



Climate change, travel and complex futures¹

John Urry

Abstract

In this paper I examine various sociologies of the future. I argue that one future, of global climate change, is now exceptionally significant. This future is based upon certain sociological presumptions and thus sociology is central to its emerging contours and to its analysis. I examine one aspect of such a future, the role of travel and especially automobility within this emerging dystopia. I use some formulations from complexity theory to examine what might constitute an alternative to global heating and the scenario of 'tribal trading'. It is suggested that one feasible alternative is a 'digital panopticon' and I examine some small changes that might tip the system to such a post-automobility system. But there is no free lunch here. It is argued that the world may be torn between two bleak scenarios as a consequence of the twentieth century's exceptional degree of resource use, between a Hobbesian war of all against all and an Orwellian digital panopticon. The twentieth century would seem to be reaping its bitter revenge.

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'the automobile . . . only fulfils its destiny: it is destined to wipe out the world' (Ilya Ehrenburg, Russian journalist in 1929; quoted Monbiot 2006: 142)

A society is a 'partnership not only between those who are living, but between those who are living, those who are dead, and those who are [yet] to be born' (Edmund Burke [1790] quoted Beinhocker 2006: 454)

Predicting 'futures'

Many sociologists and other social scientists have speculated about the future, developing various scenarios of future societies and future lives. These

scenarios are generally based upon extrapolations of the present, seeing some particular feature in the present as the key to how people's lives will unfold within the next few decades. Examples include Weber's dark account of the emerging 'iron cage' of bureaucracy, Durkheim's anxieties as to the future significance of anomie or normlessness within social life, and Simmel's extrapolations as to how life within the metropolis will increasingly entail systems of punctuality *and* the spread of a blasé attitude.

And Marx too saw in steam power and the railway key harbingers of the future that would provide the conditions for the proletariat to become a 'class-in-itself' (Marx and Engels 1952 [1848]). Marx and Engels describe how: 'the bourgeoisie has through its exploitation of the world market gives a cosmopolitan character to production and consumption in every country' (1952: 46–7). This worldwide capitalist expansion will: 'smash down Chinese walls' and spread capitalist exploitation and hence the emergent proletarian class worldwide. Capitalist exploitation results in emergent effects of a revolutionary proletariat increasingly organized across the globe bringing about a 'catastrophic' branching of capitalism into a new emergent order of world communism. Marx further believed that it was the task of philosophy, or social science as we would now say, to help to change this exploitative bourgeois world and not just to analyse it: 'The philosophers have only interpreted the world, in various ways; the point is to change it' (Marx and Engels 1962 [1845]: 405). Marx sought to establish both the theory and the practice that would bring about the overturning of the capitalist system. But we now know that this analysis was 'mistaken' in predicting worldwide social revolution starting in the most advanced capitalist political economies. It started first not in the most advanced economies but in Tsarist Russia; it did not involve a large organized proletariat; and it resulted not in communism or even socialism in one country but in a future worse than anything previously envisaged. This 'failure' to get the future right led much subsequent social science to eschew predictions of the future, to see visions of the future as ideologically serving the interests of specific social groups, and to critique utopias of alternative futures as dangerous and mistaken (Popper 1960; Kumar 1991).

In the rest of this paper I use some insights from the complexity sciences to try to think the future in different ways. I seek to 'think' the future through the notion that the future is populated with various 'complex adaptive systems'. There are various characteristics of the analysis of such complex systems that I now elaborate. First, such complex systems are seen as necessarily processual and flow within time – time is not just a dimension along which systems move but all entities are constituted through their becoming, through process, through an arrow of time or the genie that is let out of the bottle and can never be put back (Whitehead 1929). Moreover, there is no tendency for systems to move towards equilibrium and hence the equilibrium models dominant in most economic system analyses are inappropriate (Beinhocker 2006: ch. 3; note

Keynes' realization of this when referring to the 'chronic condition of sub-normal activity': Keynes 1936: 249). Thus we should not distinguish between equilibrium states and growth states – all systems are dynamic and demonstrate the power of the second law of thermodynamics, that physical and social systems move towards entropy (Beinhocker 2006: 66–7; see Malpas and Wickham's critique of the notion that social systems move towards 'social equilibrium': Malpas and Wickham 1995). Such powerful systems in the contemporary world are simultaneously economic, physical, technological, political and social. They thus possess emergent properties that are irreducible to any of these individual 'factors' (see Urry 2003). Moreover, there is increased interconnectedness or linking of system components through software, cybernetic architecture and a more general networked character of life – and such an increased scale of networked relationships produces more 'system' effects (Barabási 2002).

Such systems are unpredictable as almost all systems pertinent in the social domain are open rather than closed, with energy and matter flowing in and out (Prigogine 1997). Positive feedback mechanisms take systems away from equilibrium as shown in, for example, Keynes' analysis of the positive feedback consequences of a fall in consumer confidence (Keynes 1936). Thus systems are characterized by a lack of proportionality or 'non-linearity' between apparent 'causes' and 'effects' so that there *can* be small changes that bring about big system shifts (Nicolis 1995). But at the same time systems once established can get 'locked in' and hence survive for very long periods even though there appear strong forces that 'should' undermine such long term irreversibilities (Arthur 1994). The ordering of events are not 'forgotten' and hence 'time matters' in the development of events and systems (Abbott 2001). Overall systems adapt and co-evolve in relationship to each other and hence possible futures are irreducible to single 'structures', 'events' or 'processes' (Wynne 2005) and where futures are messy and complicated (Law 2004). Each such system has to find its place, to climb the peaks, within a fitness landscape which predates its development and mode of adaptation (Kauffman 2003).

More generally, thinking the future through this systems lens raises various significant issues: what are the various systems and their interdependencies that bring about such futures, how effective social science can be in interpreting such futures, how to analyse the very long term and path dependent, how to avoid thinking in terms of equilibria, and whether and to what degree social science ought to be normative about alternative futures?² Resolving these issues in the contemporary moment is essential, environmentally, economically, governmentally, socially and intellectually. The social sciences have no 'choice' but to engage with various futures, to develop 'sociologies of the future'. This is partly because there are now various methods for developing visions of futures, especially through scenario building and backcasting. But the main reason is because one particular vision of the future is now overwhelmingly significant in terms of its implications for economic, social and

political futures of life upon earth. This is the thesis of global climate change and the multiple ways 'social' systems and processes have generated, and will apparently continue to generate, such temperature increases into the foreseeable future (Stern 2006). According to Monbiot this is the biggest of global issues, namely to stop temperatures rising more than a couple of degrees above their pre-industrial levels (Monbiot 2006: 15).

And the 'social' is intrinsic to this analysis of a future of rising carbon emissions and temperature increases. This produces two utterly crucial major tasks for the social scientist. First, it is necessary to examine what sociologies of the future are being imagined in various scientific models and whether they are remotely plausible. The second task is to ask what possible alternative sociologies of the future can be imagined in which the consequence for rising global temperatures could be substantially reduced. These tasks I examine here but initially I make some further observations about sociology and 'futures'.

Futures

First, central to the analysis of many future scenarios are various new technologies and of their presumed transforming impacts.³ But it is important to resist a technology-first analysis since technologies do not just develop for endogenous reasons and nor do they then simply transform the economic and social landscape in their own image once they have developed.

Technologies are always to be seen as embedded within forms of economic, social and political life (Hughes 1983). In other words, a new large scale system requires a reconfigured sociology in which those technologies will be placed and developed. Such a sociology can establish certain limits and possibilities of how a new technology, or rather a new architecture of technologies, could enter and remake the economic and social world.

This analysis is not just a question of the business model – although it is partly that – but of the sociological model, the forms and possibilities of social life that enable the insertion of novel technologies that at that moment and in that society are stably embedded but which nevertheless have future unpredictable consequences. Beinhocker in his advocacy of complexity economics provides a similar analysis when he advocates examining not just new physical technologies but the social technologies that are crucial to economic and social growth and development (Beinhocker 2006: chap 12). Latour's analysis of the 'failure' of Aramis, a driverless on-demand light rail system, shows that innovations must connect to existing networks in order that the particular new configuration can be established and then remain stable or locked-in for a substantial new period of time (Latour 1996). There is a 'fitness landscape' and any new physical-and-social technology has to find its place within the environment that is structured by the pre-existing patterning of that landscape.

At the beginning of the twenty first century, there is a landscape of mobility systems with automobility as the dominant evolutionary peak (Urry 2007). Automobility changes the environment or fitness landscape for all other existing and future systems; and it achieves this through its superior capacities to adapt and evolve by comparison with all other mobility-systems, especially those that are much more organized through hierarchical relations. Automobility adapts as it spreads along the paths and roads of each society, it draws in many aspects of its environment which are then reconstituted as components of its system, it is central to and locked in with the leading economic sectors and social patterns of twentieth century capitalism, it promotes the notion of convenience rather than speed, it seems to provide the solution to the problems of congestion that it itself generates, it externalizes dangers onto those outside the system as it provides enhanced security for those 'within', and it is central to the individualist, consumerist affective culture of contemporary capitalism (Sheller and Urry 2000). There are close to 600 million cars currently roaming the world's highways and they can be conceptualized as a modern day Leviathan: 'automobility stretches its six fingers – production, possession, pipelines, projection, pressure and power – to tighten its global grasp upon humankind' (Latimer and Munro 2006: 35; Urry 2004).

Overall, therefore futures are heavily circumscribed by an array of cognitive and non-cognitive human capacities, the embedded practices and traditions within each society, the power and conserving effect of national and international states, interlocking global processes operating at multiple scales, the relative fixity of the built environment, various economic, technological and social path dependencies, and large-scale enduring economic-technological, social, environmental and political inequalities around the globe (and see Adam and Groves 2007, for many ways in which futures are told, tamed, traded, transformed, traversed, thought, tended and transcended). Thus different systems can be locked in and limit the possibilities of future change. As Rifkin argues specifically with regard to energy: 'Like Rome, the industrial nations have now created a vast and complex technological and institutional infrastructure to sequester and harness energy' (Rifkin 2002: 62). And within the industrial nations the USA developed during the twentieth century as *the* disproportionately high energy consuming society, especially through its specific combination of automobility and electricity. While it possesses around 5 per cent of the world's population it consumes a quarter of the world's energy and accounts for close to a quarter of global carbon emissions (Nye 1999: 6).

Moreover, because of how systems co-evolve and mutually adapt it is almost impossible for social groups to anticipate what in certain circumstances would be the means of effecting appropriate system change. So although many social groups are seeking to realize various projects of change it is enormously hard to do so in ways that produce anything like the intended outcomes, especially

if the change is or has to be global. Knowing what will engender desired global change is almost impossible although countless social groups are seeking to do that all of the time, including some exceptionally powerful social groups (see Castells 1997, on projects for social change). There are many unintended consequences stretching across time and space of economic, social and political innovation; and these consequences themselves engender further adaptive and evolving system consequences.

Nevertheless, in the history of societies there are moments of heightened openness, when the die is less cast and various futures are structurally placed upon the table. Not that such change is uncaused but it is less reducible to pre-existing systems. There is less lock-in; Laszlo refers to there being certain momentous 'chaos points' when systems may tip from one path to another (Laszlo 2006). In the rich 'north' the period around 1990 seems to have been a recent moment when a wide variety of political, informational and communicational systems more or less simultaneously adapted and co-evolved (Castells, 2001; Urry 2007: ch. 8). But not all changes. Abbott argues that while change is the normal order of things and indeed many assessments of contemporary social life emphasize the increasingly accelerating nature of profound changes, certain systems are stabilized for very long periods of time (Abbott 2001). They are path dependent. Causation flows from contingent events to general processes, from small causes to large system effects, from historically or geographically remote locations to the general (Arthur 1994; Mahoney 2000). Path dependence is a process model in which systems develop irreversibly through a 'lock-in' but with only certain small causes being necessary to prompt or tip the initiation of the original 'path'. Such small causes are mostly unpredictable, difficult to foresee although in hindsight they appear explicable in terms of how they tipped the system into new path dependent patterns. Lock-ins mean that institutions matter a great deal as to how systems develop over the long time (North 1990: 104).

Moreover, when change happens it may not be gradual but can occur dramatically, at a moment, in a kind of rush (Gladwell 2000). If a system passes a particular threshold, switches or tipping points occur through positive feedback and 'punctuated equilibria'. The system turns over, as with a liquid that turns into a gas with small changes in controlling temperatures (Nicolis 1995), or with the internet growing dramatically in the late 1990s as countless people and organizations adapted and co-evolved with it (Castells 2001), or where minor increases in global temperature may provoke out-of-control global heating (Lovelock 2006).

One system I examine below that has been remarkably stable and unchanging is that of automobility. And this is so even though a massive economic, social and technological maelstrom of change surrounds it. Such locked-in institutional processes are extremely difficult to reverse as billions of agents around the world co-evolved and adapted to it and built their lives around

automobility's strange mixture of coercion and flexibility. One would predict that whatever else happens, the current car is here for the foreseeable future; there is what Adams terms a hypermobile 'business as usual' (Adams 1999; Urry 2004).

But I have just noted that a key feature of complexity thinking is that, although there are long term irreversibilities, nothing is fixed forever not even the universe (Davies 2001). Abbott maintains that there is: 'the possibility for a pattern of actions to occur to put the key in the lock and make a major turning point occur' even if the timing and processes involved are impossible to predict accurately (Abbott 2001: 257). But so far most thinking about the 'future' of automobility is linear. The question is whether one particular aspect of the 'car' can be changed, and what will be the consequences of such a linear change, of improved fuel efficiency, or reduced weight to power ratio, or increased car sharing.⁴

I turn now to one set of predictions which detail presumed future changes in economic and social processes, in global temperatures and in the probable nature and extent of life itself upon earth. This is the future that Lovelock calls 'global heating'.

Global climate change

Over the past few years there has been a significant reduction in the uncertainties involved in the multiple sciences of climate change.⁵ Though the scale and impact of future temperature changes are still much debated and, especially in the USA and certain developing societies, denied. World temperatures have risen by at least 0.74°C over the past century and this is almost certainly the product of very many forms of human practice that raised the levels of greenhouse gases in the atmosphere (Stern 2006: ii; Monbiot 2006; Timmons Roberts and Parks 2007). Moreover, it is predicted that greenhouse gas levels and world temperatures will increase significantly over the next few decades; and these rises will in turn further increase temperatures through multiple forms of positive feedback. Especially significant is the potential melting of Greenland's ice cap which would dramatically change sea and land temperatures worldwide with the possible turning off of the Gulf Stream (Lovelock 2006: 33). These multiple future processes are locked in and according to Lovelock: 'there is no large negative feedback that would countervail temperature rise' (Lovelock 2006: 35). As Monbiot succinctly expresses this in his book *Heat*: 'climate change begets climate change' (Monbiot 2006: 10).

The overall economic, social and political consequences of such unique changes are global and, if they are not significantly mitigated, will very substantially reduce the standard of living, the capabilities of life around the world and probably the overall population worldwide as the impacts are especially

experienced in poorer countries in much of Africa and significant parts of Asia (Stern 2006: vi–vii; see Timmons Roberts and Parks 2007, on the ‘climate of injustice’). With business as usual, the stock of greenhouse gases could treble by the end of this century and there is a significant risk of more than a 5°C increase in temperatures and the resulting transformation of the world’s physical and human geography through a 5–20 per cent reduction in world consumption levels and probably in the size of global population (Stern 2006: iii, x).

There is thus a growing consensus that reducing global carbon consumption is environmentally and economically essential (Stern 2006). And within this overall pattern, bearing down on carbon use within transport is crucial since it accounts for one-third of total carbon dioxide emissions (Geffen, Dooley and Kim 2003). It is also the fastest growing source of greenhouse emissions, with the predicted growth of car and lorry travel within China and elsewhere throughout the world, the rapid growth of air travel, and the increased ‘miles’ flown and travelled by sea by manufactured goods, foodstuffs and friends (see Larsen, Urry and Axhausen 2006, on ‘friendship miles’). In 1800 people in the USA travelled on average 50 metres a day – they now travel 50 kilometres a day (Buchanan 2002: 121). Today world citizens move 23 billion kilometres; by 2050 it is predicted that that figure could have increased fourfold to 106 billion (Schafer and Victor 2000: 171).

There are moreover potential alternatives to carbon-based systems in powering ‘cars’ and so reducing carbon use with regard to personal mobility is increasingly high up economic and policy agendas (Motavalli 2000). And such a move away from a carbon-based transport system is increasingly expressed as a short term imperative that will generate long term savings if it can be achieved in time. There is a ‘high price to delay’ (Stern 2006: xv).

Relatedly, it is realized that oil supplies around the world are about to start running down. Peak oil production occurred in the USA as far back as 1971 and it seems that oil production worldwide may have already peaked especially because of the failure to discover new fields at the same rate as they were discovered in the past (Heinberg 2005; Rifkin 2002: ch. 2; but see Jackson 2006). Energy will be increasingly expensive and there will be frequent shortages especially with the world’s population continuing to increase. Rifkin claims that the oil age is ‘winding down as fast as it revved up’ (Rifkin 2002: 174).

So if these processes continued unchecked what sociology of the future can we envisage? I turn here to some scenario building for the year 2055 undertaken by the UK Government’s Foresight Programme (2006).⁶ ‘Tribal trading’ is the name given to the scenario which would be realized if the effects of global warming were within the *middle* levels of impact as in the Stern Report. With tribal trading, what I would now call ‘regional warlordism’, oil (and gas) wars and the escalating impact of global warming lead to the substantial

breakdown of many of the mobility, energy and communication connections that currently straddle the world. September 2005 New Orleans best captures what this scenario would be like for a major city in the rich but highly unequal 'north' (as argued in Hannam, Sheller and Urry 2006). There would be a plummeting standard of living, a relocalization of mobility patterns, an increasing emphasis upon local warlords controlling recycled forms of mobility and weaponry, and relatively weak imperial or national forms of governance. Infrastructural systems would collapse and there would be increasing separation between different regions, or 'tribes'. Systems of repair would dissolve with increasingly localized recycling of bikes, cars, trucks and phone systems. Only the super-rich would travel and they would do so in the air within armed helicopters or light aircraft, with very occasional tourist-type space trips to escape the hell on earth (to get the ultimate 'tourist gaze' of the 'blue earth', something already close to feasible⁷). This scenario involves a Hobbesian war of each warlord dominated region against their neighbours, especially for control of water, oil and gas. And with extensive flooding, extreme weather events and the break-up of long distance oil and gas pipelines, these resources would be exceptionally contested and defended by armed gangs. Those who could live in gated and armed encampments would do so, with in general the privatizing of many collective functions. There would be no monopoly of physical coercion in the hands of national states. Somewhat similarly Gallopin et al. devised a scenario they characterize as that of 'Barbarization' (Gallopin et al. 1997).

There are many foretastes of this scenario today but especially regional warlordism is already found in parts of contemporary Afghanistan, Iraq and Somalia. And there have been various oil wars, while the heated-up planet will also usher in water wars. It is calculated that a temperature increase of 2.1 degrees would expose up to 3 billion people to water shortages (Monbiot 2006: 6). There will be other 'wild zones' developing where the 'west' will *exit* as fast as possible, if and when the oil or water no longer seem to flow. Societies will be left to ethnic, tribal or religious warlordism, to the multitudes that from time to time re-enter the safe zones as migrants or slaves or terrorists (Lash and Urry 1994; Bauman 2000; Hardt and Negri 2006).

So if this is the scenario if medium level impacts of climate change and oil shortages come to pass, what system development would substantially offset those systems that are already in place and which, in adaptive, co-evolving relations with each other, are bringing into being apparently irreversible climate change processes? In the Stern Review the kinds of 'behavioural changes' that are necessary to mitigate climate change are weakly described partly because of its adoption of an individualistic model of 'society' (Stern 2006). But if we think such processes through the notion of systems then it is clear that only some exceptionally powerful systems could offset those tendencies that are currently moving the whole earth towards unstoppable global

climate change. The positive feedback loops implicated in climate change will need to be confronted with an enormously large and powerful set of alternative social-physical systems. Exceptionally rapid and major shifts will have to take place in order to slow down and then to reverse increasing global temperatures. There is only limited time according to Stern before imperial and national systems collapse and what I have called 'regional warlordism' becomes widespread. There is a 'chaos point' when for a period at least systems may move in various directions but this period is limited in duration (Laszlo 2006).

This limited duration stems from how various interlocking systems have, over the hugely fateful twentieth century, irreversibly taken the world into this uncharted and possibly irreversible territory. As Stern writes: 'Climate change . . . is the greatest and widest-ranging market failure' (2006: i). The global market has engendered enormous 'external diseconomies', as economists put it, or untold global risks, as sociologists say. Either way the adaptive and evolving relationships between enormously powerful systems are, as Giddens once expressed it via a mobility analogy, a 'juggernaut' careering at full pace to the edge of the cliff (1990). And slowing down that juggernaut even slightly would require equally if not more powerful systems than those currently powering it towards the abyss. Thus my claim is that the only way of 'correcting' such a massive market failure and hence taming the dominant car system is by producing a step change in how mobility machines are organized as a system or better as a set of systems.

Saving the planet

What society of the future would slow down this global heating juggernaut? What could such an alternative mobility system be like, bearing in mind that we are not considering here single 'technologies' but a transformed architecture of 'technologies and practices' (Beinhocker 2006: 175).⁸

One scenario of such a restructured architecture of technologies and practices is described by the Foresight Programme as that of 'good intentions' (Foresight 2006).⁹ Such a society of the future would involve rejecting the 'modernist' separation of different transport systems and would seek to replace this with an 'organic' model (2006: 132). Peters clarifies:

Whereas the modern style attempted to solve the problem of intersecting speeds by preventing them from meeting in the first place, the organic design style seeks to *integrate* traffic participants. In this approach, the traffic landscape had to be designed in such a way that differences in speed were minimized (Peters 2006: 132).

Such an organic model represents a return to the form of traffic landscape found before the car system took over and monopolized most roads, and which

led other road users to seek protection within separate zones. An organic model reorganizes the relationalities between these different mobility systems.

This organic system, commencing in some societies in the rich 'north', would consist of multiple, dense forms of movement mainly of small, ultra-light, smart, probably battery or hydrogen-based, deprivatised 'vehicles'. Flexibilized travelling would involve accessing small, light mobile pods as and when they were required. Electronic regulators embedded in lampposts and in vehicles would regulate access, organize price and control the vehicle speed. Some such vehicles would be driverless. The movement of vehicles would be electronically and physically integrated following the organic model with other forms of mobility. Specifically then 'good intentions' involves a mixed flow of slow-moving semi-public micro-cars, bikes, hybrid vehicles, pedestrians and mass transport and these are integrated into networks of physical *and* virtual access. There would be electronic coordination between motorized and non-motorized transport and between those 'on the move' in many different ways (Hawken, Lovins and Lovins 2002: 47). Smart 'cards' would control access to and pay for people's use of the various forms of mobility. And software systems will 'intelligently' work out the best means of doing tasks, meeting up or getting to some place or event. Simultaneously neighbourhoods will foster 'access by proximity' through denser living patterns and integrated land use. People will live in denser, much more integrated urban areas that will maximize co-presence. Such redesign would 'force' people to bump into each other since their networks will overlap. This scenario would involve carbon allowances as the new currency that is allocated, monitored and individually measured so constraining much physical mobility. Much of the time physical travel would be replaced by modes of virtual access which will effectively simulate many of the affordances of physical co-presence.

This 'good intentions' scenario would constitute a dramatic break with current patterns of travel and communications. Such a break would be made possible by inserting and combining digitized information *within* systems of movement. And as such, it may bring about something that has not happened for the past hundred years, namely a major change in the form of ground transportation. Such an innovation did not occur during the *longue durée* of the 'century of the car' (Gilroy 2000). But we may be at a tipping point when personal vehicles will be combined with a smart and powerful infrastructure, to develop more of a nexus than a series system (Sharpe and Hodgson 2006). This will represent an epochal shift as cars are reconstituted as a networked system rather than as separate 'iron cages', as a potentially integrated *nexus* rather than as a parallel *series* (see Foresight 2006).

Other current small changes that might turn into preconditions for developing this 'good intentions' scenario are shifts in transport policy away from predict and provide models, new fuel systems for cars, vans and buses, new

materials for constructing 'car' bodies, various moves to deprivatize cars through car-sharing, cooperative car clubs and smart car-hire schemes, and the development of 'smart-card' technology that will transfer information from car to home, to bus, to train, to workplace, to web site, to shop-till, to bank (see US Department of Transportation 1999; Vigar 2002). More generally, Rifkin argues that: 'The really great economic revolutions in history occur when new communications technologies fuse with new energy regimes to create a wholly new economic paradigm . . . Today, hydrogen and the new fuel-cell distributed-generation technology are beginning to fuse with the computer and telecommunications revolution to create a wholly new economic era' (Rifkin 2002: 201; Dennis and Urry 2007, detail these developments).

If 'good intentions' is then a major alternative to 'global warlordism', just how plausible is it and how likely is to develop? This new system needs to be realized fast and on a worldwide basis so that it rapidly impacts upon carbon emissions and temperatures rises around the world. Although the individual components of this post-car system are in place in various sites worldwide, they are nowhere in place together and nowhere are they sufficiently locked in as a system to challenge, even within a local context, the still hegemonic car system (except maybe Singapore). There are four major issues that such a scenario raises.

First, this scenario would not involve returning to the pattern of nineteenth century 'public mobility', of the *dominance* of publicly owned, managed and timetabled buses, trains, coaches and ships. That public mobility model has been irreversibly lost because of the self-expanding character of the car system that produced and necessitated individualized mobility based upon instantaneous time, spatial fragmentation and coerced flexibility.

Second, the development of a 'good intentions' scenario is unpredictable and may occur through certain small changes that, if they happen in optimal order, would provoke a new path dependent locked-in pattern. The tipping point towards a nexus system should not be read off from linear changes in existing firms, industries, practices and economies. Just as the internet and the mobile phone came from 'nowhere', so the tipping point here will emerge unpredictably, probably from a set of technologies or firms or governments not currently a centre of the mobility industry and culture. And this is because, according to Beinhocker more generally, it is mainly not companies that innovate but markets that bring about innovation (2006: 333, 374). The economy is driven more by the entry and exit of firms, by emergent effects, than by individual companies themselves able to adapt and evolve. It is most likely that the post-car system will first emerge in a small society or city-state where there is very dense informational traffic and with innovating market relations and culture.

Third, the establishment of such a new mobility system will also depend upon future configurations of the global order and especially on the balance of

power between the three 'empires' of the USA, EU and China. The apparently declining powers of the US hegemon relative to the EU may indicate that developing a nexus system across the EU could be part of the process of realizing what Rifkin calls the 'European Dream' (2004; see Walby 2008, for a related analysis of US and EU 'hegemons'). The apparent weakness of post-Iraq USA may provide a chaos point that enables a post-Kyoto consensus to move towards a nexus vehicle system. Rifkin describes the slow death of the American Dream and argues that it is gradually being replaced by the European Dream, that is: 'more expansive and systemic in nature and, therefore, more bound to the welfare of the planet' (Rifkin 2004: 14; see ch. 3 on how the EU is a bigger economy than the USA). However, Timmons Roberts and Parks describe the enormous difficulties especially related to 'trust' in getting the poor south to sign up to any post Kyoto agreement with the rich north so this requires political leadership on a global scale that has so far been entirely lacking (Timmons Roberts and Parks 2007).

Finally, although I have so far used the Foresight scenario term 'good intentions' a better way of characterizing this nexus system is that of the 'digital panopticon'. This has some parallels with the scenario termed 'Fortress World' as envisaged by Gallopin et al. (1997). The scenario of 'good intentions' necessitates the following technologies of tracking and tracing as I partly elaborated above: satellite tracking; CCTV; data mining software; biometric security; general database-ization; the standardization of space; the location of sensors within street furniture and moving vehicles; automated software systems for allocating road space; a smart code space to determine the route, price, access and speed of vehicles; processors enabling vehicles to self-navigate; and the tracking and tracing of each person's carbon allowances and carbon expenditures (Graham 2005; see Monbiot 2006; ch. 3, on the desirability of 'rationing').

Such a system would constrain the complex consequences of unrestrained automobility, moving away from the modernist to an organic system. This would tip the individual car system, a series of cars, into a nexus system that orders, regulates, tracks and relatively soon would 'drive' each vehicle and monitor each driver/passenger in ways that would be systematically challenged for its 'illiberalism' (Rajan 2006). And this tipping depends upon a rich environment of information and messages that are themselves mobile and increasingly sentient. People would need to be locked into sentient, smart and responsive swarming behaviour and this would hugely change the very nature of the 'car-driver' affective experience (Sheller 2004; Thrift 2004; Ahas and Mark 2005; Graham 2005; Sharpe and Hodgson 2006; Information Commissioner 2006; and generally *Surveillance and Society*).

However, developing such a digital panopticon is beset with risks and complexities. First, such a panopticon would be very costly to implement and this may make it globally impractical to implement on any extensive scale even

if some prototype cities were able to develop such an organic, nexus model. It is a 'first world' solution. Further, such a development represents a major transformation of the nature of the 'individual self', including the threat to the 'freedom' to walk, drive or move unnoticed through various environments. However, such a freedom is already transformed through the consequences of the global war on terror as well as the global war on international crime networks. And developing such a model will be significantly contested for both its cost and for its negative effects upon human rights, but this is in a period in which there is already worldwide a hugely heightened 'securitization' of individual selves. 'Smart solutions' can be contested and will often be contested in 'democratic' societies. This contestation at a time of much other conflict around securing populations may slow down the development of the 'good intentions' scenario, unless the threats from global warming become so palpable that there seems to be in effect no alternative. By which time of course the climate change changes will already be upon us and it may well be too late anyway (see Monbiot 2006: xv, on some of the dilemmas of more 'regulation' without 'state planning').

Conclusion

So my argument is that two possible sociologies of the future are regional warlordism and the digital panopticon. 'Regional warlordism' involves a barbarism of unregulated climate change, increased flooding and extreme weather events, the elimination of many existing 'civilizing' practices of economic and social life, and the dramatic collapse of long range mobility and related developments of the past decades, with the flooding of New Orleans iconic of the future. Life even in the 'north' will be nasty, brutish and almost certainly 'shorter', while life in parts of the 'south' is already being transformed by global climate change. Bangladesh in the low lying Ganges is the country worst affected by global climate change and yet has only produced small amounts of carbon emissions. These emerging global relationships have been termed 'climatic genocide' with millions being forced to migrate away from global climate change risks that are overwhelmingly engendered from within the rich 'north' but are so far mainly experienced in the poor 'south' (Timmons Roberts and Parks 2007).

But then it might be possible to avoid this if many transformations occur that bring about a tipping point to a digital panopticon. The future of *human* life seems to depend upon moving across a tipping point towards a system based upon the extensive *and* intensive 'digitization' of each self. Such a system of tracking and tracing involves step changes in the character of life. In order that much of the population can continue to move around, a new Faustian bargain to be struck fast. This involves a digital Orwell-ization of self and

society, with more or less no movement without digital tracing and tracking, with no-one beyond the panopticon (with London's congestion charging¹⁰ or Singapore's Electronic Road Pricing as indicative first steps). This may tame the car system (and other energy systems) if many developments take place simultaneously, including the tracking and tracing of each person's carbon allowance which should come to function as the public measure of worth and status. So life goes on and indeed extensive co-presence through travel would be still achievable for many, but only because each individual self is tracked and traced enabling the individualized car-system to tip into a nexus, organic vehicle system (Urry 2007: ch. 11, describes the enduring significance of co-presence in relationship to travel).

Nothing in this analysis suggests that all is set in stone and systems are forever. But so far futures seem poised between two possible alternatives. And the reason for all of this is the legacy of the twentieth century. A series of path dependent mutually adapting systems were set in motion then that are having their bleak impact today, most strikingly within the high energy society of the USA (on the car more generally, see Böhm et al. 2006). Since 'regional war-lordism' involves almost unimaginable reductions in the nature of economic, social and political life, it is imperative to consider its opposite. But moving to the digital panopticon model of a nexus vehicle system is beset with enormous difficulties, especially cost, the problems of implementing on a worldwide scale, and likely opposition on grounds of curbing the 'freedom to drive' and the threats to the 'freedom of the individual' resulting from its panoptic character. Moreover, the next couple of decades – according to Stern the key period for combating climate change – are likely to be globally shaped by further system developments that are going to make the environment for moving to a nexus vehicle model even more troublesome. In particular the 'war of terror' is already producing heightened suspicion and lack of trust in states and in their 'unnecessary' and draconian securitization of populations. Within the context provided by these system developments it is going to increasingly difficult to move vehicle systems to a nexus model. So the global war on terror may be 'won' but only by losing the global war on climate change (at least as regards the issue of personal transport).

As many now suggest (even on Capitol Hill) the latter war seems much the bigger war (better than winning the battle and losing the war!) albeit in the Middle East they are highly interconnected through the pursuit of cheap oil and its engendering of radical Islam. The need for a war on climate change has come about through the awesome irreversibilities of the twentieth century. This century of unprecedented energy production and consumption paid no attention to Burke's proposed partnership between 'those who are living, those who are dead, and those who are [yet] to be born'. Many of those who are yet to be born may well be still born unless some unpalatable and freedom restricting innovations take root.

This will require exceptional political leadership worldwide to ensure that political rights are significantly protected *if* the scenario of the digital panopticon is developed. So far there is no sign whatsoever that states recognize the sheer economic, social and political complexities of implementing a sociology of the future that would dramatically slow down the rate of carbon emissions without huge reductions in certain kinds of personal freedom. However, of course there is little personal freedom in being stuck in traffic congestion or being killed or maimed in a car accident (deaths from car accidents are 1.2m worldwide per year). It is certainly necessary to separate the flexibility of personal transportation from any notions of personal freedom (see Rajan 2006) although the implications of a digital panopticon are more extensive than this and will engender more opposition.

We know from Milton Friedman there is no such thing as a free lunch. However, the twentieth century operated in a way as though the whole century was a free lunch to be enjoyed at the expense of following centuries. And now when we are in the next century we find that there are no good outcomes, only degrees of bad, and maybe for many within even the relatively short term future there will be no lunch at all, free or otherwise.

(Date accepted: December 2007)

Notes

1. I am very grateful for the comments of Kingsley Dennis. This paper draws on material we are developing for a book entitled *After the Car*.

2. And see Adam and Groves 2007, for extensive discussion of many 'future matters' in part influenced by complexity notions I cannot deal with here.

3. See the web site on Transportation Futuristics at http://www.lib.berkeley.edu/news_events/futuristics/index.html (accessed 26 December 2006).

4. This dominant linear approach is found in the UK's Royal Academy of Engineering's Report on *Transport 2050* (2005). There is no examination in that Report of automobility as a complex system, interconnected with a multitude of economic and social practices, or with how a set of small changes could in very particular circumstances provoke system change.

5. See <http://www.ipcc.ch/>

6. I was involved in some of these discussions facilitated by Waverley Consultants and the Henley Centre. See Foresight 2006, for details of the four scenarios. For an earlier scenario exercise see Gallopin et al. 1997.

7. See the review of current space tourism developments, http://www.economist.com/displaystory.cfm?story_id=3500237 (accessed 19 December 2006).

8. I focus here only at the level of the individual 'society' and upon future land-based mobilities (ignoring other energy-relevant architectures).

9. I adapt somewhat the Foresight scenario here.

10. The Metropolitan Police in London have recently been allowed access to the congestion charging photo evidence so that they can track the movement of cars suspected of terrorist offences; see http://news.bbc.co.uk/1/hi/uk_politics/6902543.stm (accessed 20 July 2007).

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