

# Transport and economic development

### Learning Outcomes:

On reading this chapter, you will learn about:

- The link between economic development and levels of both freight and passenger transport
- Issues surrounding the direction of causation between the two, specifically the differences between demand led and supply led effects
- Research on the topic of the impact of transport improvements and economic development in order to assess the actual impact of transport on economic growth
- Look at transport's role in the operation of the local economy
- The link between transport and the wider social development issues
- A backdrop and context for what is to follow and link directly into Chapter 14 on Transport Appraisal.

## INTRODUCTION

Transport has played a vital role in economic development and in the evolution of society to the point where we are at today. Stretching far back when people lived in caves, modes of transport simply did not exist. Consequently, all basic wants and needs, in this case those required for a basic existence, had to be found within walking distance. Whilst shelter was provided by the cave, food had to be hunted which also provided some form of protection from the natural environment from the fur of the animal hunted. In today's terms, we would describe such a life style as self-sufficient, where there is no division of labour and all basic needs are provided solely by the individual. Importantly in our context, we would say there was no separation of production from consumption. In other words, where things were 'produced', such as meat for consumption, was the same location where they were consumed, and hence did not require to be transported over any great distance.

Within such an existence, one important factor missing was the trade of goods and services. Importantly, however, trade could not take place without transport. In turn, as transport systems became more efficient and sophisticated, the more trade became a viable possibility and subsequently did take place. Whilst this may seem like a rather brief history of civilisation as we know

it, this is, in fact, a continually evolving process and one that is still on-going today, fostered and overseen by the World Trade Organisation (WTO). The WTO was founded on 1 January 1995 as the successor to the General Agreement on Tariffs and Trade (GATT). In simple terms the WTO is an international organisation that oversees trade agreements between its members. Since the creation of the original GATT in 1947, this has seen a progressive reduction in the institutional barriers to trade (e.g. import taxes, import quotas etc) and has been largely responsible for what we now refer to as the global economy.

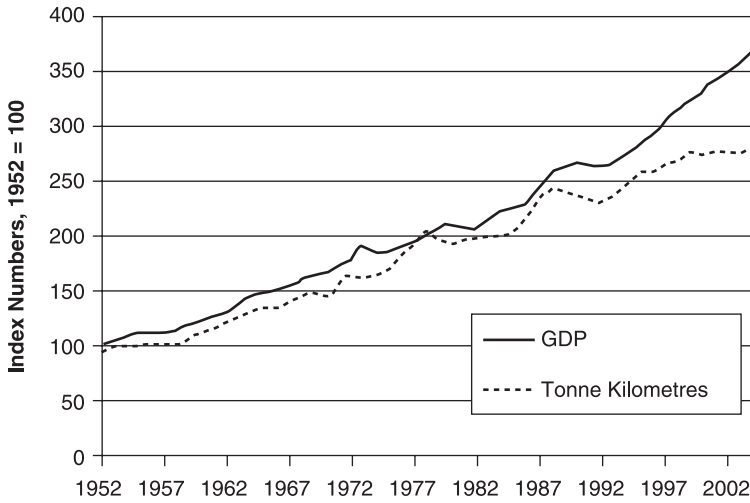
Whilst such a brief overview of the role of transport in the development of society has a clear focus on freight transport and the movement of goods (and completely ignores the importance of money markets and foreign exchanges), these ideas should not be solely limited to the transport of cargo. It can also be expanded to the movement of people and the role that increased mobility has played in economic development. This is clearly the case in the provision of services, which in most cases are provided by an individual. Hence it is very difficult to get a haircut without the movement of people – either the consumer moving to the barber's, or the barber coming to the individual. It is not only in the direct provision of services however that the movement of people plays an important role, but also in the bringing together of individuals into a group where their individual specialities can be allowed to be developed and enhanced to the maximum. Thus synergies can be created where the whole is greater than the sum of the individual parts. With regard to the movement of people into such groupings, this of course relates to the employment of labour in private companies/public bodies. Through the provision of efficient transport services individuals are able to access work opportunities where their skills will be valued the highest and hence be of most benefit to society.

All of these issues will be further explored and developed in this chapter. The purpose of the chapter however is not to examine the economics of transport but rather to bring out the importance of transport in the development of society today and hopefully in turn to then illustrate why getting it 'right', i.e. the transport problem, is important.

## **THE LINK BETWEEN TRANSPORT LEVELS AND ECONOMIC WEALTH**

The link between transport levels and economic wealth has never been in question, the two are highly correlated. This is best illustrated by a simple figure, which is given opposite.

Figure 2.1 shows the level of freight transport as measured by tonne kilometres and the level of GDP, in real terms, i.e. adjusted for inflation. GDP is an important measure of 'National Income' and in very simple terms is the aggregation of everyone's income. Both these variables are shown as an index, hence Figure 2.1 tracks the changes that have occurred in both variables since 1953. What this clearly shows is the closeness of the relationship between the two. What it also shows however is the dramatic increase in tonne kilometres over the period, hence in 2004 freight transport levels had almost trebled since 1953. Whilst that may be simply stating the obvious from the figure, it does raise the question as to why such a dramatic increase has occurred. One answer is population growth, but at around 20 per cent over the whole period that on its own does not account for such a large increase in freight transport levels. The real driving force behind the increase has been society's continued evolution and movement away from a subsistence-based economy towards one with an ever increasing demand for more material goods and services. These



**Figure 2.1** Freight transport and real Gross Domestic Product, Great Britain, 1953 to 2004

Source: Compiled from DfT (2007) and Eurostat Figures

can only be provided through trade, either international or domestic, both of which then generate a demand for transport.

It is not only simply increased trade however that accounts for this increase, but also the movement towards a consumer society. As a consequence, rather than just simply more goods and services being demanded, it is the fact that such goods and services are being demanded at a faster rate. In simple terms, people consume goods and services quicker than they used to (hence more waste), therefore there is a need to produce more. This in turn requires more people to be employed, hence incomes rise, hence people spend more, hence increased demand for freight transport services and so on. This ‘virtuous circle’ is a simple form of what is known in economics as the multiplier effect, where a pound, Euro or dollar is spent more than once. Hence what I spend on having the plumbing in my house fixed, is in turn my plumber’s income, which he then goes out and spends on other goods and services that in turn is the recipient’s income and so on. Note however that at each stage some of the money will slip out of the system. For example, not all that I pay my plumber will end up in my plumber’s pocket, some will be taxed. Or indeed he may not spend it all, but save some of it to spend on future consumption. Nevertheless, this is a simple explanation for the rise in both variables, and the closeness of association between the two.

Whilst this association has long been recognised (and clearly shown in Figure 2.1), there remains real question marks over the direction of causation. Clearly one would imagine that a higher level of GDP causes a higher level of freight transport. Or put another way, as incomes rise (GDP), more goods are demanded and these need to be transported from the point of production to the point of consumption. This view fits very much with the classic notion of the derived nature of transport demand. However, it is not quite as simple as that. Advances in freight transport will result in reduced transport costs and this in turn will lead to more goods being produced (and transported) as the final price in the market will now be lower and more competitive, i.e. profitable. In this case, therefore, it is advances in freight transport that lead to increases in GDP.

This difference has important policy implications. As an example, would the economic problems affecting a particular region be overcome by upgrading the transport access infrastructure or would such actions have little impact? If it is believed that increases in GDP cause increases in trade (and hence the need for transport), then in simple terms such improvements would be a waste of public resources, as the improved infrastructure would be little used. If however one believes that transport causes increases in GDP, then clearly the answer would be yes. This has led to two different schools of thought on the issue, the supply led and the demand led models of economic development and transport.

### **Supply led view – transport leads to economic development**

To adopt a supply led model is to suggest that the causal relationship is that improving the transport infrastructure of an area will automatically stimulate economic activity and stimulate economic development. Increasing or improving the quality of the supply of transport services or transport infrastructure will automatically bring about such a change. This would occur for a number of reasons:

- **Widening of markets, increased production and multiplier effects**

It is the provision of high quality transport facilities that leads to the widening of markets, hence rather than being restricted to selling in local markets that are easily accessible, the range of potential markets will be expanded. This is important because the potential that these newly accessible markets offer will only be exploited if a profit can be earned. If this is not the case, there is no point in doing it. This will therefore directly increase wealth in the area and almost certainly lead to an increase in the production of that particular good or service. In order that more be produced, more resources will be required, in particular labour, and this labour will have to be sought from either other industries or from those not currently employed. Either way, this leads to a general increase in incomes as employees will only change jobs where it is worth their while to do so, and in most cases such changes of job will be motivated by higher incomes. This will also lead to multiplier effects, as those increased incomes will in the main be spent on local services, hence the idea of ‘recycling’ increased income back into the local economy. The basic argument is that markets that were too costly to service in the past now become more cost effective to serve as the transport gap that did exist between producers and consumers is narrowed. The improvement of transport provisions therefore is the spark that sets the whole process off.

- **Indirect effects on employment in construction and operation**

Whilst termed ‘indirect’ effects in many ways these are the direct effects of upgrading transport links or services. Many such projects will consist of major infrastructure improvements, such as the building of bridges, the construction of new roads and railway lines or the installation of light rapid transit systems. These projects will directly create an increase in the demand for local labour both in the construction of such systems as well as their operation once in place. This again will lead to an increase in local incomes with all the associated multiplier effects.

As regards examples of supply led transport improvements, the most obvious is the role of the

railways during the Industrial Revolution in Britain. It is said that the rapid construction of the railways throughout Britain in the mid 1800s literally ‘powered’ the Industrial Revolution, i.e. the movement from an agricultural to a manufacturing based economy, across the whole country. The railways enabled production to be linked to markets, hence led to the separation of consumption from production and thus helped to stimulate economic development. An often overlooked facet is that mass production cannot exist without mass consumption, and the railways enabled or even caused that mass consumption to become a reality. The second far from righteous example of supply led development is the exploitation of the Brazilian rainforest. The pursuit of better lines of communication to the more remote parts of Brazil led to the provision of better transport infrastructure. This in turn led to vastly improved access to the resource of timber, and in turn this led to mass exploitation. This is almost the spider’s web argument, where areas that had been remote and distant in the past become more accessible as transport links are improved. This in turn leads to the improvement of further links into ever more remote areas in the pursuit of the exploitation of timber reserves.

### **Demand led models – economic development drives demand for transport**

Contrasting with the supply led view is the alternative idea that transport provision is invariably a response to a basic demand, hence the casual relationship is that economic development leads to a demand for better transport facilities. Without a basic demand for an area’s goods and services, then irrespective of the quality of the transport infrastructure this will never stimulate that demand and hence the subsequent economic development that would follow. As highlighted above, this is the classic view of transport as a derived demand. To take an extreme example, there is little point in upgrading the A9 to a four lane dual carriageway north of Inverness to John O’Groats as basically there is insufficient demand between the two locations to justify such a large capital expenditure. It may stimulate some form of economic development; however, this will be relatively minor in relation to the expenditure incurred. What is lacking is the basic demand for transport to and from John O’Groats. Even the unlikely discovery of a large unexploited diamond reserve on the outskirts of the village is unlikely to stimulate such a demand as the current infrastructure would be more than adequate to cope with the increased transport involved.

The basic demand required arises from one of two sources, revealed and latent demand.

#### ■ Revealed demand

Revealed demand is expressed in the journeys that are actually made or the goods that are transported using the existing infrastructure. If this increases, it may be found that the existing infrastructure requires upgrading in order to cope with the current level of demand, e.g. the packed London Underground or the heavily congested M25 circular motorway around London. This higher demand therefore directly impacts on the improvement in the infrastructure.

#### ■ Latent demand

There is also however what is known as a latent demand. In technical terms, latent demand is that segment of the demand curve to the right of the equilibrium point. This will be examined in Chapter 3; however, in this context latent demand exists where there is a demand but one that cannot be satisfied due to inadequacies in the existing infrastructure. In

other words, individuals may wish to travel to a particular location, hence the basic demand, but the cost in terms of the time that it would take to actually get there more than offsets any benefit gained from undertaking the journey. As a consequence, the journey is not made. If however the current provision is improved, then the cost of the travelling would fall and hence some of those who had not previously travelled will now make the journey.

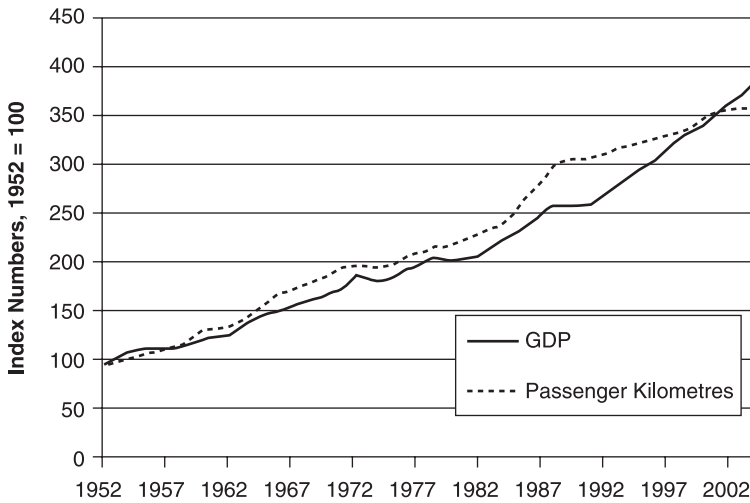
Under this view of the relationship between transport and economic development, transport's role in the process is seen as one of a facilitator. Improving transport links is a necessary but not sufficient condition for development. Transport is the means by which demand for goods and services is satisfied but that demand must already exist, as improvements in transport will not on their own create such a demand. Hence simply improving a road into an area where there is no demand for the area's goods and services will not stimulate economic development in that region, the demand for the region's produce or services must already be present, and will be shown by existing links being under strain and hence clearly inhibiting economic growth.

What can be taken from this albeit brief review of the relationship between economic development and transport is that whilst the two are closely associated there is no clear answer as to the direction of causation between the two variables. You will no doubt be aware of examples of significant improvements to infrastructure facilities that are considerably under utilised whilst at the same time you will also be aware of other infrastructure links that are under severe pressure. The first example would be a clear case where a supply led view was mistakenly taken, whilst the second is an example of a demand led syndrome. As to which of the two schools of thought is the 'correct' one, the simple answer is that there is no one correct view that would fit all situations. Both views are consistent, as there exist some situations in which the supply led factor is more apparent, whilst in other instances the demand led view is more pertinent. In terms of policy initiatives, the important aspect is in understanding the basic drivers underpinning the local economy and the role that transport plays in supporting these drivers. Under a supply led view, improving transport services and/or upgrading the infrastructure is a necessary and sufficient condition for improved transport to lead to economic development. Under a demand led view, however, it is a necessary but not sufficient condition, i.e. the only condition required. There has to also be a basic derived demand for transport services in order for transport developments to then facilitate economic development.

## **The role of passenger transport in economic development**

Whilst the role of freight transport in economic development is clear and founded upon the principle that trade is never a zero sum game, what may not be so evident is the role played by passenger transport. As before, the relationship between passenger transport and economic growth can be shown graphically.

Figure 2.2 clearly shows the very close association that exists between passenger transport and the level of GDP, revealing very similar overall trends to that shown above between GDP and freight transport. Interestingly in this case, the association clearly broke down in the mid to late 1980s, a period in UK economic history which has now become known as 'the Lawson Boom'. This was a period of unsustainable economic growth overseen by the then Chancellor of the Exchequer, Nigel Lawson, and cited as an economic miracle at the time. As the figure illustrates,



■ **Figure 2.2** *Gross Domestic Product and passenger kilometres travelled, Great Britain, 1953 to 2004*

Source: Compiled from DfT (2007) and Eurostat Statistics

however, this ended in recession in the early 1990s. The Lawson Boom as such appears to have effectively halted the closeness of the association between economic progress and passenger transport for some 15 years before it appeared to have resumed in the late 1990s; however, the latest years appear to show a slower growth in passenger travel than GDP.

Looking at Figure 2.2, does this mean therefore that by simply travelling around people become better off? In some ways the answer to that question is actually yes, but due to the derived nature of demand it is obviously dependent upon what they do once they get to where they are going. The question thus again arises as regards the direction of causation, does increased GDP lead to increased passenger travel or is it the other way around? As before, this can be best characterised as demand led and supply led effects.

### *Supply-led effects*

Under a supply-led effect the simple act of upgrading existing transport links will increase passenger travel and thereby increase GDP. It could be argued therefore that with regard to passenger travel there will be no supply-led impacts, all effects will be demand led. In simple terms, if people don't have a motivation (i.e. a need) to travel to a particular location, then building a new road won't make any difference. Over the last few years, however, Britain and many other countries have seen a considerable rise in the commuter belt zone. These are areas that lie around the main economic centres from which people commute. In some ways this is a supply-led effect, as the upgrade of links between the centre and the commuter belt has caused people to move out to those areas. An example of this is shown later in the chapter in Case study 2.2.

### *Demand-led effects*

Unlike freight transport where demand effects can be split down into revealed and latent demand, with passenger travel a third demand effect is present, which can be best described as a derived demand effect. Revealed demand will be shown where the existing transport infrastructure is under pressure, hence clearly displaying a high demand for the movement of people between two given locations. This most often arises in heavily used commuter routes where roads become severely congested and public transport services overcrowded. Economic development therefore may be suppressed due to the lack of sufficient capacity in the transport system. This would be a clear case of the old business adage that 'time is money', and hence time stuck in a traffic jam is time not spent earning an economic return. Improving the transport links therefore removes such constraints and economic development can flourish.

Latent demand in this case relates to where individuals may travel to a particular area but do not do so due to limitations in the transport services. If these limitations are removed, then as with freight, individuals may then make the journey but will only do so if it increases their net benefit, which then indirectly leads to economic progress. A rather simple example would be where an individual may not commute between Bristol and London due to the journey time involved, and also would not re-locate due to social ties and the higher cost of living, particularly housing, in and around the London area. If however a high-speed railway line was to be constructed between the two locations, then with considerably reduced journey times more individuals are likely to make the daily commute from Bristol to London.

As regards derived demand effects, increased wealth generally creates a demand for more leisure activities, or ever more sophisticated leisure activities. Thus as incomes rise, individual's may take two foreign holidays rather than one, and/or have more weekends away from home, thus higher incomes lead directly to increased passenger traffic. A second derived demand factor exists where higher incomes tend to produce a modal switch away from public transport towards private transport, hence increasing the number of multiple-car households. As travel is now 'easier', this will directly increase the level of passenger transport.

### **Case study 2.1 Transport impacts on economic development**

This case study attempts to underpin most of the main ideas outlined in the previous sections by looking at research into the impact of transport improvements on economic development. Whilst so far we have examined the potential impacts that transport can have on economic development, we have not considered the size that such effects are likely to be. By examining these factors, this should also help to tease out further some of the issues in the relationship between transport improvements and economic development.

We begin the case with the considerable amount of research surrounding the American experience of the relationship between highway development and economic growth. Purvis (1985) highlights that this originated from the mass of literature that appeared following the downturn in American productivity and economic growth levels from 1973 onwards. This sparked a considerable amount of research to investigate why this economic downturn had occurred. This brought to the fore issues such as increasing labour inefficiencies, wages effects and energy price increases as all potentially being responsible for the downturn. None of this



literature however mentioned public capital expenditure, and in particular public spending on transport infrastructure, thus largely overlooking this as a potential cause. Gillen (1997) in a review of the literature highlights the work of David Aschauer as changing this whole perspective. Aschauer (1989) examined the relationship between public investment and economic growth over time in order to calculate the elasticity of aggregated output with respect to infrastructure spending, i.e. the extent to which the former changed with respect to changes in the latter. He found that the decline in relative expenditure on public highway infrastructure accounted for around 60 per cent of the decrease in private sector productivity, hence suggesting that transport impacts were considerable. Further studies during this period produced similarly large estimates, with most elasticities falling in the range between 0.3 and 0.6. Munnell (1992) for example, estimated that a \$1 increase in the public capital stock raised output in the economy by \$0.60.

Simply taking the results of this early research would indicate that transport investment has a major impact on economic development. Subsequent literature however has viewed these figures as overoptimistic in the extreme and suggested that what was identified was an association between the two variables rather than a causal relationship, i.e. both variables were dependent upon an unidentified third factor. This has become commonly known as the 'Aschauer Effect' (Ezcurra *et al.*, 2005). Harmatuck (1997) for example agrees that highway infrastructure capital does have an effect on aggregate output and productivity, but suggests that the size of such estimates from previous research are highly questionable. Reworking Aschauer's findings to correct for a statistical property known as non stationarity, Harmatuck produced an elasticity estimate of 0.03 for non-military public expenditure on output, considerably smaller than the original work. This lower figure is confirmed by Gillen's (1997) review, as he highlights that most of the subsequent research reviewed suggests that although public capital expenditure does have a positive effect on output, it tends to be small in comparison to private capital and labour effects.

Whilst such studies indicate the potential impact that transport investment can have on production, they tell us nothing of the processes involved, i.e. how one transmits into the other. In order to come to a better understanding of the relationship between highway infrastructure investment and increases in productivity, the Federal Highway Administration (FHWA) (cited in Gillen, 1997) examined the impact of transport improvements on the performance of 226 manufacturing firms over a seventeen year period from 1969 to 1986. They found that the three principal reductions in production costs as a result of highway improvements arose from savings on inventories, the attainment of scale economies due to the widening of markets and finally a reduction in regional warehousing requirements as a result of more direct deliveries being made. Their research also showed that such savings had reduced over time, suggesting a diminishing return on aggregate investment in highways. This in many ways makes sense, as initial investments in highways are made in the most critical areas.

Harmatuck (1997) also highlights that the return on public highway expenditure will decline over time simply due to the fact that emphasis will switch away from new investment to the maintenance of existing highways – what Americans term the 4Rs of resurfacing, restoration, rehabilitation and reconstruction. Furthermore, research by the Congressional Budget Office<sup>1</sup> in 1991 (CBO, 1991) highlighted that 4R programmes had a higher rate of return than new investment. This is for the simple reason that new roads cannot be built simply for the sake of

building new roads and increased economic activity expected to follow. More acutely, this is the difference between supply and demand led developments, where there comes a point in time when the balance switches between these two effects and the benefits arising out of maintaining existing highways more than outweighs the benefits of new investment.

Similar research has been carried out in a European context, although this has tended to focus on the impact of all transport infrastructure and not just roads, hence has included rail, airport and sea port infrastructure. As an example, Ezcurra *et al.* (2005) used a panel data set to examine the impact of all public infrastructure stock on private sector production costs for Spanish regions over the period 1964 to 1991. In two separate specifications of the function, the authors' firstly examined the impact of public capital stock (which included all public capital in terms of transport, education, urban and health care infrastructure) and secondly the impact of a far more narrowly defined variable that isolated the effect of transport infrastructure stock on production costs. Their estimations also allowed their results to be broken down by the industrial sectors of agriculture, manufacturing and service. What they found was that transport infrastructure effects relating to agriculture were insignificant. This is partly to be expected due to the large spatial dimension in this sector and hence limited demand for the use of transport infrastructure. For the period 1964 to 1976, therefore, cost elasticities were  $-0.004$  in manufacturing and  $-0.029$  in services, and in the period 1977 to 1991 the respective figures were  $-0.01$  and  $-0.043$ . Thus, for example, between 1964 and 1976 a 10 per cent rise in the value of the transport infrastructure capital stock would produce an average of a 0.04 per cent fall in the production costs of manufactures and a 0.29 per cent fall in the production costs of services. In many ways the larger impact that transport infrastructure stock had on services makes sense, as service industries tend to have a higher labour element. Improvements in transport infrastructure therefore are likely to have a larger impact in that sector as a result of the more efficient movement of people.

Rodríguez-Pose and Fratesi (2004) examined the impact of transport infrastructure as part of a far broader remit when they examined the impact of European Structural Funds in under-developed European Union regions (known as Objective 1 areas). What they found was that despite a very high proportion of development funds being spent on transport infrastructure, the returns on these investments in terms of economic development were virtually zero. They found a larger return on development funds spent on education and human capital. In simplistic terms, this may be an indication of supply led effects, which would explain why the investment in transport infrastructure has little impact due to a lack of demand. Under such conditions, however, spend on human capital in the form of training and education is likely to have a far larger effect on economic growth. Another factor to take into account is that many of these regions had an agricultural-based economy, in which we have already seen that the impact of transport developments on this sector can be limited.

As a more direct measure of the impact of transport facilities on local production, Prud'homme and Lee (1999) examined the extent to which time savings in the transport network would result in productivity increases. In a study of 22 French cities they found that an increase in city-wide travel speed of 10 per cent would result in a 2.9 per cent increase in productivity due to an increase in the efficiency of labour markets, suggesting that the efficiency of transport networks have a very large impact on local economic production.

More recent research has focused on the idea of transport's impact on economies of density.

Whilst there may be economies of scale, i.e. advantages in production to larger-sized firms, brought about by the widening of markets, there may also be certain advantages to having firms of a similar nature located close to each other, i.e. economies of density. Rice and Venables (2004) highlight that differences in productivity levels across the UK can in part be put down to differences in industrial concentration. Thus improving the transport links into these industrial centres could increase productivity due to what are known as economies of density. The author's figures suggest that a 10 per cent reduction in average driving times would increase UK productivity by 1.12 per cent. This is based primarily on an elasticity of production with relation to density of 0.05, i.e. the extent to which production increases with economic concentration. This is broadly confirmed by Rosenthal and Strange (2004) in a review of the literature on city size/density and production, where they find a range of between 0.04 and 0.11. Finally, Graham (2005), in research undertaken for the DfT, used a disaggregated approach by industrial sector and geographical region to produce a national average of 0.04, which ranged from a high of 0.193 for Transport, Storage and Communication in the East Midlands, to a low of 0.001 for Public Administration, Media and Other in both the North East and in Yorkshire and Humberside. Two industries produced zero agglomeration economies, those being Primary Industries and Electricity, Gas and Water. This is perhaps no great surprise, as in the former case many of these industries, e.g. agriculture, tend by their very nature to be low density industries in which economies of density are likely to have little impact or in the case of the power and public utilities industries these are fairly evenly spread across the country due to local consumption, hence again little economies of density.

To briefly summarise this case, the size of the impact of transport infrastructure improvements on economic development can vary considerably depending upon the level of industrial concentration, the economic conditions facing the area and the industrial sector being examined. Impacts tend to be at their highest for service industries where there is a high level of industrial concentration. The size of such impacts need to be weighed up when transport developments or improvements are being considered to ensure that the scheme that will be implemented is the one that will most benefit the economy. This is a topic to which we will return when we consider transport appraisal.

## **Decoupling freight and passenger traffic from GDP**

As seen earlier, there is a very close association between both freight and passenger traffic and GDP; in simple terms, in the past increases in economic wealth have been associated with increased transport in all forms. This has now become a major problem, however, as the adverse effects of transport are better known and understood, particularly the negative impact on the environment. Such trends of ever increasing economic wealth and levels of increased transport cannot be continued into the future for a variety of reasons. These not only include negative environmental impacts but also concerns surrounding the use of land. Ultimately there is only so much land that can be used in the production of transport services, as it has a clear finite limit and thus is a scarce commodity. This is particularly true in heavily populated areas, such as in major conurbations or through particular corridors. In a nutshell, such trends are unsustainable as there will come a point when if unchecked there will be no more land available to provide for increased transport services.

This may therefore suppress economic growth as this would be clear evidence of a demand-led effect, however one for which there was no clear solution due to the shortage of suitable land. This in part is widely recognised as the folly of a policy stance known as ‘predict and provide’ (Banister, 2002), where under such a paradigm government’s role is to simply forecast future transport trends and then ensure that the capacity is available to support such levels. The limitations of such a policy approach are now well known and understood. Not only economic factors are present however but also other quality of life issues. For example, can sitting in a traffic jam for 2 hours every day be taken as a sign of progress, or what about living in a highly polluted environment, does this equate with better living? Whilst GDP may be a reasonable indicator of the level of general social progress, it is certainly not without its limitations. The main one being that it assumes that people who are wealthier are automatically better off. Such an assumption however clearly does not hold, as other factors of a non-monetary nature are also present, such as the state of health, the ‘quality’ and availability of leisure time and so on. More time spent in a traffic jam may well result in less time spent with family and/or friends, and hence difficult to describe as ‘progress’.

One of the major issues facing policy makers therefore is what is known as the ‘decoupling’ of GDP from transport, so that GDP can continue to grow without being associated with the same growth in transport levels that it has been in the past. Based on the albeit simplistic evidence presented in this chapter, it would appear that some progress has been made with decoupling freight transport from GDP, with freight levels flattening off since around the late 1990s whilst GDP has continued to increase. As this chapter has also shown, however, the ‘decoupling’ issue is equally applicable to passenger transport. Whilst the Lawson boom of the late 1980s did have a long-term effect on the relationship, we still have rising levels of economic wealth and rising levels of passenger travel. In some cases this may be less crucial, particularly if the transport undertaken is of the derived nature outlined above, i.e. higher GDP leads to higher levels of leisure travel; however, the increase in passenger transport continues to be far more than could be accounted for by such impacts.

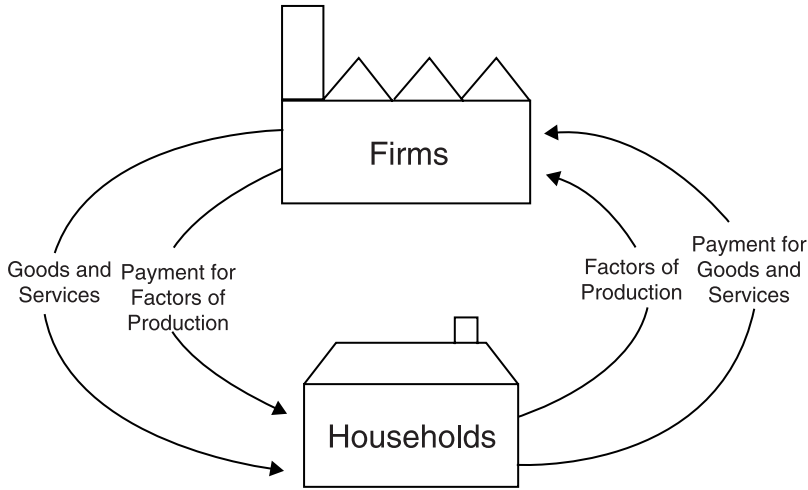
Much of this text is taken up with flushing these issues out to hopefully come to a better understanding of the causes of the problem and the viability of the potential solutions. It will also however consider the other side of the coin, i.e. the constraints that may impact upon the ‘simple’ solutions.

## TRANSPORT AND THE LOCAL ECONOMY

Up to this point we have only considered the relationship between transport activities and the level of economic development at the macro level, i.e. from a national or overall perspective. In this short section we consider the impact and necessity of transport activities to the welfare and basic operation of the local economy.

Presented in Figure 2.3 is a very simplified version of what is known as the circular flow of (national) income which we can use as a simple representation of any local economy, or indeed any economy at any level.

Figure 2.3 is the traditional representation of the circular flow of income which shows the basic economic relationships that exist in the economy. Households provide factors of production in the



■ *Figure 2.3 Simplified version of the local economy*

form of labour, capital and raw materials to firms, who then use these resources to produce goods and services that they then sell back to households. Note therefore that in this rather simplified world all firms are owned by households (a not unrealistic assumption). Households receive payment for providing these factors of production in the form of wages for labour, dividends for capital, interest for finance, rent for property and so on. In simple terms, as more money circulates around the system, this represents a higher level of economic activity and thus a greater level of economic prosperity; in effect the whole system is becoming larger. The diagram therefore also shows how the level of Gross Domestic Product, or national income, can be calculated – either by adding up all household income, all household expenditure or finally by the total value of output of firms. Essentially, in this rather simplified world, all three should equal the same. In reality, however, this is exactly how it is measured, and hence this may help to further explain why GDP has followed such a close path with levels of freight and passenger transport.

In very simplistic terms, any external injection into the local economy in Figure 2.3 will have a greater impact the less of that injection that leaks out of the system. Any intelligent reader however will see where the leakages are likely to occur, as they are essentially the main economic flows that are missing from the figure. Hence, not all money from households goes to firms, some is saved, some is taxed, and some is spent on imports. Likewise, not all firms’ income comes from households, as some comes from banks in the form of loans, some from other firms for the purchase of goods used in their production processes, i.e. capital goods, and some from foreign customers in the form of exports.

What is perhaps not so obvious however is the import role and impact that transport services have on the actual linkages that are shown on the diagram, particularly at the level of the local economy. The transport system, or more precisely an efficient transport system, allows these flows to take place far more easily and leads to more of the actual ‘value’, or wealth creation, to be transferred from one part of the economy to another. As a consequence the benefits of trade can be maximised and the local economy enhanced. If on the other hand the physical transportation

process is inefficient, then more resources are consumed in the production of transport services and are also tied up in the physical transportation of goods from firms to households and labour from households to firms. Less resources, or less of the right type of resources, remain to devote to actual wealth creation. A clear indicator of such a transport system would be one that was heavily congested, hence more resources are needed to produce the extra transport services that are required to move different elements, either goods or people, around the whole system. More significantly, however, more resources are tied up in transit and thus are engaged in unproductive activities. As a result, the local economy will not be as efficient as it could be with better transport links.

This again is the almost classic view of transport as a derived demand, in that wealth is created in firms and the transport role is one of a facilitator that is a necessary but not sufficient condition for economic development. Thus the latter follows the former (i.e. is purely demand led). Indeed this would apply to any service element in that whole process, irrespective if it is transport, legal services, insurance etc. This is an oversimplistic view; however, as with respect to an efficient transport system, this allows any particular good or service to attain its highest economic value, i.e. be positioned where it is valued the highest, thus transport is in effect directly adding to wealth creation. Thus a rare first edition copy of J.R. Hartley's *Fly Fishing* can be auctioned worldwide through eBay in the knowledge that the book can be quickly and efficiently transported to the winner of the auction at a cost that is not prohibitive to the buyer. It will therefore obtain a far higher value than if it was simply advertised locally. Whilst not a particularly good example (as it relates to a second-hand good, hence wealth transfer and not creation), it does clearly illustrate the basic principles that also apply in the case of newly produced goods or services.

To return directly to Figure 2.3, how households and firms are physically linked is a vital element in the whole process. More specifically, at the level of the local economy an efficient transport system allows:

- The easier movement of labour from households to firms
- The easier movement of goods and services from firms to firms
- The easier movement of goods and services from firms to households
- The easier switch of labour from one firm to another and the easier switch of goods and services from firms to households.

Whilst most of these points are fairly clear and have been covered above, the last one is perhaps less obvious. Whilst the first three aspects relate mainly to the current state of the local economy, things seldom remain static for very long. Hence the last point listed above relates to the medium and longer terms. Using labour rather than goods as an example, the easier it is for labour to move from one firm to another, the more efficient will be the local economy and the greater the level of local economic development. This is because it will assist the transfer of labour from one firm to another and increase the odds that the person employed in any vacancy will be the most highly qualified person for that particular post.

An alternative way of thinking about the role of transport in the local economy is the extent to which the multiplier effect is allowed to function at the local level from any external injection. The better the physical links within the local economy, then the easier it is for the benefit from any external injection to spread out and have a full impact and thus less is lost in the transfer. In simple

terms, at the level of the local economy an efficient transport system allows a greater physical separation of production and consumption, without which we would all still be living in caves!

One may rightly argue that this is an oversimplification that overstates the importance of transport in the operation of the local economy as it completely ignores the issue of location, and particularly locality decisions. Many theorists such as Weber (1909) and Hotelling (1929) would both suggest that firms of a similar nature will tend to be located near to each other for a variety of reasons. In the case of Weber, these are based primarily on the location of raw materials (which for our purposes we can extend to skilled labour) and the location of the market. Inevitably, therefore, firms in the same industrial sector are likely to come to similar decisions regarding the ideal location. Thus, for example, we end up with Silicon Glen in California or even the Golden Triangle of Motor Racing in South East England (where most of the current F1 teams are based), or in past days the agglomeration of shipbuilders on the Clyde or car manufacturers/accessory firms in the West Midlands. Such location decisions by and large overcome some of the problems associated with transport deficiencies. Indeed, these have been used as an argument for improved transport links in order to create such industrial 'clusters' (as was shown in Case study 2.1). Clearly however there is a balance somewhere between the two, which at some point tips one way or another. For example, without significant improvements in transport services we would still have shipbuilders on the Clyde and a large motor industry centred upon Birmingham. Furthermore, the decision of Guinness to close its London brewery at Park Royal in 2005 and ship all its beer directly to the British market from Dublin, is a classic example where the improvement in transport services has over-ridden original location decisions. Whilst this closing discussion on location does perhaps go slightly further than just the local economy, clearly the trade-off between location and transport issues is no more acutely felt than at the local level.

### **Case study 2.2 The local economy, transport and the Edinburgh housing market**

The case study concerns the problems surrounding the Edinburgh housing market. Whilst initially this may seem to have little to do with transport and/or economic development, the link should become clear as the case evolves, particularly the relationship between transport facilities and the local economy. Listed below in Table 2.1 are the top twenty (of thirty-two) average house prices in Scotland between April and June 2008.

As can be seen from the table, on average the city of Edinburgh has the highest house prices in Scotland. Of the 20 local authority areas shown, however, it has experienced one of the lower rates of increase over the preceding year, at 5.9 per cent. Despite the onset of falling house prices in the British housing market due to the credit squeeze, house prices in Edinburgh appear to be holding up better than most areas in Scotland. Nevertheless, this is partly as a consequence of the housing market problems in Edinburgh and the general 'overheating' of the market. If house prices are higher in Edinburgh than elsewhere in the country then fewer people can afford to live there. Local employers therefore may struggle to fill vacancies, not only at the lower end of the labour market but also in the middle and higher income categories as those best qualified are put off by higher housing costs. This will have two possible direct impacts upon the local labour market. Firstly, it may result in wages rising in order to attract the 'right' people.

■ **Table 2.1** Average house prices by local authority area, top 20, Apr to Jun 2008

Rank	County	Aver price	Quarter	Annual
1	Edinburgh, City Of	221209	6.3%	5.9%
2	East Renfrewshire	215805	7.1%	6.2%
3	East Dunbartonshire	198352	10.2%	8.9%
4	Aberdeenshire	197353	5.4%	12.0%
5	East Lothian	192747	3.8%	0.1%
6	Perth And Kinross	178701	5.3%	10.8%
7	Stirling	178249	-8.5%	2.5%
8	Aberdeen City	173730	1.7%	4.7%
9	Midlothian	170889	4.2%	1.3%
10	Scottish Borders	162988	-2.3%	1.0%
11	Highland	160130	2.4%	9.4%
12	South Ayrshire	147439	-4.8%	-4.0%
13	West Lothian	145729	5.3%	3.1%
14	Argyll And Bute	145364	1.0%	-1.9%
15	Angus	144787	5.8%	2.3%
16	Dumfries And Galloway	142971	3.3%	7.1%
17	Fife	142197	4.0%	9.0%
18	Moray	141411	2.6%	5.7%
19	Glasgow City	139371	1.1%	-1.5%
20	South Lanarkshire	135801	0.5%	3.9%

Source: Edited from BBC (2008)

Higher wages are required to offset higher house prices or the increased travel costs and inconvenience factors (mainly time) encountered in order to work in the Edinburgh area. The second possible effect is that lesser qualified, but 'available', individuals will be employed. Either way, the local economy in the longer term may suffer through higher costs in the production of goods or services. This will either be as a direct consequence of paying higher wages or indirectly through inefficiencies caused by the employment of underqualified individuals in posts to which their abilities and skills are not best matched. Clearly this is an oversimplification of the issue, as for example there also exists the rented sector of the housing market as well as the 'development' of less prosperous but 'emerging' areas within Edinburgh itself; nevertheless it does bring the issues into clearer focus.

If Edinburgh cannot always draw on the local labour market, therefore, firms within the city will have to look further afield to attract the 'right' kind of people at the 'right' kind of wages. Part of the problem however is Edinburgh's physical location, as to the immediate north of the city lies the Forth estuary and to the south the Pentland Hills with the largely rural Borders area beyond that. The nearest crossing point on the Forth estuary lies six miles to the west of Edinburgh. This consists of a road crossing that opened in 1964 that is now managed by the Forth Estuary Transport Authority (FETA), and a rail crossing, the Forth Bridge, now maintained and operated by Network Rail.

This severely restricts access to the North, with long delays experienced on the road bridge around peak period times, which begin at around 7am in the morning and last long into the early evening. Nevertheless, Dunfermline to the north of Edinburgh continues to be an attractive



commuter zone for the city. As can be seen in Table 2.1, house prices in Fife, the county in which Dunfermline lies, are considerably less than in Edinburgh. Not shown by the table however is the quality of the housing stock, hence not only is the average price lower in Dunfermline, but almost certainly the average size of property will be considerably larger, particularly with large areas of new build over the last twenty years or so.

Given these constraints, it is also perhaps not surprising that East Lothian, which lies to the east of Edinburgh, also has relatively high house prices, lying fifth in terms of Scottish counties. Surprisingly, however, West Lothian, to the other side of Edinburgh, has not. Part of this difference in house price increases will be due to the different nature of the two areas. West Lothian traditionally had a high reliance on the mining industry whilst East Lothian tends to be far more rural. The difference in the average housing price therefore will also be due to major differences in the housing stock in the two areas, with the latter tending to have a far higher percentage of larger properties. Nevertheless, some of this difference may also be put down to the transport links between the two counties and Edinburgh. The east side tends to be less congested on the approach roads. The west side of the city on the other hand has far more population, with commuters coming from as far as the west of Glasgow, and hence links to the west tend to come under far more pressure.

Given the above factors, it is perhaps not surprising that Edinburgh was the third city in the UK to seriously consider introducing a congestion charge within the city boundaries. This was put to a public referendum in October 2005 but was unsurprisingly rejected by an overwhelming majority (almost 80 per cent), hence such plans have been abolished and other options considered.

To summarise, this case has outlined the overheating housing market in Edinburgh, heavy congestion in the city centre, and increased pressure on transport links to the north and west of the city. What is outlined below are the main transport initiatives currently being undertaken to help overcome these problems:

- 1 A second Forth road crossing. After much debate and discussion the approval for a second road crossing across the Forth was given in February 2007. Serious doubts currently exist concerning the available capacity of the existing bridge in the future, due to the condition of the suspension cables, which have been found to be suffering from corrosion. At the time of writing, it is not yet known whether the cables can be repaired or not. Nevertheless, given the long lead time for such projects (the second crossing is not expected to open until 2016/17), approval has been given. In terms of our understanding of the relationship between economic development and transport, this would be clearly seen as a demand led scheme. Current capacity is under severe strain, and hence it could be argued that economic activity is being limited by the capacity of the bridge.
- 2 Re-opening of the Waverley Railway Line to the south of Edinburgh. The Waverley line ran south from Edinburgh and was a late casualty of the Beeching era of rail closures, closing in early 1969. The line originally extended through the Borders and continued on to Carlisle. Ever since its demise, however, it has been broadly recognised as a rail closure too far. Approval for the re-opening of the line as far as Tweedbank, 60 miles south of Edinburgh, was given in June 2006. One of the major driving forces behind

this initiative has been to improve links between Edinburgh and the Borders and to bring the Borders area into a viable commuting distance of Edinburgh. Road links in the area tend to be limited, with few if any dual carriageways and only low grade 'A' roads. The promoters of the project claim there will be £130m investment in new housing stock associated with the project (Waverley Rail Partnership, 2007). They also predict that the project will result in 1,800 new homes in the Borders and Midlothian as well as greatly enhancing the already proposed 2,200 new houses in Shawfair just to the south of Edinburgh. The Waverley line re-opening can be clearly viewed as a supply-led development, as this may lead to some population shift to the Borders and 'enable' some of the wealth being generated in Edinburgh to be spread to the Borders area. Indeed the project's promoters estimate that £285m will be injected into the Borders economy over thirty years and within 5 years 550 sustainable jobs created in the area.

- 3 LRT. The third project highlighted in this case study is the construction of a light rapid transit system in Edinburgh under the title of 'Trams for Edinburgh'. Like most cities in the UK the tram system was decommissioned in the 1950s, 1956 in the case of Edinburgh. The new LRT system is to run from the Airport on the west side of Edinburgh, through the city centre and down to Leith on the north east of the city. After much controversy over the real necessity of the scheme, the project was finally approved in March 2006 with construction beginning in late 2007 and an expected opening in 2011. The scheme's promoters, Transport Initiatives Edinburgh (tie), cite the forecasted increase of 30,000 new jobs in the city by 2015 as one of the main reasons for construction of the LRT, as well as the linking with several park and ride sites to the city centre (tie, 2007). Unlike the first two projects highlighted in this case, this last one is not concerned with connecting Edinburgh to its environs and improving accessibility between the two, but rather is a city-located scheme. The link between the two however should be clear, as if more individuals are to be 'pulled' in from outlying areas then they need to travel reasonably freely around the city. This last transport initiative can be primarily viewed as a demand led initiative, as whilst bus services are on the whole heavily used, with some exceptions they are not under pressure, whilst the transport infrastructure, namely the roads, are. It does however also have some strong aspects of supply led characteristics, as improving links into the city will result in increases in travel around the city.

Whilst the case highlights the problems facing Edinburgh and how transport links and projects can in part assist to overcome some of these issues, Edinburgh is far from unique. Other parts of the UK and continental Europe have the same kind of problems with transport developments being used to assist in overcoming many of these issues.

## TRANSPORT AND SOCIETY

Whilst the author may be biased in their view of the importance of the study of economics, particularly the essential part it plays in understanding 'the world' as we know it today (!), we finish this chapter with a brief look at transport's role in the development of society. Whilst one

may argue that the economy is the system by which society provides for its material needs and wants, society as such is more than just an economic system but operates at a higher level and includes governance issues, social interactions and individual motivations. Therefore, it is important to look at transport's role in the development of society as a whole.

Outlined below is a psychological theory that dates from 1943 known as Maslow's Hierarchy of Needs. This was named after the American psychologist Abraham Maslow, and was a fairly early attempt at explaining human motivational behaviour, in much the same vein as the equally controversial Sigmund Freud and his notion of the id.

Whilst not our main concern, the main thrust of the theory is that an individual is motivated by a series of needs which are in the form of a hierarchy. Thus an individual's prime motivational drivers move to the next level as each prior group of needs are satisfied. Hence the first group of needs are the basic essentials of life, thus in order to survive an individual needs to meet their hunger and thirst needs. These are primarily physiological rather than psychological needs, i.e. a must. Once these are met, then the individual may wish to secure such requirements into the future, hence this brings in to play issues of security and protection. Once these are secured and thus the individual is living in a reasonably 'safe and plentiful' environment, then they may want a bit more out of life, and thus move on to psychological needs or even sociological needs – the company of others, the love of others and a sense of belonging. This may then change from a simple membership role to a leading role, hence bringing in issues of self esteem, recognition and status. The very top of the hierarchy is 'self-actualisation', which is said to be about how people think about themselves; some debate however surrounds what is actually meant by the term 'self-actualisation'. A simple view would be the individual's achievement of their full potential.

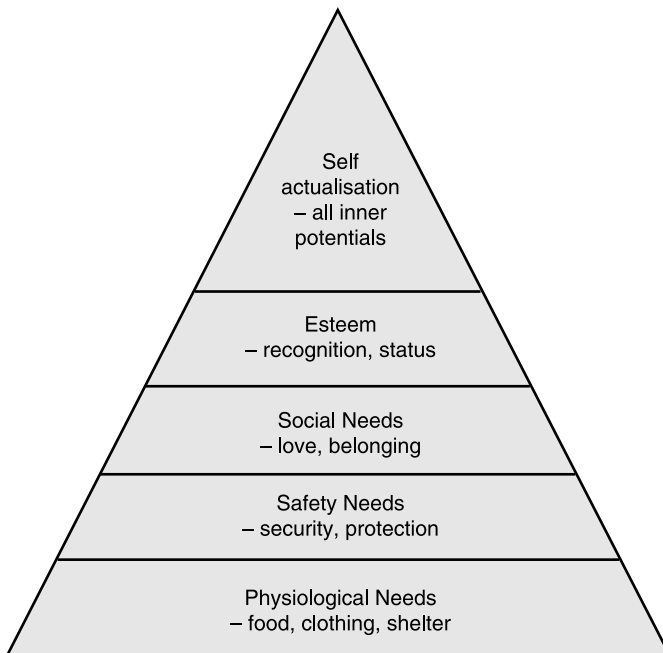


Figure 2.4 Maslow's Hierarchy of Needs

Whilst heavily criticised as unrealistic and far too simplistic at the individual level, Maslow's hierarchy of needs tends to have more credence at a societal level, and what may motivate societies, and consequently, societal development. Hence basic societies are primarily concerned with providing the essential requirements of food, water and shelter, with some even struggling to do this. Assuming these needs are met, however, then some sense of protection and society stability may be sought, and then once that is achieved the society may develop along a route which gives it a wider sphere of influence, hence allowing it to begin to influence factors beyond its borders. In the days of nations, this would be evidenced by higher levels of global influence through bodies such as the United Nations, the aforementioned World Trade Organisation and the G8, or even in more basic terms through sheer military might. This may then progress into a leading role in such bodies and then ultimately what is known as 'hegemony', or simply THE lead role. Britain for example is said to have had global hegemony from around the Industrial Revolution in the 18th century until World War II, after which it has been surpassed in terms of global influence by America.

Transport's role in societal development should now be clearer. In simple terms, the higher up the hierarchy then on the whole the higher the demand for transport, as generally these needs will require to be sought from further afield. Furthermore, increased and more sophisticated transport systems make meeting the needs of the lower levels of the hierarchy far easier. Hence for example transport allows specialisation and therefore individuals can concentrate and develop skills in a particular area (for the greater good), and all within the society need not be concerned with providing the basics of life. It also means that less time needs to be devoted to providing for such essentials and more time given over to nurturing and maintaining social relationships. Through such a course, the society as such is far more likely to achieve its full potential. Transport therefore not only has a vital role to play in economic development but also in the more general progress and development of society and to a certain extent will help to shape the degree to which it can reach its full potential.

## CHAPTER SUMMARY AND REFLECTION

This chapter has examined the link between transport and economic development. Whilst not a direct topic of the book, it is important to realise that all transport services, whether passenger or freight, do not operate in a vacuum and hence transport 'problems' are not problems for their own sake but rather need to be viewed from an economic or social context. Thus we first examined the relationship between transport and economic development and found that economic development has been closely associated with increases in both passenger and freight transport. This highlighted that one of the major issues facing transport policy makers and planners today is what is known as the 'decoupling' of economic growth from transport, as for a number of reasons highlighted in the text such increases in transport are simply unsustainable. Overcoming this problem however is dependent upon understanding the basic relationship between the two; thus does transport act as a supply-led determinant (i.e. leads to economic development), or is transport a demand-led factor (i.e. needs a basic demand)? Finally in the chapter we briefly examined the role of transport as part of a more general societal development, and saw that generally higher levels of society development could be associated with the provision of more transport and importantly more efficient forms of transport. In other words, transport is important.

## CHAPTER EXERCISES

### Exercise 2.1 Supply and demand led transport initiatives

- a) Listed below are nine major transport projects from the very old to the very new and even those that are currently still at the planning stage. Whilst it is difficult to clearly define such projects as either demand led or supply led, some will display more characteristics of the former whilst others will be more akin to the latter. In this exercise you are asked to simply divide these into these two categories and to consider the reasons why you came to that particular view. Note that in many cases you do not need to know the specifics regarding the particular transport project to come to an educated guess.
- CrossRail – this project is to build two new railway connections under central London. CrossRail 1, approved in 2007, will run east–west and is due to open in 2017. It will complement Thameslink services, which commenced north–south rail services through the re-opened Snow Hill tunnel in 1989.
  - The Channel Tunnel that was opened in 1995 and links Britain to France
  - The opening of the M6 Toll motorway around Birmingham in December 2003, thus effectively providing a Birmingham by-pass and considerably reducing through journey times.
  - The Great Belt Link, opened in 1995 between the island of Zealand and (in effect) the rest of Denmark, and providing a road and rail link.
  - The Skye Bridge – this linked mainland Scotland to the island of Skye and was opened in 1995, originally with a highly controversial toll (i.e. only slightly cheaper than the former ferry fare) that was eventually abolished at the end of 2004.
  - The Golden Gate Bridge across the opening of San Francisco Bay, completed in 1937, which provided the first fixed link northwards out of San Francisco.
  - The opening of phase one of the high-speed train line (the TGV Est) from Paris to the west of Nancy in June 2007. The line is also served by Germany’s Inter City Express (ICE) high-speed trains. Phase two, which will take the line all the way to Strasbourg near the German border, will not be completed until around 2014. TGV Est is sometimes referred to TGV EstEuropéen.
  - The construction of a container terminal at the port of Mundra on the Gujarat coast in North West India. This will be the port’s first container terminal.
  - The Jubilee line extension, opened in 1999, which connected the London Underground system to then developing Docklands area in London.
- b) From the examples listed, what overall conclusions can you draw regarding supply led and demand led transport initiatives, particularly the balance between the two?
- c) In the case of the Skye Bridge, did the imposition of a high toll make a difference as to which effect was stronger?

## Exercise 2.2 Transport and your local economy

- a) Think of your own local business environment, and the main transport initiatives or projects that have been undertaken over the last 50 years. As a side note, you do not need to be over 50 to do this exercise(!), simply consider all projects undertaken in what could be considered to be the modern era. These should not be too difficult to identify. Think of the extent to which these are demand or supply led initiatives, firstly at the (rough) time of construction and secondly in the present day. As an example, the Forth Road Bridge cited in the above case study, would have been mainly supply led at the time of construction in 1964 in order to create a more direct link from Edinburgh to the north. Now, however, the bridge would undoubtedly be demand led due to the resulting increased commuter belt zone that its construction created in the longer term.
  - b) Probably a valid criticism of transport planning is that too much onus is given to the potential impact of grand schemes and not enough attention paid to smaller initiatives. In this part of the exercise, therefore, you should consider the role played by individual transport modes, both in terms of public/private and passenger/freight, to the functioning of your own local economy/wider society. You should consider the role played by each mode and the 'function(s)' that it fulfils with regard to economic activity and society interaction. How do you see these roles or functions changing over the next 20 years?
  - c) Re-visit part (b), except in this case draw comparisons with another area or city that is familiar to you. Do you come to any different conclusions regarding the functions of particular modes of transport? If so, why so, if not, why not?
-