

Traffic reduction in Oxford: A case study of Oxford city and county

Tim Pharoah 1996

This paper formed one of a number of case studies of traffic reduction policies included in chapter 3 of:

Apel, Lehmbruck, Pharoah and Thiemann-Linden, 1997, *"Kompakt, mobil, urban: Stadtentwicklungskonzepte zur Verkehrsvermeidung im internationalen Vergleich"*, Deutsches Institut für Urbanistik (DIFU), Berlin.

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1 Introduction

This is two case studies in one. First, Oxford city provides an example of one of the few British cities to have applied traffic restraint policies over many years. Second, the city region (Oxfordshire County) allows an examination of "compact city" and "growth pole" models of urban growth, which were adopted almost 20 years ago. The latter is informed by data on the travel patterns of people in new residential areas, and of one of the growth pole towns, namely Witney, where the author has undertaken special surveys. Each case study is dealt with in turn, followed by a concluding section which sets out the main issues and findings.

2 Description of Oxford

Oxford, an historic city of 110,000 people, lies about 90 kilometres north-west of London in the centre of Oxfordshire County. The County may be regarded as the Oxford city region. It is a mainly rural county with a population of about 450,000, forming the main catchment of Oxford's regional shopping, employment and cultural facilities. There are several other free-standing towns in the county, and numerous villages (see Figure 2).

The structure of Oxford city is rather unusual, related to its location at the confluence of the Thames and Cherwell rivers. The flood plains of these rivers have meant, on the one hand, that Oxford's main districts are physically separated and, on the other hand, that highly valued open space reaches right into the centre of the city. While the older urban districts (pre-1930) are fairly dense and compact, they do not follow the conventional "concentric ring" pattern of development. West of the River Cherwell development took the form of fingers reaching out northwards, and to a lesser extent south and west, from the historic core. East of the Cherwell there are less constraints and the city spread in a more conventional way, gradually enveloping older villages and hamlets. These two halves of the city have historically been joined at the ancient crossing point of the River Cherwell, Magdalen Bridge. The completion of the outer ring road, and another river crossing in the

southern suburbs in the 1960s, has lessened the significance of Magdalen Bridge in the overall structure, but it remains as the main access to the city centre for almost half its catchment population.

The trend of population dispersal in Oxford can be seen from data for 1931 and 1939. In this period the four inner wards lost 10 percent of their population, while the outer wards grew by 62 percent.

The city structure has created severe problems for the city in trying to reconcile the conflicting demands of motorised mobility and environmental protection of the city centre. The main difficulty has been in trying to provide an inner ring road (a solution adopted in many similar sized towns) which inevitably would destroy a highly valued feature of historic Oxford: namely the riverside open spaces and historic buildings which complement each other in unique fashion.

Oxford University is one of the oldest and most famous in the world, and still is a major force in local planning and politics. But Oxford has another and totally different social side generated by the auto industry, which grew up by chance in Oxford in the 1920s. The major car plants were located at Cowley, on the south east fringe of the city, where housing and other facilities also grew up.

3 Perceived problems and motivation for traffic reduction

There are two main perceived environmental problems. First, environmental conditions in the centre of the city, in particular noise, air pollution and intrusiveness of motor traffic, including buses. Second, the need to protect from development, areas of high agricultural and landscape value around the city. A Green Belt restricting the outward spread of Oxford was designated in 1967.

Air and noise pollution is seen as problem in the central area, and especially that caused by buses in main shopping streets. The number of buses is excessive, especially since deregulation in 1986. "Competitive scheduling" between the two bus operators means that excess capacity is provided, and services are uncoordinated.

Another main concern is congestion on the radial roads leading to the city, and on the outer ring road. Elsewhere the general growth in car traffic has not until recently been perceived as a major problem.

The following problems have been quantified in the central area:

- Accidents
- Buses (waiting times, reliability, "bus hours" spent in main shopping streets)
- Nitrogen dioxide levels
- Conditions for those with impaired mobility

Elsewhere there has been little quantification of problems apart from road accidents.

There are no targets set for traffic levels, traffic reduction or pollution. Objectives of both the City and County councils tend to be expressed in general terms, without reference to specific levels, locations or time-scales.

4 Oxford city policies

The City Council, following the election of a Labour administration in 1972, adopted a Balanced Transport Policy (BTP) which has been sustained and from time to time strengthened. The BTP rejected major road-building and car parks in the city centre in favour of “balanced provision for public and private transport, pedestrians and cyclists”. The main policy components of the BTP remain as follows:

1. Restrain traffic in the city centre, by limiting parking in new developments, and by controlling and charging for public parking to discourage long-term parking;
2. Residents’ parking in a ring around the city centre, to avoid any “spill over”;
3. Provide priority for buses and cycles on radial routes into Oxford;
4. Provide park-and-ride to limit peak hour radial traffic, and as a substitute for city centre parking;
5. Increase capacity of the Ring Road to reduce congestion at junctions and on radial approaches to them;
6. Enhance the pedestrian environment and special character of the city centre by removing traffic from and redesigning certain important streets.

A summary of the measures included in the BTP is given in the County Council’s bid for Government grant under the title, “Oxford Integrated Transport Package” (Oxfordshire County Council, 1996). This described a package of measures and expenditures based on a consultant’s study.

“It consists of an integrated package of measures to be introduced incrementally over 5 years. The main features are public transport improvements, enlargement of the very successful park-and-ride system, improvements in road safety, better provision for cyclists and pedestrians, restraint of private vehicles and some highway measures to cater for re-routed traffic.”

“Measures to improve safety and environmental conditions in the centre of Oxford will follow the diversion of buses from Cornmarket Street and the closing of the High Street to through traffic.”

“It has the full support of both County and City Councils and a recent public meeting confirmed overwhelming public support” (Buchanan and Partners, 1993).

Proposed road closures in the city centre are expected to have favourable environmental consequences in the centre, including a reduction in air pollution due to an estimated reduction in fuel consumption of 300,000 litres per year. This would also reduce CO₂ production by an estimated 718,200 kg per year, but this does not take account of possible traffic diversion.

It is recognised that “the main objectives of central area environmental enhancement, improving road safety and reducing radial route traffic can only be accomplished by introducing additional measures to shift the choice of transport mode further away from the car to public transport, cycling and walking”.

The plan proposes that the “pull” measures should be introduced before the “push” measures. Thus expanded park-and-ride and radial road bus priority measures will be implemented before further reductions in central area parking capacity. The aim is to reduce peak traffic on each of the radial roads by 10 percent before the city centre road closures are implemented. Extra road capacity will also be provided on roads expected to have additional traffic, even after allowing for mode shift.

Bus priority is seen as “a key component of a strategy which seeks significant modal transfer”. The measures are designed to help buses on the radial routes to and from the park-and-ride sites. A 50 percent increase in the park-and-ride parking supply is proposed over 5 years, to be funded partly by developers (Oxford operates a policy of “commuted payments” whereby developers in the city centre pay in lieu of parking provision). On the western radial, better access to the park-and-ride site, and bus priority through the use of bus-activated signals (not until now used outside London) have been provided.

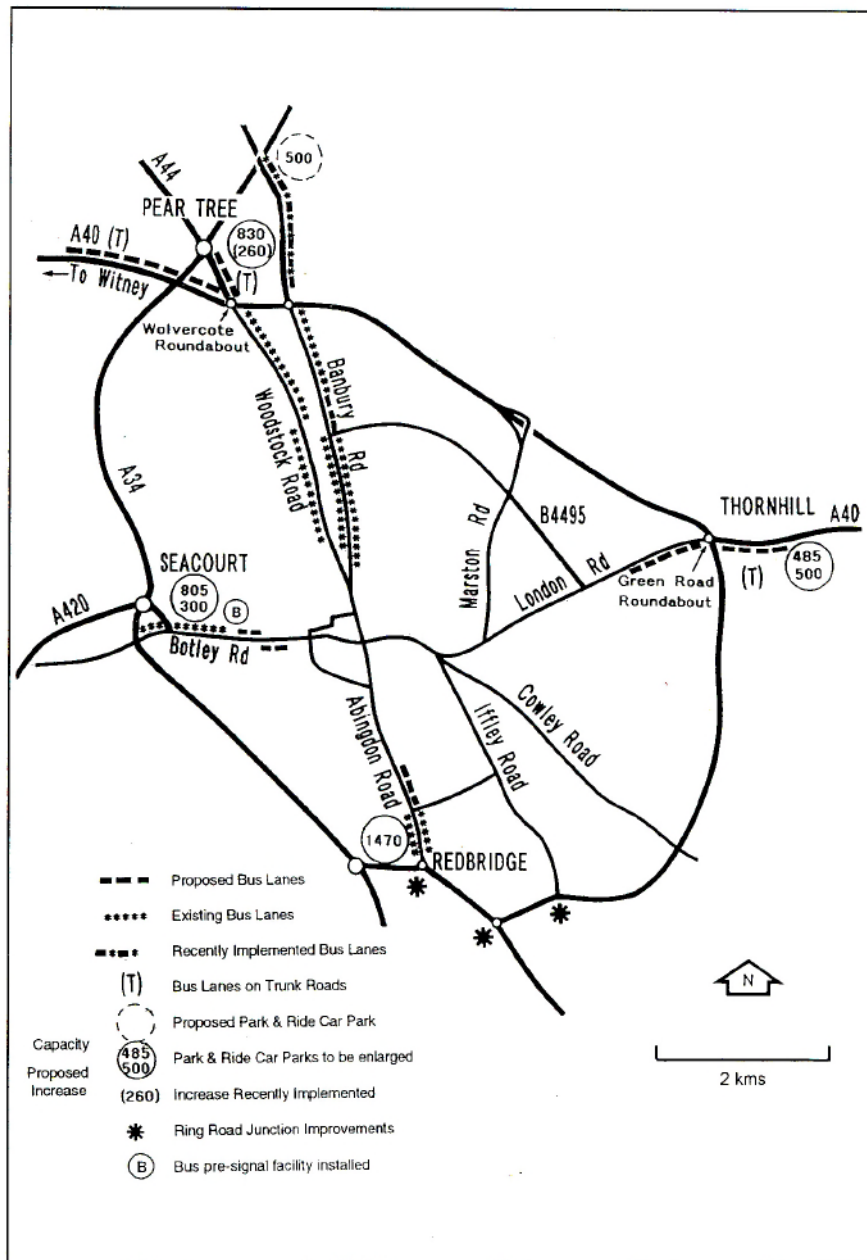
Road improvements are planned to enable buses and cyclists to be protected from the expected worsening traffic congestion on the southern radial (Abingdon Road). Other road improvements are designed to enable a bus lane extension on the northern radial (Banbury Road), to improve conditions between the railway station and the city centre, and more capacity on the southern part of the ring road.

A large number of cycling schemes are planned throughout the city.

The remaining 24 hour free parking in the inner parts of the city will be removed “to reduce radial route traffic”. Transfer of parking enforcement from the Police to the City Council is expected to bring improvements.

Measures to slow traffic are planned to avoid certain areas being used as rat-runs, in particular east Oxford and the university Science area of the city centre. Traffic calming and other measures are planned to take advantage of the reduced traffic in key city centre streets.

Figure 1: Oxford integrated transport package key measures being used to limit traffic to central Oxford*



*Source: Oxfordshire County Council, Transport Policies and Program 1997-1998, Oxford 1996, page 6.

5 Evaluation

Economic impact of traffic restraint

Oxford may be regarded as a prosperous town. Gross Domestic Product (GDP) per capita in the sub-region of which Oxford forms part is similar to that in Germany as a whole, and slightly above that for the UK as a whole. Examples of regions in Europe with similar GDP per capita are Belgium,

Denmark, and the city of Utrecht (Oxfordshire County Council, 1995). Oxfordshire also has an unemployment rate which is below that of the south east region, and also below that of neighbouring counties (Oxfordshire County Council, 1993).

A report from the Investment Property Databank (1995) shows that Oxford is one of 60 major retail centres in the UK outside Greater London, and a major office centre (one of 49 in the UK outside Greater London). The economic viability of the centre appears to be stable, though there is conflicting evidence on this point. One report indicated that retail rents were the second highest in the country (private communication with Oxford City Council, 1995).

Another rated Oxford's retail performance (ratio of investment to capital and revenue returns) at 84th out of 243 town centres (Investment Property Databank, 1995). The recently appointed Town Centre Manager has said that eight major stores had invested £13.75 million in their Oxford stores in 1995 (Planning Week 23/11/95). There is certainly continuing debate about the importance of car access to the centre's viability.

The town is not considered to be a major industrial centre, especially since the loss of 35,000 jobs in the auto industry in the 1970s and 1980s (Oxfordshire CC1995). But this decline has been in Cowley and other suburban areas mostly unaffected by traffic restraint.

Although it is not possible to distinguish the economic impact of traffic restraint from other trends in the economy, there is no reason to suspect any negative impact of city centre traffic restraint measures.

Traffic impact of the "Balanced Transport Plan"

No targets have been set by either the City or the County for transport or environmental impacts, so objective measures of achievement are difficult. Nevertheless, some impacts of the Balanced Transport Plan on travel to the centre of Oxford can be described.

The stabilisation of traffic levels in Oxford city centre, and on the radial roads at peak hours, may be regarded as a success of the BTP and has been achieved without any reduction in the total numbers visiting the centre, either for work or for other purposes. Traffic flows to and from the city centre have been stabilised, and the traffic levels recorded at the city centre cordon in 1992 were similar to those in 1967. The trend in vehicle flows across the inner cordon (of which Magdalen Bridge is part) is shown in Table 1.

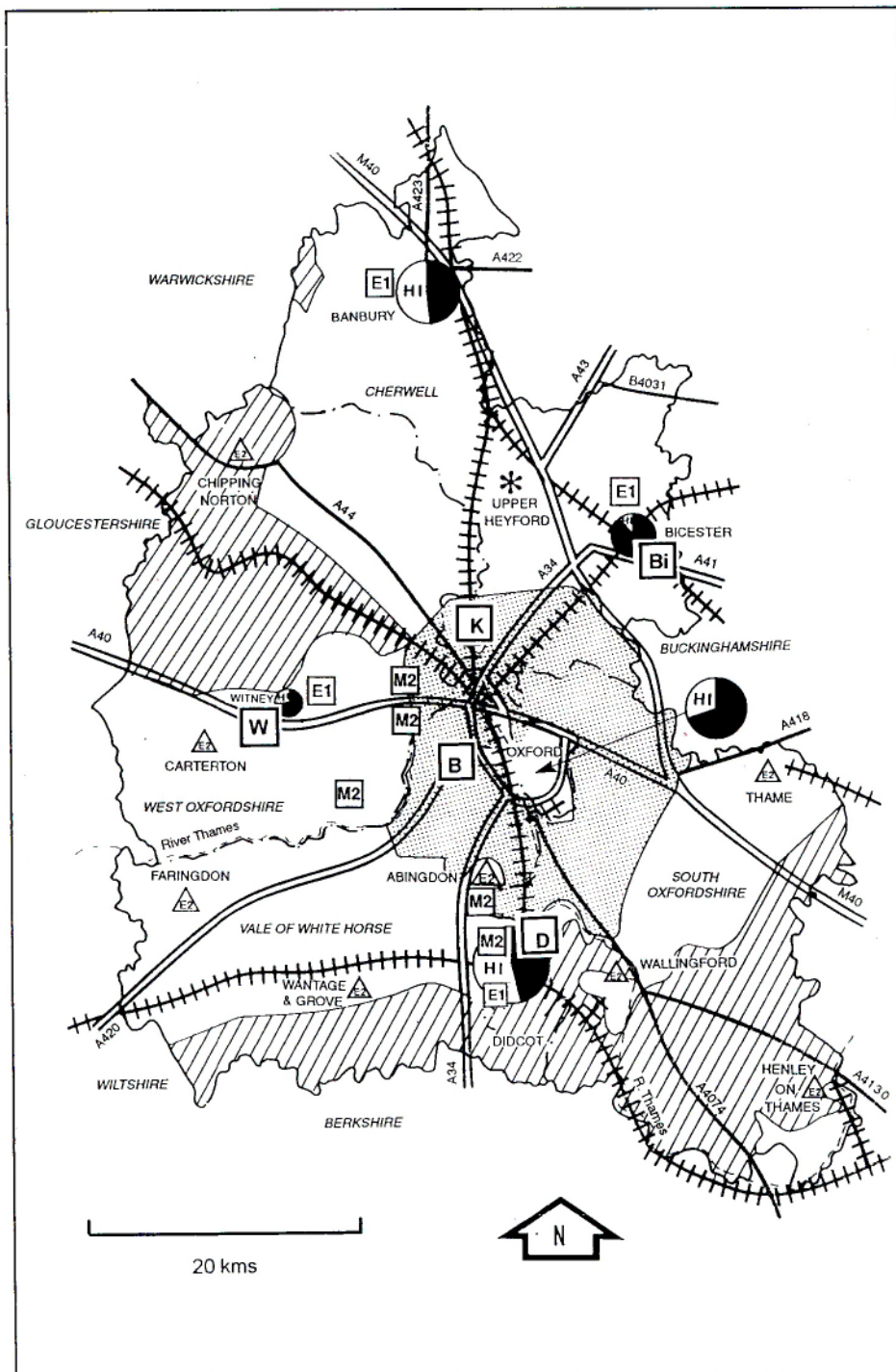
Decreases in the period 1980 to 1983 are thought to be due to various traffic management changes, as well as economic factors.

The mode split of city centre traffic is known only for 1992 (see Table 2).

The park-and-ride (P+R) system is the longest established bus-based system in Britain, and over twenty years has shown steady growth, and intercepts 17

percent of trips by car coming from outside the city to the centre, accounting for 11 percent of all person travel to the centre (Oxfordshire County Council, 1993). This has helped to moderate the growth of traffic on the radial routes, especially at peak hours. Provision of parking spaces at the P+R peripheral sites is estimated to cost half that on land close to the centre, and one tenth the cost of a space in a multi-storey garage (Jones, 1989).

Figure 2: Oxfordshire structure plan key diagram*



*Source: Oxfordshire County Council, 1996, Oxfordshire 2011: Structure Plan Deposit Draft, Oxford 1996.

Key to Figure 2

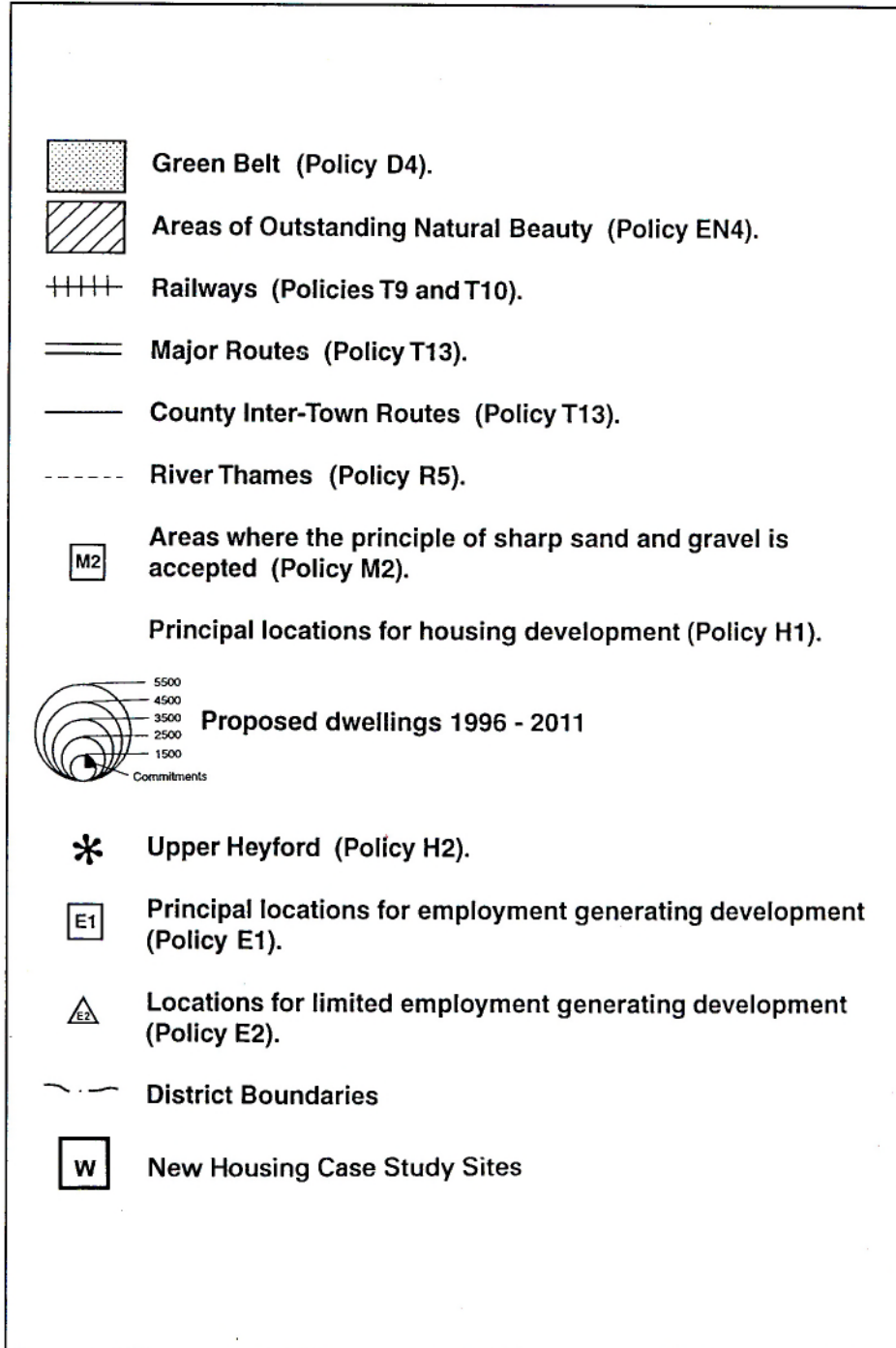


Table 1: Average weekday flows across Oxford inner cordon 1957-1992*

Year	Vehicles per day
1957	85,000
1960	114,000
1967	118,000
1972	120,000
1977	120,000
1982	110,000
1987	120,000
1992	118,000

*Source: Oxford City Council.

Table 2: Mode split of city centre trips, average weekday (7 am to 7 pm), 1992, in %*

	All trips	Work trips (35 % of all trips)
Private motorised	35	44
Public transport	33	33
Cycle	15	10
Walk	17	13

*Source: Colin Buchanan and Partners, Oxford Transport Study, Oxford 1992.

Parking

The policy for over 20 years has been to reduce the amount of long stay (commuter) parking in the city centre, and to offer park-and-ride parking at the edge of the town as an alternative. There is little doubt that car commuting to the city centre has been squeezed, and this probably explains why peak hour radial traffic has stabilised over the years. On-street parking has been drastically reduced, and almost half of the remainder has now been converted to residents' only use. Public off-street parking has not increased, and charges are imposed to deter all-day parking. The charge for 8 hours or more in 1996 was £13.50 (around 35 DM), which rules it out for most regular commuters. The addition of 3,000 P+R spaces has replaced only half the city centre reduction, which means that overall public provision has fallen by about a third.

The problem, however, is that private off-street parking is not subject to the same control. Despite limits on the parking required in new developments (whereby developers have to pay towards P+R parking) this has increased by 4,000 spaces, and in total accounts for two thirds of the total city centre parking stock. According to a survey of 26 historic towns (Thompson and Jacombe, 1985), Oxford and Cambridge had the highest proportion of parking spaces in private control, probably due to large provision within the colleges.

Changes in the parking stock are shown in Table 3.

Table 3: Parking supply changes in Oxford city centre, 1966-1992*

	1966	%	1992	%
Public on-street	8,000	50	2,000	11
Residents on-street			1,200	7
Private off-street	6,000	37	10,000	55
Public off-street	2,000	13	2,000	11
Park-and-Ride			3,000	16
Total	16,000	100	18,200	100

*Source: Oxford City Council.

The control of public on-street and off street spaces to favour short-stay parking will have increased the turnover of cars per available space, but the reduced availability means that total traffic generated is unlikely to have increased significantly. No data are currently available on this point.

Until traffic can be further reduced, environmental conditions remain unsatisfactory in the main city centre streets. In the 1940s the proliferation of bicycles was seen as a major problem (Sharp, 1948). Today an over-supply of buses since deregulation is causing much of the problem. Recently, under pressure from the two councils, the two main bus operators have agreed to reduce bus frequencies in Cornmarket (the main shopping street), and to ensure buses spend less time idling in the street.

Perhaps one of the greatest achievements in central Oxford is that the building of destructive inner ring roads has been avoided, thus preserving the unique combination of historic landscape and townscape. The rather poor conditions in the shopping streets could be seen as the price paid for the preservation of this special quality.

The City as a whole

No mode split data are available for Oxford city as a whole after 1976, but the national census provides detailed information on the journey to work for 1981 and 1991, as shown in Table 4. The car increased its share at the expense of walking and cycling, but public transport retained its share.

The 48 percent mode share of cars for journeys to work by employed residents of the whole city can be seen as favourable compared to the figure for Britain as a whole of 67 percent (see Table 4). Oxford has the lowest use of cars for the journey to work in south east England, outside Greater London (Jones, 1989). Only Cambridge and York have a similar share (49 percent and 50 percent). These two towns have also pursued traffic restraint policies in their centres, and also have a tradition of cycling. All three cities have a cycling share well above average.

Table 4: journey to work in Oxford - mode split (employed residents), in %*

	1981	1991	1991 Average for 24 towns in Great Britain
Private motorised	44	48	65
Public transport	18	18	13
Cycle	21	18	7
Walk	17	16	15

*Source: OPCS, 1981 and 1991 National Census.

The difference in Oxford is the higher than usual level of bus use. Such a level is normally only found in much larger cities of 200,000 people or more. The walking share is similar to other towns of similar size and density. Rail accounts for a very small proportion of commuting in all the towns except those within commuting distance of central London, the influence of which can be seen in Watford, Woking, Crawley, Brighton and Luton.

Density is clearly not an explanation for Oxford's low car use. Harlow, Worcester and Gloucester, for example, have similar density but around 50 percent higher use of the car.

Cambridge, like Oxford, is an ancient university town with similar characteristics. It is dominated by the University, which imposes a rule on its staff that they must live within 8 kilometres of their college. Undergraduate students are forbidden to have cars. Bus use in Cambridge is small, but this is compensated by the highest cycling share in Britain.

Car ownership increased in Oxford by about 50 percent between 1967 and 1985, but traffic in the outer parts of the city was thought to have grown at only half the national rate for urban areas (Jones, 1989). Nevertheless, traffic outside the centre has continued to grow, and vehicles crossing the outer cordon increased by 7.2 percent between 1973 and 1984. (Urban traffic nationally over this period grew by 4.5 percent). New industrial and shopping developments in the suburbs are probably adding to this trend (Parkhurst, 1993). The ring road and the radial approaches to it are becoming more congested, and the congestion is spreading to "off peak" times (Buchanan, 1992).

The county (city region)

While Oxford city has been relatively successful (compared to other British cities of similar size) in limiting the growth of traffic and protecting its historic centre and surrounding countryside, it is necessary to set this achievement in the wider context of the county (i.e. the city-region). The trends here are much less encouraging.

It is first necessary to note that the County has a poly-nucleated settlement structure rather than dispersed. Most of the rural areas are fiercely guarded against urban sprawl, and have been so for many years, so even rural development tends to be compactly built alongside existing towns or villages. Much of the County is covered by at least one type of rural protection policy, including Oxford's Green Belt, Areas of Outstanding Natural Beauty (AONB), and Areas of High Landscape Value (AHLV), as shown on Figure 2.

The restriction of growth of Oxford city led, in the late 1970s, to a policy of locating new population and employment away from Oxford, but focused on four "country towns", namely Banbury, Bicester, Didcot and Witney. We examine here first, the operation of this "growth pole" policy, and second, its impact on travel patterns. Finally, we consider the traffic effects of pursuing an alternative growth strategy.

The four country towns have indeed absorbed a considerable amount of the County's total growth over the past 15 years, resulting in a major expansion of those towns. Witney, for example, grew in population terms by 40 percent in just ten years. However, not all growth has been accommodated in the country towns, and 45 percent has been absorbed by development in the remaining, mostly rural, parts of the county. Given that rural dwellers drive more than urban dwellers, there is doubt as to the substance of the County "growth pole" policy. It is also relevant that car ownership in Oxford city was 346 per 1,000 population (1991) compared to the rate in the surrounding Districts of between 449 and 515 per 1,000, which gives some indication of the differences in car dependency.

The latest version of the County Structure Plan (October 1996) shows the intended allocation of 30,500 new dwellings in the County between the year 1996 and 2011. As can be seen from Table 5, 45 percent of all new housing is proposed to take place outside the so-called designated growth areas, exactly the same proportion which took place over the previous ten years. The actual locations of this development are not specified, but will be mostly in the form of additions to villages and very small towns. Consequently, the difficulty of locating all growth in designated growth poles must be taken into account.

Leaving aside this difficulty, is growth in the designated "growth pole" towns effective in limiting traffic generation? How has it worked in practice? Some data are available which suggest that growth in the country towns has produced high levels of traffic generation compared to growth closer to Oxford. This negative trend has been highlighted by a survey of residents in new housing estates at varying distances from Oxford (Headicar and Curtis, 1994, and Headicar 1996).

This allows comparison of travel in suburban locations close to Oxford (Botley and Kidlington), with that in three of the country towns designated to take growth (see Figure 2).

It was found for all sites that work journeys accounted for 57 percent of regular journeys, but 81 percent of the total distance travelled. The study

concluded that the work journey was the main source of differences in travel distance between the five estates surveyed. It should be noted, however, that the study covered only regular journeys.

Table 5: New housing in Oxfordshire 1986-2011*

District/Town ¹	1986-1996		1996-2011 proposed	
	dwellings	not in Growth Poles %	dwellings	not in Growth Poles %
<i>Cherwell District</i>				
Banbury	2,998		3,900	
Bicester	3,687		2,700	
Remainder	1,360		3,150	
Total	8,045	17	9,750	32
<i>South Oxon District</i>				
Didcot	3,134		4,750	
Remainder	3,718		2,450	
Total	6,852	54	7,200	34
<i>West Oxfordshire District</i>				
Witney	2,417		1,700	
Remainder	2,956		4,050	
Total	5,373	55	5,750	70
<i>Vale of White Horse District</i>				
	5,652	100	4,050	100
Oxford City	4,292	0	3,750	0
<i>County Total</i>				
Growth Poles	30,214	45	30,500	45

*Source: Oxfordshire County Council, Oxfordshire Structure Plan 2011, Oxford 1996.

¹ The towns are "growth poles".

Table 6 shows that the total regular car kilometres driven was higher in the country town sites (which are also the farthest from Oxford city). The table also shows that differences in distance travelled are explained largely by differences in the journey to work. It appears that other facilities (shops, schools, leisure facilities etc.) are found near all housing locations to an adequate standard, thus removing the need to travel further afield.

Table 6: Distance travelled per adult (regular journeys per week) by distance from Oxford*

Survey sites	Distance from Oxford kilometers	Distance travelled kilometers ¹		
		total	work/business	non work journeys
Botley	5	183	141	42
Kidlington	12	136	103	33
Didcot	19	211	174	37
Witney	24	238	195	43
Bicester	24	273	231	42

*Source: Headicar and Curtis, 1994.

¹ Excludes multi-leg journeys with a combination of purposes.

The greater travel distances by new residents living further from Oxford is associated with a larger share of their regular journeys being made by car, as seen in Table 7.

Table 7: Mode of travel used for single purpose regular return journeys, in %*

Mode/area	Car	Walk/cycle	Public transport
Botley	78	18	4
Kidlington	67	22	11
Didcot	82	10	8
Witney	85	12	3
Bicester	96	3	1
All 5 areas	81	14	5

*Source: Headicar and Curtis, 1994, and Headicar 1996.

Notes:

- Lower car use can be partly explained in Kidlington by lower income and car ownership. Higher walk/bicycle use in Botley is enabled by proximity to Oxford.
- Higher public transport use in Didcot is explained by fast rail services to London as well as Oxford.

For the journey to work, comparisons can be made in terms of where people lived previously. For all people surveyed, their journey to work time had increased by 27 percent, and the proportion travelling to work by car had increased from 69 percent to 77 percent. However, the change was almost entirely amongst those moving to the country towns (Bicester, Didcot and Witney), as can be seen from Table 8.

Table 8: Work journey time and car share before and after house move*

countrys/towns	Average journey to work time (minutes)		Percent travel to work by car	
	before	after	before	after
Botley	25	29	58	61
Kidlington	23	25	54	54
Bicester	29	37	78	98
Didcot	26	32	75	81
Witney	28	40	78	90
All 5 areas	26	33	69	77

*Source: Headicar and Curtis, 1994, and Headicar 1996.

Comparison can also be made of the mode of travel to work between the new residents and all residents. Taking the example of Witney, the car share for the journey to work for all residents was 68 percent in 1991, but for new residents the share was 90 percent.

An important concept of the “growth pole” strategy is self-containment. The Oxfordshire policy has been to ensure the provision of jobs, as well as houses, in the four country towns, to reduce the need for commuting. The policy has been successful in maintaining a rough numerical balance between employment and labour in these towns. However, this numerical balance does not ensure that people will work in their home town. Of the new residents in the three country towns surveyed (Bicester, Didcot, Witney), only 15-22 percent of respondents worked in their home town.

Taking Witney as an example, 22 percent of the new residents worked in the town. This is a markedly lower proportion than for the town population as a whole (45 percent). This difference between old and new residents suggests two possibilities: either that over time people gradually change their jobs to reduce commuting distance, or that new residents represent a trend towards a more mobile workforce, enabled by the car to be “footloose” in terms of where they live. The former trend would in the long run be favourable for reducing car travel. The latter trend, however, would mean an accelerating rate of car travel and journey distances. While at present it is not possible to say which effect is in operation, the higher car use of new residents in the country towns does cast doubt on the value of the County’s growth policy as a means of achieving more sustainable transport.

Numerical balance between homes and jobs can thus be seen as a necessary, but not sufficient condition for the self-containment of towns. Oxford city does not even have the numerical balance between homes and jobs. There are roughly 30,000 more jobs in the city than employed residents. Of course, not all employed residents of Oxford work in the city, and the actual inward commuting in 1991 was 33,620 (47 percent of the City’s workforce).

A further element in the County strategy is that travel to Oxford is easier by public transport from the country towns than from other parts of the county. The self-containment principle could therefore be relaxed provided that people work in Oxford, and travel there by rail or bus. To some extent this happens, with about a quarter of Bicester and Witney respondents working in Oxford, though only 15 percent of Didcot respondents. If home town and Oxford are combined (as the work destinations most likely to be made by non-car modes), the totals are shown in Table 9. This shows again that the residents in the country towns are more likely to be using cars for trips to work than those of estates near to Oxford.

Table 9: New residents working in home town or Oxford, in %*
Home Town New residents

Home Town	New residents
Botley	63
Kidlington	70
Bicester	40
Didcot	31
Witney	48

*Source: Headicar and Curtis, 1994.

The following further points can be highlighted from the surveys of new residents, and are dealt with in the form of question and answer.

Q. Will the location of new residents affect the number of cars per person?

A. Yes, the new residents of estates closer to Oxford (Kidlington and Botley, see Table 10) owned less cars than new residents with similar income in estates further from Oxford. (Nearer to Oxford car ownership is 15 percent less, and weekday car use is 20 percent less.)

Table 10: Car ownership and use by location and income*

	Kidlington	Didcot	Botley	Witney	Bicester
Average household income £ 1000s	23.5	24.9	29.8	29.1	31.2
Average cars per household	1.4	1.7	1.6	1.9	1.9
Kilometers by car per adult per weekday	29	41	40	53	56

*Source: Headicar and Curtis, 1994, and Headicar 1996.

Q. How important is location of new residents as a determinant of car use for non-work purposes?

A. Not very important. The total car kilometres for non-work trips of new residents was similar in all five survey locations. It should be noted, however, that all survey locations were suburban in character. A study of residents living in the centre of Oxford city found much lower overall levels of car use (unpublished results from study by Peter Jones and others, University of Westminster).

Q. How important is location as a determinant of work trip distance by car?

A. Very important (as shown in Table 11). We may conclude that proximity to the main city limits car travel to work (and therefore overall); partly because of shorter trip lengths, and partly because of much greater use of non-car modes associated with Oxford's traffic restraint policies. This finding is particularly strong for new residents, as the figures indicate.

Table 11: Car distance by new residents and mode share (journey to work)*

	Kidlington	Didcot	Botley	Witney	Bicester
Car kms per adult (average)	16	30	28	38	44
Trips by walk, cycle, bus, in %	27	12 (all residents 31)	29	10 (all residents 32)	5 (all residents 28)

*Source: Headicar and Curtis, 1994, and Headicar 1996.

Q. What impact do fast transport links to a major city have?

A. Fast links to a major city can attract a significant minority of commuters, but an insignificant proportion of non-work trips. This is shown by the percentage of work trips made to metropolitan London (by any mode):

- Estates with poor rail links to London: Kidlington 4 percent, Botley 10 percent, Witney 10 percent.
- Estate with good rail links to London: Didcot 27 percent.
- Estate with good motorway link to London: Bicester 23 percent.

Q. Does location of new housing in free-standing satellite towns lead to self-contained communities (and hence less travel)?

A. Numerical balance of homes and jobs does not in itself lead to self-containment for commuting. But for non-work activities there will be a higher degree of self-containment. For both work and other activities the specific evidence from the three free-standing towns 15-20 kilometres distant from Oxford is shown in Table 12.

Q. Does location of new housing close to the core city promote self-containment with regard to that city?

A. Possibly. But the evidence for Oxford may be influenced by the excess of jobs over labour in the city (and consequently a demand from new labour to

locate near the city). The specific data for the two estates near Oxford (showing much higher levels of self-containment) are shown in Table 13.

Table 12: New residents using local employment and other facilities, in %*

	In home town	
	work	other activities
Didcot	15	53
Bicester	18	53
Witney	21	56

*Source: Headicar and Curtis, 1994, and Headicar 1996.

Table 13: Proportion of new residents using local employment and other facilities, in %*

	In home district or in Oxford	
	work	other activities
Botley	62	78
Kidlington	66	77

*Source: Headicar and Curtis, 1994, and Headicar 1996.

6 A closer look at Witney

Mode split and other information is available for one of the country towns, Witney. A household survey in 1990 showed an overall mode split for trips by Witney residents as shown in Table 14. The level of car use is high by Witney residents, especially when it is considered that two thirds of all trips are to destinations within the town, which is little more than 2 miles (3 kilometres) across at its widest point. Nevertheless, car use by Witney residents is similar to the British average for towns of similar size.

Table 14: Mode split for all trips by residents of Witney, in %*

	All trips (whole week) British average ¹	Witney all trips weekdays	Witney all trips Saturdays
Private motorised	62	60	70
Public transport	6	5	5
Cycle	2	7	4
Walk	30	28	21

*Source: Oxfordshire County Council, Travel in Witney, Oxford 1990.

¹ Average for settlements in size range 3,000 to 25,000 inhabitants.

The author carried out a survey of residents in July 1996 in which respondents were asked about their most recent car trip. A wide spread of trip

types were described. An analysis has been carried out to determine which car trips could be made by an alternative mode, either with or without improvements to alternative modes (see Table 15). This was done by eliminating responses where the car trip was “necessary” because of certain constraints, for example: distance, need to carry things, or lack of public transport service.

Table 15: Potential for mode switch away from the car in Witney*

Car trips convertible to:	Convertible trips as % of total reported car trips
Bus only	20
Foot or cycle only	1
Bus or cycle	9
Bus, cycle or foot	7
Total convertible trips	37

*Source: Llewelyn-Davies, Witney Integrated Transport and Land Use Study. Stage 1 report, London 1996.

The table shows a considerable degree of what can be termed “car dependence”, with only 37 in percent of car trips being potentially convertible to non-car modes. Achievement of such conversion would, moreover, require the removal of present constraints such as poor bus service frequency, and roads dangerous for cycling.

The 37 in percent figure relates, however, to present car trips unmodified. It is possible that mode shift could be achieved associated with a change of destination. For example, a car trip currently made to a distant shopping centre could be replaced by a shorter trip to Witney town centre, enabling a switch of mode from car to cycle, walk or bus.

The greater degree of car use by the new residents of Witney and the other “growth pole” towns has already been noted. A closely related trend is the declining proportion of a town’s population working locally (i.e. declining degree of self-containment). In Witney the proportion of employed people working in the town declined from 49.6 percent to 41.9 percent in the period 1981 to 1991.

One positive trend, however, was that those working in Oxford city (17.4 percent in 1981, and 19.8 percent in 1991) made greater use of the bus, and less use of the car. The bus share of these trips increased from 5.7 percent to 21.2 percent (1981 to 1991). Mode switch from the car to bus has apparently continued since 1991 following further bus service improvements (now a 10 minute peak frequency), though passenger data are not available from the private bus operator.

Our special surveys in Witney revealed that around 60 percent of the car trips currently made to Oxford (for all purposes) could easily transfer to bus. The barrier to achieving this is persistent congestion on the roads between Witney

and Oxford. Bus schedules allow 30 minutes longer for the journey at peak, compared to off-peak times. To overcome this problem, a new bus lane is being planned.

Review of County “growth pole” policy

The country towns growth strategy, originally adopted in the late 1970s has not reduced traffic growth, but the main purpose of the strategy was not to reduce vehicle kilometres, but to take pressure off Oxford city centre as a regional centre, and to stop the spread of the city into the Green Belt. The findings of the Headicar study discussed above prompted a re-think of the country towns growth policy in the review of the County Structure Plan, but despite the doubts cast on the policy from the point of view of sustainable transport, the latest version of the Structure Plan continues the same policy.

7 Impact of alternative models for growth

It is therefore interesting to compare the travel impact of the adopted policy for accommodating future growth, with the alternative of expanding Oxford City. To do this a number of assumptions are made:

- Residents of new estates will have (or adopt) the employment, household and travel characteristics of existing residents of that town.
- The additional residents will not cause any change in the relative attraction of different modes of travel in the town.
- Work trips (the only trips for which data are available) are the most important in terms of car travel generation.

Three growth models have been compared, and the results are shown in Table 16.

This theoretical exercise reveals that the extra car kilometres generated by residents in the new estates would be about 50 percent higher in the case of Models 1 and 2 than with Model 3. In practice, the difference in traffic generated would be likely to be much greater, for the following reasons:

1. The assumption that new residents will have the same characteristics as existing residents is likely to understate the traffic generated by new residents. This is illustrated, for example, by the fact that in Witney the proportion of work trips by car was 90 percent for new residents in the town, compared to only 68 percent for existing residents.
2. The assumption that growth will not alter the relative attractiveness of modes is likely to understate the benefit of concentrating growth at Oxford. If growth is shared between four country towns, there will not be sufficient to raise the town size to a new threshold allowing significant extra public transport services. That is, they will still be small towns. If on the other hand growth is at Oxford only, this will result in the town almost doubling its population, which could allow significant investment in non-car modes.

Table 16: Car kilometres per person for alternative distributions of new housing (journey to work)*

	New dwellings	Em- ployees per h/h	New em- ployees	Car kilo- meters per employee	Total car kilometers	Index
Model 1: Growth distributed as per existing distribution						
Oxon Total	30500	1.26	38430	10.28	395060	118
Model 2: Growth distributed according to Oxon Deposit Structure Plan (1996)						
Banbury	3900	1.27	4953	7.14	35364	
Bicester	2700	1.27	3429	12.16	41697	
Didcot	4700	1.31	6157	11.2	68958	
Witney	1700	1.3	2210	9.39	20752	
Oxford City (Rest of di- stricts)	3750	1.09	4088	6.24	25506	
Cherwell	3150	1.27	4001	11.46	45846	
South Oxon	2500	1.31	3275	13.16	43099	
West Oxon	4050	1.3	5265	12.16	64022	
VOWH	4050	1.33	5387	10.26	55265	
Total					400510	118
Model 3: Growth located within and adjacent to Oxford City (i.e. mostly in Green Belt)						
Oxon Growth Sample	30500	1.27	38764	7.04	272922	112
Oxfordshire Existing					2213880	100

*Source: Oxfordshire County Council, Oxfordshire Structure Plan 2011. Deposit draft, Oxford 1996.

The models referred to in Table 16 are:

Model 1: Distribute housing in the county as existing housing

Model 2: Distribute housing according to the revised Structure Plan (country town growth poles)

Model 3: Locate all growth within or adjacent to Oxford city

8 Lessons and conclusions

A full study of Oxford City has not been possible because of the absence of mode split, vehicle kilometres per person, and other travel data. The case study has therefore examined traffic restraint measures in the city centre, and journey to work patterns. The main emphasis, however, has been on the County or city region, and its long-standing "growth pole" policy.

Conflicting objectives

There is a conflict between different environmental objectives in Oxford. First, protection of the historic townscape and landscape of the city centre has meant that no inner ring road has been built, and as a result of this, the traffic in city centre streets creates poor environmental and safety conditions there.

Second, keeping cars out of the centre by providing park-and-ride facilities has involved the use of land for car parks in open countryside on the edge of the city.

Third, the objective of preventing the spread of Oxford into the surrounding countryside has meant a diversion of activity away from Oxford to more remote centres of population and employment growth elsewhere in the county. This pattern of growth is leading to higher car dependence and use than would have occurred with a „nuclear compact city" model based on Oxford. Thus the protection of Oxford as one kind of environmental asset tends to conflict with the protection of other environmental values such as minimising energy use and emissions. In addition the diversion of growth away from Oxford is causing anxiety in the country towns and villages about loss of quality.

Fourth, protection of Oxford's historic centre limits the capacity of that centre to service a larger population, prompting the growth of suburban shopping facilities which inevitably generate higher levels of car use. Again, the protection of one environmental asset is achieved at the expense_of wider environmental impacts of traffic growth.

Oxford City

Plans are currently being approved for further restraint of traffic to and within Oxford city centre to improve environmental conditions there. It seems likely that further reductions of parking, further direct restrictions on access by car, and increased park-and-ride provision will succeed in meeting this objective. Private parking remains a problem, however, and now constitutes two thirds of city centre supply. An unusual feature in Oxford is the effort to reduce buses in the city centre, since they are now perceived as one of the main environmental problems.

From a development viewpoint, while efforts are being made to maintain the vitality of the city centre, no major expansion of city centre functions is intended. Indeed the main thrust of policy has been aimed at restraining such development to protect the historic environment. This would act as a serious constraint on any re-focusing of growth onto Oxford as an alternative to the current "growth pole" model.

Even so, the economic position of the centre is being challenged by the building of major foodstores and retail warehouses with large car parks in the Oxford suburbs (there are already several of these), together with new employment located in areas poorly supplied with public transport. These

developments mean that traffic growth in Oxford's suburbs is unlikely to be much different from that in other cities. Plans to expand road capacity (for example on the outer ring road) will further encourage this trend.

In addition, there is the issue of whether new out-of-town shopping around the country towns (50 percent of all retail growth in the county 1986-1992, Oxfordshire CC, 1993) is taking trade away from the country town centres, or even from Oxford city centre, or whether it is supplying the local needs of the new residential areas. Again, there are mode split and travel distance implications of this issue.

The County (city region)

Despite the stated aims of the County to "reduce the need to travel", to "reduce dependence on the car", and to "encourage a greater proportion of travel by means which are more fuel efficient and have less environmental impact", the policies examined here have not reversed the trend towards longer journeys, and higher proportion of journeys made by car.

The policy of directing growth to four country towns has not succeeded in limiting car dependence. Theories about planning to reduce the need to travel tend to emphasise the importance of settlement size and density, and of self-containment in terms of homes and jobs (and these seem to be underlying assumptions behind the country towns policy). The work of Headicar and Curtis, however, shows that location appears to be more important than size and density in determining the travel behaviour of new residents, with proximity to the nuclear city as the main factor. The data included car ownership, distance travelled, proportion by car, and location of workplace. In each case the figures were more favourable on the two estates near to Oxford. Comparisons made between Oxford and other cities also indicate little correlation between density and car use for the journey to work.

In particular, the notion of self-containment has little relevance in the country towns, since only 1 in 5 new residents worked in their home town. Had they done so, average work journeys would have been around 3 kilometres, compared to the actual average of 21 kilometres. Furthermore, the share of trips made by car by new residents is much higher than for the country towns as a whole, and again is higher in the more remote locations than close to Oxford. This is true even after differences in income have been taken into account. An important finding also was that the work journey explained most of the differences in car kilometres between the different settlements.

Overall, in terms of reducing car kilometres travelled, it is more beneficial to locate growth near to the main city (in this case Oxford with 110,000 population) than in free-standing towns of around 20,000 people located 15-25 kilometres distant. This was checked using two sets of data, the first was the survey (by Headicar) of new residents in 5 estates, the second was an analysis (by the author) of journey to work data from the national census.

The result in each case was that locating growth near Oxford would result in around 30 percent less car travel by the new residents, equivalent to about 13 car kilometres less per adult per weekday. These results cast considerable doubt on the “growth pole” model of development as a means of avoiding future growth of car use.

There are other points which can be made in relation to this:

1. The problem may not be simply that growth is occurring in (say) Bicester or Witney rather than Oxford, but that the type of growth is not suitable for meeting transport-related environmental objectives. The housing estates being built in the country towns have a car-oriented design which is difficult to serve by public transport. Foot and cycle paths are also generally poor. In addition, parking in the new areas is generously provided.
2. Politically it has been difficult for the County Council even to focus growth in the country towns (with 45 percent going elsewhere); limiting growth county-wide in favour of Oxford alone would appear to be beyond the capabilities of the local planning system.
3. Re-orientation of growth policy to Oxford would mean the rejection of other environmental objectives which have been established for several decades, namely the protection of Oxford's historic centre and surrounding Green Belt. Again, politically, this appears to be insurmountable.
4. There is some indication that the political will to achieve traffic reduction is more apparent in Oxford than in the smaller Oxfordshire towns.

9 Instruments and techniques

In this final section of the case study some comments are made about the various planning instruments and framework conditions within which they operate.

Restrictions on outward growth of Oxford might be expected to raise land prices within the city. If this is the case, it has not been reflected in higher density development (population density has fallen steadily for 20 years). Government policy advice (PPG 13, 1994) to local authorities now advocates measures to:

1. Reduce growth in the length and number of motorised journeys;
2. Encourage alternative means of travel which have less environmental impact; and
3. Reduce reliance on the private car.

Implementation of this policy could help all authorities in the county to resist pressures for out-of-town shopping and employment, and to concentrate development where a choice of mode is available. It is too early to assess the impact of this new policy.

New Government advice on retail and town centres (PPG 6) strengthens local authorities' ability to control out-of-town development and to encourage investment in existing centres which are better served by public transport. A new technique for assessing proposals has been introduced, namely a sequential test giving priority to sites within and adjacent to town centres. Again, this is too recent to be able to judge the impact.

Difficulties for local authorities in implementing these new Government policies include:

1. There is a lack of control over local public transport provision. Since de-regulation and privatisation, public transport has a bad image in Oxford, with new operators competing for business and running excessive capacity. The resulting conflicts have been called "Bus Wars". A particular problem has arisen with Oxford's main shopping street, and this is causing reaction against buses, especially in pedestrian priority areas.
2. Local authorities can only respond to private sector development proposals; decisions about the density and form of development must be negotiated. There is no equivalent of the German Bebauungsplan to shape development, though it appears that the proposed new form of Bebauungsplan to be prepared by developers will bring Germany a step closer to British practice.
3. Local councils have little autonomy to raise or spend local revenue; even so, there is probably more scope than most authorities admit. For example West Oxfordshire currently levies a zero property tax, yet still refers to funding shortages!
4. There are no mechanisms to control competition between neighbouring authorities for new development. This leads to problems in particular for implementing parking restraint. For example, West Oxfordshire District has a policy of **not** charging for public parking, so that neighbouring districts find it hard to compete for trade and visitors unless they also provide free parking.
5. There is a time lag while new plans are drawn up and put into effect.
6. The existence of large development sites which do not fit with the traffic reducing strategy. For example, a former air base site 25 kilometres north of Oxford city centre has 450 existing dwellings, yet is remote from any other settlement. The decision is whether to create a more substantial new settlement in order to increase the chances of self-containment and public transport provision.

The two-tier local government structure in Oxfordshire can be regarded as beneficial where political interests coincide. For example, Oxford City is now better placed to implement more radical traffic limitation measures since differences between the City and County of the early 1980s are mostly resolved.

There are conflicts, however, between the County and central Government. There are problems over policies for the national Trunk road network, where two examples can be mentioned. First, the A34 Trunk road links growth poles

in north-east Oxfordshire (Banbury and Bicester) with Oxford. The planned road improvements will encourage more car travel, but meanwhile the County is subsidising the rail service. Second, the A40 Trunk road between Witney and Oxford is heavily congested, yet the Department of Transport has until recently resisted County plans for reserved bus lanes which would help to achieve mode switch from car to bus.

There are also conflicts between the Department of the Environment and the local authorities over housing allocations. The Government is pressing for a higher growth in Oxfordshire than the County wants. Also, the Government's agent has undermined the growth pole policy in West Oxfordshire district, by arguing that a smaller proportion of new dwellings should be located in Witney (and that people should have more choice to live in the countryside).

Of all the policy instruments for reducing car travel, parking currently provides the most potential. But there are conflicts. For example, there are inadequate powers available to deal with private parking, though the Government is to consider new powers to enable local authorities to tax private non-residential parking.

Another issue is the conversion of public parking from long stay to short stay. In Oxford this has helped peak hour congestion on the radial roads, but it has meant higher turnover of cars per space, and hence more traffic generated per space. The worsening congestion during the day has been recognised. The issue is whether short stay parking should be provided to benefit shoppers and other visitors, or whether it deters other visitors due to worse environmental and safety conditions. There is no agreement on this issue between the city council, the town centre manager and the Oxford Central Retail and Business Group (Planning Week, 23/11/1995).

Fiscal measures are an important consideration where planning powers are insufficient to control the growth of car traffic. In Oxford city centre, the imposition of high parking charges has reduced car commuting. This strategy cannot, however, be used where development and visitors will simply divert to other locations where charges are lower. Again, this points to the need for policy at the regional level to avoid such diversion effects.

The failure of Oxfordshire's growth policy to limit car use has been noted. However, the location policy at least provides the opportunity for less car use. The problem is that with car use being cheap (i.e. not including the full social or environmental costs) there is little incentive for people to reduce their dependence on it. The imposition of higher taxes on car use could change this, especially in the longer run. Current national policy is to raise the level of fuel tax by 5 percent in real terms each year, but it remains to be seen whether this will have any noticeable impact.

The maintenance of a numerical balance between labour and jobs must therefore be seen as a necessary, but not sufficient condition for towns to be self-contained in employment terms.

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