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## **Psychological and behavioural approaches to understanding and governing sustainable mobility**

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### **Abstract**

This paper introduces and explores the psychological and social factors that both contribute to and inhibit behaviour change vis-à-vis sustainable (tourist) mobility. It is based on papers presented at the *Freiburg 2012* workshop. Specifically, it reviews climate change attitudes and perceptions, the psychological benefits of tourism mobilities, addictive elements of mobility and social norming effects, the attitude-behaviour gap (i.e., cognitive dissonance between understandings of, and responses to, climate change), the psychology of modal shifts, the psychology of travel speed/time, and psychological explanations for the perceived importance of long distance travel. It notes that anthropogenic climate change is an inescapable reality, and that tourism's share of Greenhouse Gas (GHG) emissions appears set to rise substantially. There is little prospect of technical solutions adequately addressing this problem. The paper concludes that, while a comprehensive understanding of tourist psychology is necessary to inform policy makers, it alone will be insufficient to achieve emission reductions, and bring tourism to a climatically sustainable pathway, if treated in isolation. Radical change in the structures of provision is also necessary. That change may take the form of infrastructure planning, including financial and economic infrastructure (e.g. taxation regimes and emission trading schemes) for sustainable mobility.

Key Words: Climate change, tourism, transportation, sustainable mobility, psychology, behavior.

### **Introduction**

There now exists a general scientific consensus that anthropogenic climate change is an inescapable reality (IPCC, 2007). The climate science has been subject to, and withstood, 'withering scrutiny' (Garnaut, 2008). The consequences of climate change - social, economic, environmental - will be far reaching (Stern, 2007). The critical challenge that must be taken up without delay is to achieve 'radical emission reductions' in all sectors of the economy, and across all aspects of society. The climate crisis, which demands the transformation of our lives and societies (Monbiot, 2007), raises difficult questions for consumer-based neoliberal western societies (Stern, 2007; Harvey, 2011). One important but problematic aspect of the required transformation relates to contemporary western mobility (Gössling, Hall, Peeters &

Scott, 2010). Wheeler (2012:39) states that “All tourism involves travel: all travel involves transport: no form of transport is sustainable: so how on earth can we have sustainable tourism?” While some modes of transport (e.g., human, electrical, solar powered) are more sustainable than others, the sustainability of high volume, high velocity, long distance transportation is clearly coming under increasing scrutiny (Peeters & Dubois, 2010).

The situation is particularly acute in the case of discretionary air travel (Gössling, Hall, Peeters & Scott, 2010; Cohen, Higham & Cavaliere, 2011). Monbiot (2007) highlights the considerable challenge associated with mitigating aviation greenhouse gas (GHG) emissions, given high current and projected growth in demand for air travel, and the absence of significant scope for further technical gains in aircraft efficiency (Scott, Peeters, & Gössling, 2010). In the absence of ‘game-changing’ innovations in transport technology, it is clearly evident that the United Nations World Tourism Organisation (UNWTO) *Tourism Barometer 2012* forecast of 1.8 billion international travellers by 2030 is incompatible with carbon mitigation. Western governments and the industry have to date been unwilling - or unable - to make meaningful responses to the tourism transport emissions challenge.

The continuing inability to bring aviation into emission trading schemes (ETS) is indicative of this impasse (Duval, 2012). The failure of the EU to bring international aviation into the ETS has provided the International Civil Aviation Organisation (ICAO) (2012) with a 12-month extension to consider ‘industry mechanisms’ which may include alternative fuels and operational innovations (Sustainable Aviation, 2011). IATA (2012) stands by a vision of a future of continued growth in ‘green aviation’ based on technical, operational and biofuel solutions (IATA, 2012; see Duval, 2012). Meanwhile, many other sectors are actively responding to the call for radical emissions reduction (Scott, 2011; Scott, Hall, & Gössling, 2012) such that tourism could find itself generating up to 40% of global carbon emissions by 2050 (Dubois & Ceron 2006; Gössling & Peeters 2007). Such failures of response produce an industry of environmental disregard and neglect, and contemporary tourism that may be considered profligate and dissolute.

It is clearly evident that “...technology and management will not be sufficient to achieve even modest absolute emission reductions” (Gössling, Hall, Peeters & Scott 2010:119). This, according to Gössling et al. (2010), confirms that social and behavioural change is necessary to achieve climatically sustainable tourism. Indeed the UNWTO concedes that climatically sustainable tourism requires fundamental shifts in consumer behaviour (UNWTO-UNEP 2008). However, reliance upon shifts in behaviour raises its own issues and challenges (Semenza et al., 2008). Despite evidence of growing public awareness of the impacts of air transport on climate change (Hares, Dickinson, & Wilkes, 2010; Higham & Cohen, 2011) there remains an alarming disconnection between attitudes and (tourist) behaviour (Miller et al., 2010). Thus, an increasingly informed and concerned public, which is beginning to internalise the realities of the climate crisis (Cohen & Higham, 2011), displays few signs of behaviour change (McKercher et al., 2010; Barr et al., 2010; Higham, Cohen & Cavaliere, 2014). The efficacy of individual consumers bearing the costs (social, economic) and responsibilities (psychological, behavioural) of a profoundly (environmentally) unsustainable industry is clearly open to question.

## **The Freiburg 2012 workshop**

From this overall context, the *Freiburg 2012* workshop, held in Freiburg im Breisgau in southern Germany (3-5 July, 2012) set out to explore the psychological and social factors that both contribute to and inhibit behaviour change vis-à-vis sustainable (tourist) mobility. Such insights are of importance to policy makers, as policy interventions will be less effective if not based on a rigorous understanding of tourist behaviour and psychology. Such understandings are important in negotiating or removing barriers that policy makers may perceive in implementing stronger mitigation measures by signalling how such measures can be made palatable to the public. The *Freiburg 2012* workshop provided an opportunity to advance a rigorous and theoretically informed knowledge base and research agenda for effective policy interventions to address tourism's contribution to climate change.

In terms of psychological understandings of climate change and tourism mobilities, the workshop aimed to explore: climate change attitudes and perceptions, the psychological benefits of tourism mobilities, addictive elements of mobility and social norming effects, the attitude-behaviour gap (i.e., cognitive dissonance between understandings of, and responses to, climate change), the psychology of modal shifts, the psychology of travel speed/time, and psychological explanations for the perceived importance of long distance travel. These avenues of discussion were complemented by behavioural insights into: the factors influencing travel behaviour, social practices that entrench patterns of contemporary mobility, behavioural interventions, mechanisms for encouraging modal shifts and ensuring that behaviour change is sustained rather than fleeting, and the potential for new information technologies (e.g., social media, persuasive technologies) to influence behaviour change.

The psychological and behavioural insights achieved during the workshop informed discussion of government approaches and policy measures that are required to both (a) support the efforts of individuals/consumers to respond to the emission reduction challenge, and (b) conflate the onus of responsibility (and the anxieties of consumption fuelled climate change) from the level of the individual, to the collective levels of government, industry and economy. The importance of effective policy mechanisms, as informed by insights from psychology and the social (behavioural) sciences, aimed at such things as: fostering slow travel, encouraging modal shifts, governing the travel psyche, targeting policy interventions (e.g., in terms of demography), emission mitigation policies, social marketing/de-marketing, promoting the importance of climatically sustainable mobility in tourism strategy planning, attending to mechanisms that foster hypermobility (e.g., low cost carrier (LCC) promotions) and addressing institutionally fostered mobilities (e.g., frequent flier and air travel loyalty/reward programmes). The intention was to provide critical insights into psychological and behavioural approaches to understanding (un-)sustainable mobility and, in doing so, to inform policy measures that may be required to achieve emission mitigation.

### **Sustainable mobility - no technical solution!**

The critical question is whether tourism is able to mitigate its greenhouse gas (GHG) emissions in a way that supports political consensus to avoid dangerous climate change, i.e. stabilising temperature rise below 2°C, compared to pre-industrial levels. Evidence currently suggests otherwise, with projections of emissions from tourism to increase by more than 130% over 2005 levels by 2035 (UNWTO-UNEP-WMO 2008). Of all elements of tourism, air transport causes up to 75% of the contribution to tourism related climate change (Gössling, Hall, Peeters, & Scott, 2010). Sustainable transportation is now established as *the* critical issue confronting a global tourism industry that is palpably unsustainable, and

aviation lies at the heart of this issue for reasons that have been clearly demonstrated (Gössling et al., 2010). Tony Tyler (CEO, IATA), in his closing speech to IATA's 69th Annual General Meeting, confirmed that: "Our historic agreement on carbon-neutral growth 2020 is a major achievement by any measure.... And you have set a clear and responsible path for us to work with our partners in government" (Tyler, 2013). The statement, based on a resolution accepted by all IATA members (IATA, 2013), gives the impression that aviation will achieve 'climate neutral growth' up to 2020 and will 'aspire' to continue to do so up to 2050. 'Climate neutral' is considered to be "keeping the global net carbon emissions from international aviation from 2020 at the same level" (IATA, 2013, p. 3). However, what does this mean in practice?

If the current contribution of aviation to carbon emissions is kept equal, the global impact of aviation on climate change, measured in terms of radiative forcing, i.e. the contribution of long *and* short-lived GHG to climate change, will continue to grow. Tourism's current global contribution to climate change ranges between approximately 5% if measured as CO<sub>2</sub> emissions and up to 14% of global GHG emissions if considering the impact of all GHG in a given year (Scott, Peeters, & Gössling, 2010). Tourism-related CO<sub>2</sub> emissions (leisure, business and VFR) are mainly a result of transport (72%), followed by accommodation (24%) and local tourism activities (4%) (Peeters & Dubois, 2010).

Achieving a sustainable path for climate change would require a very significant reduction of emissions by 2050 (as outlined below). While IATA considers an aviation fuel efficiency improvement of 2% per annum, across all 38 years between 2012-2050 to be a realistic goal, the industry expects passenger-kilometers volume growth of between 4.7% per year (Airbus, 2012) and 5.0% per year (Boeing, 2012) over the next 20 years. Despite efficiency gains, emissions from aviation will thus continue to grow. Moreover, historically seen, efficiency gains in aviation have fallen, and always remained lower than growth in the sector (Mayor & Tol, 2010; Penner, Lister, Griggs, Dokken, & McFarland, 1999).

Tourism transport will, in all probability, continue to grow strongly both to 2050 and beyond; growth that only in some moderate economic and population growth scenarios may slow down by the end of the 21<sup>st</sup> century (see Peeters, 2013, this issue). The main cause is an increase of average travel distance as tourism transport increases at a faster pace than the number of trips in tourism (Peeters & Dubois, 2010; UNWTO-UNEP-WMO, 2008). IATA (2013) acknowledges a gap between their carbon neutral growth vision and the failure of technology to compensate for demand growth, suggesting by way of a solution that aviation purchases credits in the global carbon market. However, as tourism accounts for a growing share of global emissions (Scott et al., 2010), offsetting cannot be feasible in the long term. In sustainable emission scenarios, the cost of carbon may rise to as much as US\$250-300 per ton of CO<sub>2</sub> (Edenhofer & Kalkuhl, 2011). It is unlikely that such costs could be sustained by the aviation sector in the absence of very significant demand reductions.

In light of this, the large-scale introduction of biofuels is the only other major innovation suggested by industry (ATAG, 2011; IATA, 2009; WTTC, 2010). The global potential of bio-energy is estimated to be between 50 and 500 EJ (Edenhofer et al., 2011), compared with energy requirements of approximately 15 EJ for aviation in 2007 (Rye, Blakey, & Wilson, 2010). With an expected growth in tourism transport to 10-15 times its current volume by 2100, even the most optimistic estimates for biofuel use will remain insufficient for air transport. Furthermore, the overall sustainability of biofuels is contested (Ariza-Montobbio & Lele, 2010; Dray, Schäfer, & Ben-Akiva, 2012; Gerbens-Leenes, Hoekstra, & van der Meer,

2009; Kant & Wu, 2011; Melillo et al., 2009; Searchinger et al., 2008), with first-generation biofuels causing conflicts with food production, and large-scale production of second-generation biofuels failing because of economic and technological constraints (Sims et al., 2011; Timilsina & Shrestha, 2011). Microalgae and other third-generation biofuels are presented to have high yield promises and relatively low costs, but remain, given a wide range of technical obstacles, little more than a future option at this point (Singh & Gu, 2010; Waltz, 2009). It is also important to note that biofuels will not reduce the non-CO<sub>2</sub> radiative forcing of aviation, which are several times aviation's cumulative CO<sub>2</sub> impact (Lee et al., 2010; Owen, Lee, & Lim, 2010). The potential of biofuels to reduce the contribution of transport energy to climate change is thus less than 30%, compared to fossil fuels.

It is clear that the current UNWTO (2012) tourism growth scenarios to 2030 are fundamentally incompatible with significant and sufficient reduction of greenhouse gas emissions. Peeters and Dubois (2010) have presented an economically optimized (i.e., maximum net revenues) tourism system to 2050, with the objective of emitting 70% less than the current system. It shows two major outcomes based on current transport technology. Either the current volume of air transport can be maintained (with no further growth), requiring that the majority of trips by car be shifted to rail/coach. The only viable alternative to this is that commercial air transport be reduced to the level of the 1970s (with no further growth in current car use) (Peeters & Dubois, 2010). Both scenarios demand fundamental changes in travel behavior. For tourists, this implies behavioral changes towards less flying, a shift from long haul to medium and short haul travel (i.e., reduction in distance), a modal shift from car to rail and coach, and less frequent travel (with longer length of stay if a reduction in total number of nights is to be avoided) (Peeters, Gössling, & Lane, 2009; Ram, Nawijn & Peeters, 2013 this issue). Changes within the sector may include rather complex shifts in the social and psychological valuation of long haul travel (Larsen & Guiver, 2013 this issue), and, on the side of tour operators and airlines, diversification of airlines into other modes of transport (railways, buses), logistics, information communication technologies, and, for destinations, a change in perspective towards revaluing closer markets. Under such scenarios, the idea of distance decay, i.e. close markets having far stronger relations with destinations than geographically distant markets (Peeters & Landré, 2012), seems undervalued by most destination managers and the tourism industry.

### **Social factors influencing the consumption of unsustainable mobility**

'Game-changing' technical solutions to transport emissions, particularly those from aviation, are thus not currently available and are unlikely to be forthcoming. In light of this, much of the social science discourse aimed at making transport more sustainable has (fairly or otherwise) turned its focus to the transport consumption behaviour of the public. This evolving discourse points to the need for social solutions to the transport emissions conundrum that would involve behaviour change on the part of consumers, industry and policy makers. Such behaviour change involves reductions in consumption levels, theoretically driven for instance through voluntary behaviour change, more sustainable product offerings and the de-marketing of emission intensive trips (see Peattie & Peattie, 2009 on social marketing as de-marketing), and/or the institution of stronger governance measures (Bramwell & Lane 2011).

Discussion of the role of tourism transport as it relates to sustainability agendas is increasingly appreciative of the fact that leisure tourism is enfolded with other mobility purposes, such as visiting friends and relatives and business travel, which makes the leisure

component difficult to disentangle for analysis. Added to that is the wider perspective that tourism mobility decisions interlink with forms of migration and as such have consequences for sustainability (Williams, 2013), with migration engendering stretched social networks that foster further movement, and tourism trips themselves often leading to migration decisions. This embroilment of leisure tourism with travel and migration makes it difficult to address tourism transport emissions in isolation, and likewise fuels the tendency in some sections of society towards mobility becoming a central feature of contemporary life.

It is important, however, to recognise that participation in the most energy intensive transport practices, such as long-haul air travel and international cruise ship journeys (Howitt, Revol, Smith & Rodger, 2010) is not evenly distributed across society. A small privileged proportion of the global population generates a majority of the transport emissions (Gössling et al. 2009). For instance, Brand and Preston (2010) observe that in the United Kingdom 61% of personal (excluding business) transport emissions are produced by only 20% of the population; long-haul air travel is the dominant contributor here. Despite claims of increased social inclusion in air travel due to the advent of low-cost airlines, flying is still primarily the domain of the wealthy, who often use the low-cost model to fly even more frequently (Casey, 2010). Ironically, an affinity between hypermobility and pro-environmental attitudes has even been documented, which is a stark illustration of an attitude-behaviour gap: Holden and Linnerud (2011) reported that Norwegians with pro-environmental transport attitudes travel more by plane for leisure than those without.

A good starting point for understanding how different stakeholders are networked together in the social production of energy intensive transport behaviour has been work focusing on social practices (e.g. Dickinson, Robbins & Lumsdon 2010). These studies point to how actors, societal structures and norms and technologies co-mingle to produce habituated routines that are difficult to disembed. For instance Gössling and Nilsson's (2010) work on frequent flyer programmes illustrates how social structures enculturate consumers into regimes of hyper-aeromobility, rewarding the consumption of distance. A social practices perspective highlights that consumers act within structures of provision and social patterns, which become entrenched as path dependencies (Shove 2010; Schwanen, Banister & Anable, 2011); one important implication of this is that sustained individual behaviour change is constrained by institutional structures through which consumption practices are routinely performed. Such a perspective does not however offer tactics for disrupting these practices.

Thus Randle and Mander's (2010) work on powering down the practices associated with unsustainable transport behaviour has left an opening for tourism and transport researchers that is not yet resolved: what mechanisms are available for engineering sustained change at a societal level that engenders more sustainable transport behaviour? A distinction must be drawn between *sustained* change and that which is short-lived. The literature on social marketing (e.g. Peattie & Peattie, 2009) warns us that initiatives associated with consumption reduction, such as those within the health field, often lead to short-term behaviour change that is not maintained, with individuals reverting back to 'old' behaviours once the factors put in place to steer the public towards certain behaviours are removed or their novelty wears off. In this issue Hall (2013) examines some of the characteristics and shortcomings of the closely related concept of 'nudging', which focuses on 'reconfiguring the "choice architecture" to encourage beneficial decision-making by consumers'. Notably, social marketing and nudge interventions do not question the broader structures and growth paradigms in which these initiatives are located (Hall 2013, this issue).

Aside from stronger governance and the prospect of progressive industry change focused on sustainable mobility, scope for voluntary behaviour change to drive reduced transport consumption levels is reportedly limited. In this issue, Cohen, Higham and Reis (2013) tease out how tourism transport is a particularly problematic context in which to seek behavioural change, as western societies have tended to associate the spaces of tourism with non-restraint, release, and the relaxation or complete abandonment of everyday social norms. Furthermore, identities and hence human behaviour more generally is observed (ibid) as being too inconsistent across social contexts to expect environmental values to necessarily transfer from environments of 'home' to those of 'away' (see also Barr, Shaw, Coles & Prillwitz, 2010). Different social identities are routinely tried on, played with, and even discarded in tourism contexts (Hibbert, Dickinson & Curtin, 2013). Such analyses do not bode well for the prospect of behaviour change in the case of tourism transport emissions, as the social norms permeating public discourses of 'mainstream' travel behaviour do not centre on rationality and responsibility, but rather the opposite.

Correspondingly, research on the social factors surrounding transport emissions has yet to effectively deal with the affective components that may underpin some travel behaviour. While Sheller's (2004) work on emotional attachment to automobiles brings out some of the affective dimensions that may prevent individuals from changing their car use practices, the extension of such analyses to experiences of air travel is wanting. Whilst Adey, Budd and Hubbard's (2007) work on the geographies of emotion and affect in civil aviation moved us forward in terms of asking questions about the role of affect in flight, they recognised that the implications of these understandings for environmental degradation are not sufficiently developed. We draw from these ideas the point that transport is not always used in rational ways by individuals, and that its consumption is bound up with symbolic value, emotions, identities and social relationships (see also Murtagh, Gatersleben & Uzzell, 2012). This observation poses considerable challenges to those who seek to reliably model travel and transport behaviour.

Symbolic value is both an under-researched inhibitor to sustainable mobility and a potential gateway to stimulating positive behaviour change. Our potential to be mobile is a form of cultural capital (Williams 2013), with mobility capital arguably one of the strongest markers of power in contemporary societies. This idea is well captured in Cresswell's (2012, p. 651) notion of the 'kinetic elite'. Owning a private aircraft, driving a high-powered sports car, and holding multiple passports, for instance, are culturally valued symbols of movement. Mobility patterns may now even in broader terms define one's standing in society, a phenomenon described by Urry (2011) as an individual's 'meetingness'. Likewise is the consumption of distance, a theme Larsen and Guiver (2013) explore in this issue: they unpack how covering distance is associated with encountering cultural difference. This acts as a driver for some tourism mobilities, and as Casey (2010) points out, distance is a way of maintaining perceived class distinctions from the holiday travelling masses. The elevation of mobility consumption to a form of cultural capital is clearly at odds with the notion of decarbonising societies.

A challenge, and a potential gateway to behavioural change, lies in, as Bramwell and Lane (2013) touch upon in their analysis of Urry's *Climate change and society* (2011), creating alternative markers of status and style that work in opposition to the cultural elevation of mobility and the consumption of distance. Slowness, stillness, stopping and closeness must be glamorised amongst the cultural intermediaries. In his discussion of lifestyles and consumer culture, Featherstone (1987) identifies the cultural vanguard as the leaders of trends

that push normative boundaries. These intermediaries, often young, well-educated and savvy with social media, have the potential to transmit ideas to a wider audience, whereby hypermobility could be refashioned as unstylish or anti-social, and contribute to redefining notions of 'good citizenship'. The potential to activate such resistive performative movements is still relatively unexplored, as is the power that celebrity endorsement may have in channelling societies towards different social norms.

### **Psychological factors, sustainable mobility and behaviour change**

In recent years, psychology has had a growing role in understanding transport behaviour. Social psychology, with roots in the development of attitude theory in the 1970s (Fishbein and Ajzen 1975), has been of major importance in understanding the role of attitudes, norms and beliefs in behaviour and behavioural change. Specifically, Ajzen's (1991) theory of planned behaviour remains one of the most often quoted concepts in transport studies, suggesting that behaviour is an outcome of an individual's negotiation of attitudes (the personal understanding of the desirability to change behaviour), norms (social moral frameworks as imposed by society and peers), and perceived behavioural control (influence over factors that may facilitate or obstruct a given behaviour). The theory of planned behaviour has been subsequently modified and developed. Complementing theories include Stern et al.'s (1990) value-belief-norm theory, which also considers the role of values, moral obligations and emotions. Habit, as a factor making it difficult to break out of routines, has also been identified as an important aspect affecting intentions to change behaviour (Verplanken et al. 1994; more comprehensive discussions of the development of psychological theory in environmental and transport contexts include Klöckner (2013), Schwanen and Lucas (2011), and Stek and Vlek (2009)).

Current thinking on the interrelationships of travel behaviour and interventions to achieve more sustainable transport behaviour has been summarized in various conceptual models, including social and psychological factors. For instance, Gehlert et al. (2013) suggest a model with rather linear relationships, where information on more sustainable transport behaviour will affect an individual's values and norms, which again will be negotiated with regard to the individual's specific attitudes and habits, leading to intentions to change mobility patterns. These intentions are negotiated in comparison to their "psychological costs" (ibid: 20), i.e. increased planning efforts, activity suppression or increased time pressure, affecting outcomes in terms of actual behavioural change. In a more complex model of the factors involved in car use, Schwanen and Lucas (2011: 31) distinguish social & cultural norms and past experiences within the field of external factors (institutional, political and legislative frameworks), as well as personal/internal factors (activity needs, resources, responsibilities, lifestyles and identities). Specifically, they acknowledge that lifestyles and identities arise out of complex interrelationships of early cognitions, perceptions, moral motivations, values, personal norms, attitudes & beliefs, personal intentions, and habits. 'Early cognitions' are mental processes shaped early in life, including learned behaviour, and are an important aspect that is ignored in most discussions of behavioural change in transport. For this special issue, an adapted version of the Schwanen & Lucas (2011) model of transport behaviour has been developed (Figure 1).

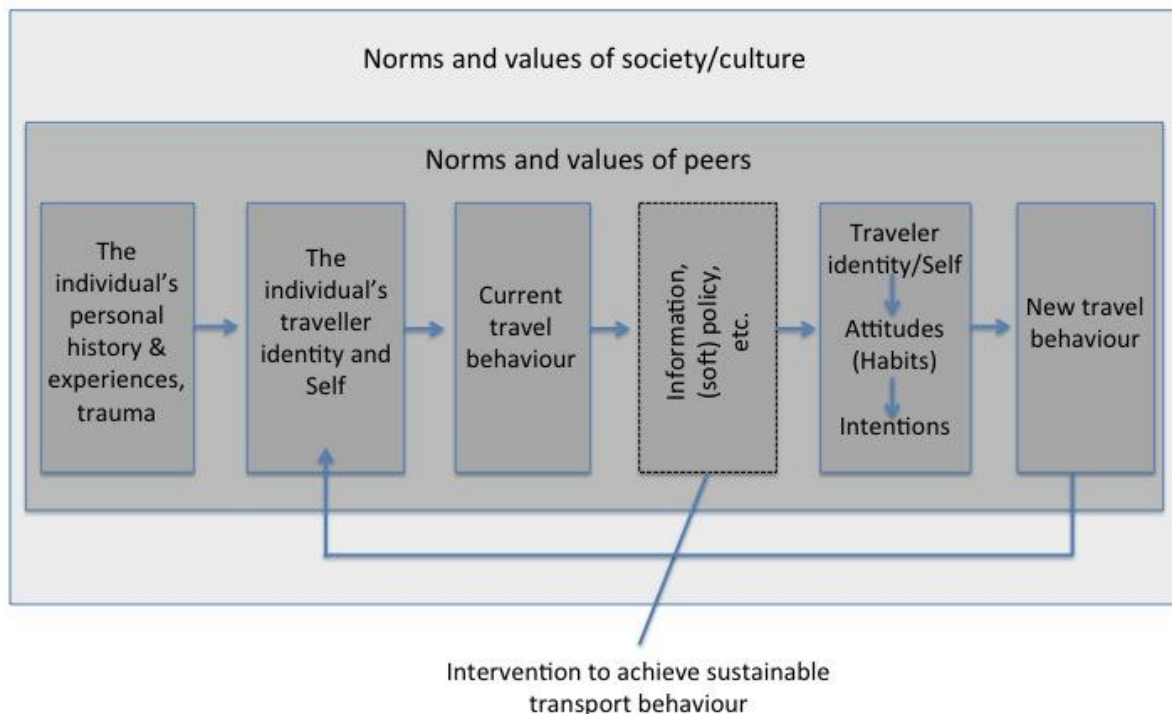
This model focuses on social, cultural and psychological aspects of transport behaviour, even though it is acknowledged that in broadest terms, mobility patterns can be modelled on the basis of only two variables, i.e. income/cost and time, i.e. based on Yacov Zahavi's suggestion that mobility is constant on averaged societal levels. For this purpose, Zahavi



introduced Time Travel Budgets (TTB) and Travel Money Budgets (TMB), hypothesizing that average travel time and the average share of income spent on transport are equal between societies. This was empirically tested and confirmed by Schäfer (1998) and Schäfer and Victor (2000), who compared the TTBs and TMBs of a wide range of societies. TTBs and TMBs have since had important implications for the modelling of global transport volumes on the basis of ‘income’ as the singular most important explanatory variable of mobility growth (e.g. Peeters & Dubois, 2010). Depending on income, the consumption of distance will grow as a function of the speed that can be purchased, as travellers will generally choose the fastest transport modes. An important addition is that while TTBs are constant on the basis of averaged societal values, there are, as already outlined, huge differences in mobility consumption between individuals within the same society, ranging from immobile to hypermobile mobility patterns, and including low-energy (i.e., bicycle, bus, train) to high-energy choices (i.e. car, ferry, cruise ship, aircraft) (Gössling et al., 2009; Urry, 2011).

However, to intervene in mobility consumption requires a far more profound understanding of the various social and psychological mechanisms at work. As emphasized, mobility patterns are the result of cultural practices and social norms, in which people, technology, knowledge and emotions are implicated (Sheller & Urry 2006). The individual is consequently not “...necessarily a sovereign, autonomous agent but rather the carrier and in some ways even the product of the practices in which s/he is involved” (Schwanen & Lucas 2011: 22), and is, consequently, a product of the social and cultural structures s/he is raised in (Figure 1).

### A sociocultural-psychological model of transport behaviour



The model acknowledges a specific role of immediate peers in influencing and shaping early cognitions, and strongly emphasizes that the individual is not a black box, but is rather the

complex outcome of past experiences; also including, for children and youths, the potential of childhood neglect and trauma, which may have an important role in transport behaviour along with other aspects of specific personality traits (Gössling 2013). Out of these personal histories, within the constantly changing “fluidity” (Bauman 2007) of social and cultural norms and values, as well as those more immediate values and norms of peers, emerges an individual’s travel identity and travelling self. This has a wide range of implications for transport behaviour, as drivers of mobility consequently include a desire to express status through mobility (Gössling & Nilsson 2010) or the assumption of desired identities through travel patterns (Hibbert et al., this issue). Interventions through information, (soft) policies, or social marketing will be negotiated with reference to the individual’s travel identity and personality. This latter part is of specific importance in the transport model, as more fundamental aspects of the individual’s traveller psychology have remained poorly researched.

As an example, Giddens (2010) suggests that Sports Utility Vehicle (SUV) purchases are irrational if considered in terms of relative fuel and cost efficiency (and therefore relative contribution to climate change), which he suggests many consumers are increasingly aware of, and concerned about. Giddens explains this observed ‘irrational’ consumer behaviour with the intangibility and invisibility of the dangers of climate change. It may be argued, however, that SUV-based mobility consumption is rational, if indeed, as suggested by Bauman (2007), fears dictate car purchases (cf. also Beck 2007), i.e. emotions that are more tangible than those related to climate change. As another current example, sports car manufacturers employ sound engineers to optimize the sound of the engine roar inside the car. If engine noise is a sales argument, what is its psychological function? Is it a question of feelings of potency, of power over and above other car drivers, as anecdotal evidence would suggest? Then, as a consequence, we have to ask ourselves why feeling superior over others is so important in our societies (Latouche 1993), and whether this is an obstacle to sustainable transportation. Consequently, emotions and “irrationalities” (from the point of view of society) may dominate a relevant share of travel behaviour, and a better understanding of these interrelationships is warranted. As traveller ‘Selves’ are dynamic, and as we play with different identities in our lifetimes – as for instance young adults making conscious choices not to get drivers licences or to become members in car sharing associations rather than owning a car – there is some hope that research into the psychology of contemporary traveller identities may also contain some of the keys to changing transport behaviour and mobility consumption.

An important point of note is that the model presented in Figure 1 attends only to the socio-cultural and psychological dimensions of travel behaviour. It does not address the wider systems of provision that are determined by government transport policies, infrastructure provision (road systems, airport development/expansion, rail networks) and the commercial services and opportunities for unrestrained mobility consumption that they afford. It can be argued that such provision, while facilitating mobilities that are cheap, fast, efficient, and unsustainable, also renders it inconvenient, expensive and less safe/secure to travel sustainably. This may be described as ‘the world as the tourist finds it’, which contributes fundamentally to current (unsustainable) mobility practices. While Figure 1, and the papers that feature in this special issue, address the social and psychological dimensions of tourist mobility, these caveats point to the critical importance of addressing the broader external factors (political, economic, technological) shaping the systems of provision that so heavily influence tourist transport decision-making.

## Psychological and behavioural insights into sustainable mobility

This special issue presents eight papers that explore psychological and behavioral dimensions of sustainable mobility as it relates to the global climate crisis (IPCC, 2007). The first paper by Larsen and Guiver (2013) addresses (tourist) mobility and *distance*. It directly attends to the fact that with increasing speed, particularly on the coat tails of aviation, the average distances consumed by tourists has increased dramatically. The phenomenon of the low cost carrier, for example, has for some (Casey, 2010) brought short/medium haul aviation into the realm of routine (car, bus, train) daily mobility. The redefinition of speed/time/distance thresholds has resulted in more travellers, travelling further, to visit more distant places, for (typically) shorter periods of time. Larsen and Guiver conceptualise distance and then, using discourse analysis, provide empirical insights into perceptions and performances of distance among members of the Dutch travelling public. It transpires that distance is rarely considered in spatial terms, but rather relative distance is expressed and understood in zonal (e.g., home/away, coastal, climate) or ordinal (e.g., time, cost) terms. This paper also highlights the importance of ‘cultural distance’, signaling the potential to promote less (physically) distant destinations that offer the desired experience of cultural difference.

The following paper by Cohen, Higham and Reis (2013) adopts modern and postmodern sociological theory to inform an empirical analysis of tourism air travel behaviour. This paper draws upon the work of Barr et al. (2010) who highlight divergences in the ‘attitude-behaviour gap’ as it applies in domestic (‘home’) and tourism (‘away’) behavioural contexts. Cohen et al. review modern sociological theory on tourism as liminoid space, and postmodern theory that views identities as contextual. These theoretical perspectives are then deployed to interpret the ‘home’ and ‘away’ environmental behaviours of consumers in Australia, Norway and the United Kingdom. Employing this approach they are able to provide empirical insights that demonstrate the alarming degree to which much tourism decision-making is absolved of environmental concern or responsibility. Indeed a disconcerted discord, which is increasingly felt by tourists themselves, prevails between environmental (climate) concerns, and the consumption of air travel. These findings prove to be consistent across different national/social contexts. Very few study participants reported that their environmental values, which are consistently performed in domestic life, are considered or meaningfully applied in holiday decision-making. This paper concludes that significant voluntary behavioural change, in the absence of strong government intervention, in the context of sustainable air travel practices is unlikely.

Hibbert, Gössling, Dickinson and Curtin (2013) provide further insights into the ‘attitude-behaviour gap’ in the context of transportation as the major contributor to tourism CO<sub>2</sub>. They do so through an *identity* lens, providing an in depth empirical analysis of the role that identity plays in decisions to undertake travel. Drawing on social psychology and sociology, Hibbert and her co-authors explain that while the construction of identities have in the past been largely prescribed by society, contemporary tourism now provides a site of consumption in which identity choices may be more freely performed. Furthermore, they observe that western society maintains a positive view of highly mobile lifestyles (Urry, 2011), whereby high mobility – particularly that involving air travel - has come to reflect an individual’s standing in society. The institutionalization of mobility through, for example, airline frequent flyer programmes that reward high levels of aeromobility (Gössling & Nilsson, 2010) with access to privilege and luxury (e.g., gold card lounges) clearly serve industry interests in tourism as a marker of exclusivity and identity. Their study links personal mobilities to future

visions of the individual, or 'possible selves'. This approach reveals that individuals have various images of the person they could become (either positive or negative) and make travel decisions that are aligned to seeking (desired) or avoiding (undesired) certain 'possible selves'. This paper questions the efficacy of behaviour change given the significant identity interests that are performed through contemporary tourism. It highlights the likelihood that identity overrides other factors, including environmental impact, in the vast majority of individual travel decision-making processes.

The next paper, by Ram, Nawijn and Peeters (2013), ties together the threads of the previous three. Given the energy constraints that confront the future of tourism, Ram and co-authors consider distance, modal shifts (e.g., the shift to public transport as a preferred mode) and the 'attitude-behaviour gap' in proposing a conceptual 'three-gear' model of unsustainable tourist behavior, to explain why leisure tourist mobility has proved to be so resistant to change. This paper provides an in depth exploration of the psychological causes for the development of unsustainable tourist mobility behaviour in a discussion that centres on the notion of *happiness*, which is implicated in key variables outlined in the model that include number of trips, the consumption of new and novel places, speed, time and distance. In doing so, Ram, Nawijn and Peeters illustrate that happiness, which is central to all elements of tourist experiences, serves as a fundamental barrier to behavioural change. Their paper outlines changes to transport infrastructure policies that may address the 'speed-distance-demand loop' which, driven by the pursuit of happiness, lie at the heart of unsustainable tourist mobility. Their theoretical contributions open various avenues of empirical study.

Khoo-Lattimore and Prideaux (2013) then introduce a specific research technique intended to facilitate psychological approaches to understanding sustainable tourism mobility. Their paper addresses the challenges inherent in influencing transport mode and destination choices towards sustainable mobility. It builds upon the growing attention paid to psychological factors that underpin tourist behaviour. It introduces and describes the Zaltman Metaphor Elicitation Technique (ZMET) as a means by which to develop insights into the reluctance of consumers to choose environmentally friendly transport modes. This technique, which is informed by Freudian psychology, employs photography and photo elicitation to explore thoughts, both unconscious and repressed, which are rarely expressed in verbal social exchange. This technique uses respondents' photographs as entry points to understanding aspects of consumer behaviour, in combination with one-to-one interviews. Khoo-Lattimore and Prideaux observe the high level of consumer awareness of the links between individual (tourism) consumer decisions and anthropogenic climate change, and the failure to date to act upon this growing awareness. Their paper explores the potential offered by the ZMET approach to explore the factors that influence the 'attitude-behaviour gap' and, most critically, the interplay of those factors which are often considered only in isolation. In doing so, researchers may become privy to deep-seated psychological factors, many subconscious or repressed, that are important determinants of complex (tourist) behaviour.

In the sixth paper that appears in this special issue, Peeters (2013) highlights the need for wide *planning time horizons* to mirror the period of climate change projections which typically extend to the year 2100. The urgent need for longer term planning horizons is cemented by the fact that transport infrastructure and technology developments take decades to develop. He presents a system dynamics simulation model (SDM), which is specially intended to model insights that extend beyond normal economic equilibrium modelling. The SDM technique is typically used under circumstances where basic theory, detailed and comprehensive longitudinal data, or understandings of complexity are lacking. Peeters'

application of SDM accommodates international and domestic tourism trips independent of geographical regions, the potential emergence of future choice options (such as the aviation revolution of the early twentieth century), and psychological (rather than solely econometric) mechanisms that influence travel behaviour. His paper demonstrates that mitigation of tourism CO<sub>2</sub> emissions is extremely unlikely in the absence of strong policy intervention. Even low tourism growth scenarios through the coming decades of the current century, which few forecast or expect, would require technological solutions to reduce emission factors for transport more than 70% to just keep emissions at current levels. Peeters highlights the urgency of policy measures to address unsustainable demand and supply for tourism, tourism transport and, interestingly, distances travelled.

The penultimate paper in this special issue, by Dickinson, Filimonau, Cherrett, Davies, Norgate, Speed and Winstanley (2013) explores the concept of ‘sixth sense transport’ in terms of the possibilities for behaviour change. Their paper considers dynamic advances in information technology, which are redefining and enhancing tourists’ space-time capabilities. As such, access to personalised information relating to destinations and travel opportunities, in real time, offers possibilities that may redefine important aspects of travel behaviour. Specifically Dickinson et al. address *time*, which has traditionally been a key determinant of many aspects of travel behaviour and tourist experiences. However, many emerging technologies are contributing to the redefinition of time, which in turn raises the need to revisit and rethink the temporal elements of tourist mobility. Dickinson et al.’s paper offers a timely (re)analysis of the role played by time in destination based travel behaviour. Employing data generated via a range of traditional and emerging approaches (including a purpose built smartphone app) their analysis illuminates the heavy influence that time, and competing forms of time, exert upon (un)sustainable travel choices.

Many of the threads of discussion presented in these papers are usefully tied together in the final paper of the special issue, in which Hall (2013) confronts the need for expanding governance for sustainable mobility. Hall explores different approaches to behavioural change - the utilitarian, social / psychological and the systems of provision/institutional approaches – highlighting the relative importance of individual agency and structural change. Each approach is reviewed in terms of the assumptions that underpin sustainable tourist behaviour. Hall observes that social/psychological approaches to sustainable consumer behaviour, in isolation, do not question the *systems of provision* that give rise to the social practices of tourist travel consumption. It is, in fact, the systems of provision that give rise to the ‘locked-in’ nature of many social practices. Hall does not deny the importance of mechanisms that may influence consumer-decision making: nudging, social marketing, education and other market-based mechanisms. These, though, need to be viewed as part of a suite of approaches that include structural change. Indeed, it is concluded that all three approaches in combination are required to achieve emission reductions, although questions are raised as to whether this can be achieved in a timely manner.

Hall draws useful parallels with smoking, where social practices have changed only very slowly over time. It is nearly sixty years since Doll and Hill (1956) presented empirical evidence to support their nascent theory of a link between smoking and lung cancer. Yet decades passed before smoking was prohibited in aircraft, and it has taken generations to change the culture associated with smoking in western societies. Furthermore, Hall points out that smoking continues in the developing world where industry and political interests perpetuate a culture of smoking. Structural barriers result

in the wheels of change turning slowly and in the case of anthropogenic climate change time is in limited supply.

Together, these papers provoke and encourage further critical contemplation of the psychological and behavioral complexities of climate change, tourism and sustainability mobility at both the individual and sectorial/institutional levels.

## **Conclusion**

There is a groundswell of opinion in tourism, transport and cognate academic fields, that the travel and tourism industry is profoundly environmentally flawed (Gössling, Hall, Peeters & Scott 2010; Wheeler, 2012). Deeply embedded in neoliberal consumer society and entrenched in the structures of late-capitalism (Harvey, 2011), efforts to address the environmental failures of global tourism have, for the time being, rested largely with the consumer. This special issue interrogates the behavioural and psychological dimensions of (tourist) mobility consumption, highlight the complexity of consumer decision-making, and in doing so draw into question the efficacy of a consumer-led industry response to the climate crisis. The papers presented here highlight that increasing climate awareness and environmental concern has little bearing upon tourism consumption (Eijgelaar et al., 2010; Hares et al., 2010; McKercher et al., 2010; Higham & Cohen, 2011; Cohen, Higham & Cavaliere, 2011). Travel decisions are deeply embedded and are intimately related to emotions, identity, time, happiness, performances of self, the attainment (or avoidance) of 'possible selves' and, indeed, unconscious and repressed psychological factors that bear upon travel decisions. The wide disparities that are apparent in domestic ('home') and tourism ('away') decision-making and behavioural contexts (Barr et al., 2010) cement the conclusion that the autonomy of individual response, when set within the systems of provision in late-capitalist consumer society, is fraught with challenge.

This special issue focuses specifically on social, cultural and psychological aspects of tourist transport behaviour. The papers that follow provide critical and fine-grained insights into the behavioural and psychological dimensions of travel decision-making. In doing so, it should be acknowledged that the behaviour and psychology of the tourist represents only one piece of the emissions reduction puzzle. While a comprehensive understanding of tourist psychology is necessary to inform policy makers, it will not be sufficient to achieve emission reductions, and bring tourism onto a climatically sustainable pathway, *if treated in isolation*. The individual consumer cannot be held accountable for the environmental failures of the tourism industry, in the absence of radical change in the systems of provision. Placing the burden of responsibility on the individual will continue to influence some, frustrate or infuriate others and be treated with disregard (out of a sense of futility) by most (Higham, Cohen & Cavaliere, in press). Radical structural change may take the form of infrastructure planning, including financial and economic infrastructure (i.e. taxation regimes and emission trading schemes) for sustainable mobility. These points raise timely and equally important questions regarding the climate psychology of decision makers in government and industry.

It should also be noted in conclusion that the focus here is western-centric. These lines of inquiry need to be extended to emergent world regions, where rapidly expanding middle classes are fueling increases in aero-consumption and the replication of the low-cost carrier model (Freire-Medeiros & Name, 2013). Randers' (2012) global forecast for the forty years to 2052 foresees the emerging markets of the world (i.e., Brazil, the United Arab Emirates, Nigeria, India, Indonesia and China among others) driving relentlessly to close the

consumption gap that exists between developing and developed (consumer) societies. The efficacy of individual consumers bearing the costs (social, economic) and responsibilities (psychological, behavioural) of profoundly unsustainable consumer societies is clearly open to question. While the rampant accumulation of capital marches on through the privatisation of profit (Harvey, 2011), it is evident that the individual consumer will not bear sole responsibility for the fundamental failures of global capitalism (Urry, 2010). Changes to the systems of provision (Hall, 2013) are clearly required, given the environmental failures of highly mobile western consumer societies (Harvey, 2011). This will be an important focus of our continuing academic endeavours<sup>1</sup>.

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### <sup>1</sup> **Announcement: *Freiburg 2014***

#### **Second biennial workshop 1-4 July, 2014:**

The second biennial Freiburg workshop will take place on 1-4 July, 2014. It will again be hosted by the Freiburg Institute for Advanced Studies (Germany) and will take place in the hamlet of Kirchzarten, less than ten kilometres from Freiburg im Breisgau, the gateway to the German Black Forest. Freiburg, a sustainable transportation showcase, is centrally located within Europe and readily accessed from across Europe by rail. Building upon the psychological and behavioural approaches to understanding sustainable mobility that were explored in the inaugural workshop, *Freiburg 2014* will expand the focus of discussions to also address structural (industry, government policy, infrastructure, technical) measures (and philosophies) that are urgently needed to achieve radical tourism emissions reduction. The workshop will accommodate a mixed delegation including academics (and postgraduate research students), government/policy makers and industry decision makers. The conference venue will again be the Hotel Fortuna (<http://www.hotel-fortuna-kirchzarten.de/>), where early accommodation bookings are strongly encouraged. For further information please contact James Higham (james.higham@otago.ac.nz) or Scott Cohen (s.cohen@surrey.ac.uk).

### **References**

- Adey, P., Budd, L. and Hubbard, P. (2007). Flying lessons: Exploring the social and cultural geographies of global air travel. *Progress in Human Geography*, 31(6), 773-791.
- Airbus. (2012). *Navigating the future. Global market forecast 2012-2031*. Paris: Airbus S.A.S.
- Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human*

- Ariza-Montobbio, P., & Lele, S. (2010). Jatropha plantations for biodiesel in Tamil Nadu, India: Viability, livelihood trade-offs, and latent conflict. *Ecological Economics*, 70(2), 189-195.
- ATAG. (2011). *Powering the future of flight. The six easy steps to growing a viable aviation biofuels industry* (No. web version). Geneva: Air Transport Action Group (ATAG).
- Barr, S., Shaw, G., Coles, T., & Prillwitz, J. (2010). “A holiday is a holiday”: Practicing sustainability, home and away. *Journal of Transport Geography*, 18(3), 474–481.
- Bauman, Z. (2007). *Liquid Modernity*. Oxford, Blackwell Publishers Ltd.
- Beck, U. (2007). *Weltrisikogesellschaft*. Frankfurt am Main, Suhrkamp.
- Boeing. (2012). *Current market outlook 2012-2031*. Seattle: Boeing Commercial Airplanes. Marketing.
- Bramwell, B. & Lane, B. (2011). Critical research on the governance of tourism and sustainability. *Journal of Sustainable Tourism*, 19(4-5), 411-421.
- Bramwell, B. & Lane, B. (2013). Getting from here to there: Systems change, behavioural change and sustainable tourism. *Journal of Sustainable Tourism*, 21(1), 1-4.
- Brand, C. & Preston, J. M. (2010). ‘60-20 emission’ - The unequal distribution of greenhouse gas emissions from personal, non-business travel in the UK. *Transport Policy*, 17, 9-19.
- Casey, M.E. (2010). Low cost air travel: Welcome aboard? *Tourist Studies*, 10(2), 175-191.
- Cohen, S.A., Higham, J.E.S. & Cavaliere, C.T. (2011). Binge flying: Behavioural addiction and climate change. *Annals of Tourism Research*, 38(3), 1070-1089.
- Cohen, S.A. & Higham, J.E.S. (2011). Eyes wide shut? UK consumer perceptions on aviation climate impacts and travel decisions to New Zealand. *Current Issues in Tourism*, 14(4), 323-335.
- Cohen, S.A., Higham, J.E.S. & Reis, A (2013) Sociological barriers to sustainable tourism air travel behaviour. *Journal of Sustainable Tourism* (in press).
- Cresswell, T. (2012). Mobilities II: Still. *Progress in Human Geography*, 36(5), 645-653.
- Dickinson, J.E., Robbins, D., & Lumsdon, L. (2010). Holiday travel discourses and climate change. *Journal of Transport Geography*, 18(3), 482-489.
- Dickinson, J.E., Filimonau, V., Cherrett, T., Davies, N., Norgate., S., Speed, C., & Winstanley, C. (2013) Understanding temporal rhythms and travel behaviour at destinations: potential ways to achieve more sustainable travel. *Journal of Sustainable Tourism* (in press).
- Doll, R. & Hill, A.B. (1956). Lung cancer and other causes of death in relation to smoking: A second report on the mortality of British doctors. *British Medical Journal* 2 (5001): 1071–1081.
- Dray, L. M., Schäfer, A., & Ben-Akiva, M. E. (2012). Technology Limits for Reducing EU Transport Sector CO2 Emissions. *Environmental Science & Technology*, 46(9), 4734-4741.
- Edenhofer, O., & Kalkuhl, M. (2011). When do increasing carbon taxes accelerate global warming? A note on the green paradox. *Energy Policy*, 39(4), 2208-2212.
- Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., et al. (Eds.). (2011). *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation*. Cambridge, UK: Cambridge University Press.



- Eijgelaar, E., Thaper, C. & Peeters, P. (2010). Antarctic cruise tourism: the paradoxes of ambassadorship, 'last chance tourism' and GHG emissions. *Journal of Sustainable Tourism* 18(3), 337-354.
- Featherstone, M. (1987). Lifestyle and consumer culture. *Theory, culture and society*, 4(1), 55-70.
- Fishbein, M., Ajzen, I., 1975. Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Reading. Addison-Wesley, MA.
- Freire-Medeiros, B. & Name, L. (2013). Flying for the very first time: Mobilities, social class and environmental concerns in a Rio de Janeiro favela. *Mobilities*, 8(2), 167-184.
- Garnaut, R. (2008). The Garnaut Climate Change Review. Cambridge, UK: Cambridge University Press.
- Garnaut, R. (2011). Garnaut Climate Change Review—Update 2011, Australia in the Global Response to Climate Change Summary.
- Gehlert, T., Dziekan, K. and Gärling, T. 2013. Psychology of sustainable travel behavior. *Transportation Research Part A* 48: 19-24.
- Gerbens-Leenes, W., Hoekstra, A. Y., & van der Meer, T. H. (2009). The water footprint of bioenergy. *Proceedings of the National Academy of Sciences*, 106(25), 10219-10223.
- Giddens, A. (2010). The Politics of Climate Change. Polity Press: Cambridge.
- Gössling, S. (2013). Advancing a Clinical Transport Psychology. *Transportation Research Part F* 19: 11-21.
- Gössling, S. and Nilsson, J.H. (2010). Frequent Flyer Programmes and the Reproduction of Mobility. *Environment and Planning A*, 42: 241-252.
- Gössling, S., & Nilsson, J. H. (2010). Frequent flyer programmes and the reproduction of aeromobility. *Environment and Planning A*, 42, 241–252.
- Gössling, S., Ceron, J.-P., Dubois, G., and Hall, C.M. 2009. Hypermobile travellers. In Gössling, S. and Upham, P. (eds) *Climate Change and Aviation*. Earthscan, pp. 131-149.
- Gössling, S., Hall, C. M., Peeters, P., & Scott, D. (2010). The Future of Tourism: Can Tourism Growth and Climate Policy Be Reconciled? A Climate Change Mitigation Perspective. *Tourism Recreation Research*, 35(2), 119-130.
- Hall, C.M. (2013). Framing behavioural approaches to understanding and governing sustainable tourism consumption: Beyond neoliberalism, 'nudging' and 'green growth'? *Journal of Sustainable Tourism* (in press).
- Hares, A., Dickinson, J. & Wilkes, K. (2010). Climate change and the air travel decisions of UK tourists. *Journal of Transport Geography*, 18, 466-473.
- Harvey, D. (2011). The enigma of capital and the crises of capitalism. Oxford: Oxford University Press.
- Hibbert, J.F., Dickinson, J.E. & Curtin, S. (2013). Understanding the influence of interpersonal relationships on identity and tourism travel. *Anatolia: An International Journal of Tourism and Hospitality Research*, 24(1), 30-39.
- Hibbert, J.F., Dickinson, J.E., Gössling, S., & Curtin, S.C. (2013). Identity and tourism mobility: an exploration of the attitude-behaviour gap. *Journal of Sustainable Tourism* (in press).
- Higham, J.E.S. & Cohen, S.A. (2011). Canary in the coalmine: Norwegian attitudes towards climate change and extreme long-haul air travel to Aotearoa/New Zealand. *Tourism Management*, 32(1), 98-105.
- Higham, J.E.S., Cohen, S.A., & Cavaliere, C.T. (in press). Climate change, discretionary air travel and the 'flyers' dilemma'. *Journal of Travel Research*

- (accepted for publication).
- Holden, E. & Linnerud, K. (2011). Troublesome leisure travel: The contradictions of three sustainable transport policies. *Urban Studies*, 48(14), 3087-3106.
- Howitt, O.J.A., Revol, V.G.N., Smith, I.J. & Rodger, C.J. (2010). Carbon emissions from international cruise ship passengers' travel to and from New Zealand. *Energy Policy*, 38(5), 2552-2560.
- IATA. (2009). *The IATA Technology Roadmap Report* Montreal: IATA.
- IATA. (2013). II. Resolution on the implementation of the aviation "CNG2020" strategy. Retrieved 22-06-2013, 2013
- Intergovernmental Panel on Climate Change (IPCC) (2007). Climate Change 2007: Synthesis Report. An Assessment of the Intergovernmental Panel on Climate Change. <http://www.ipcc.ch/>
- Kant, P., & Wu, S. (2011). The Extraordinary Collapse of Jatropha as a Global Biofuel. *Environmental Science & Technology*, 45(17), 7114–7115.
- Khoo-Lattimore, C. & Prideaux, B. (2013). ZMET: A Psychological Approach to Understanding Unsustainable Tourism Mobility. *Journal of Sustainable Tourism* (in press).
- Klößner, C. (2013). A comprehensive model of the psychology of environmental behaviour – a meta-analysis. Global Environmental Change, online first.
- Larsen, G. & Guiver, J. (2013). Understanding tourists' perceptions of distance: A key to reducing the environmental impacts of tourism mobility. *Journal of Sustainable Tourism* (in press).
- Latouche, S. (1993). In the wake of the affluent society. An exploration of post-development. Zed Books, London.
- Lee, D., Pitari, G., Grewe, V., Gierens, K., Penner, J., Petzold, A., et al. (2010). Transport impacts on atmosphere and climate: Aviation. *Atmospheric Environment*, 44(37), 4678-4734.
- Lee, R. (2006). Childhood Trauma and Personality Disorder: Toward a Biological Model. *Current Psychiatry Reports*, 8, 43-52.
- Mayor, K., & Tol, R. S. J. (2010). Scenarios of carbon dioxide emissions from aviation. *Global Environmental Change*, 20(1), 65-73.
- Melillo, J. M., Reilly, J. M., Kicklighter, D. W., Gurgel, A. C., Cronin, T. W., Paltsev, S., et al. (2009). Indirect Emissions from Biofuels: How Important? *Science*, 326(5958), 1397-1399.
- Owen, B., Lee, D. S., & Lim, L. (2010). Flying into the Future: Aviation Emissions Scenarios to 2050. *Environmental Science & Technology*, 44(7), 2255-2260.
- Peeters, P. (2013). Developing a long term global tourism transport model using a behavioural approach: implications for sustainable tourism policy making. *Journal of Sustainable Tourism* (in press).
- Peeters, P. M. & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. *Journal of Transport Geography* 18, 447–457.
- Peeters, P., & Landré, M. (2012). The emerging global tourism geography – an environmental sustainability perspective. *Sustainability*, 4(1), 42-71.
- Peeters, P., Gössling, S., & Lane, B. (2009). Moving towards low-carbon tourism. New opportunities for destinations and tour operators. In S. Gössling, C. M. Hall & D. B. Weaver (Eds.), *Sustainable tourism futures. Perspectives on systems, restructuring and innovations* (Vol. 15, pp. 240-257). New York: Routledge.
- Penner, J. E., Lister, D. H., Griggs, D. J., Dokken, D. J., & McFarland, M. (Eds.). (1999). *Aviation and the global atmosphere; a special report of IPCC working groups I and III*. Cambridge: Cambridge University Press.

- Ram, Y., Nawijn, J. & Peeters, P. M. (2013). Happiness and Limits to Sustainable Tourism Mobility: A New Conceptual Model. *Journal of Sustainable Tourism* (in press).
- Randles, S. & Mander, S. (2009). Practice(s) and ratchet(s): A sociological examination of frequent flying. In S. Gossling & P. Upham (Eds.), *Climate change and aviation: Issues, challenges and solutions* (pp. 245–271). London: Earthscan.
- Randers, J. (2012). 2052: A global forecast for the next forty years. Vermont: Chelsea Green Publishing.
- Rye, L., Blakey, S., & Wilson, C. (2010). Sustainability of supply or the planet: a review of potential drop-in alternative aviation fuels. *Energy & Environmental Science*, 3(1), 17-27.
- Schäfer, A. (1998). The global demand for motorized mobility. *Transportation Research A* 32(6): 455–477.
- Schäfer, A. and Victor, D. G. (2000). The future mobility of the world population, *Transportation Research - A* 34: 171-205.
- Schwanen, T. and Lucas, K. (2011). Understanding Auto Motives. In Lucas, K., Blumenberg, E. and Weinberger, R. (eds) *Auto Motives. Understanding Car Use Behaviours*. Bingley, Emerald.
- Schwanen, T., Banister, D. & Anable, J. (2011). Scientific research about climate change mitigation in transport: A critical review. *Transportation Research Part A: Policy and Practice*, 45(10), 993-1006.
- Scott, D., Peeters, P., & Gössling, S. (2010). Can tourism deliver its 'aspirational' greenhouse gas emission reduction targets? *Journal of Sustainable Tourism*, 18(3), 393 - 408.
- Searchinger, T., Heimlich, R., Houghton, R. A., Dong, F., Elobeid, A., Fabiosa, J., et al. (2008). Use of U.S. croplands for biofuels increases greenhouse gases through emissions from land-use change. *Science*, 319, 1238-1240.
- Sheller, M. (2004). Automotive emotions: Feeling the car. *Theory, Culture and Society* 21(4-5), 221-245.
- Sheller, M. and Urry, J. (2006). The new mobilities paradigm. *Environment and Planning A* 28(2): 207-226.
- Shove, E. (2010). Beyond the ABC: Climate change policy and theories of social change. *Environment and Planning A*, 42(6), 1273-1285.
- Sims, R., Mercado, P., Krewitt, W., Bhuyan, G., Flynn, D., Holttinen, H., et al. (2011). Integration of Renewable Energy into Present and Future Energy Systems. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, K. Seyboth, P. Matschoss, S. Kadner, T. Zwickel, P. Eickemeier, G. Hansen, S. Schlömer & C. von Stechow (Eds.), *IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation* (pp. 609-706). Cambridge, UK; New York, NY, USA: Cambridge University Press.
- Singh, J., & Gu, S. (2010). Commercialization potential of microalgae for biofuels production. *Renewable and Sustainable Energy Reviews*, 14(9), 2596-2610.
- Steg, L. and Vlek, C. (2009). Encouraging pro-environmental behaviour: an integrative review and research agenda. *Journal of Environmental Psychology* 29: 309–317.
- Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A. and Kalof, L. (1990). A Value-Belief-Norm Theory of Support for Social Movements: The Case of Environmentalism. *Human Ecology Review* 6(2), 81-97.
- Timilsina, G. R., & Shrestha, A. (2011). How much hope should we have for biofuels? *Energy*, 36(4), 2055-2069.
- Tyler, T. (2013). Tony Tyler's AGM 69 Closing Remarks, 04-06-2013. Retrieved 22-

- 06-2013, 2013.
- United Nations World Tourism Organization (2012). UNWTO Tourism highlights 2012 edition. Retrieved 10 May 2013 from:  
[http://dtxqtq4w60xqpw.cloudfront.net/sites/all/files/docpdf/unwtohighlights12enlr\\_1.pdf](http://dtxqtq4w60xqpw.cloudfront.net/sites/all/files/docpdf/unwtohighlights12enlr_1.pdf)
- UNWTO-UNEP-WMO. (2008). *Climate change and tourism: Responding to global challenges*. Madrid: UNWTO.
- Urry, J. (2011). *Climate change and society*. Cambridge: Polity.
- Urry, J. (2011). Social networks, mobile lives and social inequalities. *Journal of Transport Geography* 21, 24-30.
- Verplanken, B., Aarts, H., van Knippenberg, A., van Knippenberg, C., 1994. Attitude versus general habit: antecedents of travel mode choice. *Journal of Applied Social Psychology* 24, 285–300.
- Waltz, E. (2009). Biotech's green gold? *Nat Biotech*, 27(1), 15-18.
- Wheeller, B. (2012). Sustainable mass tourism: More smudge than nudge – the canard continues. In *Critical Debates in Tourism*, T.V. Singh (Ed). Bristol: Channel View Publications.
- Williams, A.M. (2013). Mobilities and sustainable tourism: Path-creating or path-dependent relationships? *Journal of Sustainable Tourism*, 21(4), 511-531.
- WTTC. (2010). *Climate Change. A Joint Approach to Addressing the Challenge*. London: World Travel & Tourism Council.