

# Transport

## A 25 Year Projection

ENV – 2E02

2004 – 2005

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## **Introduction**

The transport sector is the largest demand sector for energy in the United Kingdom. Over the next 25 years demand for energy in this sector is likely to increase significantly. This will come about from rising levels of personal mobility and increased freight movements. By far the two biggest demands in this sector come from road transport and aviation; with nearly all the energy being supplied in the form of oil, especially petrol, diesel and aviation fuel. As a result this report will focus on these two sectors in particular.

## **Efficiency**

### **Road Transport**

Although there has been a significant increase in engine efficiency in the past, this trend is unlikely to continue. The new Volkswagen group FSi petrol engines are very close to the technical limit for a four cylinder petrol engine, and the new four cylinder Honda i-CDTi diesels are also pushing at the technical limits for diesel power. Despite the increase in engine efficiency it should be noted that this has not translated into huge gains in terms of overall vehicle efficiency. This is demonstrated by the results of a Department of Transport of study shown in figure one. Vehicles are now heavier than they were 30 years ago, despite the use of thinner steels in construction. This weight gain has come from many areas. Every 4 to 5 years manufacturers bring out a new model and every time they do the dimensions of the vehicle increase very slightly. This creeping increase can be demonstrated in the fact that the current VW Polo is bigger in every dimension than the original VW Golf (the next model up the range). Manufacturers have also been fitting ever more entertainment, comfort, navigation and safety equipment to cars, and although this may seem a small weight increase, it all adds up (combined with the increased power demand, especially for air-conditioning). At the same time, the rolling resistance of the average vehicle has increased with wider tyres being fitted, for safety and handling reasons. Aerodynamics have improved considerably, but again potential for a future increases is more limited. At the same time pollution control legislation has been denting efficiency. However, there are a few hopes for the future. Aluminium construction is now much more practical, with new models like the Jaguar XJ being built entirely from the metal. This will help to keep weights down. The new Toyota Prius is a show ground for some of the technologies of the future. All of the main controls are drive by wire to reduce the weight of hydraulic and mechanical couplings. The vehicle also employs regenerative

breaking, a petrol-electric hybrid drive train, continually variable transmission, low rolling resistance tyres and advanced aero-dynamics. The result is a petrol car with a 56.5mpg fuel consumption figure on the urban cycle. At the bigger end of the market Chrysler are fitting a system to their new V8 saloon where half of the engine cylinders are shut down under steady cruising and at tick-over when less power is required to save fuel, but all eight cylinders are available for acceleration when more power is required.

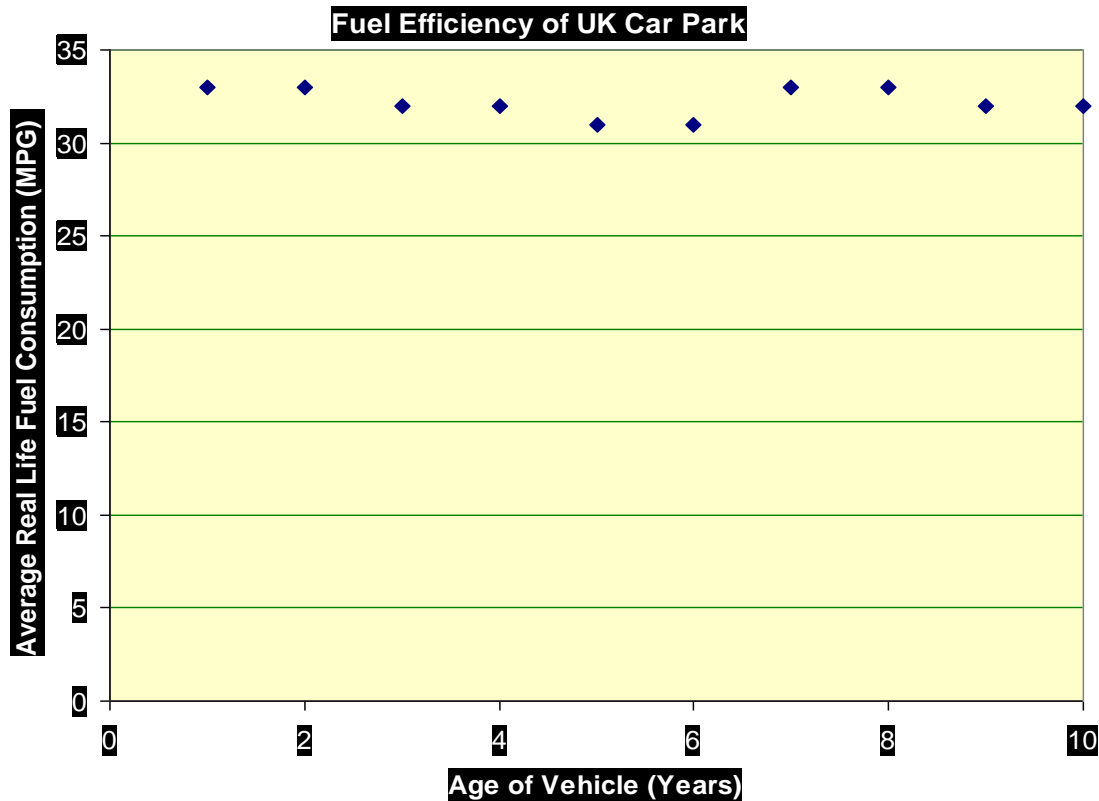


Figure One, Results from Transport Statistics of Great Britain 2004 study into the average fuel consumption of light vehicles of different ages in the UK.

Aviation

Aeroplanes are also becoming more fuel efficient, but here the progress is much slower as manufacturers bring out new models on a scale of decades not years. For example, the new Airbus A380 uses 12% less fuel per km than its main competitor, the Boeing 747, yet can carry 35% more passengers. There is also the possibility of retro-fitting existing planes with new technology to help increase their efficiency. For example, Boeing are to retro-fit the entire Ryanair 737-800 fleet with wing tip ‘winglets’ (aerodynamic device) which will reduce fuel consumption by around 2%. Perhaps the simplest way to increase efficiency, is for operators to fill as much of the empty passenger and cargo capacity as possible on each plane, thus reducing the demand for extra flights. This they are doing,

and seat occupancy rates have been rising recently, especially with the no frills airline such as Ryanair and Easy jet.

## Demand

### Road Transport

Road transport, is the largest consumer of energy in the transport sector. Demand is growing faster than efficiency at present, so the total energy demand is set to increase. However, there are limits to growth as we will reach a point where everyone is making the ideal number of journeys per year and have no further demand to travel by this method. We have not reached that point yet, although it may not be as far off as you might imagine. By looking at more advanced economies with higher levels of car ownership we can seek to extrapolate at what point the growth will peak. Luxembourg is the richest country in the World and also has the highest rate of car ownership in Europe. For this projection it was assumed that UK car ownership would continue to rise at its current rate, until we reached a level similar to that in Luxembourg. This will occur in around 2021 when the average Briton will own 0.61 cars (figure, 2).

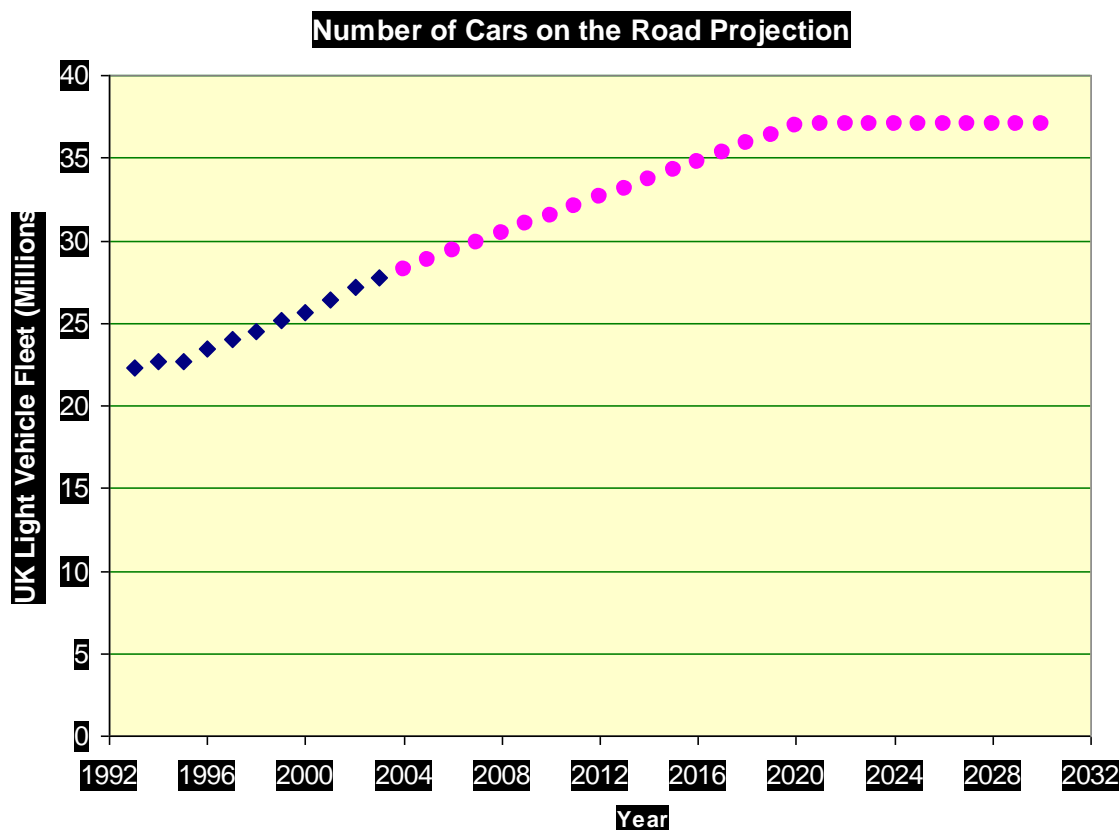


Figure Two, Projection for size of UK light vehicle fleet to 2030. Actual data taken from Transport Statistics of Great Britain 2004.

The number of cars on our roads is set to rise over the next 15 years, although the distance we drive per car is set to decrease. This is because the UK is a mature market and a large portion of the extra cars that will come onto the roads over the next few years will be second, third, fourth and fifth cars. When a family buys a second or third car it generally has the effect of reducing the pressure on the existing car/cars, so although there is a modest overall increase in family mileage the mileage per vehicle is reduced. This phenomenon is best demonstrated by Figure 3. Car utilisation rates are likely to flatten off around 2021 when the growth in car numbers flattens off.

The likely affect of car ownership and car utilisation rates flattening off around 2021 will be the total distance travelled by motor vehicles will also flatten off. This is shown in figure four.

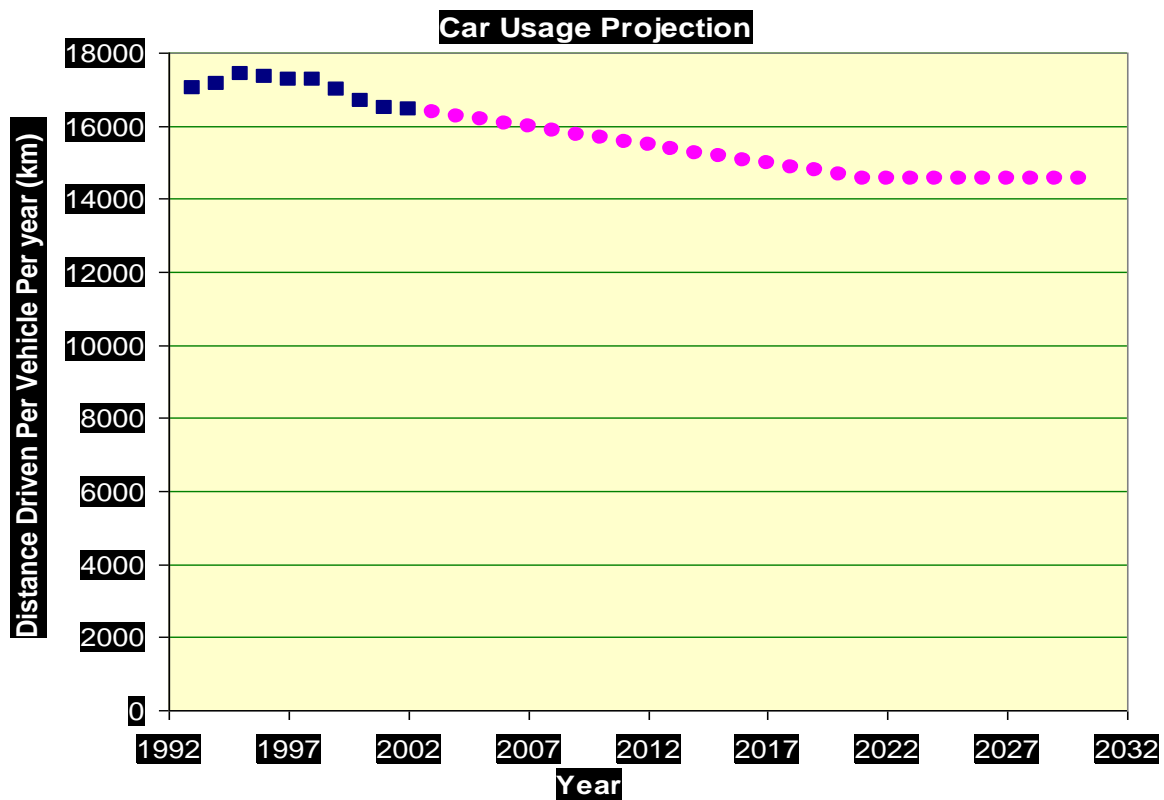


Figure Three, Projection for car utilisation levels to 2030. Actual data taken from Transport Statistics of Great Britain 2004.

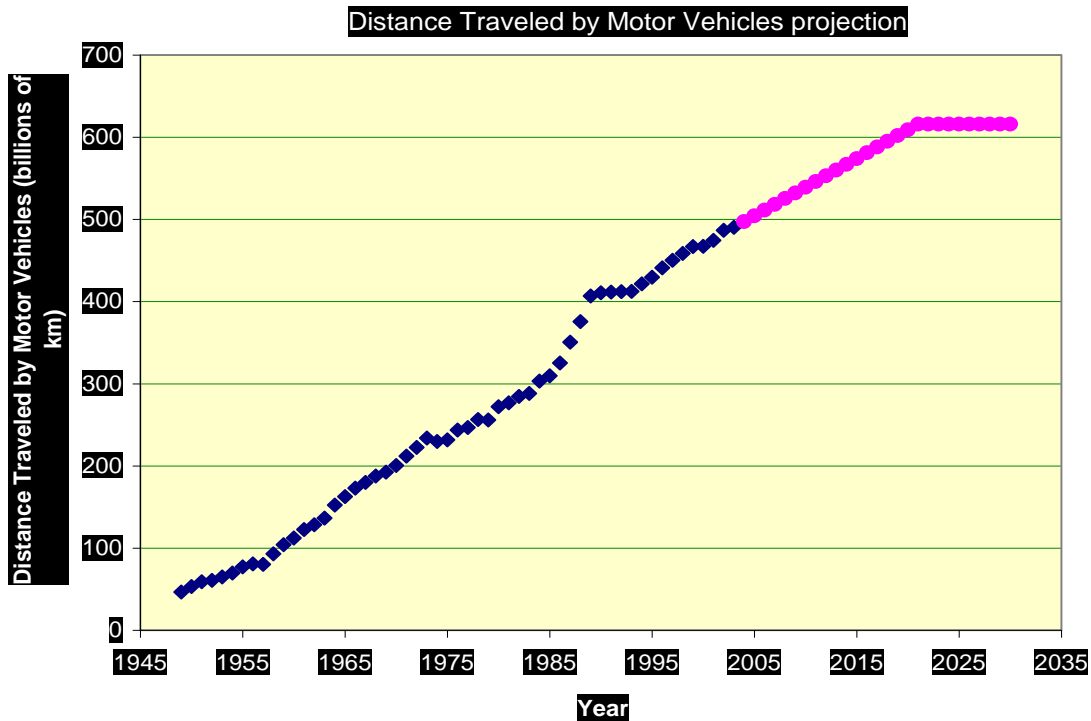


Figure Four, Projection for total distance travelled by motor vehicles. Actual data taken from Transport Statistics of Great Britain 2004.

### Aviation

Airbus predicts that the global airline business will triple within the next 20 years. Here a large portion of the growth will be in the emerging markets, such as China. In the more mature European market the growth will be less, but in the UK we could easily see a doubling in passenger miles flown by 2030, if the current trends continue, as demonstrated in figure five. Currently air freight is a rapidly growing sector taking the form of both dedicated air freighters and using excess hold storage on schedule flights. This seems to be because the “just in time” economy is prepared to pay the extra cost for a quicker, more efficient service and also because the cost is now lower than it used to be. The Royal Mail actually switched to using air freight instead of post trains as a cost cutting measure. This can also be demonstrated in the case of fresh meat. Fresh New Zealand lamb is cheaper in many supermarkets than British lamb despite the fact it has to be air freighted to the UK in refrigerated cases. As supermarket buyers seek out more lucrative opportunities like these abroad, air freight is set to rise. As the efficiency gains will not keep pace with demand there will be a significant demand for more energy, and in this sector that energy all comes in the form of aviation oil.

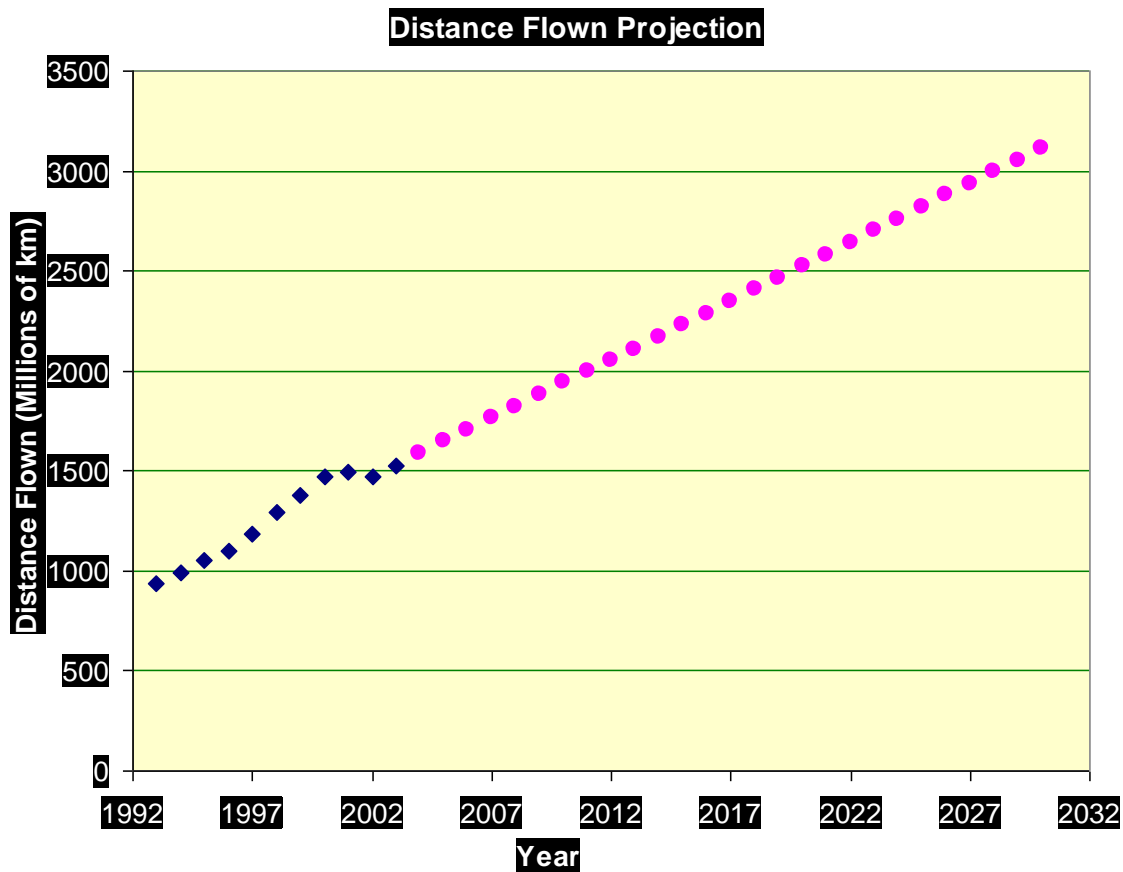


Figure Five, Projection for growth in aviation to 2030.

### Strategies to Reduce Energy Use

Below is a list of ‘carrot and stick’ policy instruments that could be used to reduce the demand for energy from the transport sector.

- Increase fuel excise duty on road fuel.
- Congestion charging and or variable road pricing to encourage more efficient use of the road network.
- Levy VAT and or fuel excise duty on aviation fuel (NB. this would have to be done with Europe Wide agreement to be effective).
- Quicker, safer, more reliable, more pleasant and more affordable public transport.
- Improved infrastructure for walking and cycling.

## **Conclusions**

Table one, is a table of the projected transport related energy demands until 2030.

Fuel Type	2000	2010	2015	2020	2025	2030
Coal	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Oil	2,515	2,720	2,870	3,020	3,120	3,250
Nat Gas	V Small	V Small	V Small	V Small	V Small	V Small
Electricity	35	30	30	30	30	30

Table One, Projected total UK transport related energy demands in Peta Joules per year, by energy source. Year 2000 actual figures from Transport Statistics of Great Britain 2004.