



Policy Studies Institute

MAKING THE MOST OF DAYLIGHT HOURS

The implications for Scotland

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October 2010

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ACKNOWLEDGMENTS

This study has been kindly sponsored by the Crescent Trust. Earlier Policy Studies Institute reports on the subject were made possible with grants from the Nuffield Foundation.

The author wishes to thank the following for their support in the preparation of this Report:

Steve Jebson, Library Information Officer at the Meteorological Office in Exeter.
Selina Owusu, National Travel Survey Unit at the Department for Transport
Dr. Elizabeth Garnsey, Centre for Technical Management at the University of Cambridge.

Malcolm Rigg, Director of *Policy Studies Institute*
Staff of the *10:10 Campaign*.

Colin Dawson, former Chief Executive and Martin Barratt current Chief Executive of the *British Association of Leisure Parks, Piers and Attractions*.

He would also like to thank the staff of many organisations answering requests and supplying data, often at short notice, for many of the calculations in the report, in particular:

Directorates, Divisions and Units of the Scottish Government.
Department of Energy and Climate Change, Statistics Division
Department for Transport, Statistics Division
General Register Office for Scotland, Demography Division
The Meteorological Office

Finally, he wishes to express his appreciation to the staff of the following organisations who provided replies to requests for comments and supporting evidence on whether, from their perspective, the clock change would be advantageous or disadvantageous:

Age Scotland	Liberal Democrats Party in Scotland
ALVA (Association of Leading Visitor Attractions)	NFU (National Farmers Union) Scotland
AIRSO (Association of Industrial Road Safety Officers)	Northern Constabulary, Aberdeen Road Safety Scotland
Association of Scottish Self-Caterers	RoSPA Scotland (Royal Society for the Prevention of Accidents)
CAPT (Child Accident Prevention Trust)	Rural Development Scotland
Chief Fire Officers Association	Scottish Government
Children in Scotland	Scottish National Party
Consumer Forum Scotland	Scottish Tourist Forum
COSLA (Convention of Scottish Local Authorities)	Visit Scotland
Highlands and Islands Enterprise	Youth Scotland

The views and interpretations of the evidence presented in the Report are entirely those of its author.

EXECUTIVE SUMMARY

Introduction

The UK's adherence to Greenwich Mean Time and British Summer Time has been the subject of popular and political debate for many decades. Recently, however, policymakers have been looking at this issue more closely, with an eye to possible reform. The most widely-discussed proposal is to move to GMT+1 in the winter and GMT+2 in the summer – essentially advancing the UK's clocks by one hour throughout the year.

Advocates claim that this proposal – known as 'Single Double Summertime' (SDST) or simply 'lighter evenings' – would allow UK citizens to make better use of the available daylight and bring a host of social benefits. Alternative time regimes have historically struggled to gain traction, thanks in no small part to concerns about their effect on people in Scotland whose northerly latitude makes for particularly short winter days. Opponents of the change in Scotland worry that, were SDST to be implemented, the loss of daylight in the morning would offset or outweigh the benefits of the extra light in the afternoons and evenings.

There has been no shortage of passion in this debate, but progress has been hampered by the lack of an evidence-based assessment of the proposal's costs and benefits for Scotland. This report aims to fill that gap. It assesses the consequences of the proposal for all sectors of Scottish society and seeks to establish whether a move to lighter evenings would be of general benefit to people in Scotland. The key findings are as follows:

ALIGNMENT OF WAKING HOURS WITH DAYLIGHT

Examination of the times of sunrise and sunset in relation to the time when the majority of people in Scotland get up clearly indicates that moving to SDST would enable a better match of their waking hours with the available hours of daylight. It would result in an extra hour of evening daylight on every day of the year, while working people would only be affected by the later sunrise on about 60 weekdays in winter.

In Scotland, the change would mean that adults in 9-to-5 employment would enjoy a yearly total of almost 300 additional hours of daylight, with more than half of these falling on working days. For Scottish children, there would be a yearly increase of about 200 daylight hours, with roughly half of these falling on school days.

ROAD SAFETY

The behaviour of road users in the UK has changed considerably in the last 40 years following a series of legislative changes. The composition, volume and speed of traffic have also altered significantly. Surveys show that road crashes are more likely to occur during the evening peak, when driver attentiveness declines and darkness reduces visibility. Aligning the evening 'peak' in traffic with daylight hours is therefore anticipated to reduce the frequency of such accidents.

The 1998 study by the Transport Research Laboratory (TRL) on the impact of the clock change on road casualties estimated that it would lead to an overall reduction of 0.7% deaths and serious injuries on Scotland's roads, with a 0.2% reduction in casualties of all severities. Applying these estimates to 2009 road casualty figures for Scotland implies potential reductions of around 20 deaths or serious injuries and around 30 casualties of all severities. However, it should be noted that the TRL report acknowledged a fair degree of uncertainty in its estimates. Indeed, there are strong grounds for suggesting that they are conservative.

Based on the Department for Transport's figures for the costs of road casualties, the value attached to these reductions would be in the region of £8 million.

TOURISM

For the UK as a whole, the clock change has been estimated to boost tourism revenues to the tune of £3.5 billion and generate around 80,000 jobs. Scotland, therefore, could expect additional annual earnings of at least £300 million and the generation of 7,000 jobs on top of its current annual tourism earnings, which presently constitute about 11% of the Scottish economy. Growth in this vital sector is particularly valuable during this time of rising unemployment.

SPORT AND LEISURE

Surveys indicate that the majority of people prefer to participate in outdoor leisure activities, including sports, during daylight hours. An additional hour of daylight in the evenings will result in more people taking advantage of existing sports and recreation facilities.

HEALTH

This outcome is likely to increase the health and well-being of the Scottish population as a whole, without incurring expenses for sports organisations that would otherwise struggle to meet demand. As well as encouraging the higher levels of physical activity, the additional sunshine exposure has been shown to have direct medical and therapeutic benefits, including compensating for vitamin D deficiency and reducing levels of SAD (Seasonal Affective Disorder) and other forms of depression.

ELECTRICITY CONSUMPTION

Recent evidence shows that advancing the clocks would lower electricity demand on every evening of the year due to a fall in the need for artificial light. Demand in the mornings, meanwhile, would only rise in the winter months. Overall, Scottish domestic electricity bills would be reduced by around 1.5%, creating an annual saving for Scottish bill-payers of around £15 million.

CARBON EMISSIONS

There are no separate figures for Scotland on the reduction in greenhouse gases from power stations that would result from a fall in demand for artificial lighting in the evenings. However, it has been calculated that, across the UK as a whole, CO₂ emissions from power stations would drop by about 450,000 tonnes.

SECURITY

Many types of crime, such as mugging and vehicle theft, are more likely to occur after nightfall. Fear of crime also increases at these times, resulting in self-imposed restrictions on outdoor activity especially for the elderly and in parentally-imposed restrictions on children. The proposed clock change would enable concerned or vulnerable Scottish people to feel safe on the street for more of the day.

TRADE and INDUSTRY

If the lighter evenings proposal were adopted, Scotland and the rest of the UK would achieve temporal harmonisation with key trading partners in the EU. This would consolidate economic relations with those countries through the closer alignment of working hours and increased convenience and simplicity of business travel. UK markets would also be better-aligned with those in the Far East.

FARMING

Widespread mechanisation and the affordability of new farming equipment, use of artificial lighting, better farming practices, and the development of new shelf life-extending technologies have reduced the need for very early morning collections. Moreover, nearly all cattle, including all dairy cows, are now kept indoors for at least the six months from October to April, and most cows are milked in artificially lit automated parlours. These developments mean that traditional concerns about the clock change among the Scottish farming community have softened in recent years. Most notably, the National Farmers Union in Scotland has adopted a 'neutral' stance on this issue.

WHO SUPPORTS THE PROPOSAL?

- All road safety organisations
- Many sectors of industry – especially tourism and leisure services
- Nearly all bodies involved in trade, travel and communications
- Organisations providing sports, recreational and cultural facilities
- Groups representing children, teenagers, women, pensioners, and people in rural communities.

CONCLUSION

The evidence presented in this report indicates that advancing the clocks would bring the Scottish people at least as great benefits as those predicted for the rest of the UK. This finding - combined with recent Scottish polls showing fairly evenly-divided support for and against the move - adds up to an exceptionally strong case for reform.

1. INTRODUCTION

The UK's adherence to Greenwich Mean Time and British Summer Time has been the subject of popular and political debate for many decades. Recently, however, policymakers have been looking at this issue more closely, with an eye to possible reform. The most widely-discussed proposal is to move to GMT+1 in winter and GMT+2 in summer – essentially advancing the UK's clocks by one hour throughout the year.

Advocates claim that this proposal – known as 'Single Double Summertime' (SDST) or simply 'lighter evenings' – would allow UK citizens to make better use of the available daylight and bring a host of social benefits. Alternative time regimes have historically struggled to gain traction, thanks in no small part to concerns about their effect on people in Scotland, whose northerly latitude makes for particularly short winter days. Opponents of the change in Scotland worry that, were SDST to be implemented, the loss of daylight in the morning would offset or outweigh the benefits of the extra light in the afternoons and evenings.

There has been no shortage of passion in this debate, but progress has been hampered by the lack of an evidence-based assessment of the proposal's costs and benefits for Scotland. This report aims to fill that gap. It assesses the consequences of the proposal for all sectors of Scottish society and seeks to establish whether a move to lighter evenings would be of general benefit to people in Scotland.

It is now 40 years since the UK abandoned a three-year experiment to establish the impact of maintaining the summertime clock (GMT+1) throughout the year. This was called British Standard Time (BST). Since then, changes to daily life (such as the shorter working week) have altered the relationship between daylight and waking hours.

Today, even a cursory comparison of daylight hours with patterns of daytime activity suggests that they could be more closely aligned.

In the mid-1980s, I observed that the great majority of the UK population get up well after sunrise for most of the year, but are then denied opportunities for outdoor activity by the onset of darkness at the end of the day. I referred to it as a 'waste' of daylight hours. In the latter half of 1987 and early 1988, I undertook the first comprehensive study of the wide-ranging social and environmental consequences of advancing the clocks by an additional hour in both summer and winter, that is **GMT+1 hour from the end of October to the end of March** followed by **GMT+2 hours to the end of the following October**. The extra hour of natural light in the latter part of the day would be appreciated for all 365 days of the year whilst, for most of the population, the loss of the hour of daylight in the morning would only be felt in the winter months.

In 1988, Policy Studies Institute published a report titled *Making the Most of Daylight Hours*. Its findings were updated in 1993 with the *Time for Change* report. The two studies contained detailed analyses of the likely effects of the clock change on:

- Road casualties
- Security issues
- Leisure activity
- Health and well-being
- Industry and public services
- Domestic tourism
- Overseas trade
- Travel and communications
- Fuel consumption.

The conclusions of these reports - namely that the clock change would deliver wide benefits for society with only a few disadvantages - were widely supported at the time, including by all the major broadsheet editorials.

Since then, the most vocal objections to the proposal have come from Scotland. These have tended to focus on the increase in road casualties in the early mornings during the 1968 to 1971 experiment and the darker winter mornings that came in the wake of its adoption. Although the substance of these reservations have not been subject to careful scrutiny, they have prevailed in many subsequent debates in Parliament, partly perhaps because of the perceived unpopularity of the proposal among the Scottish electorate.

This study has been undertaken to look exclusively at the evidence on what the lighter evenings proposal would mean for Scotland. The areas of daily life that would be affected have been examined using a framework similar to that employed in the previous studies to provide objective evidence of the likely effects and to consider the validity of the arguments adduced both by opponents and by supporters. Throughout this report, the present clock regime is referred to as **GMT/GMT+1** or the *status quo* and the proposed change as **GMT+1/GMT+2** or simply 'lighter evenings'.

2. ROAD CASUALTIES AND PERSONAL SECURITY ISSUES

When we examine the distribution of road casualties throughout the day, the relationship between daylight and road safety becomes apparent. A similar correlation can be seen in the timing of many criminal acts, and in the role that street crime in particular plays in imposing a *de facto* curfew on many people's freedom to go out after dark. This is true of senior citizens, younger women and indeed most children, owing to parental anxieties about the dangers to which they think they will be exposed.

Road casualties and commuter travel

The frequency and severity of injury on the roads is closely related to lighting conditions. Analysis of hourly road activity shows that traffic levels peak in the evening. This coincides with a deterioration of road user attention caused by increasing tiredness as the day runs on. As a result, there are far more injuries on the roads during the evening peak than during the equivalent period in the morning. This is particularly so for pedestrians and cyclists, who are at even greater risk than vehicle occupants during periods of heavy traffic.

During the 1968–71 experiment with BST, there were 11% fewer fatalities and serious injuries in England and Wales than would have been expected under the *status quo*. The overall reduction in Scotland was significantly greater at 17%, in spite of a small increase in casualties in the morning in northern Scotland.

Road safety for schoolchildren

The issue of children having to travel to school in the dark in the winter, with a consequential increase in the risk of their injury on the roads at that time of day is best seen in a wider context.

Examination of 'time budget' surveys show that children's travel, involving journeys to friends' houses, or to places of recreation, occupies nearly as much of their time as journeys to and from school, and that far more of it takes place in the late afternoon and early evening than in the morning peak hour when children are usually travelling straight to school.

In the four winter months alone from November to February inclusive, and taking into account road casualties on all seven days of the week, there are nearly three times as many fatal and serious injuries among children in the peak hours from 3pm to 6pm as from 7am to 10am - and over 50% more among adults in the peak hours from 4pm to 7pm as from 7am to 10am.

It is also necessary to take account of weekends, holidays and half-terms - three-quarters of children's waking hours are spent outside school hours. Thus, children go to school on just over a half of the days of the year and, indeed, the three weeks of Christmas holidays coincide with the darkest period of the year.

Partly as a consequence of this, children are far more likely to be injured in a road crash on journeys *other than* to and from school. In fact, school journeys account for only about 1 in 10 child fatalities, with a higher proportion of these occurring on the return journey from school to home. This may reflect the increasing frequency with which children are escorted, often by car, on their school journeys. However, far more of their time spent outside the home is associated with less predictable, more dispersed patterns of activity.

Reductions in road casualties and costs

Because the risk of casualties on Scottish roads is higher than in England and Wales, there is also greater scope for casualty reduction. On the road safety front, therefore, Scotland stands to benefit disproportionately from the move to lighter evenings. This potential is best understood by segmenting these incidents by time of day and month of year, particularly within the three-hour period in the winter afternoons most affected by the clock change. As was noted earlier, road fatalities and serious injuries in Great Britain as a whole are far higher during this afternoon period than during the equivalent time in the morning, particularly in Scotland.

Many legislative changes affecting road user behaviour have been introduced in the last 40 years, and the composition, volume and speed of traffic have altered too. The 1998 study by the *TRL (Transport Research Laboratory)* of the likely effects of the clock change on road casualties in Scotland estimated that it would lead to an overall reduction of 0.7% (or around 41) deaths and serious injuries on Scotland's roads, with an overall 0.2% reduction (or around 57) in casualties of all severities.

Applying these estimates to 2009 road casualty figures for Scotland implies potential reductions of around 20 deaths or serious injuries and around 30 casualties of all severities. Based on the Department for Transport's figures for the costs of road casualties, the value attached to these reductions would be in the region of £8 million.

It should be noted that the TRL report acknowledged a fair degree of uncertainty in its estimates. Indeed, there are strong grounds for suggesting that they are conservative. In Scotland, vehicle ownership is a quarter lower than in England and Wales, and there are, *pro rata*, 20% more journeys made on foot. Because of the increased risks associated with pedestrian travel, people in Scotland are disproportionately involved in road accidents: they run a 27% higher risk of fatalities and serious injuries than people in England and Wales.

This holds particularly true with regard to children's travel. Their greater dependence on walking accounts for much of the difference in casualty rates and explains why increased conspicuity in the evenings rather than the mornings would be of even more benefit to children living in Scotland than to their southern counterparts.

Impacts of lighter evenings

Putting clocks forward by one hour would be likely to reduce road casualties in Scotland as more journeys home in the evening would be able to be made in daylight. Additionally, the wider fears associated with being out after dark and their impact on preferred activities in the evening suggest that it would also lead to some reduction of many criminal offences which are more commonly committed in the dark, yet are rarely committed in the hours before dawn.

With a rising proportion of the working population - now three-quarters of the total - in white collar occupations, and with typical office hours starting at 9am, the concomitant darker winter mornings would affect fewer people than in the past. However, it should be borne in mind that meteorological data show darker winter mornings occasionally bringing with them more hazardous road conditions in the form of ice or fog, though, these conditions vary only slightly during the hour that would be affected by putting the clocks forward.

Security and the fear of crime

The figures published in the *Scottish Crime and Justice Statistical Bulletin* shows that in the last year for which data are available, there were, for instance, over 25,000 incidents of housebreaking, over 32,000 thefts of or from motor vehicles and over 100,000 acts of vandalism and crimes of violence that include serious assault and robbery. Criminal damage of all kinds accounts for nearly one in three of all crimes. The Home Office's *British Crime Survey (BCS)* has found that about 3 in 4 acts of vandalism and vehicle-related theft, and about 1 in 2 burglaries and bicycle thefts, are committed under cover of darkness.

Unfortunately, the *BCS* does not cover Scotland and the Scottish Regional Constabularies have no data on the hour of day that any crime is committed that would enable an England-Scotland comparison of daylight's influence on levels of criminal activity. However, there is no reason to believe that the pattern of crimes in England and Wales differs very much from that recorded in Scotland. When it is borne in mind that the ratio of waking hours in daylight compared with those in darkness is of the order of 3:1, this finding suggests that darkness represents a significant facilitator of these types of crime.

Added to the incidence of criminal activity on the streets is the fairly prevalent fear of going out after dark which results in a limitation of much evening activity outside the home. The great majority of parents restrict their children from going out after dark. Recent research by the Policy Studies Institute has revealed that very few primary schoolchildren, and only about 1 in 3 secondary schoolchildren under the age of 15, are allowed to do so. The primary reason cited by parents for imposing this restriction is the fear of their children being injured crossing the road or being molested or abducted.

Similarly, many older people are concerned about increased criminal activity after dark, and as a result choose to limit their outdoor activity in the evenings. In *British Crime Surveys*, the primary reason given for not going out after dark is feeling 'fairly unsafe' or 'very unsafe'. Moreover, of the small proportion of crimes occurring in conditions of twilight, far more occur at dusk rather than at dawn.

In some instances, a further contributory factor is declining visual acuity. Of course, the effects of this condition are less debilitating in daylight. An *Age Concern* survey found that 4 out of 10 of those over the age of 50, and 3 in 4 elderly women, say that they do not go out after dark and that one of the changes they would welcome is 'better lighting'.

Security issues

Consideration of personal security provides further support for the 'lighter evenings' proposal. Fifteen years ago, the Home Office calculated that an extra hour of evening daylight would lead to about a 3% reduction in the number of crimes, with criminal damage in particular being lowered as it is far more commonly committed under the cover of darkness. Here too, some benefit could be anticipated from the clock change as parents would be more inclined to let their children stay out and about for a longer part of the day, both after school and during weekends and holidays.

All the main organisations and bodies - including those in Scotland - with interests in reducing injuries on the roads and in reducing crime and the fear of crime have repeatedly indicated their support for the clock change.

3. LEISURE AND RECREATION

There is growing interest in making the best possible use of daylight hours. The working week is shortening, leisure time and paid holidays are increasing, and more people are working part-time, at home or are on flexitime allowing them to arrive home earlier in the evening. This process, combined with widening public interest in sports and recreation, is increasing participation in outdoor activities of all kinds.

Schools are looking at new types of timetable that enable more use of their facilities outside normal school hours. Generally, we work on weekdays and take our recreation at the weekends when more time is available. All this suggests a general preference for leisure hours being enjoyed in as much daylight as possible. The early hours of the morning are rarely a key time for leisure activity.

Most outdoor amateur and professional sports and other types of informal recreation are sensitive to daylight hours as well as to climate. In the UK as a whole, and thus for Scotland, levels of participation in most leisure and recreational activities are much higher in summer than in winter, and this is only partly accounted for by improved weather conditions. The number of trips made on Saturdays and Sundays varies by season, though not to the extent that could be expected: trips in the summer are only a third higher than in the winter. Not surprisingly, countryside trips are more influenced by daylight availability than by temperature as the increase in trips in the summer on weekdays is far more marked than it is on Sundays. People prefer walks and countryside and park visits in the middle to late afternoon at weekends.

Half of the most popular ten adult sports are daylight-dependent. They include walking, which predominates in all age groups, cycling, running, athletics, and soccer. Particular reference can be made to golf and fishing, as well as to tennis and football as only a small proportion of courts and pitches have floodlighting. The most popular outdoor daylight-dependent leisure activity is gardening.

Analysis of available comparable data undertaken as part of this report indicates that participation rates in sports and physical recreation in Scotland are about 15% higher than in England and Wales. A survey in Scotland a few years ago recorded that about 2 in 3 adults had engaged in one or other of these activities in the four weeks preceding the survey – including a somewhat higher proportion of men than women.

Table 3.1 below has been derived from data combining the number of trips to participate in sports in the two months before and after the clock changes in spring and autumn. It enables comparison to be made between Scotland and the rest of Great Britain. The figures in it are based on analysis of special tabulations commissioned from the National Travel Survey. They cover the years from 2002 to 2008 and show average monthly changes in the incidence of travel to participate in sports in Scotland. It reveals that during the seven months with the summertime clock, over a quarter more of these types of journey were made than during the two months of GMT before the clock change. The more extreme impacts of longer and shorter daylight hours in Scotland at different times of the year may well be explained by the major influence of latitude and (to a lesser extent) longitude.

Table 3.1 Changes in the recorded number of trips to participate in sports, England and Wales, and Scotland, 2002 to 2008

	Feb/Mar	Apr/May	Sep/Oct	Nov/Dec
England and Wales	1952	2101	2055	1488
<i>change</i>		+ 8%		- 28%
Scotland	199	260	234	150
<i>change</i>		+ 31%		- 36%

Source: to obtain reasonable sample sizes, the special tabulations from which data in the Table have been calculated have been supplied by the Department for Transport's National Travel Survey for the most recent seven-year period for which they are currently available.

Impact of lighter evenings

More daylight in the evenings would have a considerable impact on leisure activities. Most of the population work indoors, many of them under conditions of artificial light, and return home in the late afternoon or early evening. Depending on the time of year, they then have to rely on artificial light for some or all of the evening. Indeed, in the UK as a whole, people spend about 60% more time watching television in winter than in summer, suggesting a strong relationship between such sedentary activities and the available daylight hours.

Lighter evenings would allow for more extensive use of existing facilities, thereby catering for the growing demand for sports, which at present have inadequate provision. For instance, most people would prefer sunset an hour later on every day of the year - especially during the month of December, when the sun currently sets in Scotland in mid-afternoon. It would be difficult to deny the attractions of sunset at 7pm instead of 6pm in mid-March, 8.30pm instead of 7.30pm in mid-September, or 5pm instead of 4pm in January and November. Lighter evenings would also enable facilities catering for outdoor sports and leisure activities in Scotland such as camping and caravanning, angling, rowing, sailing and skiing to remain open longer. They would also extend the current season for many spectator sports such as horseracing and bowling. However, a few organisations representing these activities have expressed concerns about over-use of sports surfaces and recreational paths, and loss of leisure time for their staff.

This study has not identified any Scottish organisations representing indoor pursuits such as pubs, bingo halls, cinemas, theatres, museums and galleries, restaurants, youth clubs, and evening classes which have data on the influence of daylight and darkness on attendance. However, concern has been expressed at the prospect of increasing daylight hours leading to lower attendance at these facilities. On the other hand, it could have little effect - pub visiting hardly varies from summer to winter and, surprisingly, even cinema-going is generally higher in the summer months.

Table 3.2 reveals the extent to which the clock change would alter the number of 'accessible' hours for outdoor daylight-dependent activities (i.e. those not spent in bed or at work or school). The detailed figures have been compiled from the monthly timing of sunrise and sunset in three geographically-spread Scottish locations - Glasgow, Aberdeen and Lerwick in the Shetland Islands. They show a comparison of the number of hours between finishing work or school and going to bed, under the existing GMT/GMT+1 system and under the lighter evenings regime. The detailed figures on which the table is based can be found in Tables 3.3 to 3.5 at the end of this chapter. At present, the average time of sunset during the year is 6.35pm - taking account of the five months of GMT and the seven months of GMT+1. This means that a move towards lighter evenings would result in the average time of sunset occurring at 7.35pm - a net average daily gain of an hour of 'accessible' daylight in the late afternoon or evening.

Table 3.2 ‘Accessible’ daylight hours per year, under a GMT/GMT+1 and GMT+1/GMT+2 clock regime, in three Scottish locations

GLASGOW		‘accessible’ daylight hours			
Adults		GMT/GMT+1	GMT+1/GMT+2	Extra hours	% change
Working	436	611	175	+40	
days					
All days	1648	1949	301	+18	
Children					
School days	525	621	96	+18	
All days	1985	2185	200	+10	

ABERDEEN		‘accessible’ daylight hours			
Adults		GMT/GMT+1	GMT+1/GMT+2	Extra hours	% change
Working	435	594	159	+36	
days					
All days	1625	1920	295	+18	
Children					
School days	506	612	106	+20	
All days	1966	2171	205	+10	

LERWICK		‘accessible’ daylight hours			
Adults		GMT/GMT+1	GMT+1/GMT+2	Extra hours	% change
Working	461	621	160	+35	
days					
All days	1627	1921	294	+18	
Children					
School days	500	584	84	+17	
All days	1915	2096	181	+ 9	

The table shows the change in the number of daylight hours made accessible separately to adults and children by putting the clocks forward by an hour in the three locations. For the purposes of calculating the number of ‘accessible’ daylight hours for outdoor activity, a typical adult’s day after work has been taken to run from 5.30pm to sunset and, on days when not at work (weekends and holidays), to be from 10am to sunset. For children, a typical day after school hours has been taken to run from 4pm to sunset, or bedtime at 8.30pm (whichever is the earlier), and on days when not at school (weekends and holidays), to run from 10am to sunset or bedtime at 8.30pm, (again, whichever is the earlier).

It demonstrates that this change would lead to a substantial increase (incidentally, not significantly dissimilar to that in England and Wales), in the number of daylight hours for leisure at weekends. On weekdays, it can be seen that, for adults, there would be an additional 18% (roughly 300 hours) of daylight overall, including 35-40% (about 160 hours) on working days. For children, there would be an additional 9-10% (181-205 hours) increase overall, including a 17-20% increase on school days. The clock change would also lead to a similar proportional increase in sunshine hours which, in Scotland, account for about a quarter of daylight hours and are fairly evenly distributed throughout the day.

The extra hour is likely to lead to significantly higher participation in outdoor activities - not only after work or school, but also at weekends. It would fit in with the national strategy aimed at extending the use of existing facilities in parks, sports centres and schools (after hours, at weekends and during holidays). This would incur only small additional costs for providers, especially compared to the cost of constructing new facilities. The latter concern is particularly relevant in view of the economic recession. The extension of evening daylight would also fit in well with the strategy of health promotion by enabling more people to participate in sport and informal recreation more often – a subject discussed in more detail in the next chapter.

It is obvious that the clock change would achieve a better relationship with the warmer time of day, i.e. the late afternoon and evening, rather than the early morning. In order gain a better understanding of the likely influence of monthly variations in daylight hours and temperature, the Meteorological Office was asked to run a special tabulation for this report. This was obtained for the Salsburgh station situated between Edinburgh and Glasgow. It included the hourly temperature on the 15th day of each month between 2000 and 2009. The results are recorded in Table 3.6 at the end of this chapter. They reveal additional benefits of setting clocks forward. For example, it can be seen that while there would be a slight decrease in average morning temperature around 8am of about 0.4° C, the 5pm average would increase by 2.5° C.

The increase in the hours when outdoor daylight-dependent activities are possible would enable more journeys to both indoor and outdoor activities to be made in daylight, and in the summer allow more return journeys home to be made while it is still light. This would particularly benefit people in Scotland where, owing to its latitude, daylight hours in the summer are significantly higher in number than in England and Wales.

While the conditions in a winter morning rush hour would be made somewhat worse by the later time of sunrise, those having to start work early would be compensated by having the additional hour of daylight in which to travel home in the late afternoon or for engaging in more outdoor leisure activities at that time.

The majority of adults go to work between 7.45am and 9.00am and travel home between 5.00pm and 6.00pm. Surveys of employed people's use of their weekdays show typically four hours of 'free time,' but, with the current clock regime, about three-quarters of this is spent during hours of darkness. If no change were made in commuting times following the adoption of the clock change, the proportion of time in the year that they would be travelling in the dark would increase marginally.

Most children go to school between 8.15am and 8.45am and travel home between 3.30pm and 4.00pm during term-time. If this pattern remained the same under a lighter evenings regime, the proportion of time in the year that children would be making journeys to and from school in the dark would also increase marginally. However, children's journeys for social and recreational purposes mostly take place in the afternoon and early evening, especially during holidays, half-term and weekends. The benefits for children in particular are acknowledged by organisations such as Youth Scotland, which specifically represent their interests.

The extra hour of daylight on every day of the year would also improve visibility, with its associated benefits for all types of journey made in the evening. These benefits would be particularly marked for essential journeys made in the late afternoon in winter, such as shopping, visiting the doctor, and so on, as well as coming home from school or work. Shops are rarely open early in the day and the extra hour of winter daylight in the afternoon would therefore enable nearly all shopping to be carried out before dusk for most of the year. This would be of special benefit to retired people as their shopping in the winter is strongly influenced by the availability of daylight. There are grounds too for suggesting that lighter evenings would encourage social visiting, participation in further education courses, club functions and other leisure pursuits as fewer return journeys would have to be made after dark. Studies have shown attendance falling in the evening compared with daytime owing to the concern about being out after dark.

While some of the observed changes in participation in sports during the year can be attributed to changes in weather, particularly temperature, there can be little doubt that the number of daylight hours available also plays an important role. As could be expected, due to its more northerly latitude and therefore more marked difference in daylight hours in summer and winter, the extent of change in the Scottish sample is significantly greater than in England and Wales. It can therefore be concluded that the clock change would lead to an appreciable increase in outdoor activity. In addition, in view of its effect on the likelihood of any travel having to be made in the dark, it is very likely that there would also be an increase in indoor leisure activity as well.

Table 3.3 Average daily daylight hours by month and daylight ‘accessible’ hours per month, Glasgow

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Current times:													
<i>Sunrise</i>	08.38	07.42	06.33	06.12	05.05	04.31	04.53	05.48	06.48	07.48	07.53	08.41	
<i>Sunset</i>	16.16	17.20	18.20	20.23	21.23	22.04	21.52	20.54	19.35	18.17	16.10	15.43	
Daily daylight hours	7.38	9.38	11.47	14.10	16.17	17.32	16.59	15.05	12.46	10.29	8.17	7.01	
Monthly accessible hours*													
Children													
GMT/GMT+1	94	116	160	215	222	215	222	222	191	157	89	83	1985
GMT+1/GMT+2	125	144	191	215	222	215	222	222	215	188	119	108	2185
Difference	+31	+28	+31	0	0	0	0	0	+24	+31	+30	+25	+10%
Monthly accessible hours*													
Adults													
GMT/GMT+1	71	76	108	169	206	219	220	191	145	110	68	65	1648
GMT+1/GMT+2	83	98	139	199	237	249	251	222	175	141	79	76	1949
Difference	+12	+22	+31	+30	+31	+30	+31	+31	+30	+31	+11	+11	+18%

* In this and the following two tables, the number of hours in each box has been determined for adults by calculating the time between coming home from work and sunset and, for children, the time between coming home from school and sunset or going to bed, whichever is the earlier, in all instances multiplied by the number of days in the relevant month.

Table 3.4 Daylight and daylight ‘accessible’ hours per month, Aberdeen

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Current times:													
<i>Sunrise</i>	08.38	07.37	06.25	06.01	04.50	04.13	04.35	05.35	06.39	07.41	07.50	08.42	
<i>Sunset</i>	16.00	17.09	18.11	20.18	21.21	22.06	21.53	20.50	19.27	18.06	15.55	15.25	
Daily daylight hours	7.23	9.31	11.46	14.17	16.31	17.53	17.17	15.15	12.48	10.24	8.05	6.43	
Monthly accessible hours*													
Children													
GMT/GMT+1	87	110	154	214	226	219	226	226	188	152	85	79	1966
GMT+1/GMT+2	118	139	185	219	226	219	226	226	217	183	114	99	2171
Difference	+31	+29	+31	+5	0	0	0	0	+29	+31	+29	+20	+10%
Monthly accessible hours*													
Adults													
GMT/GMT+1	68	74	106	167	206	220	222	189	143	104	65	61	1625
GMT+1/GMT+2	79	95	137	197	237	250	253	220	171	134	75	72	1920
Difference	+11	+21	+31	+30	+31	+30	+31	+31	+28	+30	+10	+11	+18%

Table 3.5 Daylight and daylight ‘accessible’ hours per month, Lerwick

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Current times:													
<i>Sunrise</i>	8.54	7.44	6.22	5.48	4.26	3.39	4.06	5.18	6.32	7.44	8.03	9.03	
<i>Sunset</i>	15.35	16.55	18.06	20.23	21.38	22.13	22.13	20.59	19.27	17.56	15.35	14.56	
Daily daylight hours	6.41	9.11	11.44	14.35	17.12	18.53	18.07	15.41	12.55	10.06	7.32	5.53	
Monthly accessible hours*													
Children													
GMT/GMT+1	81	104	152	215	222	215	222	222	187	146	78	71	1915
GMT+1/GMT+2	104	132	183	215	222	215	222	222	217	178	101	85	2096
Difference	+23	+28	+31	+0	+0	+0	+0	+0	+30	+31	+23	+14	+9%
Monthly accessible hours*													
Adults													
GMT/GMT+1	63	71	103	169	214	225	232	194	141	98	61	56	1627
GMT+1/GMT+2	74	89	134	200	245	254	263	223	171	129	72	67	1921
Difference	+11	+18	+31	+30	+31	+30	+31	+31	+30	+31	+11	+11	+18%

Table 3.6 Average temperature in Centigrade at 8am and 5pm by month, with clocks on GMT/GMT+1 and onGMT+1/GMT+2

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	MEAN
8am													
GMT/GMT+1	3.7	1.7	3.7	4.4	8.7	11.3	12.8	11.3	10.6	7.8	4.8	1.0	8.5
GMT+1/GMT+2	3.8	2.0	3.3	3.7	8.1	10.3	11.9	11.6	10.2	7.7	4.6	1.4	8.1
Difference	+0.1	+0.3	-0.4	-0.7	-0.6	-1.0	-0.9	+0.3	-0.4	-0.1	-0.2	+0.4	-0.4
5pm													
GMT/GMT+1	3.8	4.1	6.5	9.9	10.6	15.3	19.9	16.0	16.0	11.8	5.2	1.4	10.0
GMT+1/GMT+2	3.9	4.2	6.9	10.7	10.9	12.2	19.7	15.6	16.4	112.2	5.6	1.9	12.5
Difference	+0.1	+0.1	+0.4	+0.8	+0.3	-3.1	-0.2	-0.4	+0.4	+0.4	+0.4	+0.5	+2.5

The figures in the Table have been compiled from the average of the readings by hour of day on each day of the years 2000, 2003, 2006 and 2009 at the Salsburgh weather station situated between Edinburgh and Glasgow.

4. PHYSICAL HEALTH AND WELL-BEING

Scotland has one of the highest levels of chronic illness in Europe, and this has become a serious public health problem. A major contributing factor is physical inactivity. Medical authorities have calculated that adults should accumulate at least 30 minutes of moderate or vigorous-intensity activity on most days of the week, and children at least one hour daily. However, this no longer features in most people's everyday lives. The *Scottish Health Survey* revealed low levels of fitness affecting two in three women and over one in two men, and one in four boys and over one in three girls. A *Foresight Report* in 2008 estimated that, on current trends, over half Scotland's population will be clinically obese by 2050.

Promoting active lifestyles

The Scottish Government has adopted the advice of its independent academic health experts who have recommended the setting of targets and a timetable by which this situation can be remedied. Fortunately, most people are aware of the health benefits that follow the take-up of more active lifestyles. There is strong scientific evidence that such a strategy can help to prevent many of Scotland's most prevalent and harmful diseases, including coronary heart problems, obesity, diabetes, hypertension and some cancers. The government's aim is to engage Scotland's inactive population so that, by 2022, 50% of adults aged over 16 and 80% of children will have met the minimum recommended levels of physical fitness by engaging in moderate-intensity aerobic activity such as going for a walk or gardening, or more vigorous activity such as aerobics or jogging. At present, the school curriculum allocates insufficient time for this and insufficient numbers of adults are motivated to incorporate sports and active recreation into their regular routine throughout the year. For both groups, the onset of dusk for a significant part of the year considerably limits their opportunities for outdoor activity.

Attention has been drawn to the need for Scotland to catch up with other European countries which enjoy more equable climates. A recent Scottish Government Review highlighted a number of key areas where effective measures could aid the drive to get the inactive population to take more exercise. The focus of the review was on social, economic, behavioural and psychological benefits created by environments that encourage and support physical activity. For instance, the report draws attention to the importance of providing good-quality local open spaces and safe networks of accessible routes for walking and cycling to reach them. The review however appears to have overlooked the beneficial role that could be played by increasing the number of 'accessible' daylight hours available for outdoor sports and recreational activity.

More accessible daylight hours would play a greater role in another important facet of daily life: being physically active is widely recognised as one of the best ways of promoting mental health and well-being. People feel happier, more energetic and have lower sickness rates in the longer and brighter days of summer, whereas their mood and spirit tend to decline - and depressive states to intensify - during the shorter and duller days of winter. There is a greater sense of well-being in daylight, an overwhelming preference for it rather than artificial light, and a natural disposition towards sleeping in the hours of darkness.

SAD (Seasonal Affective Disorder), the most extreme form of depression that results from lack of daylight and sunlight in winter, is thought to affect a small proportion of the population and is more common in northerly latitudes. It has been found to disrupt biological rhythms, leaving people so lethargic, withdrawn and irritable that they require medical treatment. It therefore represents another possible area for policy intervention in relation to the availability of the limited hours of winter daylight especially in northern latitudes.

Impact of lighter evenings

Many studies of physical and mental health point to a wide range of benefits that are likely to be derived from an additional hour of daylight in the evenings on every day of the year. The tables in the previous chapter have shown that the additional hours proposed would significantly increase opportunities for outdoor activities for both adults and children, as well as leading to an overall improvement in people's quality of life. It would also have a preventive health role for several medical conditions. Research indicates a link between physical exercise and mental health, again suggesting that more outdoor activity can be helpful in treating anxiety and depression.

As has been seen in Chapter 2, most children are restricted by their parents from going out after dark. The extra hour of late afternoon and evening daylight would diminish this anxiety, allowing children to spend more time outdoors. There would be the further advantage for children of being able to develop physically and socially, and engage in activity free of adult surveillance. It would also increase their opportunities for more exposure to daylight, as they come home from school much earlier than most working parents and have much longer holidays.

The reluctance of an increasing proportion of older people to go out after dark because of anxiety about assault was noted earlier. Many physiological factors forming part of the ageing process also interact in a way that makes it difficult for them to get around in the dark. Vision - especially at night - declines progressively with age and adaptation to the dark is slower, recovery from glare takes longer, peripheral vision is reduced, and identification of moving objects takes longer. The lower temperatures in the winter also deter them from going out. However, the darker winter mornings of the clock change would have little impact on their everyday lives as surveys show that they tend to go out relatively late in the morning, whereas the lighter evenings throughout the year would be advantageous to them by making the perceived curfew of dusk one hour later.

Sunshine and health

Some specialists believe that exposure to daylight and sunlight improves the condition of some people suffering from depression. The extra hour of daylight in the period when people come home from work or school make it highly beneficial in this respect.

Adopting the clock change would also allow more access to summer sunlight, with all its associated therapeutic benefits. Meteorological records show that just over a quarter of daylight hours in Scotland are sunlit. Thus, it can be assumed that of the additional daylight hours stemming from the clock change (as calculated in the previous chapter), adults and children would enjoy an annual increase of 75 and 50 hours of sunshine respectively. It is noteworthy too that more illness and death occur in winter months which have less daylight and sunlight as well as lower temperatures.

The poor level of health in Scotland is also linked to low exposure to sunshine, a prime factor associated with gross vitamin D deficiency, but one that has received little attention from policy-makers. Indeed, Scotland has a relatively extreme climate with as little sunshine as some places in the Arctic Circle. Sun exposure stimulates vitamin D production, making it the best means of obtaining this nutrient.

In particular, children and pregnant women – whose vitamin D requirements are far higher than those of the general population – would benefit. One in three women suffers a fracture in later life owing to osteoporosis, a condition which often results from lack of exercise or a deficiency of vitamin D. The risk of skin cancer from exposure to sunlight is very low at the moderate levels generally experienced in the UK. In fact, a far higher proportion of the population as a whole die from femoral fractures than from this form of cancer, and for elderly women, the ratio is higher still.

General well-being

Daylight activates many biological functions in the body, and although less morning light could mean that people take longer to ‘get going’ in winter, the health benefits of more daylight overall are likely to outweigh any reduction in morning performance. The one hour shift of the clock in spring and autumn does not seem to affect the natural daily rhythm of life for more than a day or two. Lifestyles are more influenced by personal social timetables of work, sleep, meal times and leisure than by the balance of the hours of daylight and darkness.

Concerns have been raised about the potential difficulty of getting children to fall asleep in the evening while it is still light outside. However, children living in Scandinavia cope with exceptionally long light evenings. Research there has shown that sleeping problems are four-time more prevalent during the long dark nights of winter.

5. DOMESTIC TOURISM AND LEISURE INDUSTRIES

Tourism in Scotland is an important aspect of its social, economic, environmental and cultural life, both in its cities and in its rural areas. This chapter is focused on the likely impact of the clock change on Scottish tourism and its leisure industries. The aim is two-fold: first, to establish the frequency of tourist visits and the earnings and employment associated with these industries and second, to consider how these figures relate to the temperature and sunrise and sunset data. At the outset, it is important to note that in recent years tourism has grown to become a major sector of the Scottish economy in terms of 'value-added', about three quarters of tourist spending is in hotels and restaurants while the rest comes from shopping, travel and entertainment.

The role of daylight and climate

Tourist activity varies substantially during the year, and a number of factors can be invoked to explain this: school holidays and public holidays, long-term weather forecasts, the state of the economy, currency differentials between countries, and the fact that, since April 2008, all people in employment are now statutorily entitled to at least 28 days of paid holiday each year. However, although it is not possible to establish a precise link, two further strongly related factors - daylight and weather (especially temperature) - influence the level of tourist activity. The tables in Chapter 3 show the extent to which daylight and temperature vary by month in three fairly representative Scottish locations.

About 15 million tourists now make overnight visits to Scotland - about 17% of them from overseas. A significant proportion of their holidays are taken in the spring and autumn. Table 5.1 shows that, even in winter, numbers are by no means negligible. Indeed, it can be seen that, rather than falling to a very low level, both domestic and overseas visitors in the winter are about half of those in the summer. It may be concluded from these figures that although afternoon temperatures in the summer are of course very much higher than in the winter, temperature is not an overriding factor. Thus the figures can be interpreted as potential for lighter evenings to boost tourism throughout the year.

Table 5.1 Annual domestic and overseas visits to Scotland, by season

	Jan to Mar	April to June	July to Sep	Oct to Dec
Domestic visitors %	17	28	35	20
Overseas visitors %	17	27	37	19

Hotel occupancy rates are also a useful source of data on the attractions of different times of the year for tourists coming to Scotland. The figures in Table 5.2 confirm that tourist visits are by no means restricted to the warmer time of the year with its larger number of daylight hours. From this, again, it could be deduced that, even in the winter months, the extra hour of daylight in the late afternoons would encourage more visitors to Scotland.

Table 5.2 Hotel room occupancy in Scotland, by month

	Jan to Mar	April to June	July to Sep	Oct to Dec
Percentage occupancy	52	68	77	58

During the course of this brief study, no Scotland-specific data could be obtained on the patterns of tourist and tourist-related activities at different times of the year so analysis has had to rely on UK-wide evidence. However, there would appear to be few reasons why the general pattern of tourist activity in Scotland would be very different in this respect. The UK report on this subject revealed attendance peaking in mid- to late afternoon, allowing for a return home or to hotel before the onset of darkness.

Owing to Scotland's latitude, there are - depending on location - approximately 15 to 18 daylight hours during the summer: about one and a half times more than in spring and autumn, and two to three times more than in winter. When combined with the figures on tourist activity by season, this suggests strongly that daylight plays a greater role than temperature in influencing the visitor numbers.

The tables in Chapter 3 further indicate the actual influences of daylight and temperature. Their contents were drawn from monthly data on participation in sports and recreational activities. Those relating to tourism provide unsurprising evidence of greater demand for hotels, guest houses, B&Bs, self-catering accommodation and camping and caravan sites when days are longer and warmer.

Impact of lighter evenings

In Scotland, the tourist industry has a goal of increasing earnings by 50% between 2005 and 2015. The clock change significantly increases the prospect of realising – if not exceeding – this goal. Analysis of the monthly variations in tourist-related activities in relation to monthly variations in temperature and the timing of sunset indicates that an extra hour of accessible daylight throughout the year would bring significant advantages.

While there are generally sufficient daylight hours for outdoor tourist activity in the height of summer under the *status quo*, there is considerable scope for increasing the number of light evenings simply by putting clocks forward. The most significant benefits for tourism in Scotland, especially for overseas visitors, would occur during the 'shoulder' months in spring and autumn. Sunrise now occurs in April and October at roughly the same time as it would in March and November with the clock change. Thus, lighter evenings would be likely to result in some extension of Scotland's peak tourist season by enabling a later finish to the day outdoors

The generation of additional tourist activity and employment

Lighter evenings would encourage more day trips and weekend breaks, with a significant boost to revenues and employment. In addition, as the effect of the change would result in clocks being harmonised with nearly all those in central and west European countries, we can predict more convenient trade, travel and communications with these regions. It would be very likely to accelerate the rapidly growing trend towards off-peak and short-break holidays in Scotland for walking, climbing, sailing and other sporting activities. More of these are taken in the cooler months of March, April, September and October than in June and July. As has been shown in Chapter 3, a better relationship would also be achieved with the warmer time of any day - in the late afternoon in winter and in the evening during the rest of the year than is presently the case.

Lighter evenings would also expand opportunities for spectator sports, such as those provided by professional football clubs, the horseracing industry and sports centres. Spectator sports would also attract more revenue from the gate: matches could start at a more convenient hour on winter afternoons in order to finish before dusk. It is very likely too that as word spread over time, lighter evenings would make a trip to the UK more attractive to visitors from overseas.

While a later sunrise would expose tourists to a slightly lower temperature on average, it is important to note that surveys of time use show that there is a very low level of tourist and leisure activity in the early morning at any time of year so that the loss of opportunities resulting from the clock change would be very low. Opening times of the major indoor and outdoor visitor attractions listed in a Visit Scotland factsheet indicate that at present none of their opening times would be affected by an extra hour of darkness on winter mornings. On the other hand, it is clear that their closing times, which are at present predominantly 5pm, could be extended in the winter if those running them so desired, owing to the extra hour that would be available before sunset. The extra hour of late afternoon daylight in the winter would be of particular relevance to skiing in Scotland. In other areas of tourist activity it could often prove worthwhile to lengthen opening hours. As a consequence, the slightly lower morning temperature effected by the clock change is unlikely to have any significant effect on tourism.

Since people on holiday prefer to travel in daylight to and from facilities, lighter evenings would also encourage visits to popular destinations in Scotland such as seaside resorts, castles, churches, historic houses, parks, as well as camping and caravan holidays and walking in the countryside and, in the winter, skiing - all of them heavily daylight-dependent. It would also be advantageous for conferences organisers and attendees who tend to prefer the time of year allowing for outdoor activities after formal proceedings. It would also seem reasonable to expect that the recession, combined with the attractions of lighter evenings, will encourage people from elsewhere in the UK to take holidays in Scotland rather than travelling abroad.

While it is possible that the greater opportunity for daylight-dependent pursuits would cause a decline in indoor activities such as theatre and cinema-going and attendance at concerts and some sporting events, this could be offset by people's preference for daylight travel to and from indoor activities.

If we (conservatively) estimate that only a quarter of the monthly changes in tourist activity can be attributed to differences in the temperature and number of daylight hours, and three-quarters to other factors such as the time of the year set for traditional holidays, the boost to Scottish tourism by lighter evenings would be even greater than for the rest of the UK.

For the UK as a whole, the clock change is expected to boost tourism revenues to the tune of £3.5 billion and generate around 80,000 jobs. *Pro rata*, that would suggest that Scotland (whose tourism sector accounts for 11% of GDP) could expect additional annual earnings of at least £300 million and the creation of 7,000 new jobs. These include both highly qualified and relatively low-skilled employment, part-time and full-time, for men and women alike. The Scottish Government would also benefit from the additional tax revenues arising from increased earnings from the industry, including the additional contribution to its balance of payments from taxes drawn from overseas visitors.

In conclusion, the benefits of the clock change would be highly advantageous to the Scottish tourism and leisure industries, both in terms of higher earnings and more jobs. Few problems are foreseen, although concerns have been expressed that the change would lead to more vandalism at outdoor locations and that the change in hours could encourage more visitors to areas of outstanding natural beauty where paths have already been damaged by excessive wear, and decreased participation in indoor activities. It could be expected that the prospect of this virtually costless growth in earnings in this important sector of the Scottish economy would merit serious consideration and would command broad support from the Scottish tourist industry, including most of its regional tourist boards, as is the case among bodies covering the UK at large. The reasons for any lack of support within the Scottish tourist industry are discussed in Chapter 9.

6. OTHER INDUSTRIES AND SERVICES

The last chapter has shown that tourism would benefit considerably from lighter evenings. However, it could pose problems for some sectors of the Scottish economy where work has to begin at a set early hour of the day in order to service a particular population. Nowhere is this more apparent than in the largely daylight-dependent sectors which involve outdoor work, especially construction and agriculture. However, in the last 20 years, there has been a substantial move away from jobs in which an early start to the day has to be made and which therefore would be likely to be more affected by the prospect of later sunrises during the winter months. Employment in these sectors has fallen quite sharply: for instance, there has been a loss of about a third of the former jobs in agriculture. On the other hand, there has been a substantial increase in jobs in the service sector, including employment in distribution, catering, tourism and sports-related industries.

Impact of lighter evenings

Putting clocks forward by one hour would affect groups within this sector in different ways. There would be a relatively small number who would be disadvantaged by having to adjust their working practices owing to the loss of the extra daylight hour on winter mornings, while others would benefit from the opportunities opened up by the extra hour of daylight later in the day.

Building and road construction

The construction industries usually start work relatively early. If no change were made to current practice, putting the clock forward by one hour could necessitate working in the dark early in the morning for two or three months in the winter and for a somewhat longer period for those living in the north of Scotland where, in mid-winter, sunrise does not occur until 9.30-10.00am. However, it is important to note that the sky lightens appreciably from about half an hour before sunrise and work outside without floodlighting is currently curtailed in the depths of winter by sunset at 3.15pm-3.30pm.

There is some divergence of opinion within this industry on the subject of putting clocks forward. Claimed disadvantages include higher fuel bills for artificial lighting on site, increased unpunctuality and absenteeism, and more accidents owing to work having to start in the dark. It has also been claimed that the change would cause more traffic congestion in the rush hour and would require local site arrangements to be renegotiated if employers did not wish to incur additional costs from overtime rates. It is also felt that, in order to make up for the later start in winter, work would have to finish later, with a resultant shortening of the period of evening leisure and disruption to family and social life.

Agriculture, horticulture and forestry

Though the wider opportunities for work later in the day in other mainly outdoor industries such as agriculture were recognised during the 1968 to 1971 experiment with BST, similar problems to those of the construction industries have been raised. Livestock farmers, particularly in the north of Scotland claimed in the past that they were unable to get their animals to early markets before daylight and that the dairy farmers had to spend longer rounding up grazing cows in the dark in time to get their milk on the first morning train to town.

However, many of these problems have had declining relevance in recent decades as the character of farming has changed. Nearly two thirds of agricultural land is now used for rough grazing where the relationship with daylight and the hour of day is of little significance. The more widespread application of mechanisation and affordability of new farming equipment, use of artificial lighting, better farming practices, and the development of new technologies enabling, for instance, developments in the use of refrigerated vehicles and plant, and in extending shelf life through new food processing techniques, have reduced the need for early collection and speedy delivery of produce. Nearly all cattle, including dairy cows, are now kept indoors for at least six months from October to April, and most cows are milked in artificially-lit automated parlours. These changes have clearly altered attitudes to the proposal to put clocks forward. For arable farmers an extra hour of daylight in the latter part of the day is considered desirable, particularly at harvest time and for ploughing and sowing in spring.

Earlier this year, the NFU (National Farmers Union) stated that it has no strong views on whether we should or should not put the clocks forward. In fact, the last time it tested opinion among its members three years ago, there was a narrow majority in favour of lighter evenings. Nevertheless, whilst acknowledging that the proposed clock change would now cause fewer problems for the industry than in the past, NFU *Scotland* maintains its preference for the *status quo*. It has however indicated that it would welcome detailed studies on a sample of farms across Scotland to measure the likely effects of the proposed clock change.

Service industries

Some jobs in service sector industries also entail outdoor activity with little capacity for flexible working hours. Where services are provided over an 18-hour day as with some transport sectors or others requiring shifts or rotas to cover 24 hours, any change to the clock is unlikely to affect working practices. However, some difficulty could arise for those employed in postal, milk and newspaper deliveries as darker winter mornings would make their working lives in these months less pleasant. The small number of people who work outdoors, such as groundsmen in parks and outdoors sports facilities, may also be affected in the winter if they were unable to start work an hour later. In this case, the clock change could cause some loss of their efficiency.

In the past, the prospect of an extra hour of winter darkness was certainly not welcomed by organisations representing many of these groups. They argued that the change could lead to difficulties in recruitment, higher levels of unpunctuality and absenteeism, and some increase in the incidence of accidents among postal delivery workers. In addition, it has been thought that they would be more vulnerable to criminal attack in the dark, though evidence cited in Chapter 2 of this report suggests that these concerns are unfounded. Recent changes in working practices in many of these industries now allow for greater flexibility in working hours and wider opportunities to benefit from lighter evenings.

People who work in retail may be marginally affected by the clock change when travelling to work on dark mornings but, as noted previously, they would also be more likely to be able to return home in the light and have wider choices in the evenings. Analysis of the pattern of times when people shop in summer and winter indicates that shopping is somewhat more restricted to the morning in the winter. The extra hour of daylight on winter afternoons would therefore also remove this restriction and thereby spread shopping more evenly across the day, thereby leading to some improved operational efficiencies. While lighter evenings may incur some disadvantages for these sectors of society, formal objections have largely subsided reflecting changing lifestyle patterns

Sports and related industries

Chapter 3 explained how the clock change would extend the number of accessible daylight hours after work or school on weekdays and at weekends. This would open up considerable opportunities for the leisure industries (including the promoters of outdoor spectator events) in the late afternoon in the winter and on summer evenings.

Not surprisingly, this sector of the leisure industry has stated that it would wholeheartedly welcome the clock change as it could lead to more take-up of daylight-dependent sports and other leisure activities. Indeed, although some members of the Confederation of British Industry (CBI) are concerned about the effects of the change, the organisation as a whole has indicated support for its adoption

Finally, we should ensure that the concerns of those whose work is principally outdoors are understood in context. The latest Scottish Labour Force surveys show that only about 1 in 15 and 1 in 70 of the Scottish workforce is engaged in construction and in agriculture and forestry respectively - with fairly similar proportions of gross value added to Scotland's economy. The Scandinavian practice of starting an hour later in the winter months is one possible solution to the problems of working in the dark for the additional hour on winter mornings, and would enable employees to enjoy the extra hour of evening daylight in their leisure time throughout the year.

7. TRADE, TRAVEL AND COMMUNICATIONS

The UK is effectively a 'time island' at present, isolated by its current adherence to GMT. Trade, travel and communications with most countries in Central and Western Europe, stretching from Serbia and Albania up to Sweden and Norway and across to Spain, are made more difficult by the fact that their clocks are one hour ahead of ours throughout the year. The inconveniences caused by this affect Scotland as much as they affect England and Wales.

Impediments to trade

As a trading nation, Scotland is dependent upon high standards of communication with its overseas partners. The significance of this for the Scottish economy is indicated by the fact that nearly half of Scottish exports, currently worth nearly £15 billion (two-thirds of manufactured products and over a quarter of the output of the country's service sector) are to European countries, the majority of which operate on a Central European Time, that is the same as the GMT+1/GMT+2 clock under consideration.

The destinations of overseas business trips made from Scotland reflect the balance of trading activity. The number making visits for business purposes to and from mainland Europe is consistently many times higher than those made to and from equivalent destinations in North America.

Continental travel and transport operators

The need for cross-channel rail, shipping and air services to account for the current one-hour difference causes inconvenience for those travelling to and from mainland Europe. Misunderstandings and some frustration are common throughout the year. Some indication of the exceptional relationship between Scotland and mainland Europe is given by the fact that over 80% of international air passenger traffic through its main airports is to and from EU countries. The difference in clock times on either side of the English Channel not only affects the convenience of tourists. It also reduces the efficiency of many bodies in the cultural, entertainment and sporting fields which have to maintain contact with Continental countries and schedule their activities and services accordingly.

Telecommunications

The problem of synchronicity for organisations dealing with colleagues on the Continent is compounded by other practical difficulties. Manufacturing industries there typically start work at 7.30am, and offices at 8.00am, earlier than is common in all parts of the UK, including Scotland. This earlier start leads to lunch breaks and the end of the day being around two hours ahead of those in the UK. As a consequence, organisations which need to maintain telecommunication contact are restricted to the overlap of less than two-thirds of the working day. For journeys involving interchange for business people involved in meetings, visiting athletes who have less time to adjust for training sessions, or spectators going to sporting or cultural events, the impact can be more than trivial.

Impact of lighter evenings

Putting clocks forward by one hour would result in all the regions of the UK being in the same time zone as most central and Western Europe countries, thereby allowing greater efficiency and competitiveness all year round. Although comparable data for Scotland alone is not available, previous UK-wide analysis has shown that the change would increase convenience for holiday makers and businesspeople travelling to mainland Europe. It would also enable transport operators to simplify their timetables as clocks in the UK would be synchronised with the rest of Europe throughout the year. A valuable by-product of the clock change would be the consolidation of the European Union's 'internal market' through the removal of this temporal barrier.

Lighter evenings would also be advantageous for all transactions and other commercial carried out via telephone, fax or email. It would also increase the overlap of office hours between UK and Far East markets, though it would reduce the overlap with North America.

Organisations which have dealings with 'opposite numbers' on the other side of the English Channel would also benefit from a common time zone. In the field of radio and television transmissions, matching the times of programmes of interest to people in all Western European countries for which the programmes are intended would have clear advantages. It would also make televised events, such as live football matches and concerts on either side of the English Channel, a more saleable commodity.

In conclusion, it is not surprising that the clock change has been widely supported by most UK organisations whose activities are affected by the current one hour time difference with most countries in Central and Western Europe.

8. ENERGY CONSUMPTION

As noted earlier, most people get up well after sunrise for about nine months of the year, and therefore do not need artificial light in the morning. But they are highly likely to go to bed after sunset throughout the year, making their demand for artificial light in the evening sensitive to the time at which sunset occurs. Sales of electricity are much higher in the winter than in the summer, reflecting the monthly variation in the hours of the day during which artificial lighting is necessary.

The mismatch between our waking hours and daylight hours affects domestic demand for lighting. At present, lighting accounts for about 13% of all domestic electricity consumption and for about 30% of all electricity used in offices and public buildings. Hourly fluctuations in demand (particularly the two daily peaks in the morning and in the afternoon) reduce the efficiency of power generation. Fuel use can also be influenced by temperature changes during the heating season as demand changes throughout the day. Finally, fuel required for transport can vary with the time of day and daylight availability which affect the opportunities to do so.

Impact of lighter evenings on lighting demand

Putting clocks forward by one hour would lower the demand for electricity on every evening of every day of the year through a reduced need for lighting. This should result in financial savings on each household bill as lighting would be needed for one hour less in the evenings throughout the year whereas the additional hour for morning lighting would only be needed in the winter months.

The total annual payment for electricity by households in Scotland is over £980m. Domestic lighting accounts for about 13% of this figure. Calculations based on the data in Tables 3.3 to 3.5 show that the effect of this would be to lower demand for lighting in the region of 9%. This would lead to annual savings for Scottish consumers of about £10 million.

Lighting demand in offices, industrial premises and public buildings would also be lowered with the clock change as the number of hours during which it was needed would decrease. However, it is difficult to estimate the possible savings with any precision as published statistics do not differentiate between electricity used in offices and shops within the commercial sector. Moreover, people working in offices tend to be less careful about switching off lights when they are not needed. The clock change would not lead to reductions in electricity for street lighting, railway stations and other public places due to the now-common practice of leaving lights on all night for security reasons. Having said that, trials are now taking place across the UK which will ensure more efficient use of street lighting.

Although no detailed analysis of the demand for artificial lighting has been undertaken in Scotland specifically, it is likely that the larger number of waking hours during the winter in conditions of darkness in its northern latitudes would be matched more or less by the smaller number required during the summer months.

Heating costs

The better matching of waking hours with the hours of daylight could also affect heating costs during the cold winter months. Advancing the clocks by one hour would mean that people would be getting up closer to sunrise. A study undertaken by the Building Research Establishment in 2005 reported that the change would lead to a small increase in energy demand for heating in non-domestic buildings for this reason and that, from a national perspective, this could offset the savings from a lowered need for light in the home. However, the study concluded with the *caveat* that some uncertainty could be attached to its findings as they were based on a limited number of simulations in its modelling exercise.

The tables in Chapter 3 provide some support for this. They show the changes in exposure to ambient outdoor temperatures at the times of the day that would be affected. As can be seen in Table 8.1, the temperature at 8am during the winter months requiring central heating is identical with the current winter (GMT) clock as it would be with the clock advanced by the one hour, and very similar at 5pm, that is around the average time of sunset in the winter months. However, the demand for the extra hour in the morning would be slightly higher than that in the evening as the temperature difference at this time of year is between 1°C and 2°C. A strong case could be made either for a special study or indeed an actual trial period to establish with any degree of precision whether, as expected, the consequent change in heating costs would be more than minimal.

Table 8.1 Temperature in Centigrade at 8am and 5pm during the heating season with clocks on GMT and GMT+1

	GMT	GMT+1	Difference
	November to March	November to March	
8am	3.0	3.0	-
5pm	4.2	4.5	+0.3

The figures in the Table have been compiled from the average of the readings by hour of day on the 15th of the relevant months of the years 2000, 2003, 2006 and 2009 at the Salsburgh weather station (situated between Edinburgh and Glasgow). The monthly figures on which they are based can be seen in Table 3.6 in Chapter 3.

Balancing the two daily peak demands for electricity

The Centre for Technical Management in the University of Cambridge recently carried out a detailed study of the likely effects on electricity demand in the UK of lighter evenings maintained through the winter months. Of particular interest is its calculation that lighter evenings would reduce demand by at least 0.3% and peak demand by up to 4.3%. Somewhat higher savings could be expected for people living in Scotland owing to its more northerly latitude.

At present, the higher peak demand for electricity in the late afternoon results in it being met either by using less efficient spare generating capacity (such as oil-fired stations and pumped-storage facilities) or by imports from France by cable under the English Channel (accounting for little more than 2% of total electricity used in Great Britain). Owing to the peak demands in France and Great Britain differing by price and time of day, it would be difficult to determine the outcome of the clock change for generating companies' costs. To do so, it would be necessary to compare the price of imported electricity with that of using the less efficient spare capacity at the specific time it was needed. Scottish electricity generators stand to make somewhat greater efficiency savings than their English and Welsh counterparts owing to a larger transfer of evening to morning peak demand that would help to flatten the two daily peaks.

Thus, further consumer savings on electricity bills are possible though they are likely to be small and furthermore dependent on the generating companies passing these on to their customers. However, in the absence of a systematic evaluation of the effects of the clock change, a reliable answer could only be arrived at following a trial period with the change. But there is sufficient understanding of the likely consequences of achieving a better alignment between the morning and evening peak to anticipate a beneficial outcome.

Fuel consumption for travel

Another likely impact of the clock change on fuel use is an increase in travel mileage (and therefore transport fuel consumption) effected by extended opportunities for evening activity. However, again, no studies have been undertaken to reveal the extent to which this would be likely to happen.

9. PUBLIC OPINION AND POLITICAL PERSPECTIVES

While the issue of putting the clocks forward has long been controversial, the previous chapters have provided substantial and up-to-date evidence of the many benefits associated with lighter evenings. It seems likely that the great majority of the population will wish to see these potential benefits become a reality once they are made aware of the re-evaluated consequences that the study has identified, particularly in areas such as farming and road safety.

The ease of putting the clocks forward has been increased by the tide of public support for the change. The advantages are still as considerable, and the investment required just as small as when the Policy Studies Institute published its first report on the subject in 1988. The substantial case for reform presented in the report resulted in a serious response from government in the form of a Green Paper released in the year following its publication.

In 1990, the Observer described the proposal as being “one of the very few ways in which the Government could enhance the happiness of the greatest number of people at a stroke and at no expense to anyone”. It is clear however that all the main parties have seen it inadvisable to support the change: since the Home Office Green Paper over 20 years ago, no action has been taken by any government, and the *status quo* has survived.

Many Early Day Motions on the subject however have been put forward and many unsuccessful bills proposed in Parliament. They have included those by John Butterfill in 1995 (*Time [Extra Daylight] Bill*), by Lord Tanlaw in 1995 (*Lighter Evenings [Experimental] Bill*), and by Tim Yeo in 2006 (*Energy Saving [Daylight] Bill*) calling for a three-year experiment to advance the clocks by one hour throughout the year - as happened during World War 2. Sadly, most of the debating time on its First Reading was spent on a clause in the Bill that would have allowed Scotland and England to be in different time zones, an outcome that, not surprisingly, found little favour with MPs. All the bills to date have been ‘talked out’, that is debated until the time ran out thus preventing a vote as insufficient numbers of MPs turned out for the debate. The most recent effort this year, the *Daylight Saving Bill*, has been made by Rebecca Harris, a newly-elected MP.

With the party political shelving of the proposal, organisations and affiliations of bodies approving of the change have not remained silent and have formed lobby groups calling on government to legislate to bring about the change. These have included the *Daylight Extra Campaign*, the *Daylight Robbery Campaign*, the *Longer Day Campaign* and now, in 2010, the *Lighter Later Campaign*. The *Daylight Extra Action Group* was set up to raise public support for putting clocks forward by increasing public awareness of the beneficial consequences. Early in 1993, a conference it organised, attended by MPs, civil servants, captains of industry and heads of national organisations, passed the following resolution unanimously:

“There are overwhelming reasons for the Government to move with all speed to Central European Time and the Government is urged to make Parliamentary time available in the next session so that lives can be saved and the quality of life is enhanced for all.”

One conclusion that could be drawn from several governments’ apparent procrastination on the subject is that all the main political parties have been cautious about making changes that were perceived to affect Scotland negatively. This report provides evidence that should contribute to assuaging any remaining reservations relating to the impact of clock change in Scotland.

Public Opinion

Support for the clock change has been regularly confirmed in opinion polls. In 2006, a survey conducted by *Gallup* recorded 86% of respondents supporting the proposal that there should be a three-year trial during which clocks were put forward by an additional hour in both summer and winter - albeit once respondents were informed of the projected reduction in road casualties arising from the change. The most recent survey on the subject was conducted last year by YouGov. It enabled close examination of the differences in the opinions of people living in the different regions of the UK.

When the attitudes of Scottish respondents to the proposal were separated out, there were slightly fewer expressing support than expressing opposition. They were asked which, if any, of a list of consequences they thought would come in the wake of its adoption. Top of the positive reasons for the support was that it would allow extra daylight for leisure and sports activities (37%), followed by reduced electricity usage and carbon emissions (24%), and that it would *‘improve my general feeling of well-being’* (23%). On the negative side, the fact that *‘going to work in the dark will be depressing’* (39%), concern about the *‘adverse effects on the farming industry’* (22%), and *‘would decrease my general feeling of wellbeing’* (18%) were considerations most frequently cited. In reply to the question on what respondents would do with the extra hour of evening daylight if clocks were changed, leisure (40%), outdoor hobbies (32%), and sports (24%) were the activities most frequently mentioned. Indeed, a majority said that they would engage in more leisure pursuits if evenings were lighter.

Grounds for objecting to the proposal for the clock change

The grounds for objection of many Scots and Scottish organisations do not stand up to scrutiny. They relate to the impact on road casualties, the prospect of darker winter mornings, the questioning of the need for harmonising our clocks with the majority time zone on the Continent and objection to the State imposing on the electorate a requirement to conform to its decision on the subject.

Road casualties

This is one of the most important issues and therefore the one for which reliable evidence is most crucial. Some years ago, a public opinion survey found that Scots were twice as likely to believe that putting clocks forward would increase rather than reduce road casualties. As has been seen in Chapter 2, detailed examination of the evidence shows that although there was a small increase in road casualties on the darker mornings in winter during the three-year experiment with BST, this was far outweighed by the fall in casualties in the afternoon and evening.

The misleadingly selective representation of the facts by making exclusive reference to casualties among children on their way to school in the dark, backed up with lurid photographs of the actual victims of the small morning increase in northern Scotland, was and, even today, is quoted as a major feature of the campaign of opposition to the clock change. It remains imprinted on the public memory to a remarkable degree, so much so that it still frequently leads to oversight of the far more substantial decrease in casualties, especially in Scotland, stemming from the lighter afternoons. The press may perhaps have found it more difficult to present a fair account of the effects as those whose lives had not been lost could not be shown other than on the basis of statistical analysis. Nevertheless, the morning increase was the main reason why, although a small majority of British people in an opinion poll in 1970 supported keeping the clock change, the experiment failed politically with an overwhelming majority of MPs voting to return to the old *status quo*.

Some of the press have continued to misrepresent the facts. In 1990, PSI wrote to the Secretary of State at the Scottish Office drawing his attention to Scottish opposition to the clock change being widely founded on the false belief that it would result in more road casualties. Further misleading evidence has been used more recently. Even this summer, in commenting on the proposition of putting clocks one hour ahead of their current setting, David Cameron, the Prime Minister, correctly referred to one of the problems associated with it, namely that of “getting children to school in the North of England and in Scotland” but failed to note the *overall* reduction in child casualties on the roads that would result from the lighter evenings.

The Union of Construction Workers (UCW) attempted to justify its opposition with reference to a report in an American medical journal which showed that most injuries in this industry occur in “the early hours”. However, it transpired that the evidence was quoted out of context - the early hours referred to the hours after midnight at the end of shifts when tiredness leads to carelessness, not to the early hours of the morning after getting up.

Another misleading comment can be seen in the 'virtually unanimous' call by the Convention of Scottish Local Authorities (CoSLA) for the retention of the *status quo*. In its response to the Home Office Consultation Paper in 1989, it cited these grounds in support of its position. It now attempts to justify its preference for the *status quo* by stating that Scottish opinion is divided. Visit Scotland, the organisation set up to promote Scottish tourism, too has cited “current uncertainties” over the impact of the clock change on tourism across Scotland to justify its opposition.

More recent press opinion since the publication of the PSI reports in 1988 and 1993 has demonstrated, as well as overwhelming support for the clock change, a clearer grasp of the reality of road casualties. In March 2008, the West Highland Free Press stated that *“While everyone knows the downside of morning darkness, the benefits of more daylight hours in the afternoons and evenings are consistently understated. For example, it is a matter of statistical fact that there is a higher incidence of road accidents and more children are killed or injured in the afternoons than in the mornings, in Scotland as elsewhere in the UK. That fact cannot be ignored simply because it has become the ritual to oppose this measure.”*

Dark winter mornings

The second reason put forward in support of objections to the change is the very reasonable statement that the more northerly the latitude of Scotland, particularly its northern regions, the later sunrise occurs in the winter. From this perspective, it is argued that it would be unfair for Government to exacerbate this disadvantage especially for the groups in the population such as some farmers and others engaged in outdoor work that now start the day in the dark during the winter.

Much of the objection stems from exaggeration of the facts on the later hour of sunrise or from the misleading way in which these have been presented. Indeed, some of the objections on this issue appear to be aimed at deliberately distorting public understanding. To stress the concern on this aspect, attention has been drawn to extreme cases of late midwinter sunrises in northern Scotland, with no acknowledgement of the fact that the sun now sets at about 3.30pm in Aberdeen and at 3pm in Lerwick. With clocks advanced by one hour therefore, it would do so at 4.30pm and 4pm respectively in these locations, a far cry from the statement made by visit Scotland that the sun would not rise until noon!

In considering the significance of such objections, the following factors should be borne in mind: firstly: while it cannot be denied that few people like to start the day before sunrise, it is clear that the problem of winter days in more northerly latitudes stems from the paucity of daylight hours at that time of year rather than from their distribution. In fact, in the north of Scotland, there is only one-third of the number of hours of daylight in the depths of winter compared with the height of summer, making it all the more important that they are put to the best possible use.

Secondly: the sky brightens perceptibly half an hour before sunrise and remains fairly light for about half an hour after sunset. It is for this reason that, until very recently, lighting-up times were set to finish half an hour before sunrise and to start half an hour after sunset.

Thirdly: the structure of modern employment means that relatively few people have to get up early in the morning and contend with the additional hour of morning darkness during the winter. In any case, those that continue to rise early also have social lives and recreational interests, and would gain on every day throughout the year from more evening daylight.

Fourthly: school holidays and the closure of most workplaces around Christmas and New Year coincide with the time of day when sunrise is at its latest, meaning that people would be less likely to have to go out early on some of the darkest mornings. While dark morning commutes in Glasgow and Aberdeen, for instance, would occur on 50 to 60 more days of the year, there would be a similar increase in the number of days commuting home in daylight in the evening – as has been seen a time of greater risk of injury on the roads. Again, it is worth recalling that the clock change would also provide far wider opportunities for leisure activity in the evening.

Clock harmonisation with other EU States

The third reason cited for objecting to the proposal to put clocks forward is the belief that it followed pressure from business people wishing to be in the same time zone as are most countries in central and western Europe in order to be able to make their transactions and travel more convenient, or that it has been promoted by the European Commission in Brussels seeking to impose a bureaucratically-inspired harmonisation of clocks among member states of the European Community. This is untrue. Since 1970, a succession of Directives from the Commission allowed the UK and Eire to terminate summertime at a different date to that of other Member States. Partly as a result of strong representations from the UK, the Commission agreed that summertime for all Member States would start at the UK Government's preferred time, that is, at the end of March and that it finishes on the fourth weekend in October.

Government and the ‘nanny’ state

The fourth reason frequently cited is that the clock change would represent an example of unnecessary State intrusion into how people lead their lives as it would entail the Government requiring everybody to conform to its decision on the relationship between clock times and sunrise and sunset. It is argued that individuals should be left free to choose whether or not they wish to maximise their use of daylight hours. They could, it has been argued, get up an hour earlier from the end of March to the end of October. It has been suggested sarcastically that “*those in the south of the UK who claim they don’t have enough leisure time at the end of the day could go to bed an hour earlier and get up an hour earlier and hey presto! 60 minutes of leisure time in the glorious morning sunshine.*”

It is true that, in some instances, for example, artists, writers, and perhaps other people who work from home, can use the day as they wish. However, the invalidity of this line of reasoning is immediately apparent when one considers the need for a commonly-shared time regime for, for instance, schools, offices and shopping, and for public transport timetables.

Other concerns

Some more general objections to the clock change have also been made. A recent Scottish Government document on the subject refers to the fact that winter sunlight is too weak to have health benefits and therefore, that putting clocks forward by one hour “*would not bring any noticeable benefits or disbenefits*”. However, this judgement overlooks the fact that achieving the better matching of daylight with waking hours that would follow adoption of the clock change, would result in a considerable widening of the opportunities for more outdoor activity and, with it, the extra hours of exposure to sunlight in the seven months of summer.

In addition, it has been suggested that if the clock change were made, the transition to the new regime would cause disruption. In reality it would be extremely simple and straightforward. In the autumn of 2011, clocks would *not* be put back. In the following spring, they would be put forward by one hour, with the current arrangement for summertime of putting clocks back one hour in the autumn and one hour forward in the spring would continue thereafter.

The lighter evenings proposals leaves open the possibility of modifying the timing of school and work hours for the small population living in the north of Scotland, in order to avoid any disadvantageous effects to commuter journeys in that area.

In conclusion, it has been seen that the grounds repeatedly cited in support of keeping the present time zone in Scotland have lost much of their relevance over the past 20 years, particularly when account is taken of the wide benefits of reform. However, several Scottish organisations responding to the invitation forming part of this study to set down their attitudes, have expressed a strong preference for the *status quo*. Most surprisingly, these include bodies representing tourism and tourist resorts and some sports such as football. Their opposition to the clock change stems primarily from a concern about the effects of darker winter mornings.

CONCLUSIONS

This study has sought to identify how Scottish society would be affected by the proposal to advance the clocks by one hour in summer and winter. The source of the problem at present is that during the year we spend on average about five of our waking hours *before* midday - few of them when it is dark - but nearly half of the ten to eleven of our waking hours *after* midday, when it is dark. Adopting the proposal is an effective, practical and remarkably easily managed way of achieving a better alignment of our waking hours with the available daylight during the year.

As with the findings of the previous studies of these consequences for the UK as a whole, most of the chapters in this report have established significant benefits that would come in the wake of the change. This is simply explained. As the great majority of the general population get up well after sunrise for most of the year, it would result in an extra hour of daylight being enjoyed in the evening on *every one* of the 365 days of the year, whereas the extra hour of morning darkness would typically affect working people on only about 60 weekdays of winter in Scotland. Further benefits are as follows:

- The change would create far more opportunities for outdoor leisure in the evenings, whether for sports or other recreational activity involving getting out of the home.
- It would be a boon for the tourist and leisure industries in terms of revenue and job generation – particularly needed at a time of rising unemployment.
- Sunset an hour later throughout the year would give the great majority of the population, including those living in Scotland, more daylight hours to enjoy in the evenings.
- Most parents would be able to extend the hours that they allow their children to be out and most elderly people fearful of going out after dark would be freed for the additional hour from this concern.
- There would be a small reduction in road casualties and in lighting costs.
- Most importantly, we can predict a marked improvement in health and quality of life for the great majority of the population.

It would be unrealistic to expect that such a major change to our way of life could be achieved without some disadvantages for some people at some times of the day, but it is important that the disadvantages to a small proportion of the population be duly weighed against the likely benefits for the great majority. Indeed, this appears to be the principal objection raised by opponents of the clock change and grounds for some resentment, especially by those living in Scotland, at what appears to them to be a conspiracy to deprive them of an hour of their daylight – *“a classic instance of the English not realising how far north Scotland is”!*

Any government introducing this reform is likely to reap substantial political rewards, particularly as public opinion in the UK has repeatedly been shown to favour the clock change - now about 4 to 1 in England and Wales and fairly evenly divided in Scotland, in spite of opinion being coloured by the unbalanced portrayal of its effects in sections the Scottish media.

Strong support is apparent from all road safety organisations, many sectors of industry (especially tourism and leisure services), nearly all bodies involved in trade, travel and communications, and in the provision of sport, recreational and cultural facilities, as well as those representing particular groups such as children, teenagers, women, pensioners, and people living in rural communities.

The decision on the proposed clock change is a political one based on assessment of its advantages and disadvantages compared with maintaining the *status quo*. That decision is best made on fact rather than on opinion. On balance, the findings in the various chapters of this report suggest that the benefits for Scotland of putting clocks forward would be substantial and would more than compensate for any downsides. Indeed, there is reason to believe that lighter evenings would bring the Scottish people marginally greater benefits than those enjoyed in the rest of the UK.

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