’ time = 100/(1+0.06)^10 = £55.84
- 25 years’ time = 100/(1+0.06)^25 = £23.30

How is net present value established? Net present value is the value today of a stream of future net benefits (benefits less costs), discounted at a given rate of interest. Calculating NPV involves adding up the sum of the discounted net benefits for each year of the project.

Why is the discount rate important? The value chosen to discount future values affects the present value. Eg the value now of £100 in 10 years’ time at different discount rates:

a) @ 6% = 100/(1+0.06)^10 = £55.84
b) @10% = 100/(1+0.1)^10 = £38.55
Give a worked example of a CBA Assume the life of a bridge is 25 years. The costs of building fall in year 1. Calculating net benefits for each year gives a Net Present Value of £10m

<table>
<thead>
<tr>
<th>Bridge</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3….</th>
<th>Year 25</th>
<th>Total over 25 years</th>
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<td>ie the value today of a future cost or benefit</td>
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<td>5</td>
<td>4</td>
<td>1</td>
<td>380</td>
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<td>External costs</td>
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<td>10</td>
<td>10</td>
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<td>-204</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>10</td>
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</tbody>
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When is a project worth public investment? A project is worth doing if social benefits (eg £50m) exceed social costs (£35m) ie if net present discounted value (PDV) is positive (£15m).

How can government chose between competing projects. Using CBA establishes the present value of each project eg a new bridge (+£20m) or a new school (+£30m). The new school is chosen because it has a higher positive net present value.

What is a benefit cost ratio (BCR)? BCR is the ratio of a project’s present value benefits to its present value costs. Eg widening the M27 J3-4 has a BCR of 7:1

What does a BCR of 7 mean? Every £1 invested in this project yields £7 of net social benefit.

Why is a BCR useful? A positive BCR means a project is worth undertaking. BCRs can be used to prioritise projects – undertake those projects with the highest BCR.

List challenges in undertaking a CBA. Many external costs and benefits are difficult to

- **Identify**: which costs and benefits are best included or left out
- **Value**: lost time and biodiversity has no market price. A shadow price must be imputed. What is the value in money terms of loss of a species of butterfly or human life?
- **Predict**: How accurate is input data. How reliable are the forecasted costs and benefits for a project requiring engineering work. Is there a significant margin of error or risk?
- Projects usually create ‘winners and losers’. Society may gain but what if costs fall mainly on the disadvantaged while the benefits are enjoyed by the privileged ie inequity?

**COBA**

What is COBA? COBA (COst Benefit Analysis) is a computer model used by the DfT to estimate the monetary value of highway improvements

Outline COBA methodology.

- assumes a proposed road scheme has a working life of 60 years
- assesses the impact of a project by estimating the difference between what the situation in the study area would be with *(Do Something)* and without *(Do Minimum)* the project.
- estimates the monetary value of benefits (called user cost changes) of the road scheme
- estimates the total costs ie initial construction costs and annual maintenance costs.
- Uses discounting to establish present values of benefits and costs
- 60 years of net benefits are discounted at a 6% *discount rate* to establish net present value
What does the phrase user cost changes mean in COBA. COBA uses the term user cost changes to describe the user benefits of a road improvement scheme. User cost changes are the monetary savings enjoyed by users of the improved highway eg from reduced journey times.

List the benefits measured by COBA. A new or improved road usually causes:

- **time cost savings** from reduced travel times for commuters, freight operators, etc.
- **vehicle operating cost savings** as less congestion means less fuel consumption
- **accident costs savings** from a reduction in the number and severity of accidents and lower damage to property, insurance administration, and police time costs involved

How does COBA value time savings? COBA estimates an average money value of time for travelling for work, commuting or non-work purposes. Average wages value work time while a lower figure is used those commuting or travelling for non-work reasons. Eg for COBA the value of time per occupant of a car, in working time, is £2.18 per hour.

How are vehicle operating cost savings calculated? COBA places an estimated monetary value on the cost savings to users from the scheme eg using less fuel because of less congestion.

What are the issues involved in valuing accidents? The total cost of accidents on a road network is calculated by multiplying the number of accidents predicted to occur on the network by the cost per accident. Not all accidents are equally serious. Accidents can result in damage to property, slight injury or death. COBA values a fatality at £1,249,890.

How can COBA be used to decide between competing projects? Given limited resources road improvements with the highest positive net present value are undertaken first.

Distinguish between appraisal and evaluation. An appraisal is a forward looking (ex-ante) assessment. An evaluation is a retrospective (ex post) assessment after a scheme is operational.

What criteria does the DfT now use for highway appraisals? The DfT assesses potential road projects against five objectives: environment, safety, economy, accessibility and integration.

What are Appraisal Summary Tables? An Appraisal Summary Tables (AST) is a one page tabular summary assessing the impacts of a given transport project on the five government transport objectives: environment, safety, economy, accessibility and integration.

How is COBA used in an AST? COBA now forms part of a broader appraisal process. The results of a COBA impact on three of the five govt transport objectives

- **Economy objective**: a monetary value for net benefits to road users the form of reductions in journey times and vehicle operating costs
- **Safety objective**: a monetary value for changes in accident costs and casualties;
- **Environment objective**: a monetary value for changes in CO2 emissions

What are the limitations of COBA? COBA is a narrowly focussed form of CBA as it only estimates the safety and economic impacts of projects to direct users of a road schemes. Wider effects such as the impact on the local economy and negative externalities are ignored.

Link consumer surplus and highway improvements. A road improvement scheme reduces price of a journey from P1 to P2 causing (Q2-Q1) more users to travel

The benefit to existing users is P1 L N P2. The benefit to generated traffic is L N M. The total rise in consumer surplus is P1 L M P2
Public Private Partnerships and Private Finance Initiative

What is transport investment? Investment is capital expenditure on producer goods and in transport can be in infrastructure or vehicles, buses, rolling stock (trains) aircraft etc.

What are Public Private Partnerships? Public Private Partnerships (PPPs) are joint ventures between private sector firms and public sector agencies eg Metronet and London Underground.

What is the difference between PPP and PFI? The private finance initiative (PFI) is a method of financing public private partnerships (PPP). PFI means private finance for public projects.

How does a PFI work? Private sector firms contract to finance and build an infrastructure project eg an underground line. The public sector pays an annual charge for the completed project for 25-30 years; operates the network (or outsources management to the private sector); ensures safety; assumes ownership of the asset at the end of the 25-30 year contract.

Why is the PFI needed to modernise public transport infrastructure? Investment in public transport has been neglected for decades. Billions of pounds are required to modernise and expand the network. Involving the private sector increases the amount of fund available for investment.

How can the government fund transport projects? Funds for investment can be raised from current taxation or from borrowing ie selling government bonds paying annual interest.

Why is the government reluctant to issue bonds? New bonds increase the national debt.

What are the arguments for the Private Funding Initiative?

- Finances projects that might otherwise not be undertaken. PFI means the government can invest in current transport infrastructure without raising taxes, increased borrowing or diverting expenditure from other priority areas such as education.
- Offers better value for money than public funding by encouraging greater control of costs over the project's lifetime. The private sector is motivated by profit. There are incentives to be more technically efficient than the public sector resulting in cost savings. Eg penalty clauses act as an incentive for firms to finish projects on time and within budget. Private sector firms are 'better managers' who can improve labour productivity.
- Transfers risk to the private sector. Profit is the reward for risk taking. All engineering projects face uncertainty. Private sector firms now assume that risk.

Why are Private Funding Initiatives in transport criticised? Critics argue PFI:

- Offers poor value for money. Private sector firms require high profits for assuming high risk. Increased profit margins exceed the potential savings from greater efficiency. The government can borrow money at lower rates of interest than the private sector because there is less risk of default.
- Fail to transfer risk to the private sector. Loss making firms cease trading leaving government ultimate responsibility for finishing the project

Give an example of a successful public private partnership. Midland Expressway Limited (MEL) is a private company with the government concession to design, build and run the M6 Toll until 2054. Construction costs of £900 million were privately financed.

Government transport policy

What is the role of the Department for Transport (DfT)? The DfT sets transport policies, and oversees strategy and delivery for aviation, bus, rail and road services in the UK.

What are the objectives of government transport policy? In 2011 The DfT lists five priorities:

- Prepare for a national high speed rail network for the whole of Britain.
- Addressing the high cost of the UK railway compared with other railways and comparable industries; continue to invest in Crossrail and Tube upgrades in the capital.
- Encourage sustainable local travel by making public transport cycling and walking more attractive and promoting lower carbon transport and tackling local road congestion.
- Tackle carbon and congestion on our roads eg support the early market for ultra-low emission vehicles, address the causes of congestion.
- Promote sustainable aviation.

Can government transport policies conflict? Economic growth both requires and generates increased transport demand but has a negative impact on the environment and climate change. Reducing transport threatens growth. Rapid growth of transport threatens future generations.

Integrated transport policy

What is integrated transport? Journeys often involve switching from one mode of transport and another. Integrated transport occurs when passengers and freight can easily switch between different modes of transport over a given journey. Results in a seamless journey using different modes.

Define integrated transport. Integrated transport occurs when different modes of transport work increasingly more effectively and efficiently together. Inter-modal travel is encouraged.

How are transport modes interlinked? Transport modes are interlinked eg motorists arriving at a park-and-ride need a bus to continue their journey to a town centre or railway station.

Give an example of integration. A car driver arrives at an out of town park-and-ride and quickly catches a bus to the city centre rail station in time for a waiting train. Taxis are readily available for journeys to and from rail stations.

What is an integrated transport policy? A government action plan to link two modes of transport.

What are the benefits of integrated transport? Coordinated intermodal journeys:

- reduces journey times and lowers the cost of travelling for households and firms
- switches demand from private transport to mass public transport

How can transport be made more integrated? Integrating modes of transport requires better coordination of the transport network through

- better information systems eg signs at bus stops stating expected arrival time
- coordinated timetables eg trains leave after and not before a scheduled bus arrival
- improved ticketing arrangements eg the ability to buy one ticket, online, for a train journey using several train operators
- better interchanges well situated park and ride schemes with large enough car parks to meet demand, cafes and covered bus stops
- give public transport priority access to roads in urban areas at peak times eg bus lanes

Why does integrated transport require government action? Only the government has the ability to ensure transport services are coordinated by

- passing legislation requiring train and bus operators to coordinate their timetables
- investing in infrastructure eg park and ride and roadside information screens.
Transport Policies

Outline the difference between market and non-market based solutions. Market based policies change the conditions of supply or demand. Non-market based policies use laws, regulations and standards to overrule market behaviour.

List the main types of transport policy:

- increase supply with sustained investment in infrastructure to increase capacity
- make better use of existing capacity: improve transport management
- manage travel demand to cut journeys or encourage intermodal switching

How can the government increase the supply of transport? Increasing supply requires new roads, rail track, airports, buses, etc.

Can an increase in capacity reduce congestion? An increase in capacity increases supply, reducing the cost of journey and causing an extension in demand. The impact depends on PED.

What are the limitations of increasing supply? New infrastructure

- enables more traffic and so generates more negative externalities such as pollution
- increases use of non-renewable resources such as oil threatening sustainability
- means the permanent loss of land threatening sustainability
- may simply generate new traffic so that congestion on a given route remains constant

How can better use be made of existing capacity? The government can

- Manage road speeds eg variable speed limits, 40 mph at rush hour, effective on the M25.
- Improve traffic light and junction design
- high occupancy priority eg special lane for motorists carrying passengers
- convert hard shoulder safety lanes on Motorways into an extra lane for vehicles

How can the level of travel demand be managed? The level of demand can be influenced by using the price mechanism. Eg

- road pricing taxes increase the private cost of motoring and reduced quantity demanded
- rail and bus subsidies encourage road users to switch to substitutes such as rail
- improved information provision: raising public awareness about the environmental impacts of polluting emissions from transport affects the demand for car travel.
- Workplace parking charge: tax employees who have a parking space at work
- Quotas to limit the number of cars that can be owned.
- More/improved park and ride schemes to improve integrated transport
- Improve public transport capacity and quality to make substitutes eg train, trams or buses as convenient to sue as cars when commuting.
- Use planning regulations to halt new out-of-town super stores
- build houses near work and encourage teleworking or home working through tax incentives

Outline the problems in using environmental taxes. The aim of an indirect tax is to make the polluter pay and so internalise the externality. However implementing taxes is problematic

- Setting the ‘right’ tax rate if the monetary value of a negative externality is hard to measure
- Cost of collection: road charging requires expensive infrastructure eg IT system of billing
- Inelastic demand: higher petrol prices via higher indirect taxes has little effect on demand
- Redistribution effects: Indirect taxes are regressive and affect low-income household most.
- Increased costs: Higher indirect taxes may cause cost-push inflation affecting consumers who did not pollute and international competitiveness if environmental taxes are higher in one country than another.
Why subsidise railways? Rail subsidies lower price and can be justified on these grounds:

- **social equity**: subsidies mean low-income groups are now more able to afford public transport and loss making but socially essential services are maintained
- **environmental**: to encourage private car users to switch to greener public transport systems

How effective are subsidies in encouraging commuters to switch from road to rail? Road and rail are substitutes. A rail subsidy makes tickets cheaper and encourages car commuters to switch, depending on the cross elasticity of demand value) between cars and trains. Only if commuters can easily switch from cars to rail, are subsidies effective.

**International road schemes**

Outline the Singapore experience Singapore is a small island that uses coordinated transport polices to reduce congestion:

- A 10-year license permits to own a car is sold at monthly auctions in limited numbers at up to $75,000. Sales tax and import duty are double the price of a car. The fixed cost of putting a car on the road is almost $200,000
- Introduced in 1997 electronic road pricing (ERP) charges motorists a variable toll by time of day and type of vehicle – according to the level of congestion and to maintain traffic speeds. Cars are fitted with a radio unit holding a pre-paid debit card. Cars pass under overhead gantries that deduct charges direct from the motorist. As tolls vary with congestion levels, tariffs more accurately reflect the marginal external costs of a trip.
- Subsidised buses and extensive railway network that covers much of the 25-mile-long island offers substitutes for cars.
- Traffic control: police use closed-circuit television to coordinate traffic lights and manage traffic flows

Outline the Greece experience. Athens has tried:

- Closing the city centre to cars for 2 1/2 hours to encourage Greeks to try public transport. The resulting traffic jams increased carbon monoxide level by 50%.
- Alternate-plate driving days, whereby cars are allowed in every other day depending on the last digit of their license number. Car ownership actually rose: drivers bought a second car with different plates so that they could drive every day.

Outline the Melbourne experience Melbourne, Australia's opened a 22 kilometre privately-operated, electronic City Link toll road in 2002. Toll booths have overhead cameras gantries reading pre-paid e-tags fixed to windscreen. The system uses similar vehicle identification technology to the London scheme.

What is the Germany Lorry Toll Scheme? Germany has successfully introduced a distance-based road GPS toll scheme for lorries. In 2005 lorries over 12 tonnes began to pay between €0.09 and €0.14 for each kilometre of road travelled on Germany's autobahn (motorway) network. The tax charged depends on the lorry's emission levels and number of axles. The charge is calculated via an on board unit and satellite tracking system.

The German government's objective in introducing the lorry road pricing scheme is

- make the 'user pay' - road wear from a 40 tonne HGV is up to 60,000 times higher than a car.
- To introduce fairer competition for freight encourage operators to move traffic from road to rail or inland waterway.
- To generate additional revenue for upgrading of transport infrastructure in Germany.

Early results show an improvement in haulage load per vehicle and the number of empty trips is down by six per cent. There has been a six per cent shift to rail from freight transport. Some lorries are diverting off autobahns onto other roads to avoid paying the charge.