Troublesome Leisure Travel: The Contradictions of Three Sustainable Transport Policies

Erling Holden and Kristin Linnerud

Abstract

Sustainable passenger transport policies are most often directed towards everyday travel and ignore the large and expanding amount of leisure travel. The paper examines whether policies aimed at reducing energy consumption and CO_2 emissions for everyday travel may have the opposite effect on leisure travel by reviewing studies of three sustainable passenger transport policies: developing more compact cities, building pro-environment awareness and attitudes, and promoting the growth of information and communication technologies. We found that the policies may indeed have unintended effects and suggest several mechanisms that could explain why this opposite effect occurs. Consideration is also given to the implications for developing more comprehensive sustainable transport policies.

Prologue

The very first article to appear in *Urban Studies* in 1964 was entitled "Planning for leisure". At the beginning of the article, J. B. Cullingworth wrote

> Forty-seven million people living on 58,000 square miles, owning over 6.5 million cars; 30 million holidays a year involving an expenditure of £420 million; 4.4 million caravan holidays annually; ten national parks covering one-eleventh of the country—these are a few indications of the measure of the problem of planning for leisure in a densely populated small country. *The subject—and the problem—is a large one.* It encompasses national parks, access to the countryside, nature reserves, camping, caravanning, rambling and youth hostelling, waterways, parks and many other aspects of recreation. *A study of this wide field is urgent* (Cullingworth, 1964, p. 1; emphasis added).

Erling Holden is in the Faculty of Engineering and Sciences, Sogn og Fjordane University College, Fosshaugane Campus, Sogndal, 6851, Norway. E-mail: erling.holden@hisf.no.

Kristin Linnerud (corresponding author) is in the Centre for International Climate and Environmental Research, Oslo, Norway. E-mail: kristin.linnerud@cicero.uio.no.

Thus, in the inaugural issue of *Urban Studies*, Cullingworth urged the need to study the environmental impacts of increased leisure. Today, more than 40 years later, the need to address the negative impacts of increased leisure—particularly increased leisure-time mobility—is even greater than Cullingworth ever could imagine. Indeed, the demand for leisure has increased tremendously during the four decades and so have its environmental impacts.

The relation between the increased demand for leisure and environmental impacts has, however, changed in two aspects since the beginning of the 1960s. First, although Cullingworth paid particular attention to the increased use of the private car as the preferred means for leisure-time travel, he did not foresee how strong this increase would become. Moreover, he was largely unaware of the imminent increase of leisure-time travel by plane (at that time a largely unknown means of transport in this respect).

Secondly, whereas Cullingworth mainly addressed local leisure-time travel and local environmental impacts, present demand for leisure and its environmental impacts, has gone global. The global challenges noted by the UN Commission on Environment and Development in their 1987 Report *Our Common Future* (WCED, 1987) were to him largely unknown. Thus, he was not yet familiar with the concept of sustainable development, which presently is a political imperative for all societal sectors—including leisure-time travel.

1. Introduction

The level and growth of passenger transport—or travel—represents a major challenge to environmentally sustainable development (EEA, 2002; OECD, 2000, 2002).[1] Among a number of environmental consequences, climate change, air pollution and excess energy consumption are the most important.

In developed countries, leisure travel constitutes a major and growing share of total travel. In the EU, for example, leisure travel accounts for approximately one-third of all trips (EEA, 2008). A survey of travel in Norway (Denstadli *et al.*, 2006) suggests that leisure trips are responsible for more than half of total CO_2 emissions from travel because leisure trips tend to be longer and use more energy-consuming modes of transport than everyday trips. Banister *et al.* (2000) projected that, over the next 20 years, more people will spend more time on leisure activities because of an ageing population in OECD countries. Much of this increased leisure travel could involve long-distance air travel because more people have the means, time and desire to see the world (Gössling, 2010).

Meanwhile, research on sustainable passenger transport has mainly focused on everyday travel. Among the driving-forces for everyday travel are globalisation, lifestyles and individual travel preferences, demographic trends, household structure, economic growth and household income, urban sprawl and specialisation in education and labour (Banister, 2005; Banister *et al.*, 2000; Tengström, 1999; Black, 2003; Geenhuizen *et al.*, 2002; Salomon and Mokhtarian, 2002).

Although these driving-forces may also influence the demand for leisure travel, we generally lack a deeper understanding of which factors affect leisure travel decisions and the sustainability of leisure travel (for example, see Black and Nijkamp, 2002; Holden, 2007). Leisure travel is usually undertaken by choice, not by necessity. This distinction is important for policy-makers because they can explore policies for reducing the need for or length of necessary trips or for enhancing alternatives to driving (Handy *et al.*, 2005), but they may confront greater problems in reducing the amount of leisure travel because this kind of travel may be valued in its own right. User requirements are also different for leisure travel and everyday

commuting. Commuters require timeliness and predictability, but leisure trips are often less time critical. They may involve a greater load (baggage) as well as travel to and in areas with less developed or unfamiliar public transport systems. Lifestyle and psychological factors are also crucial in explaining demand for leisure travel and leisure travel choices are linked to peoples' expression of identity. Thus, designing efficient, sustainable and comprehensive transport policies requires an understanding of how leisure travel differs from other types of travel.

As has been true with research, sustainable passenger transport policies have been directed more towards everyday travel and not leisure travel.[2] Some policies have been tailored to reduce energy use and emissions related to everyday travel—for instance, by building more compact cities to reduce the average distances of necessary trips. Such policies, however, may have little or no impact on leisure travel. In addition, some policy instruments are not applied widely enough to encompass important aspects of leisure travel. For example, the success of reducing greenhouse gas emissions in tourism will depend critically on policy and practice changes in the aviation sector, but this sector so far has not successfully been included in binding policy agreements (Scott *et al.*, 2010).

More surprisingly, under some circumstances, some policies that aim at reducing the negative impacts of everyday travel may have the *opposite* effect on leisure travel. That is, while people respond to these policies by consuming less energy on everyday travel, they consume even more energy on leisure travel, thus reducing the effectiveness in terms of meeting the goals of a sustainable transport sector and reduced greenhouse gas emissions.

In this paper, we present a typology for sustainable transport policies and show why policies that indirectly deal with the emissions problem in one sector may produce unintended side effects in another sector. Secondly, we examine studies of three sustainable transport policies—developing more compact cities, building pro-environment awareness and attitudes, and promoting growth of information and communication technologies—designed to reduce emissions from everyday travel but that may also increase emissions from leisure travel and suggest mechanisms to explain why a given policy may produce these contradictory effects. Finally, we examine the policy implications of the results and discuss further research.

2. Sustainable Transport Policies: A Typology

The three main types of policy approach to reducing greenhouse gas emissions from transport are: improve technology to reduce emissions by reducing the carbon intensities[3] of fuels and/or by increasing the energy efficiency of engines; change travel patterns by changing how transport needs are met— that is, by switching to more environmentally friendly modes of transport and by planning more carefully how to meet our transport needs; and, reduce travel volume to reduce the total emissions from transport (Holden, 2007; Banister, 2005; OECD, 2000).

The three main types of policy instrument are market-based instruments, information-based instruments and command-and-control policies (Holden, 2007; Banister et. al, 2000). Market-based instruments include taxes and subsidies, which affect our behaviour through their impact on market prices. Ideally, the authorities should make all emitters pay a Pigouvian tax—that is, a tax on emissions equal to the marginal cost of the emission to society.[4] An alternative is to use fuel as a proxy for emissions and levy a differentiated fuel tax. Examples of more indirect ways of addressing the emission problem are to give subsidies to low-carbon

fuels (such as biofuels), support research and development of low-carbon technologies and subsidise public transport. These indirect marked-based instruments may, however, have unintended side effects. Subsidising public transport, for example, may result in some people reducing their use of bicycles (Sandmo, 1976).

Information-based policies are based on the assumption that informed consumers will make more socially desirable decisions; that is, providing consumers with better information on the social costs of emissions and the availability of more environmentally friendly options will make them voluntarily change their behaviour (Stern, 1999, 2000). Even if we disregard for the moment the complex relationships between information, attitudes and behaviour, there are simple examples of possible unintended side effects from the use of such information-based instruments. If, for example, the information is focused on reducing emissions from one activity (such as shifting to more energy-efficient lightbulbs), while other mitigating activities are ignored (such as reducing the number of flight trips), then individuals may allocate their mitigation efforts in a way that does not reduce overall emissions.

Control-and-command (CAC) policies impose standards on products and processes and use physical planning to steer behaviour directly in the desired direction. For instance, authorities could set a minimum vehicular emissions limit or a minimum energy-efficiency level on new cars, they could invest in public transport systems or they could use land use planning to reduce travel distances. Again, unintended side effects occur because these policies do not impose the same cost of emitting on all emitters. If, for example, a more energy-efficient car will reduce the amount of energy consumed per kilometre, it may also give the driver an incentive to drive further since the fuel cost per kilometre is reduced.
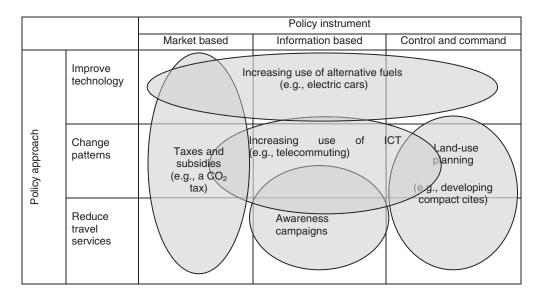
A typology for sustainable transport policies can be constructed using these three policy approaches and three policy instruments (Figure 1). Figure 1 shows a number of sustainable transport policies—a combination of policy approaches and instruments—which potentially can reduce CO_2 emissions from transport. Only a widely applied CO_2 tax (Pigouvian tax) will not produce side effects because all transport emission sources face the same cost of emitting and none of the policy approaches is favoured. The more tailored a policy is to meet a specific policy approach (for example, improved public transport) in a specific part of the passenger transport system (for example, work travel), the more likely it is that the policy will produce unintended effects. In section 3, we examine three such policies.

The three policies are chosen due to their prevalence in the literature on sustainable transport. Moreover, these three policies are high on the political agenda in most developed countries. This is not to suggest, however, that other policies are insignificant; rather, a large number of policies should be studied accordingly.

Indeed, there are synergies between the policies shown in the figure. For example, compact, mixed-use development encourages efficient public transport systems and increased use of new technologies such as electric vehicles. Likewise, increased environmental attitudes due to awareness campaigns might well ease the introduction of environmental taxes. The division into separate policies serves well, however, for analytical purposes.

3. The Contradictory Results of Selected Policies

We studied the results from studies of three sustainable transport policies to determine whether they support our claim that, although the main effect of the policies is to reduce

		Policy instrument		
		Market based	Information based	Control and command
Policy approach	Improve technology	Increasing use of alternative fuels (e.g., electric cars)		
	Change patterns	Taxes and subsidies (e.g., a CO$_2$ tax)	Increasing use of ICT (e.g., telecommuting)	Land-use planning (e.g., developing compact cites)
	Reduce travel services		Awareness campaigns	

Figure 1. A typology for sustainable transport policies. Each transport policy (in circles) may be represented by a combination of one or more policy approaches and one or more policy instruments.

the emissions from everyday travel, an unintended side effect is that they simultaneously increase emissions from leisure travel. The selected policies are developing more compact cities, building pro-environment awareness and attitudes, and promoting information communication technologies.

3.1. Compact Cities

The main principle in the theory of compact cities is that of high-density development close to or within the city core, with a mixture of housing, workplaces and shops. The supporters of compact cities (for example, Newman and Kenworthy, 1989; Elkin et al., 1991; McLaren, 1992; Sherlock, 1991; Næss, 2006; Geurs and van Wee, 2006) claim that they result in the least energy-intensive everyday travel pattern, thereby reducing greenhouse gas emissions. The question we raise is whether the reduced amount of everyday travel is counterbalanced by increased leisure travel.

Most empirical studies confirm that urban form affects everyday travel behaviour.

Newman and Kenworthy (1989) explored the relationship between urban density and transport-related energy consumption in 32 cities in North America. They found that the gasoline consumption per capita was significantly lower in compact cities. Although Newman and Kenworthy (1989) have been criticised on methodological grounds (for example, Rodriguez et al., 2006), later analysis (for example, Holtzclaw et al., 2002; Cervervo and Kockelman, 1997; Kitamura et al., 1997; Holden, 2004; Holden and Norland, 2005; Næss, 2006) arrived at similar conclusions, even when controlling for socioeconomic, sociodemographic and attitudinal variables. In a recent review of the literature, Rickwood et al. concluded that

> There is clear evidence from both intra and intercity comparisons that higher density, transit oriented cities have lower per-capita transport energy use (Rickwood et al., 2008, p. 57).

It is possible, however, that people live in city centres because they prefer to travel less, not that they travel less because they live in city centres. Recently, this 'self-selection' bias has been given more emphasis when designing empirical models of the relationship between the built environment and the frequency of regular non-work journeys (for example, Boarnet and Sarmiento, 1998; Boarnet and Crane, 2000; Cao *et al.*, 2009). Cao *et al.* (2009) found that, although residential preferences and travel attitudes significantly influenced the frequency of auto, public transport and non-motorised trips, neighbourhood characteristics retained a separate influence on behaviour after controlling for self-selection.[5] Thus, it seems that a compact city structure causes lower energy consumption on everyday travel, even after accounting for self-selection bias.

These studies did not, however, examine the effect compact cities have on leisure travel. Titheridge *et al.* (2000) claimed that the relationship between non-work travel, especially long-distance leisure travel, and urban form has been neglected, but a few empirical studies have been conducted (for example, Tillberg, 2002; Schlich and Axhausen, 2002; Holden and Norland, 2005; Næss, 2006). These show that, although residents in densely populated areas travel less in their everyday life, they do sometimes travel more in their leisure time.

Næss (2006) undertook a comprehensive quantitative and qualitative analysis of households' travel behaviour in the Copenhagen metropolitan area.[6] In a multiple regression analysis, he regressed each dependent travel behaviour variable on land use, socioeconomic, sociodemographic and attitudinal variables. When controlling for the location of the residence relative to city-centre Copenhagen and lower-order centres, he found the following significant indications of compensatory travel at weekends among respondents living in dense local areas: longer average distance travelled by cars, a lower proportion of public transport use (by distance travelled) and fewer trips made on foot (p. 206). Moreover, he found a correlation between city-centre living and the likelihood of making holiday trips by plane.

Holden and Norland (2005) conducted a similar study of eight residential areas in the Greater Oslo region in Norway.[7] One of their findings is that residents in compact cities consume less energy for everyday travel but much more energy for long-distance leisure travel by plane than do residents of other urban forms. They reached this conclusion by regressing each dependent variable on land use characteristics as well as socioeconomic, sociodemographic and attitudinal variables. The regressors reflect differences in utility attached to travel.[8]

Using the data collected in the survey by Holden and Norland (2005), we modified and re-ran the regression models. Unlike those of Holden and Norland, the modified models include three different indicators for attitudinal variables

—An index for general pro-environmental attitudes. The respondents were asked to respond to six general pro-environmental statements on a 1–5 point scale where 1 was 'very much disagree' and 5 was 'very much agree' (for a possible range of 6 to 30). The average response was 17.2.
—A dummy variable for membership of one or more environmental non-governmental organisations (NGOs).
—An index for specific pro-environmental attitudes related to transport. The respondents were asked to respond to three pro-environmental statements that were specifically related to transport, again using a 1–5 point scale (for a possible range of 3 to 15). The average response was 8.3.

The impact of the attitudinal indicators is discussed in greater detail in section 3.2. The estimation of the full regression model is given in the Appendix (Table A1), and the

results for the land use variables only are shown in Table 1. The energy consumption for everyday travel increases significantly with distance from residence to the city centre and to the local sub-centre, whereas energy consumption for long-distance leisure travel by plane increases significantly with housing density in residential areas and with lack of access to a private yard.[9]

Three mechanisms may explain the contradictory result found in these studies. First, people who live in densely populated areas may undertake longer trips in their leisure time to compensate for lack of access to a private yard and local greenery. In in-depth interviews, Tillberg (2002) and Næss (2006) found some support for the hypothesis that residents of densely populated areas may compensate for a lack of access to private yards and local greenery by taking longer weekend trips by car. The residents may also spend less time gardening and maintaining a single family home. Holden and Norland (2005) showed that residents having access to a private yard use significantly less energy for long-distance leisure travel by both car and plane than do residents without such access. This finding is further supported by the results of our revised regression presented in Table 1. Taken together, these studies suggest that access to private yards and local greenery reduces the amount of leisure travel—both by car and by plane.

Secondly, people may budget approximately fixed amounts of time and money for travel. If people do have a fixed budget and if living in a compact city means saving time and money on everyday travel, more money and time will be used on leisure travel—and vice versa. The assumption of fixed budgets of time and money devoted to travel was originally put forward by Zahavi (1981) and was further explored by Marchetti (1993, 1994). Based upon time use and travel surveys from numerous cities and countries throughout the world, Schafer and Victor (2000) estimated

Table 1. The impact of land use variables on household energy consumption for everyday and leisure travel

	Everyday travel (kWh/person/year)			Long leisure travel by plane (kWh/person/year)		
	Model E1[a]	Model E2[a]	Model E3[a]	Model L1[a]	Model L2[a]	Model L3[a]
Access to private yards (yes = 1)				−969* (0.024)	−1017* (0.016)	−910* (0.032)
Land use mix (percentage)[b]	5 (0.580)	6 (0.502)	4 (0.659)			
Residential density[c]	22 (0.691)	36 (0.512)	26 (0.638)	142 (0.068)	172* (0.024)	169* (0.028)
Distance to city centre (km)	107** (0.001)	112** (0.000)	108** (0.000)	20 (0.651)	38 (0.372)	39 (0.370)
Distance to local centre (km)	233* (0.036)	214 (0.051)	212 (0.051)	−49 (0.705)	−43 (0.728)	−24 (0.846)
Average value (kWh/person/year)	4435	4435	4435	5917	5917	5917

[a] E refers to everyday travel and L to leisure travel; 1, 2 and 3 refer to the three different indicators for environmental attitude, as defined in section 3.1. The individual coefficient is statistically significant at the * 5 per cent or ** 1 per cent level.
[b] Percentage of area used for residential buildings.
[c] Number of households per decare.

Notes: Significance levels are given in parenthesis under the coefficients.

that a person spends an average of 1.1 hours per day travelling and devotes a predictable fraction of income to travel. They also showed that these time and money budgets, as an average taken at regional and national levels, have been relatively stable over space and time. However, this remains an area of contested points and, while a review by Metz (2008) concludes that travel-time budgets are constant, a review by Moktharian and Chen (2004) concludes that they are not—except perhaps, at the most aggregate level.

The underlying mechanisms explaining the regularities in travel budgets are not well understood, but demand theory may provide some insight. A reduction in the price of a normal good will have two effects: a decrease in price of one good relative to others results in a rise in demand for the cheaper good; and, income saved results in an increase in demand for all goods. The first impact is emphasised by, for example, Crane (2000) who argued that, if compact cities results in less time spent per trip, people will undertake more everyday trips. However, we think it is likely that major parts of everyday travel (such as commuting to a job) are bounded with respect to distance and frequency, and therefore that they are less sensitive to changes in cost (time or money). If so, the income effect dominates and reductions in time or money consumed on everyday travel may result in increased time and money spent on leisure travel. This is especially the case if consumers divide their total budget into separate sub-budgets, implying a separate travel budget, as suggested by the Mental accounting theory (Thaler, 1999).

Thirdly, we cannot rule out that the contradictory result in these studies is at least in part a result of self-selection bias. That is, decisions on where to live and where to travel may be simultaneously determined by values and preferences not included in the model. Also, decisions on whether to have a yard or whether to buy a car may be determined by the same values and preferences that determine travel behaviour. If so,

including these households and land use characteristics as right-hand variables in regression models of travel behaviour will result in biased coefficients.

Næss (2006) believes self-selection bias to be the main explanation behind the apparent correlation between urban form and leisure-time travel. He stated

> This [more flights by residents living close to central Copenhagen] is hardly a causal influence of residential location. A possible, yet speculative explanation is that an 'urban' and cosmopolitan lifestyle, prevalent in particular among young students and academics, contributes both to an increased propensity for flights and a preference for inner-city living (Næss, 2006, p. 221).

Like Næss, we find it plausible that values and preferences influence both our housing and leisure travel decisions. However, the causation may also work the other way around; over time, a compact city may facilitate and foster an urban and cosmopolitan lifestyle, which includes a propensity for leisure travel flights. The interrelations between the different variables are complex and further research is needed involving careful model specification, more sophisticated estimation techniques (for example, the instrument variable technique) and in-depth interviews.

3.2. Pro-environment Attitudes

Authorities can use information-based policies to influence people's attitudes and knowledge and thereby influence people to choose more environmentally friendly transport technology and pattern and amounts of transport. If these policies are successful, one could expect that people with pro-environment attitudes would make everyday and leisure travel choices that would contribute to lower emissions. The question we raise is whether people with pro-environment attitudes compensate for reduced everyday travel with increased leisure travel.

A number of authors (Pieters, 1988; Ronis *et al.*, 1989; Thøgersen, 1999; Moisander and Uusitalo, 1994; Ajzen, 2005; and Holden, 2008) have discussed the conditions necessary for environmental attitudes successfully to direct household energy and transport consumption. They concluded that attitude–behavior consistency improves when attitudes directly relate to the travel decision that should be changed, when attitudes are developed under direct experience and when environmentally friendly travel options are easily accessible when travel choices are made.

Few empirical studies of travel behaviour and land use characteristics, however, have included data on environmental attitudes in the list of explanatory variables (for example, see Kitamura *et al.*, 1997; Holden and Norland, 2005; Næss, 2006).[10] Kitamura *et al.* (1997) examined the effects of attitudinal characteristics on the number and proportions of everyday trips by mode of transport for residents of five San Francisco Bay Area neighbourhoods. Attitudinal variables were drawn from survey responses designed to elicit opinions on the environment, driving, public transport and related questions. The dependent variables were regressed on land use, socioeconomic, sociodemographic and attitudinal variables. Although each block of variables offered some significant explanatory power to the models, the attitudinal variables explained the highest proportion of the variation in the data. For everyday travel, they found that the pro-environment variable significantly increased the number and proportion of non-motorised trips and significantly reduced the proportion of auto trips.

Holden and Norland (2005) included membership of one or more environmental NGOs as a control variable when investigating the relationship between land use characteristics and household energy consumption related to travel. Surprisingly, they found that members of environmental organisations did not have significantly lower energy

consumption related to housing, everyday travel and leisure travel by car after controlling for socioeconomic, demographic and land use characteristics.[11] Furthermore, they found that respondents with membership of environmental organisations, all else equal, consumed significantly more energy than non-members on leisure travel by plane.

Using the data from the Greater Oslo survey (Holden and Norland, 2005), we analysed the impact of attitudes more thoroughly by constructing three previously described pro-environmental indicators that differ with respect to how directly the attitudes relate to the travel decision that should be changed. The results of the full multiple regression models are given in the Appendix (Table A1) and the impacts of the three attitudinal indicators on everyday travel and long-distance leisure travel by plane are shown in Table 2.

We drew three conclusions on the basis of the results. First, while general environmental attitudes are poor predictors of travel behaviour, specific transport environmental attitudes are significantly correlated with travel behaviour. These results are in accordance with the attitude–behaviour consistency theories referred to earlier.

Secondly, respondents who express concern for the environmental consequences of transport have significantly lower household energy consumption related to everyday travel compared with other people. For example, respondents who very much agreed with all three pro-environment transport-specific statements (an index value of 15) consumed an average of 1008 kWh less on everyday travel, compared with respondents who very much disagreed with the statements (an index value of 3).

Thirdly, and most surprisingly, respondents who have a high score on the transport-related environmental attitude factor travel more by plane for leisure than do others. For example, respondents with an index score of 15 consumed an average of 1188 kWh more

Table 2. The impact of attitudinal variables on household energy consumption for everyday and leisure travel

	Everyday travel (kWh/person/year)			Long leisure travel by plane (kWh/person/year)		
	Model E1[a]	Model E2[a]	Model E3[a]	Model L1[a]	Model L2[a]	Model L3[a]
General environmental attitudes	−8 (0.804)			−6 (0.894)		
Membership of environmental NGO (yes = 1)		47 (0.912)			1060 (0.070)	
Transport-specific environmental attitudes			−84* (0.025)			99* (0.050)
Average value (kWh/person/year)	4435	4435	4435	5917	5917	5917

[a] E refers to everyday travel and L to leisure travel; 1, 2 and 3 refer to the three different indicators for environmental attitude, as defined in section 3.1.
Notes: Significance levels are given in parenthesis under the coefficients. The individual coefficient is statistically significant at the * 5 per cent or ** 1 per cent level.

on leisure travel by plane, as compared with respondents with a score of 3. Thus, whereas 'green' individuals to some extent comply with their green attitudes (for example, by using public transport in their everyday lives), their attitude and behaviour are not consistent when travelling for leisure.

As with compact cities, this result may be partly a result of self-selection bias. That is, preferences and values not included in our model may affect both people's environmental awareness and their preferences for travel to distant locations. For example, people who are interested in distant cultures and concerned about global issues simultaneously may be concerned about climate change and have a strong preference for leisure travel by plane. This conflict of interest (environmental concerns and preference for long leisure travel by plane) may be solved in a moral accounting context, in which long leisure travel by plane may be justified or offset by environmental contributions in other parts of a household's consumption. This line of reasoning is similar to and extends the fixed time and money budget line of reasoning presented in the section 3.1.

Some support for the moral accounting explanation is found in Holden (2001, 2007), who used in-depth interviews of Norwegians to study the relationships between environmental attitudes and household consumption. The interviews revealed three mechanisms that influence whether individuals behave in an environmentally friendly way: a desire to project an environmentally friendly image (being a 'hero'), a sense of powerlessness (being a 'victim') and a desire to indulge oneself (being a 'villain'). Holden suggests that the sense of powerlessness is related to running a home and everyday travel and that the desire to indulge oneself dominates during leisure hours. Consequently, 'other consumption' (such as food and clothing) becomes the primary way one projects an environmentally

friendly image. From our perspective, the important point is that the third mechanism, in particular, influences long-distance leisure travel by plane.

Thus, while green individuals strive to act in an environmentally responsible manner in their everyday lives, they seem to have a conflicting need to cast aside their environmental concerns when travelling for leisure. Many respondents (Holden, 2001, 2007) indicated that they have a desire to indulge themselves in some situations—to free themselves from the constraints involved in environmentally friendly behaviour. Moreover, they seem to feel that they do their fair share for the environment in their non-leisure time and therefore that they should not have to continue behaving environmentally responsibly during their leisure activities.

3.3. Information and Communication Technology (ICT)

The interaction between ICT and personal activities and related travel has been an important theme in transport research in recent years.[12] From the evidence provided by these studies, it is apparent that this interaction is highly complex and that there is no clear-cut evidence as to whether ICT use is neutral to, increases or decreases total travel demand. There are, however, some findings suggesting that, although ICT may reduce the need for everyday travel, it may stimulate the demand for leisure travel.

Salomon (1986) classified the direct impacts[13] of ICT on travel: substitution (ICT replaces travel), complementarity (ICT generates new activities that result in increased travel), modification (travel is modified in different ways, such as choice of different travel modes and trip timing, trip chaining and activity sequencing) and neutrality (no effect on travel). Using this classification, Andreev et al. reviewed about 100 studies on the impacts of ICT on personal activities and travel and concluded

Of the four major direct impacts of ICT on travel—i.e. substitution, complementarity, modification and neutrality, substitution has been the most prevalent impact for telecommuting, with complementarity most prevalent impact for teleshopping and teleleisure (Andreev et al., 2010, p. 3).

Telecommuting, which enables mandatory personal activities such as work, is the most studied activity. According to Andreev et al.

It is safe to say, in general, that in the short term telecommuting leads to reduction of the various travel characteristics (e.g., vehicle kilometres, passenger kilometres, morning-peak hours, emission and number of commuting trips). In the long term, however, telecommuting impacts are still blurred (Andreev et al., 2010, p. 10).

Tele-leisure can be defined as the use of ICT to enable leisure activities (including leisure travel). Investigation of the impacts of tele-leisure remains the most understudied issue in tele-activities studies (Mokhtarian et al., 2006; Andreev et al., 2010). A few empirical studies have been carried out, however, and some did not find a substitution effect (for example, Handy and Yantis, 1997; Krizek et al., 2005) and others found complementary impacts (Hjorthol, 2002; Senbil and Kitamura, 2003; Wang and Law, 2007). Thus, there appears to be some support for the claim that ICT currently results in decreased travel related to mandatory personal activities (such as work) and increased travel related to discretionary activities (such as leisure travel).

If, as previously stated, people have a fixed time and income budget related to travel, we would expect that saved money and time on everyday travel resulting from ICT enables more use of money and time on leisure travel. As pointed out by Banister and Stead

even if there are reductions in one set of transport-related activities (e.g., the journey

to work), there may be compensating increases elsewhere as the car is now available during the day for other uses (e.g., for shopping and social activities) or for other users (Banister and Stead, 2004, p. 613).

Early empirical support for such compensatory mechanisms between work and non-work travel can be found in Henderson and Mokhtarian (1996), Gould and Golob (1997) and Balepur *et al*. (1998). For example, Henderson and Mokhtarian (1996) observed a considerable reduction in commute-related travel and a slight increase in non-work travel as a result of telecommuting. Gould and Golob (1997) found that people working exclusively at home spend significantly more time shopping on work days than people who work away from home.

Although ICT may be a substitute for work travel (moving information rather than people), it may be a complement for leisure travel by plane. That is, ICT may influence the demand for flights, for example, through using the Internet to provide last-minute deals to sell excess capacity, particularly for flights, hotels and holiday packages. Apart from the cost savings on marketing, companies can build up a profile of that market and adapt their products to meet the perceived requirements of the customer. Banister and Stead stated that

> The potential increase in travel is immense, as people take more overseas holidays and cheap trips to see friends, sites or other destinations. It has facilitated new ownership patterns of second homes in the Sunbelt of Europe and the ability to regularly reach them for long weekends (Banister and Stead, 2004, p. 624).

In a similar fashion, Gössling and Nilsson (2010) illustrated how frequent-flyer programmes, facilitated by the use of ICT, may work as an institutionalised framework for high mobility by rewarding and thus increasing interest in aeromobility.

On the other hand, ICT is to an increasing extent used to facilitate public transport and thus reduces the emissions from everyday travel. One of the greatest obstacles in convincing people to use surface-bound public transport systems is the real or perceived inconvenience in travelling from point A to point B, which usually involves covering some distance by foot and the co-ordination of different modes of transport. In Gössling (2010) a solution to this co-ordination problem, involving the use of iPhone, is suggested. The idea is based upon a public transport initiative called Dutch 9292, which includes a database with schedules for all Dutch public transport systems. Another initiative is WISETRIP which includes multimodal door-to-door solutions for journeys involving international travel.[14] These examples illustrate how ICT can be used to stimulate an environmentally friendly change of transport mode.

4. Conclusion

Our main finding is that well-known policies aimed at reducing energy consumption and CO_2 emissions of everyday travel may have the opposite effect on leisure travel. We examined studies related to three sustainable transport policies—developing more compact cities, fostering pro-environment attitudes and promoting the use of ICT—and found that they may facilitate more use of public transport and reduce trip distances in everyday life, but they may also directly or indirectly stimulate leisure travel.

The main reason for this unintended side effect is that the policies are not directed towards the main objective—reducing CO_2 emissions from all travel. Instead, they are tailored to achieve an intermediate objective, which almost always is targeted at everyday transport. For instance, the intermediate objective of a city planner may be to reduce average trip length for cars or other vehicles. However, reducing the distance travelled also

affects the cost of travelling and the quality of life in a city, which in turn may influence the demand for leisure travel.

Several mechanisms may contribute to this result. People seem to have relatively fixed money and time budgets for travel, and the time and money saved on everyday travel are then consumed on leisure travel. In addition, a given policy may stimulate substitutes for everyday travel and complements to leisure travel. And, finally, people seem to find it difficult to align their behaviour with their environmental attitudes during their leisure time. They, therefore, may keep a moral account and long-distance leisure trips may be justified or offset by environmental contributions in other parts of a household's consumption. More descriptive research is needed in this area to test whether and why such compensation mechanisms exist. More generally, there is still a lack of knowledge of the complex relation between everyday and leisure travel.

As the understanding of these relationships and mechanisms deepens, policy-making must change. According to economic theory, the optimal strategy would be to apply policies that directly target the problem of emissions from transport. This implies setting a price on CO_2 emissions on all modes of transport—including aviation. A widely applied emission price would create incentives for reducing travel volumes as well as choosing environmentally friendly technologies, travel patterns and modes. Moreover, it would promote development of city infrastructures, ICT solutions and attitudes in which the emissions from both everyday and leisure activities would be considered and reduced. This emission price could be implemented as a global tax on fuels differentiated to reflect the amount of CO_2 emissions (similar to the system introduced in Sweden and Norway in 1991) or by a global quota system (similar to the EU Emission Trading System).

However, a widely applied emission price of the required level may not be publically or politically acceptable. While the cost is clearly visible, the benefits are not. Also, public acceptance may be especially lacking for decreasing desirable journeys, like leisure-time travel, as compared with necessary journeys, like work-related trips (Moktharian, 2005; Holden, 2007). And policy-makers may view leisure-time journeys as less economically productive than work-related journeys and, thus, less relevant for policy-making (Andreev et al., 2010).

Thus, a carefully designed policy mix is needed, in which a CO_2 price is complemented by other instruments. Since traditional sustainable transport policy measures may be less relevant to leisure travel, these must be improved and complemented with other policy measures to achieve comprehensive sustainable travel. Three ideas worth considering are the following.

First, limits to urban density: decentralised concentration of smaller cities or polycentric development within larger cities could be promoted. While offering good opportunities for developing an affordable and well-functioning public transport system which may lead to lower energy consumption for everyday travel, it also avoids some of the disadvantages caused by extreme densities and may reduce the incentives for long-distance journeys by plane.

Secondly, attitudes to leisure travel: the public could be informed about the environmental consequences of leisure-time journeys, especially by plane. In-depth interviews reveal that people generally are not aware of the negative environmental consequences of leisure-time journeys (Holden, 2008). Tailored information campaigns may alter leisure travel behaviour. And increased environmental awareness could give the political legitimacy to levy taxes on emissions from such journeys.

Finally, ICT and leisure travel choice: the use of ICT could be promoted to facilitate environmentally friendly modes of transport in people's leisure time. For instance, multimodal journey planners involving international travel could be developed along the same lines as the WISETRIP project funded by the EU Seventh framework programme—although, for each journey, the total emissions should be given, enabling the traveller to chose the most environmentally friendly option.

Notes

1. The term sustainable development, as defined in the Brundtland report (WCED, 1987), includes social and environmental dimensions. In this article, we only address the environmental dimension. For further discussion of the sustainable transport concept, see Holden (2007).

2. True, some attempts have been made to influence mode choice for longer distance journeys, including travel for leisure. The *dominant* attempts are, however, meant to influence everyday travel.

3. By 'carbon intensity', we mean the amount of CO_2 per energy equivalent. This concept should be applied to the life-cycle of the fuel.

4. These taxes were first described by Pigou (1920). Total emissions of greenhouse gases should be set to the volume where the marginal social damage of more emissions is equal to the marginal social cost of more mitigation. The polluter should pay a price for emissions equal to the marginal cost. However, this approach may be difficult to implement in the transport sector since it would require measurements of small emissions from a high number of vehicles.

5. Survey respondents evaluated statements in support of public transport and non-motorised travelling (for example, biking and walking) as well as car safety statements.

6. The study includes qualitative interviews of 17 households, a questionnaire survey with 1932 respondents and a detailed diary survey with 273 respondents.

7. The study focused on the relationship between land use characteristics and household energy use for housing and transport using a questionnaire survey with 941 respondents divided among eight residential areas. The residential areas represented a variety of key land use characteristics, such as type of housing, housing density, location relative to the city centre and local sub-centre, access to public transport and mix of housing, business and services.

8. Explicit travel time/cost variables are not included. The everyday travel model was run with variables for accessibility (distance to bus station, distance to tube station, frequency of bus/tube departures, etc.) However, none of these variables had a significant impact on journeys and they were all correlated with the regressors distance to city centre and distance to sub-centre. (See Holden and Norland (2005) for a thorough presentation of the model specification, variable choice and data source.)

9. We have not made an explicit statement about the overall energy consumption (and CO_2 emissions) for different groups. Although we identify and discuss opposite directed influences of different variables on everyday and leisure journeys, we do not think one survey is enough to draw firm conclusions on the magnitude of those impacts and the sum of these impacts for different groups.

10. Cao *et al.* (2009) included attitudinal factors based upon positive statements concerning public transport, walking/biking and travelling, and other statements about car dependence, minimising travel and car safety. The statements did not, however, relate to the environmental attitudes of the individual.

11. Members of environmental organisations did consume less energy for housing and travel than non-members, but these differences were explained by differences in income, housing and other explanatory variables included in the multiple regression model (see Holden and Norland, 2005, table 2).

12. See, for example, *Transport Research Part A*, vol. 41 (2007) and *Transport Research Part C*, vol. 18 (2010).

13. Banister and Stead (2004) also noted longer-term, more subtle indirect and direct effects of technology innovation on travel.

14. See: http://www.wisetrip-eu.org/.

Acknowledgements

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Table A1. Results from a multiple linear regression analysis of household energy consumption for transport

	Everyday travel[f] (kWh/capita/year)						Leisure travel by plane[g] (kWh/capita/year)					
	Model E1[a] (n = 650)		Model E2[a] (n = 671)		Model E3[a] (n = 664)		Model L1[a] (n = 733)		Model L2[a] (n = 762)		Model L3[a] (n = 749)	
	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance
Constant	1579	0.162	1125	0.231	2056*	0.037	3026*	0.042	2442*	0.035	1588	0.213
I. Land-use characteristics												
Access to private yard (yes = 1)							−969*	0.024	−1017*	0.016	−910*	0.032
Land-use mix (percentage)[b]	5	0.580	6	0.502	4	0.659						
Residential density[c]	22	0.691	36	0.512	26	0.638	142	0.068	172*	0.024	169*	0.028
Distance to city centre (km)	107**	0.001	112**	0.000	108**	0.000	20	0.651	38	0.372	39	0.370
Distance to local centre (km)	233*	0.036	214	0.051	212	0.051	−49	0.705	−43	0.728	−24	0.846
II. Socioeconomic and sociodemographic background												
Second home (yes = 1)							−293	0.435	−272	0.451	−296	0.420
Age (year)	−12	0.281	−11	0.32	−9	0.425	−16	0.268	−18	0.214	−19	0.179
Woman (yes = 1)	−844**	0.002	−746**	0.004	−757**	0.004	45	0.900	58	0.865	7	0.985

Table A1. *(Continued)*

| | Everyday travel[f] (kWh/capita/year) | | | | | | Leisure travel by plane[g] (kWh/capita/year) | | | | | |
| | Model E1[a] (n = 650) | | Model E2[a] (n = 671) | | Model E3[a] (n = 664) | | Model L1[a] (n = 733) | | Model L2[a] (n = 762) | | Model L3[a] (n = 749) | |
	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance
No regular work (yes = 1)	−1047*	0.019	−967*	0.027	−943*	0.030	−1100	0.058	−1129*	0.042	−1048	0.064
Income (100 000 NOK)[d]	174*	0.034	183*	0.025	167*	0.040	316**	0.000	324**	0.000	330**	0.000
Higher education (yes = 1)[e]	−99	0.733	−85	0.763	−74	0.791	872*	0.029	760*	0.045	777*	0.043
Discount card public transport (yes = 1)	−664*	0.016	−637*	0.019	−558*	0.043						
Access to car (yes = 1)	1722**	0.000	1784**	0.000	1582**	0.000	−173.5	0.921	−7	0.988	194	0.689

Table A1. *(Continued)*

	Everyday travel[f] (kWh/capita/year)						Leisure travel by plane[g] (kWh/capita/year)					
	Model E1[a] (n = 650)		Model E2[a] (n = 671)		Model E3[a] (n = 664)		Model L1[a] (n = 733)		Model L2[a] (n = 762)		Model L3[a] (n = 749)	
	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance
III. Attitudinal variables												
General environmental attitudes	−8	0.804					−6.04	0.894				
Membership of environmental NGO (yes = 1)			47	0.912					1060	0.070		
Transport-specific environmental attitudes					−84*	0.025					99*	0.050
R^2	0.247		0.239		0.253		0.089		0.101		0.096	

[a] E refers to everyday travel and L to leisure travel; 1, 2 and 3 refer to the three different indicators for environmental attitude, as defined in section 3.1.
[b] Percentage of area used for residential buildings.
[c] Number of households per decare.
[d] For everyday travel, we use personal gross income. For leisure travel by plane, we use gross household income.
[e] Education after secondary school.
[f] Annual energy use for everyday travel. Energy use during the week of the survey multiplied by 47 weeks (excluding holidays). Respondents that have experienced an 'unusual travel pattern' during the week of the survey were excluded. Extreme values (> 14 735 kWh per capita/year) were also excluded.
[g] Annual energy use for long-distance leisure travel by plane. Extreme values (>20 846 kWh per capita/year) were excluded.
Notes: The individual coefficient is statistically significant at the * 5 per cent or ** 1 per cent level.