The national road maintenance condition survey 1976–1983

Col. G. A. Leech

Col. Leech

The published Paper which described the objectives, methodology and so on of the survey, of necessity only referred to the survey results up to 1983. However, the latest results, of the 1984 survey are now available.

58. With the inclusion of 1984 the NRMCS has eight years of results available. Bearing in mind the statistical basis of the survey, I believe it is now possible to use all this information to start and look ahead to what may be happening to our road system.

59. The survey results are distilled to produce a statistic (the defects index) which is a measure of the condition of the carriageway. Fig. 5 shows how this index has varied for the various classes of road between 1977 and 1984. It is clear that, in general, there was an improvement in road conditions up to 1980. However, the 1984 survey results have confirmed a clear trend of deterioration since 1980, although the condition of the roads in 1984 would appear little different to the condition in 1977. Nevertheless I believe that it is vitally important to recognize this now clear trend of deterioration over the last 4 years which produces a serious prognosis. The need for corrective action is clear.

60. The picture does vary between road classes, although even with trunk roads, where initially conditions remained relatively stable, there appears now to be the beginning of a discernible trend of deterioration. The most significant result for concern, in national terms, is the development of the trend of deterioration in our principal roads (both rural and urban).

61. The solid data collected over eight years must be carefully analysed to maximize its value. Much needs to be done in this direction and as a tentative first step I have crudely tested the data available to see if it would be feasible to establish a correlation between the defects index and relevant maintenance expenditure.

62. Figure 6 shows the yearly variation in expenditure on principal and non-principal roads on strengthening and resurfacing, compared with the variation in the defects index. The graphs do suggest there may be a relationship between road condition as measured by the survey and expenditure, although the picture is complicated by an apparent lag factor and extraordinary expenditure on frost damage repairs arising from the 1981/82 winter. This graph is not the result of a rigorous analysis, but should be viewed as indicative of one direction in which

DISCUSSION

Fig. 5 Variation in defects index in England and Wales 1977-1984; 90% confidence intervals; 1977 = 0

Fig. 6 Maintenance expenditure against defects index

further analysis of the NRMCS data will be directed to try and improve knowledge of underlying reasons for the now declining trend in the condition of our road system. In due course, it may assist in predicting by how much and how soon conditions can be improved for a given increase in expenditure.

Mr K. Williams, West Sussex County Council

The conditions survey holds a great deal of mystery for many of the lower levels of management in county highways departments, because they feel from their direct contact with the roads that the survey is not really showing what they believe to be the facts on site. They feel that the deterioration over the first years of the survey has not been reflected in the figures. However, particularly over the last few years, there has been a consistency in the figures that have been produced, and that

consistency leads me to have confidence in the way the survey is working. It is not possible just by sheer chance to have the smooth curves that are being produced, particularly on the urban principal and rural principal roads, and it must be reflecting the actual condition of the roads to a fairly high degree. It gives no satisfaction to anyone that the survey is showing a deterioration in the roads which is already believed to be true.

64. One cause for concern about the survey is that it is purely visual. Because of costs, surface dressing is being used in many instances where an overlay would be preferable. This is covering up many of the defects that there are on the road, and a purely visual survey does not in fact show all that is happening. It is papering over the cracks. Therefore, it is essential that alongside the visual surveys, all the county councils carry out complementary deflectograph surveys to show what is happening to the structure. For example, in West Sussex in 1984, 41 sites were surveyed for deflection. Eleven of those sites required an overlay of between 40 mm and 190 mm. It is to be hoped that there is no statistical significance in that, because if 25% of our roads have no life left I shall be very worried indeed. More significantly, of those eleven where an overlay is required, 4 showed no physical visual defects at all. Three of those 4 had been surface dressed. Covering up imperfections in the road network now will lead to greater expenditure in the future. As much information as possible is needed to persuade the politicians that highways departments need more money, consistently. There is no point in waiting till the roads have actually failed, because highway departments would not then be able to afford it; too much would be required all at once for which nobody will thank us.

65. Another point, which perhaps goes beyond the survey, is the need to get better value for money by looking at intervention levels, and to be thinking about which particular process to use on the roads at any particular time. Unless more is known about the condition and actual life of the roads, how can effective repair measures, at the appropriate intervention level, be determined and value for money obtained? That sort of survey has still to be done, but before it can be started the condition survey is needed to provide a base of information.

Mr M. F. Hardy, Hertfordshire County Council

I have been a staunch supporter of this survey since it started, and I am still a strong supporter and can see nothing emerging which would dissuade me from supporting it in the future. It is an excellent means of obtaining national indicators for trends on the various classes of highway and forms of deterioration. There is no other means of doing this at the present time, and the information collected since 1977, and that is a long way back now, really constitutes a very large data bank and a reliable indicator. So it should certainly be continued in the future. However, some of the limitations have been referred to both by the Author and by Mr Williams, and these should be examined more carefully.

67. The index of 100 applied to the year 1977 but that year was an arbitrary starting point, and it had no economic or technical relationship with what might be considered to be ideal or optimum road conditions against which to measure. Nevertheless a study such as this has to be started at some time, and whatever date was chosen there would be criticism that we were not starting at the right point. This argument is wearing a little thin now. If it is trends we are looking at, it does not really matter where they started or what the conditions were at that time.

68. I suspect that the action and the policies adopted by councils and engi-

neers since 1977 have concentrated on short-term objectives, that is, holding the roads together rather than going for treatment which would give minimum long-term cost. That is certainly the situation in my county where the surface dressing programme increased alarmingly some few years ago to try and hold the roads together.

69. The survey does not pick up whether this short-term approach is actually taking place or not. Longer term investment needs may be storing up and there is a danger of being lulled into a false sense of security by the survey results in the shorter term. But here again, as time goes on, and the short-term measures are picked up in the survey, it becomes less and less important.

70. The sensitivity of the survey results is unclear. It does not show, if there is significant change, what it means in investment terms or in economic terms. If that sort of material is going to be used on a national scale by central government, not only does it have to look at the trends, but also diagnose the cost of changing those trends, and that is something missing at the present time. For indicating trends at a national level, the survey is excellent. However, application of the statistics on a regional basis or a county basis is less certain. Great care must be taken not to produce data which have no reliable statistical basis and which do not relate to executive authorities. It may well be useful for the Department of Transport to produce regional information on trunk roads and motorways. However, I cannot see any use for regional information on county roads. There is really no point in collecting and evaluating data, at the cost of staff and computer time, unless it can be used positively and beneficially by the executive authority.

71. The Author tried to relate expenditure to road condition. I have tried that in my own authority and it is a total mismatch. There must be statistical problems in relating county level expenditure to conditions. We have measured on the ground the investment needed year by year to deal with structural maintenance

Fig. 7 Hertfordshire structural maintenance expenditure on county roads

overall. Fig. 7 shows expenditure required and actual expenditure. Hertfordshire has a firm policy of investing all the money considered necessary for the main roads and leaving the shortfall on minor roads, shown on the figure as increasing from £4.3 million to £12 million over 5 years. Our county version of the latest National Road Survey applied to those minor roads shows they are improving. That is in complete contrast to our own assessments.

72. As well as a continuing survey that investigates trends, a move towards more detailed engineering based assessment data is needed to quantify and to cost necessary structural maintenance, evaluate treatment options, settle priorities, provide initial technical data on individual lengths of road which warrant treatment, and monitor performance. These are the sort of objectives that are set out in the Local Authority Association's Code of Good Practice for Highway Maintenance.³ It would be better to invest time in collecting data with those objectives in mind than to try and twist a national survey system so that it can be used at county level. Data which has very wide application can then be obtained.

Mr R. H. Daniels, Powys County Council

The survey is finding out what has happened in the past, and there is still insufficient evidence to say that this is necessarily a trend for the future. The figures being dealt with are called statistically representative samples and necessarily of relatively short lengths of road. According to statisticians, on the National Survey these results caused some factual deductions nationally, but provide no basis for interpretation for individual counties because of the limited number of samples. From the CHART Survey apparently comparisons cannot be made between counties on the basis of results but only within one county.

74. Reference has been made to the expenditure and attempts to relate the conditions with expenditure. A time lag would be expected and had more money been spent one year this would show that roads were improving and would last rather more years than was shown in the viewgraphs. What are the Author's comments on that?

75. I participate in the survey and appreciate the efforts made, but am concerned that limited sections are taken, and much of the concern with road maintenance is now with structures. Some of the Author's photographs in the outside exhibition show some fairly horrifying appearances of bridges. To what extent are these weighted in the exercise?

76. Further reference has been made to public utilities activities, and these occupy a relatively small area of carriageway or footway space, but are quite devastating in their effect upon the travelling public in riding quality, on road safety, pedestrian safety and structural integrity.

77. It is very often public utility reinstatement, however well done, that is showing signs of weakness, and I am sure that these do not show up proportionately in the National Survey.

Mr M. F. Callery, Lancashire County Council

To comment on what Col. Leech showed in the way of comparison in his own county of the spending profile against survey trend, I was a little surprised that Mr Hardy suggested that this on a regional basis should be discouraged, because I think quite the opposite is true, and that there is a need to look more specifically at the conditions of the National Road Survey to see what is happening at the local

level. It is all very well to have a national trend, but the national trend has been misleading. In the first issue of the Institution of Civil Engineers' Infrastructure Report there was a somewhat bland reference to the National Road Condition Survey indicating that it showed recently some adverse trends, but by and large the situation was all right because the condition now was more or less the same as in 1977.

79. The lesson that has been learned is that a more in-depth look is necessary in the second phase of the Institution's infrastructure report which is now being considered. I have encouraged the Infrastructure Group to take a closer look at the National Road Condition Survey in relation to expenditure trends and there is a feeling in the Board that for all sectors of the infrastructure this is an admirable way of trying to gauge trends. The National Road Condition Survey should be copied by other sectors—sewers for example, would benefit from a similar study.

80. There is nothing wrong in being more specific, taking Mr Hardy's qualification that there must be a statistically sound base. But there are already counties where there is a sufficiently large sample to ensure that there is a statistically sound base for that particular county. It depends on the number of survey points. I see nothing wrong in studying those particular cases. My old county, Cheshire, had excellent roads some years ago, but since 1974 there has been a consistently downward trend in expenditure on roads in Cheshire, and the effects of this reduction in expenditure can now be seen.

81. The Cheshire trend shows a much worse picture by and large than the national picture. So what is wrong with looking at those trends in relation to spending profiles? The reason Col. Leech is suggesting regional groupings is that many counties do not have individually statistically significant samples, therefore it is necessary to group them in one way or another, so that significant statistical samples are achieved. That may be on a regional basis; it may be in areas where there is a very high proportion of heavy loads. The North West Region probably has a much larger percentage of heavy vehicles than the South West. What is wrong with looking at those particular specific areas or specific counties and trying to find out what exactly is happening and why it is happening as well as where it is happening? Presumably in some parts of the country the condition of the roads must be improving if other parts have much worse trends than the national pattern. So with all the caveats about being careful, yes, do be careful, but providing you have the right degree of sampling why not use it?

Mr A. D. W. Smith, *Richard Barrett Associates Ltd*

I have always been one of the critics of this survey because there was no basic standard. I am however, beginning to agree with Mr Hardy that, now it has gone on for a number of years, trends can be seen and it is much better value. It is rather like the weatherman who said don't look at your barometer to see whether it is high or low, but see whether the barometer is going up or going down.

83. The reason that the year 1977 was chosen stems from the Marshall Report published in 1970.⁴ After the Marshall Report, the Department of Transport did make more money available for maintenance for trunk roads, but that was not reflected in the counties. Then came the energy crisis of 1973/74, and around 1977 there were three economic White Papers in 20 months so that budgets were cut, and overall expenditure on roads was reduced over those years. There was such a fuss about the lack of road maintenance that in the end the Government agreed to have a survey carried out to see whether it was true or not.

84. This brings me to the point concerning the graph which shows expenditure rising against the downward trend I mentioned. Certainly it was surprising to see expenditure going up in 1975, 1976 and 1977. I am not saying the Author is wrong, because it was only the principal roads he was looking at. That may be right, but certainly the overall trend was down. Could Col. Leech comment on the trend of the financial curve compared with the index defect curve, because it is extremely difficult to correlate the two, and even if you do, there must be some time lag in between, and it would not be something that ought to be pursued too much.

Mr B. L. Parker, Surrey County Council

Taking up the point about deflexion measurements, it seems that there will be pressure now to widen the scope of deflexion measurements and this is commendable. I would just sound some notes of warning.

86. Firstly, the cost of carrying out deflexion surveys is extremely high, hence to obtain value for money there is an understandable tendency to concentrate that work on the principal roads. If it is to be extended to cover all classes of roads a cautionary note is needed that there are insufficient deflectographs available in this country.

87. Secondly, if the techniques are applied to the more minor roads it is likely that the latter will compromise a majority of surface dressed roads that have existed for many years and perform as a kind of 'spring'. Therefore although high deflexions are recorded they are belied by the appearance of the highway. Under those circumstances doubt may be expressed as to the validity of the deflectograph readings since the mechanism of failure and prediction of failure is not well understood by many highway engineers. Care is necessary in any evaluation since what will damage the highways is the first statutory undertaker's trench or bad frost damage that allows water to penetrate into such 'spring' type roads. The worst possible solution would be to apply a stiff remedial surface over such a road and the predictive value of the deflectograph readings would soon be confirmed.

88. Thirdly, if deflectograph data is to be evaluated as an adjunct to the NRMCS use could be made of the work proposed in TRMM 5/84,⁵ together with work on county highways from which a reasonable number of sites could be selected so as to yield the information required. Nevertheless it cannot be done to any extent in the same comprehensive way as the condition survey is undertaken.

89. I would leave the Author to consider the question as to whether the condition survey gives the correct weight to the important factors. Reference was made to the problem of looking at values that do not seem to be represented by the appearance. Deflectograph readings should only be applied directly to those bases which are covered by LR 571⁶ and LR 833.⁷ Application to other types of base can be misleading. The question then remains, is it really desirable to put as much weight as we do into the measurement of rutting?

Mr G. Jones, Wootton Jeffreys Consultants Ltd

The mentioning of privatization should be not avoided in connection with highway maintenance. It may or may not happen, but if there is a move in that direction, there will be a dilemma in respect of overall responsibility. This must always lie with the highway authorities and cannot all be passed on to the consultants, as the highway authorities will direct the consultants in respect of what they

should do (standards) and where (priorities). A point Mr Hardy made should be emphasized, that the Code of Practice on Maintenance presents methods of assessing priorities and monitoring systems, and so forth. The survey which the Author has presented was never aimed at these. Good highway inventory data must be obtained to enable assessment of what the priorities are this year and next year, and the building up of a data base.

91. The methods under discussion in respect of analysing maintenance requirements concern samples of 100 m lengths over 9100 km which is satisfactory to look at the national situation. The statistics themselves are being improved and more will be obtained from them. An alternative might be, instead of obtaining a large amount of detailed data over 100 m, to collect less detailed data over a much longer length. Roads are linear, and therefore why should the data collected not be linear?

92. Now that video equipment is available that can be linked to computers and moving vehicles, these could be used economically. There were perhaps less data but for longer stretches of road the requirements of the counties could be more closely matched making a useful supplement to the methods introduced for the condition survey.

Dr M. Howe, British Gas Corporation

Having conducted research into road structures for the past few years, I have always found the information from the National Survey very valuable indeed.

94. The British Gas Corporation looked at the structural strength of roads in connection with utility work in streets, and found the deflectograph an expensive and imprecise piece of equipment, certainly for urban roads. It does not travel well on some of the urban roads because of its low ground clearance and measures stiffness every 3 m. To overcome this, the Corporation has developed a very simple deflexion instrument that will cost about £1000.⁸ It can be put anywhere on the road and will measure the deflexion of the road under a wheel very accurately indeed. Readings of this new instrument have been correlated well with deflectograph results.

Mr J. W. M. Vallis, Warwickshire County Council

I am a strong supporter of the Survey and it would be absolutely fatal to drop this method of survey which has now been carried out for 8 years in favour of something else. If the trend over the next two years continues upwards, then no doubt the Department would probably grasp at trading the survey for some other method so they could then start from scratch. It is necessary to keep the survey on for at least another 10 years to get the real picture. The scene is changing fairly slowly in all ways. Attempts to correlate expenditure with the state of the roads cannot be done over a short time scale. It is a long time scale judgment. For instance, when I went to Warwickshire in 1974 they spent a great deal of money on resurfacing every year, and I am not at all surprised that although when I got there they started to cut back, the roads still seemed to be improving, because the rate of deterioration of the lengths surfaced a few years before was not as great as the rate of the surfacing increase, and it was only after deterioration became greater than could be dealt with that the swing could be detected. Even now, say, in two years' time if the county was able to put more money into road maintenance, this survey

will still show a trend of deterioration until the rate of improvement is greater than the rate of deterioration.

Mr V. A. Knight, Cheshire County Council

I am a firm believer in measuring the conditions of the road, and have been a supporter of the National Road Maintenance Condition Survey. Cheshire is one of those counties which has a statistically significant number of sites to judge the condition of the roads within the county. Cornwall is another. I took the view that it was essential to measure condition, because after all we are the county highway authority. But what good it has done I fail to see, because in the 10 years since local government reorganization the amount of money available for highways in Cheshire has fallen by 25% in real terms. The traffic has also been measured, and the rate of growth is twice the national rate of growth, and therefore it is not surprising that the rate of deterioration of the Cheshire roads is twice the national rate of deterioration of the national roads. This started in 1980/81 after the bad winter when the county council refused to put any additional money into repairing the damage and no increase has been provided since that time.

97. Although all these facts can be collected, it is no good if the politicians will not hear. I wrote a letter to one before the election and said there are none so blind as those who will not see, and that is the problem. It is no good blaming the consultants. It is the politicians who will not see the condition, and will not understand what is happening. It is a very serious situation, and one which will cost a great deal to correct. Mr Hardy needs support in his efforts to estimate the cost of repair and measure the effect of the defects.

Mr R. Phillipson, British Aggregate Construction Materials Industries (BACMI)

What matters for a road at a given state of deterioration is, surely, its remaining life. There is a table in NRMCS which divided the remaining years of life into 0 to 5 to 10 and so on. I think that it is a more precise analysis on that basis that justifies the Department of Transport in successful claims for funds from the Treasury for the rehabilitation of motorways, and now the same policy is moving on towards trunk roads. It is moving on towards trunk roads with sufficient arithmetic expertise to be able to say it is £30 million short of what it ought to be. If that sort of level of information is reached there is a much better case to make. It does not matter if it is getting worse if it is still not bad. But if it is getting worse and it is already bad, and you know that disaster comes in three years' time, it concentrates the mind!

99. When the Author said that the deflectograph study was not reconcilable with the overall survey was it because there were responses on the deflectograph from part only of the survey participants? If that is what he said, is it then reconcilable with the survey information from the sample that does exist. If the sample is representative could more emphasis be given to the results? If it is not should not efforts be made to get a statistically valid sample?

Mr T. Toole, Overseas Unit TRRL

The presentation was most interesting because as a member of the Overseas Unit at TRRL a large part of my time is spent examining pavement conditions. From the Paper it is clear that work is not done on road roughness. Overseas, to justify

the channelling of funds to road maintenance and demonstrate to economists its value, the Unit has always emphasized the physical condition of roads, particularly the riding quality (or road roughness), and have determined how this affects the economy of a country as a whole through its effect on vehicle operating costs. Although road roughness may not always be the most appropriate method for describing the deterioration of all types of pavement it could provide a rapid means of assessing from year to year the changing condition of rural road pavements and non-principal roads in the United Kingdom. The message needs to get through to politicians and economists that a large part of national funds, in terms of costs to road users, are spent on maintenance of vehicles as a result of poor road conditions. Why therefore, is this not included in the National Road Condition Survey? In the case of defects in the road it is not clear what maintenance techniques are recommended as being appropriate for remedying certain types or levels of distress. In particular surface dressing has been criticized, but, used properly and where it is the appropriate treatment it can and does perform successfully.

101. The Overseas Unit has also conducted visual condition surveys as part of the evaluation for maintenance requirements. Deflexion surveys are also undertaken. However, possibly on a more detailed basis, the measurement techniques and criteria set for maintenance intervention need to take account of the different types of pavement structures which exist.

Mr W. Harrison, *BACMI*

It is sensible to have a survey, and one supports what Col. Leech is trying to do. When the results are presented to highway engineers, they are valuable because the shortcomings and the necessary allowances are known. Highway engineers know what trends mean. But the survey was started at the instance of politicians because county surveyors were saying that our roads were falling to bits, and probably the politicians said they were sick of those people playing the same old gramophone record, so let's have a survey. Sure enough in the first few years it showed improvement. Highway engineers knew exactly what that meant, but they did not, and were highly delighted. Mr Hardy is quite right in saying there has to be a starting point and therefore 1977 was neither the right year nor the wrong year. It is important to know what road conditions were like then and whether it is the worst roads of the fairly decent roads that are getting worse.

103. I agree with Mr Hardy that the strength of the road must be measured and the residual life predicted in real terms. That is what matters. Whether or not conditions improved the previous year or the year before is history.

104. Col. Leech said how conditions in North Yorkshire compare with the national survey conditions, but can he say how they compare with the state of the roads he sees when with his divisional surveyors? In my view that is what matters in North Yorkshire or whatever county. These surveys are important and we must try as engineers to understand what they mean. However, the difficulty is that when they are published and read by politicians, it is not engineers but the politicians who provide the money. I have great misgivings about those who not only do not understand, but who do not want to understand what these things mean, looking at the graphs and tendencies and drawing the wrong inferences. So it must be emphasized that conditions today are only being compared with those in 1977, and it is not known really whether things were right in 1977; they were not in my

own county, and other County Surveyors would not agree that everything was all right in their counties in 1977. It is the true structural state of the highway slab that should be measured, and the useful residual life projected.

Col. Leech

Mr Williams' point that a purely visual survey may not show all that is happening and papers over the cracks worries me. For example, roads are surface dressed normally in the early summer into mid-summer, and depending on when you actually put your survey team on the ground to measure, if that road has been newly surface dressed it must cover the defects. That is a problem. Ideally, of course, it is hoped that teams would survey their roads consistently at the same time each year, so although the survey is far from perfection, providing it is consistent the changes in condition should be picked up. How is the problem overcome? Do you not do the survey because of that? Of course not, and Mr Williams would surely agree.

106. He very properly drew attention to the deflexion survey. I deliberately did not refer to deflexion although it is part of the full report. The visual survey records the visual evidence on the ground at that moment, but the deflexion survey is predictive by nature. There should be some sort of correlation between the two—although establishing a correlation has its problems because unfortunately the deflexion information is only based on a sample of approximately 30 counties out of a total of 54, and those results to a large extent can only be representative of the participating counties.

107. *Mr Hardy* confirms that he is still a strong supporter of the survey and this is gratifying. It is pleasing that Mr Hardy agrees that if clear trends can be identified, it is of great value, and without too much concern about the 1977 base. The survey does not pick up some of these problems which arise out of the short-term measures referred to by Mr Hardy and this is of concern.

108. As to sensitivity, what does change mean in cash? Mr Hardy is talking about the very work which I used to illustrate the attempt to derive that sort of relationship.

109. The statistics at county level are not dubious, but their limitations must be recognized. This was illustrated when, interpreting the results in North Yorkshire, I was able to be fairly firm about the position on the county's principal roads, because a clear position is developing. A much more cautious view was offered about some of the other classes. Providing this approach is taken there is value in looking at results at county level.

110. When I was trying to show the correlation between expenditure and defects index, the graph showed national expenditure figures extracted from Table 5 in the latest report of the survey which picks out clearly right the way through to 1983/84 expenditure under the subheads of maintenance. I stand by the figures on expenditure remembering they are for resurfacing and strengthening only. They do not include surface dressing, and therefore there is a complication for it does not include expenditure on patching, but this was an attempt to see whether there was a relationship between those two subheads and changing conditions.

111. Mr Hardy referred to work on analysis, and I do agree with him. There are some who say how marvellous to do all this tremendous amount of extra measurement and analysis of our road conditions; but some County Surveyors say that with the money available they are in a crisis situation with their expenditure, and they have no difficulty in finding where the money should be properly spent. I

am not going to go further on that point, but I just make the point because in some parts of the county we may be moving to that.

112. *Mr Daniels* referred to the validity of the survey when only 100 m lengths of road are surveyed. I have to put it to him quite strongly that by virtue of the sheer size of 9100 randomly selected sites, my belief is that 100 m lengths, with that size of sample, must be giving a reasonable picture about what is happening. Providing the sites are selected at random and there is sufficient size, the 100 m length does not worry me.

113. *Mr Daniels* also mentioned structures, and he is absolutely right. There are two points here. First of all, the condition of structures plays no part in the survey. But the second point concerning expenditure is also very important, certainly in my county, where £625 000 has been reallocated at the expense of other spending to deal with extra bridge maintenance, encouraged by a bridge collapse early in 1985. The majority of this expenditure has been capitalized to avoid a cut in road maintenance, but some savings have had to be made under other heads. The cost of bridge maintenance is worrying me enormously. The new assessment has not been started on yet, so I am concerned about that. Without additional money how shall we finance it?

114. It is good that *Mr Callery* supports the analysis. Sometimes of course, as all have experienced, it is done only to prove the answer is not what was originally thought. Unless we try to get more out of the work which we do, and start to work with these figures and analyse them as I started to by relating expenditure to defects index, we should be failing. Some of it may of course be too difficult and there may be too many variables.

115. *Mr Smith* refers to the graph showing the trend of the financial curve compared with the defects index curve. The financial curve is taken from Table 5 of the new report, and I believe those statistics to be reliable. The time lag he mentioned is certainly the sort of thing under investigation.

116. *Mr Parker* raised the question of deflexion. There are no plans to extend it to minor roads for the simple reason that as yet there are still not more than 33 of the 54 counties properly participating in deflexion on trunk and principal roads. If deflexion is valuable and if deflexion is important, then one could only claim full credibility as to what is happening nationally by getting full participation of the counties concerned. We have somehow or other failed to achieve that objective. Trunk and principal roads must take priority over minor roads. I certainly go along with the point about statutory undertakers' trench problem.

117. *Mr Parker* questions whether or not the survey gives proper attention to the things that are important. As every year passes we can think of better ways of doing things. However—like it or not, the form of the survey has been consistent from the start in terms of the defects surveyed and if all that eight years' of work done so far is not to be invalidated the survey should be carried on and those defects measured. The inclusion of other survey data, for example the bump indicator, has been considered. It is a very valuable instrument, but after enormous deliberation we decided it would be another increase in work load, while counties were still concerned about taking on the task of carrying out deflexion measurements which we believed to be fundamental to the survey. That is the sort of problem which we face in the Executive Group and County Surveyor Members of the group who are trying to make the most of this survey support that view.

118. *Mr Jones* referred to privatization, and presumably he is talking about trunk roads. On county roads the physical work is being offered to the private

sector, although not much change seems to have taken place here. It is appreciated that consultants may well be brought in on trunk roads and motorways.

119. Good inventory data is required, although in practical terms there may be different views on the collection of inventory data in counties with a high mileage of roads compared to those with a low mileage.

120. The point about less detailed data over a longer length is very sound. We have to make the best of what we have. However, I am concerned about changing the rules half way, particularly when the results of the survey seem to be arriving at a very interesting stage.

121. *Dr Howe* raised the question of the expense and convenience of using the deflectograph and he referred to a simpler, cheaper instrument being developed by the British Gas Corporation. This is an interesting development and merits further interest by highway authorities.

122. I am grateful to *Mr Vallis* for his support of the survey. As to his point about expenditure against condition and a longer time scale being required, of course this can be said about the whole survey. Clearly the longer the survey goes on, the more trends may or may not develop. All are impatient to know and prove what the position is so that when something is showing that is believed to be reliable, we must not fail to speak about it.

123. The question of the time lag and more finance is probably one of the most significant points that concerns us at present. Knowledge of the relationship between financial input and cause and effect on the road is badly needed. It is a terribly important question, but the answers to that are not yet known and we may not have them for some time.

124. *Mr Knight's* support for the survey is strong for which I am very grateful. He raised the question of cash reductions and the question of the notice taken by local politicians about what the survey is saying about the condition of the roads in Cheshire. It is of concern that local politicians are not responding positively to the situation. This point was recognized at the start of the survey, when *Mrs Phillips*, the Chairman of the Somerset CC Policy Committee said that she fully understood about the survey providing objective information, but asked whether there was a danger that politicians would still make subjective decisions. *Mrs Phillips* made a most astute observation but I do not think that we should stop the survey on account of that.

125. In reply to *Mr Phillipson*, the now published report of the 1984 survey contains information on the trends in structural condition of the carriageway from the deflexion survey. It tells exactly what is happening on the nation's trunk and principal roads so far as it can go with the participating 33 counties.

126. *Mr Toole* from the TRRL is absolutely right about surface dressing. Surface dressing is very important over the whole country, but regrettably it is made even more important today, because although some of the surface dressing is carried out as a perfectly proper treatment (i.e. the requisite treatment for restoring skid resistance and waterproofing the road surface), probably 50% of that surface dressing is applied to a road surface that requires completely different treatment. The proper remedy of that road surface should actually be an overlay. But because of financial restrictions it is expedient to seal the surface and to try to keep the water out for another couple of years.

127. *Mr Harrison* asked whether I believe what my county results seem to be telling me. I can honestly say that I do. It is a great source of disappointment to me that after the efforts of earlier years put into improving the principal roads of my

county, subsequently having to divert those moneys on to non-principal roads, the effect of that action is now showing through on the principal roads. Now we have to reverse our policies perhaps, and take the consequences of what happens to our 3000 miles of rural classified roads.

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