WHO'S AFRAID OF THE CONGESTION WOLF?

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Transplan

1. INTRODUCTION

Traffic congestion is a symptom of there being too much traffic for a given road capacity. It affects a relatively small proportion of the road network, at certain times. Most attempts to tackle congestion have focused solely on the affected area, with little regard for the impact of the solutions (such as network expansion or congestion charging) on other places and issues. Congestion itself has become the 'big bad wolf', which, according to some, dwarfs climate change in its seriousness.

Like congestion, wolves have had a bad press throughout human history, mostly undeserved. Many remaining populations are now carefully protected, as the wolf's importance in ecosystem management has now been recognized. Similarly, congestion has a role to play in managing travel demand. Not only that, but attempts to eradicate congestion can lead to more widespread and intractable problems than those it causes.

This paper considers the causes of congestion and its effects, looks at why it is a sign of both economic success and failure, and considers the wider impacts of policies, particularly congestion charging, designed to tackle congestion. What becomes clear is that the stereotypical character of the wolf, dominated by hunger, greed and aggression, is exactly the economic and psychological mindset that creates traffic congestion and blinds policy-makers to any other course of action than that which has led to the problem in the first place.

2. CONGESTION

Congestion is a symptom of there being too much traffic for a given piece of transport infrastructure. The limitations of the infrastructure are conventionally seen as the problem, with consideration of the traffic usually being limited to the marginal users on the edge. A broader view sees that the whole of the traffic is the issue, not just the marginal users that are deemed to impose disproportional costs on the rest.

2.1 Congestion: Economic Success or Economic Failure?

Congestion is conventionally seen as a cause of wasted time, time that otherwise would have been used in productive work, not travelling (Banks, *et al.*, 2007). That this is a simplistic view is shown by the realisation that travel time is remarkably constant over time and that time savings are used for longer journeys (see 2.2, below). Despite this, however, congestion is assumed to cost the economy notional sums of money equivalent to 'lost time', based on the difference between actual speeds and free-flow journey times. On this basis, for instance, congestion was believed to cost the East of England region £658 million in 2003, a figure expected to increase to £1,339 million by 2021 (Steer Davies Gleave, 2008), with no analysis of how the region would actually look if that money could somehow be 'saved'. It is

assumed that these figures represent a failure of the region and by extension the country to prioritise its economy.

In fact, congestion is a direct result of economic success. The more work there is to be done, the more trips (independent of distance or mode, *per se*) are made in order to do it. The more that people earn from that work, the more they can afford to choose where to live (often at a distance from the work) and whether or not to own a car, which in turn increases their options for trip dispersal. The greater the capacity of the transport network, the greater the travel distances that can be accommodated, until travel volumes catch up with capacity and congestion occurs. The simplistic notion is that the capacity is now a constraint, when travel has in fact expanded to fill that capacity. If a business makes a locational decision when a new road has just been opened and is fairly empty, and five years later finds that road congested and its transport costs rising, the failure surely lies with the lack of foresight on the part of the business, not the road's capacity.

2.2 Road Capacity Expansion and Contraction

The realisation that we cannot build our way out of congestion is not new (Plowden, 1972; Thomson, 1977), and even Buchanan (1963) was reticent, although many still do not accept it. Roads are essential to the movement of people - and it is people that are key, not vehicles - but it is not affordable, financially or environmentally, to keep building them *ad infinitum*. In fact, it tends to be self-defeating; new road capacity unlocks suppressed demand in congested areas or where there is the opportunity to develop land, so increasing traffic still further, and with it demand for more road space (SACTRA, 1994; Pfleiderer and Dieterich, 1995; Newman and Kenworthy, 1999).

However, our appraisal of transport projects is still based on time savings, with dubious economic benefits (Wenban-Smith, 2010; Headicar, 2009). Worse, these time savings inevitably lead to increased travel, eating up the road space newly provided and making society ever more dependent on unsustainable levels of transport. This is because the amount of time we spend travelling is remarkably constant over time (Metz, 2008) and because easier road haulage conditions allow cheaper goods transport, leading to further concentration and specialisation of production and distribution (Böge, 1995).

On the other hand, reducing road capacity, by road closures or reallocation of road space away from cars to public transport, cyclists and/or pedestrians, has been shown to reduce overall traffic:

"…for schemes whose initial effects on traffic are substantial, the responses that are likely to occur are generally of a form which would reduce the estimated amount of congestion and traffic-related environmental damage (or slow down its rate of increase), and hence the overall social benefits of the scheme are increased, compared with *the serious impacts there would be if all traffic simply reappeared on another route."* (Cairns, *et al.*, 1998, p. 61)

This should not really be surprising. It is the corollary to SACTRA's (1994) findings that new roads generate traffic, but it is also to be predicted from the late Martin Mogridge's work. Mogridge (1990) demonstrates how in congested environments

road space fills up with general traffic while the generalised cost of using it remains lower than that of alternative options. If the cost of using that road space is increased, whether by charging or by restricting it, whilst making the generalised cost of using an alternative lower, then there is a shift to the alternative until the two options are once again in equilibrium in terms of relative generalised cost of use.

Mogridge's (1990) groundbreaking work demonstrates clearly that public transport investment and subsidy allows for greater urban travel speeds, whereas investment in inevitably limited increases in road capacity merely reduces speeds, as it allows for a diversion *from* public transport until a new equilibrium is established.

However, there is a down side to investment in fast public transport. Whilst Mogridge recognises that advances in transport technology and speed, particularly on rail systems, facilitate the spread of urban areas, he does not consider the consequences of this.

- Extra travel (trips and distance), by whatever motorised mode, requires more energy and produces more pollution.
- Access journeys to rail networks are more likely to be by car the further out from the urban centre the access station is, because the density of development and the quality of public transport gets lower, and because those making the journeys are more likely to live in suburban and rural areas, with poorer public transport, beyond walking and cycling distance of their stations.
- This occurs because car ownership allows origin points (*i.e.* where people live) to be independent of public transport networks and outside congested areas. This point is surprising by its absence in Mogridge's discussion of the urban-expansion effects of transport technology, where cars are considered to have no effect on the rate of urban expansion. Mogridge (1990) does say that "Cars are essentially replacing walk and bus travel" (p. 272), which means that cars facilitate a spreading away from rail corridors and make those rail corridors more effective in urban expansion because they allow such dispersed access journeys.
- The combined effect, therefore, is of greater travel *per se* and of greater access travel (again, trips and distance) undertaken by car.

What does not feature at all in Mogridge's arguments is the similar impact that road pricing, or congestion charging, as he advocates, would have. The choice outside the centres of major cities is between more than two options, car and public transport. The third option, of changed destination (and even origin) in order to maintain the advantages of car use, is not recognised when the discussion, and traffic modelling, is focussed on city travel, with a constrained set of destinations.

However, it is clear that destinations are not constrained. Free-time journeys are very flexible in their destinations, even in the short term, and essential journey destinations can, and do, move over time. As car ownership has become widespread, so facilities – for shopping, leisure, healthcare and work – have tended to move to places of higher convenience of car access, and higher inconvenience of access by any other means.

2.3 Road Pricing and Congestion Charging

Road pricing, or road-user charging, is not new. A number of river crossings around the country have tolls, and there is a the M6 Toll motorway in the West Midlands, in keeping with the historical development of the UK's main roads as turnpikes: roads with tolls to fund their maintenance and improvement. Economists began talking about road pricing as a means of reducing *congestion* in the twentieth century, before environmental impacts of traffic were widely recognised. The economist's congestion argument is still dominant today, at any rate in the UK, but the potential has also been recognised for road pricing to manage traffic, even to reduce it, as well as to raise money for transport improvements.

2.3.1 The economic rationale for road pricing

Economists believe that everything can be measured in terms of money. They also believe that if things are not priced 'efficiently', they work poorly or lack investment. Sometimes they are right; continental cities that have tried free bus services, as a means of cutting car use, have seen bus capacity stretched, but with no revenue to pay for more, and no real drop in car use (Baum, 1973; Echeverría-Jadraque and Guerrero-García, 1994). It is already evident that free concessionary bus travel in this country is generating similar, if lesser, problems.

In other cases, society needs things to be available regardless of individual willingness to pay. Examples here include clean air, health, (at least basic) education, defence and the police. Roads are somewhere in between, being infrastructure on which everyone depends to some extent, but which it is not sustainable, financially or environmentally, to keep building *ad infinitum*, especially as new capacity unlocks suppressed demand in congested areas (see section 2.2, above).

Congestion is inefficient in economic terms, not just because people take longer to reach their destinations than they think they should, nor because engines perform less efficiently, but because a scarce resource (*i.e.* road space) is not distributed by the dynamic of supply and demand. There is a cost to driving in congested conditions, the cost of time spent in addition to what is perceived as necessary, but this is not deemed sufficient. As each extra vehicle has a disproportionate impact on other vehicles, the willingness of the driver of that vehicle to pay the time cost is not a satisfactory way of allocating road space. 'Efficient' pricing would solve the problems and provide a revenue stream for maintenance and continued investment (Winston, 1991). Road pricing, particularly congestion charging, is seen as the means to this efficiency of pricing. The financial efficiency argument is also why it is often considered vital that road pricing is fiscally or revenue neutral, *i.e.* other taxes and duties are removed or reduced, such that overall taxation remains the same as before.

2.3.2 Traffic reduction potential

Road pricing can be used to reduce traffic *beyond* the free-flow conditions considered by economists to be efficient. This is important, as journey times are faster in free-flowing traffic, allowing people to cover greater distances in the same time. The time people spend travelling, on average, is remarkably constant over time (Metz, 2008),

hence, as journey times fall, people tend to travel further. This is conventionally taken as a sign of economic growth, but there is no real benefit to the economy, as the economy rearranges itself to fit the enlarged travel propensity. Moreover, ever-increasing travel is socially, individually and environmentally unsustainable (RCEP, 1994).

Road pricing is therefore also seen as a means of reducing traffic and travel to more sustainable levels. In this context, revenue neutrality and congestion reduction are considered inadequate; road pricing only brings strong environmental benefits if it tackles pollution, particularly carbon dioxide emissions, by increasing the cost of motoring (TAR, 2006).

2.3.3 Revenue raising potential

Road pricing can also provide a revenue stream to fund transport investment (if fiscal neutrality is not required), as in the case of the Norwegian city tolls. The money potentially raised by road charging has been seen by a number of towns and cities in the UK as an extra source of funding for local improvements, immune from central Government control. London's Congestion Charge raised £137 million net in 2007/8, most of which paid for bus service improvements (TfL, 2008). It is worth emphasising that schemes which raise revenue are not revenue-neutral, by definition.

2.3.4 City centre tolls and congestion charging

The first urban road pricing scheme started in Singapore in 1975. Singapore's charged area is actually unusual: physical expansion and therefore choice of destinations is constrained. Vehicle ownership is also restricted by taxation and a quota system; restraint on car ownership is a major factor in Singapore's traffic management (Chin, 2002). In Norway, Bergen introduced a toll ring in 1986, followed by Trondheim, Oslo and Nord-Jaeren (Stavanger). The purpose of these schemes has been to raise money for new roads. In Trondheim, sufficient was raised and the scheme came to an end in 2005. Oslo on the other hand uses the money for public transport too.

London began its Congestion Charge in 2003 and expanded (perhaps temporarily) its area covered in 2007. The scheme seeks to reduce congestion, improve bus services, improve the reliability of car journey times, and make goods distribution more efficient. It also raises money to fund transport investment and has reduced traffic's environmental impacts. Congestion fell by 30% at first, but has since risen again, as the capacity of the general traffic network has been reduced, temporarily due to road works, and permanently due to the locking-in of benefits by means of bus lanes (TfL, 2008).

2.3.5 Impacts of charging zones

Where the road network allows, traffic that does not need to enter a charged area, or a higher priced zone therein, tends to divert around it. A simulated scheme for Leeds showed this clearly (Balwani, 2008). The effect can be expected to increase with time, as people choose destinations outside the charged area. The real problem in social, economic and environmental terms is traffic growth, and congestion charging singularly fails to tackle it:

"Traffic growth has already virtually ceased in urban centres because they have reached capacity. … The need for restraint by pricing is in those areas where traffic growth is fastest – in precisely those areas not *targeted by electronic road pricing."*
(Adams, 1992, p. 329)

Area-based charging works best where it covers places to which people will still come, so that the number of people (as opposed to vehicles) entering or moving around the area is unaffected (or even increases). Central London is a special case. Most towns and cities are far from unique and compete with shops, jobs and leisure activities outside the area likely to be charged. City-centre tolls and congestion charges can only increase the advantage of out-of-town destinations.

2.3.6 A national scheme: generalised road pricing based on congestion charging

With the previous UK Government, the reduction of congestion was the over-riding aim of road pricing, supported by the Eddington Transport Study in 2006 (Butcher, 2009; House of Commons Transport Committee, 2005), despite claims that it was an environmental policy. The UK is actually unusual in this:

"…it is clear that the primary focus of Road Pricing in the UK is addressing problems of congestion, while the majority of schemes worldwide explicitly seek to achieve a wider range of objectives." (Atkins, 2006, pp. 4-9)

The new coalition Government is not expected to continue work on a national road pricing scheme, and whilst in opposition, the Conservative Party stated perceptively (informed by the Campaign to Protect Rural England's submission to the House of Commons Transport Committee (2005, p. 10)) that any system of charging which varies by road and time of day is a means of managing congestion, not pollution. Indeed, congestion charging would actually result in higher emissions due to traffic diversion and would spread traffic intensity over a wider area:

"There are also very reasonable concerns that road user charging could shift activity patterns from high charge to low charge areas, turning what is currently an acute problem (of too much traffic in specific places at certain times) into a chronic problem afflicting a wider area, more of the time. This would increase travelling distances, so acting against policies for sustainable land-use planning."
(Quality of Life Policy Group, 2007, p. 346)

A national congestion-charging scheme would be expected to cause a general spreading of traffic out from congested places (Balwani, 2008; Adams, 1992), leading to more traffic in currently quieter places and fewer people driving into and within congested areas. Rural areas would see mixed effects, according to a study by the Commission for Rural Communities (CRC, no date). There are limitations to the CRC's work, particularly its assumption that traffic levels in urban hinterlands would fall, whereas the opposite is likely as urban traffic spreads.

The CRC indicates that the increased motoring costs from a *revenue-raising* charging scheme would improve the rural economy, helping local shops and services. On the other hand, a *revenue-neutral* scheme would reduce motoring costs, especially at a distance from congested cities, promoting increased traffic. This would have undesirable effects, especially the disappearance of remaining shops and services,

and increased access deprivation for non-car-owners. The situation would be more complex in tourist areas, such as National Parks. In a *revenue-neutral* scenario, the reduced motoring costs would also attract more visitors and in-comers, resulting in growth in the tourist economy. At the same time, however, local shops and services would be undermined and house prices would be forced up, alongside increased traffic and poorer non-car access. In a *revenue-raising* scenario, tourist areas would benefit from reduced traffic and lower house prices, but lose some tourism income.

2.3.7 Distance-based charging

Road pricing based on *distance driven* could be used to manage traffic levels across the entire network and so reduce pollution from all traffic, not just that in congestion. Such charges would need to be *revenue raising*, as there would otherwise be no overall effect on motoring's fiscal environment. On the other hand, unless and until electric cars become significantly more common, fuel duty will still be a better proxy for an emissions tax, particularly for carbon dioxide (Stern, 2007).

The Commission for Rural Communities (no date) study does not consider distance-based charging, but the distinction between revenue-neutral and revenue-raising charging is still pertinent. Distance-based charging could be expected to benefit the local economy and increase the availability of local shops and services, including public transport, without increasing house prices. This would be the case even with revenue-neutrality, as people in rural areas tend to travel greater distances. In a revenue-raising scenario, the effect would be greater. The impacts on car-based tourism would vary, according to distance from major population centres.

The Dutch Government (Verkeerenwaterstaat, 2010) has been planning a national system which would charge per kilometre driven, across the Netherlands, at a rate varying according to each vehicle's carbon dioxide emissions. This base tariff would be supplemented by a peak-hour surcharge, on motorways and urban and regional trunk roads. The scheme would be revenue neutral, replacing existing vehicle and fuel taxes. The expectation is that the base tariff would reduce the distance driven by 10-15% overall, by 17% for commuting and 29% for leisure travel, but result in a slight increase in travel for business due to reduced congestion. The peak-hour supplement would be expected to cut the perceived congestion time penalty by 40-60%.

The problem with a congestion-based supplement, in keeping with free-stranding charging zones, is that there would be a financial pressure for people to change their behaviour in ways other than those desired. In central London, people are likely to change travel modes, car-share or travel at different times. In most other places, people would be expected to avoid the charge if possible, by means of longer routes, around the charged area, and find different, cheaper destinations in the longer term.

2.4 Other Effects of Congestion

Having discussed the economic and traffic impacts of congestion and standard approaches to its mitigation, it is important to consider the other effects it has, positive as well as negative.

2.4.1 Positive impacts of congestion

Congestion is actually a *necessary* element of traffic restraint by road-space reallocation. If road space is taken away from general traffic and given to public transport, walking and/or cycling, then the more sustainable options have faster journey times, whereas the more congested car traffic has longer journey times. This tips the balance of generalised travel costs in favour of the non-car options.

However, the presence of congestion on the road space available to general traffic is essential to the maintenance of this new equilibrium. If that congestion were to be lessened by some means, the dynamic would shift again and usage of the alternative mode would decline until increasing car traffic pushes congestion up to its original level (Mogridge, 1990). Indeed, if there is a decongesting impact of some transport measure, whether traffic restraint (perhaps by road charging) or improved off-road public transport (*e.g.* rail), it is *essential* that road-space is removed from general traffic in order to lock in the benefits of the change:

"Where increased use of public transport brings about higher levels of non-user benefits measures should be taken to prevent the road space released from being used by new private car journeys. If such measures are not taken the initial level of non-user benefits could be reduced by at least 50 percent." (Tyson, 1991, p. 25)

2.4.2 Delays to essential traffic: sustainable modes, deliveries, emergency services

Congestion does not just affect cars. It delays public transport, pedestrians and cyclists (especially where drivers block crossings and park on footways and cycle-tracks), and prevents disabled drivers, essential deliveries and emergency service vehicles from getting to their destinations. A more nuanced approach to congestion has to deal with the needs of this traffic.

However, it should be remembered that the modern business preference for reduced on-site storage and just-in-time deliveries is a result of low-cost transport and is in itself a contributor to congestion. Similarly, emergency services have tended to relocate in peripheral areas in recent decades, the better to respond quickly across wider areas from fewer bases, but reducing their ability to respond in central, congested areas in the process.

2.4.3 Road danger

Frustration can lead to poor decision-making on the part of road users, collisions and road rage. This does however, have to be set against the greater increase in danger and severance likely to result from increased traffic speeds and volumes, which would come from 'solving' congestion.

2.4.4 Pollution

Whilst we continue to run our motor vehicles on combustion engines, we will have a problem of air pollution at the point of use (as opposed to pollution emanating from power stations, in the case of electric vehicles, for instance). This pollution is worse with heavy, slow moving traffic that stops and starts frequently, *i.e.* in congestion. As

discussed above, any method of relieving congestion that effectively increases a road's vehicle capacity is likely to increase traffic levels, resulting in increased emissions overall, although the precise mix and area of impact will be different. If we are not going to relieve congestion for this reason, we still need to deal with the localised impact of these emissions, particularly of nitrogen dioxide and particulates. Similar applies to noise, whether from engines, horns or car stereos.

3. THE WOLF

3.1 The Wolf and Human Attitudes

Most wolves are of the species *Canis lupus*, the Grey Wolf. Wolves once roamed most of the northern hemisphere (Boitani, 2003), but humans have reduced their numbers by means of habitat change, competition for food species and direct hunting. Pogroms against wolves became most intense when wild prey animals gave way to domesticated livestock and, in Britain, when the royal sport of hunting made deer especially precious and the wolf especially villainous. (Note in this context the medieval term 'wolfshead', applied to outlaws, who could be killed not only with impunity, but also as a duty.) The last wild wolf in England and Wales was probably killed in the sixteenth century (if not earlier), and in Scotland in the eighteenth (Pluskowski, 2006).

Humans have always had mixed attitudes to the wolf, from deep respect to irrational fear and loathing, with the latter perhaps genetically hard-wired into us from a time when our evolutionarily distant ancestors were more likely to be prey (Fritts, *et al.*, 2003). As we pushed the wolf's range into the 'wastes', so the wolf became associated with the wilderness, and the scariness with which that concept was (and still is) often associated, although even now the wolf is not confined to such areas (Fritts, *et al.*, 2003; Pluskowski, 2006). On the other hand, we took wolves into our homesteads at least 100,000 years ago and began the process of the creation of a new sub-species, *Canis lupus familiaris*, the domestic dog, which has continued to exchange genetic material (*i.e.* inter-breed or hybridise, depending on perspective) with wild wolves ever since (Vilà, 1997).

Mythology and folklore have presented multiple images of the wolf. Traditional societies, from North American First Nations to the Saami of Northern Europe, have had a balanced respect for the wolf in general, killing it to keep predation of herds to an acceptable level, but honouring the wolf spirit and seeking its aid in shamanic practice, as well as giving it a key role in creation myths (Fritts, *et al.*, 2003; Grambo and Cox, 2008; Lopez, 2004).

In the mythology of Northern Europe, the wolf has multiple layers of meaning, but usually with a dark aspect. The All-Father, Odin, is accompanied by a pair of wolves and a pair of ravens, the two quintessential undertakers of the slain, as he stalks the battlefields and waste places. Warriors take on the mantle of the wolf to become ferocious death-dealers in battle (which is still a living military phenomenon, although today less likely to involve wolf body parts and narcotics). Nobles consider themselves descended from wolves (like the Wuffing dynasty of the old kingdom of East Anglia (Newton, 1993)). The Sky God, Tyr, loses his hand to the *über*-wolf, Fenrir, as the gods desperately, but deceitfully bind him. And as the Sun and Moon

flee from wolves in their diurnal round, so Fenrir returns at *Ragnarök* to take his revenge and swallow Odin, and end the world as we know it (Ellis Davidson, 1964; Pluskowski, 2006). Similar concepts, of the wolf as a cosmic destroyer, appear to be present in the Celtic west as well (Green, 1992).

In the south of Europe, however, where human-wolf interactions are perhaps less charged, Apollo is associated with the wolf, as wolf-born *and* as wolf-slayer (Lopez, 2004). A wolf-mother suckling Romulus and Remus becomes a symbol of Roman imperial power and prestige, such that it is taken over by the Christian church. Elsewhere in medieval Christianity, however, the wolf becomes a symbol of the Devil, and the Devilish transformation represented by the werewolf is perceived as a real threat (Pluskowski, 2006).

Into the modern period, western society has viewed the wolf in an overly negative way, blaming it for exaggerated versions of its own worst traits (Lopez, 2004). In folklore, legend and children's literature, the wolf is associated with war, death, lust, darkness, moral corruption, rapaciousness, ravenous hunger, savagery and (despite the existence of packs) selfishness, as well as gullibility. The presence of the wolf as the evil character in children's stories, like Little Red Riding Hood, is of concern, as it still inculcates a fear and hatred of wolves at an early age. It is also telling:

"…for all wolves in literature are the creations of adult minds, that is, of adult fears, adult fantasies, adult allegories, and adult perversions" (Lopez, 2004, pp. 250-251).

Not everyone has regarded the wolf in this way, however. In Japan, wolves were worshipped and honoured for their control of animals that feed on crops until the end of the Shogun period in 1868, after which Western advice on agricultural development was adopted and attitudes to wolves reversed (Fritts, *et al.*, 2003).

Just as the hunting of remaining wolves was becoming technologically more effective (snowmobiles, helicopters, better firearms), the twentieth century saw a change in attitudes, in keeping with a new-found respect for nature, helped by a more urban population and influential writers, like Aldo Leopold (Fritts, *et al.*, 2003; Boitani, 2003). There is a complex and polarised set of attitudes in today's society, but wolf protection is now in force in many countries and reintroductions have returned wolves to many of their traditional ranges.

3.2 The Character of the Wolf

If the character of the wolf is stereotyped in most human discourse, dominated by hunger, greed and aggression, the reality is somewhat different.

3.2.1 **Hunger, greed and play** (Lopez, 2004)

Wolves tend to eat infrequently, going a number of days without food, then gorging themselves on a kill. They are indeed hungry most of the time, and adapted to acquiring and eating large amounts of food in one go. Wolves do sometimes kill in excess of what they need (as can humans), but this is probably an instinct for killing enough for other pack members (see 3.2.4, below). However, even when having not eaten for some time, wolves can leave potential prey alone. Similarly, attacks can be

more for practice, or even in play, than in earnest, in that they are not always followed through.

3.2.2 Livestock predation

Livestock farmers have, perhaps understandably, always over-rated the incidence of wolf predation, which can actually account for a very small proportion of livestock deaths (Fritts, *et al.*, 2003; Chadwick, 2010). In their European ranges, in particular, wolves are often blamed for attacks by dogs. Studies across Europe have shown that wolves actually prefer wild prey and that the reintroduction of a range of wild deer and boar (in particular) reduces livestock predation, aided by better livestock management (Fritts, *et al.*, 2003; Meriggi and Lovari, 1996). Many countries and states with wolf protection programmes have compensation or insurance arrangements in place to soften the blow to farmers when wolves are shown to have killed livestock (Fritts, *et al.*, 2003; Boitani, 2003; Boitani and Ciucci, 2009).

3.2.3 Competition: conflict avoidance *versus* aggressiveness

Wolf territoriality appears to have developed from the economic defensibility of resources in a competitive environment, maintained by a balance between aggressiveness, where boundaries are infringed, and avoidance of that conflict by means of howling and scent marking (Mech and Boitani, 2003a). However, within the pack, actual competition is markedly absent (Lopez, 2004).

3.2.4 Sharing

Wolves hunt most efficiently in pairs, not packs; most of the pack is not involved in the kill (Peterson and Ciucci, 2003). In other words, some members of the pack hunt and then share their kill with the rest of the pack. It is more efficient in evolutionary terms to share a surplus with kin and offspring than to let it go to competitor packs or scavengers. A pack is basically an extended family, usually based on a mated pair (Mech and Boitani, 2003a).

3.2.5 Population self-regulation

Contrary to the lustful image projected on to wolves, packs are based on one pair breeding, although in some packs the 'alpha' female mates with a pack member other than the 'alpha' male (Lopez, 2004). Normally, sexually mature wolves have to leave a pack in order to breed, or depose the 'alpha' of their gender. Non-related wolves approaching the pack may be admitted to it, or chased and even killed, depending on a variety of factors (Mech and Boitani, 2003a).

3.2.6 Intelligence

Wolves display intelligent behaviour, with clearly conscious hunting strategies designed to bring down prey efficiently in a varied and changing environment (Lopez, 2004; Packard, 2003).

3.3 The Value of the Wolf

3.3.1 Ecosystem stability

The reintroduction of wolves is, on balance, a stabilising influence on those ecosystems they traditionally inhabited. The eradication of wolves in many places allowed former prey species to expand unchallenged, with an overall loss of biodiversity due to their feeding habits, reversed following the reintroduction of wolves, although, as in all cases where we attempt to put right our ecological impact, this result is not guaranteed (Mech and Boitani, 2003b; Chadwick, 2010).

3.3.2 Economic

Wolf eradication, driven as it has been by partly irrational motives, is expensive, and not killing wolves, or at least moving to a policy of limited control, is significantly cheaper, although compensation payments to livestock farmers reduce this benefit. More positively, wolf-related tourism has emerged as a significant economic benefit in several regions (Fritts, *et al.*, 2003).

3.4 Wolf Characteristics, Human Characteristics and Congestion

The stereotypical character of the wolf, dominated by ravenous hunger, greed, selfishness and aggression (not forgetting a dash of gullibility), is exactly the economic and psychological mindset that creates traffic congestion and blinds policy-makers to any other course of action than that which has led to the problem in the first place.

- **Greed and selfishness** relate to our expectation that transport and travel should always be easy and cheap, regardless of our personal travel choices.
- **Ravenous hunger** relates to our pursuit of economic growth above all else.
- **Aggression** relates to the 'might is right' approach to traffic management, *i.e.* those in large, dangerous vehicles expect to have precedence over those not in them, a perception generally backed up by the police, the *Highway Code* and traffic planning (from speed limits to the removal of footways and pedestrian crossings in so-called shared surface schemes), which serves to reinforce the advantages of car travel.
- **Gullibility** relates to the lack of foresight in selfish modal choice and in business and other locational decisions that fail to see that congestion is caused by these very choices and is not an external imposition.

4. CONGESTION: CAN WE LEARN FROM THE WOLF?

The wolf as perceived by people is a creation of people's minds, different from the biological and ecological reality (Lopez, 2004). The same seems to be the case with congestion, as outlined in section 2, above. If we humans behave like our negative conception of wolves, creating both congestion and our general irrational hatred of it, can we learn anything from the more positive characteristics of the wolf, such as intelligence, loyalty and self-regulating organization, or indeed from wolf conservation?

4.1 Management of Human-wolf Relations

Livestock compensation is paid to farmers whose livestock is killed by wolves in a number of countries, regions and states (Boitani, 2003). It is not a perfect system, and there are arguments about its long-term effectiveness and affordability (Fritts, *et al.*, 2003). It has to be part of an integrated strategy for managing relations between humans and wolves, including stakeholder participation (Boitani and Ciucci, 2009; Stone, 2009). Overall:

"A combination of zoning for wolf population control, indemnity payments, lethal and nonlethal control methods, animal husbandry modifications, and research offers the best hope of balancing wolf conservation with livestock production." (Fritts, *et al.*, 2003, p. 312)

The management of public attitudes to wolves is key to their conservation. Wolves can adapt to there being areas where they are not tolerated at all, areas where they are controlled selectively, and areas where they have free reign, but it remains to be seen whether humans can be as adaptive (Boitani, 2003; Chadwick, 2010).

4.2 Applying Positive Wolf Traits and Lessons from Wolf Conservation to Economic and Transport Policy

This integrated approach seems ideal for congestion management as well. Some elements can be elucidated further.

4.2.1 Intelligence

If we plan our transport systems intelligently, focussing on the kind of society we want to achieve rather than providing a playground for 'market forces', we are more likely to achieve true prosperity, a steady-state economy with fair distribution of wealth, rather than the impossible dream of limitless growth (Jackson, 2009).

4.2.2 Sharing and loyalty

If we share road space equitably, so that residents, businesses and *people* (not vehicles) travelling have fair use, rather than accepting the aggressive hegemony of motor vehicles, then congestion need not dominate.

4.2.3 Restraint and self-regulation

TEST (1989) showed how traffic restraint improves city centre economies. And the late J. Michael Thomson (1977) emphasised the role of urban population increase and rising car ownership in urban traffic problems. If there were only a few of us, spread over large areas, we would not have significant pollution or congestion problems from transport. We are not in that position, so we need to regulate our travel choices to fit the densely populated land in which we live.

4.2.4 Territoriality for conflict avoidance

If we set clear boundaries, conflict between dangerous vehicles and vulnerable people is reduced. This includes everything from effective kerbs and pedestrian

crossings at the small scale, to car-free areas, night-time lorry bans and low emission zones at the large scale.

4.2.5 Zoning of management

Some areas clearly need to be free of congestion. Examples would include access routes to hospitals and bus lanes. At the other end of the scale, some areas can be allowed to congest without causing real problems. Examples here include general traffic lanes on roads where public transport, cycle and pedestrian traffic is effectively segregated and prioritised. In this context, it would make sense to employ mitigation measures to deal with any remaining local impacts of congestion, although being in a constrained space means that fewer vehicles are involved. In between these two extremes lie most roads, where limited control of congestion is inevitable, as essential traffic (sustainable modes, emergency services, *etc.*) is not separated from general flows. However, the priority here should be the movement of this essential traffic, and congestion should not be a reason for rejecting the prioritisation of more sustainable modes.

4.2.6 System management

Congestion is a tool that can be used to manage overall demand for motor vehicle travel. It is essential to the maintenance of benefits derived from measures such as segregated public transport (see 2.4.1, above), as new traffic undermines the change if not controlled. Congestion is itself a form of traffic restraint, holding back the increases in carbon dioxide emissions and the expansion of land lost to development that would result from free-flow travel.

5 CONCLUSION

The positive characteristics of the wolf, such as intelligence, loyalty and self-regulating organization, are present in more sustainable transport strategies. If the big issues, such as climate change, access deprivation, poor health and economic exclusion are tackled (prioritising access, public transport, walking and cycling), the congestion wolf can be allowed its wild time, within designated refuges, as it will not do us any real harm.

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