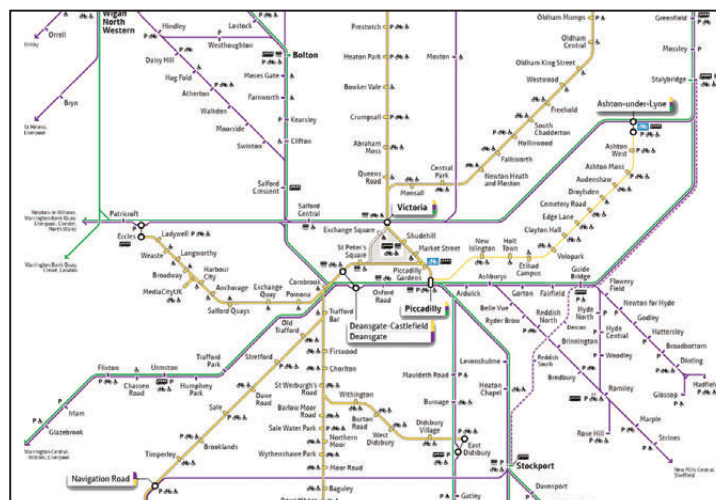




# Connectivity and Cities

## Why transport is the key to our collective intelligence

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Alan Baxter



# Connectivity and cities: Why transport is the key to our collective intelligence

## Preface

Britain has been profoundly shaped by its cities, and policy makers increasingly recognise that they form the foundation of our economic health. What is less often appreciated are the ways in which our settlements resemble living organisms: they evolve over time as their purposes change, they are nourished by the quality of their connectivity, and they grow and shrink depending on the networks that they foster. How can we as a nation ensure that our great cities are supported with infrastructure that enables them to realise their potential?

In this insightful and wide-ranging paper, Alan Baxter CBE offers a personal perspective on these issues, drawing from decades of experience and thinking about how to improve our cityscapes. He explores the evolution of the city, its relationship to movement, and how our settlements have been shaped by the various transport revolutions human society has experienced. By unearthing the fundamental nature of the city and its networks, he is able to reassess the changing map of Britain and our cities, demonstrating that we are at a critical juncture in our movement needs. The infrastructure we require, he suggests, must take account of these changing patterns, allowing travel across various modes, and creating a network that allows our collective intelligence as a nation to be fully harnessed. The ITC will be taking forward these themes through our 2015 Annual Lecture and work streams, but as a starting point for a deeper understanding of these issues I commend this paper to policy makers and practitioners alike.

Dr Matthew Niblett, Director  
Independent Transport Commission

June 2015

## Table of Contents

Introduction .....	1
Cities.....	4
Revolutions in Transport.....	7
Britain's Future .....	11
London .....	12
The Emerging Map of Britain .....	13
Author Profile.....	20
Endnotes.....	20
Acknowledgements .....	20

*Cover image: Manchester rail and tram network*



# Introduction

This paper is about the enormous importance of movement in our lives. It is a paper written to generate debate as a personal opinion of the author. Alan Baxter's background is as an Engineer, Designer and Urbanist with deep interests in transport and in cities, both in their history and in their future possibilities.

Transport is a term that has become in many minds associated only with its functional purpose like drains and power cables. But humans move for many reasons to explore and to exchange ideas. Our desire for movement is one of the main foundations of our human existence and civilisation. We need to consider transport in a much more holistic way to help understand why we are as we are and how we can steer what may happen next in a wiser way.

There are also strong undercurrents now throughout the world in how societies operate. What is happening everywhere is a radical and rapid shift of population into mega urban areas. In Britain we became urban dwellers many generations ago but further fundamental changes are now occurring. This paper suggests how Britain, with the right political will, can harness the good fortune of its geography and inherited infrastructure for movement to support its future in the next generations.

This country has been particularly badly served by the understanding of transport, because it has been seen as a utilitarian issue of very low interest in the bigger issues of governance as a whole. The understanding of movement and its impact on our lives is immensely complex. It does not respond easily to the linear logic of much current transport planning despite the considerable technical skills of Engineers. It needs a different mindset too. At last we now have some continuity and enthusiasm in Government about Transport.

This paper is primarily about Britain and especially its role from the Industrial Revolution until today and how it may emerge in the next generations in a fast changing and competitive world. But to understand the last 250 years we have to understand our much longer history as humans. (A further research project by the ITC explores the deeper human issues of why humans move.<sup>1</sup>)

From the earliest times of prehistoric man (fig 1) the development of civilisation has come from humans moving from place to place, interacting and spreading out ideas and colonising new territories over many thousands of generations. Cities are actually a very recent part of our long, long history as human animals. The first cities were founded only two or three hundred generations ago (fig 2). They reflected specific issues like political control, defence, cultural and social interaction, and of course the exchange of goods and ideas. Transport has always been a fundamental part of those cities whether by river or sea and by land on foot or beast of burden. The movement of goods and the movement of humans became the key to how cities developed.



Figure 1



Cities are like trees – some prosper over long periods and seed secondary ones; others lose their political strength and economic purpose and fail (fig 3 & 4). In Britain much of our urban form has developed slowly over many generations and established a strong pattern of connections so that even when a city's original purpose has been lost other activities can often take its place. Physical infrastructure has long lasting effects.



**Figure 2:** Mohenjodaro, Indus Valley, founded in 2,600 BC



**Figure 3:** Angkor, Cambodia – city of 1 million people in 1300, but abandoned in the 1430s



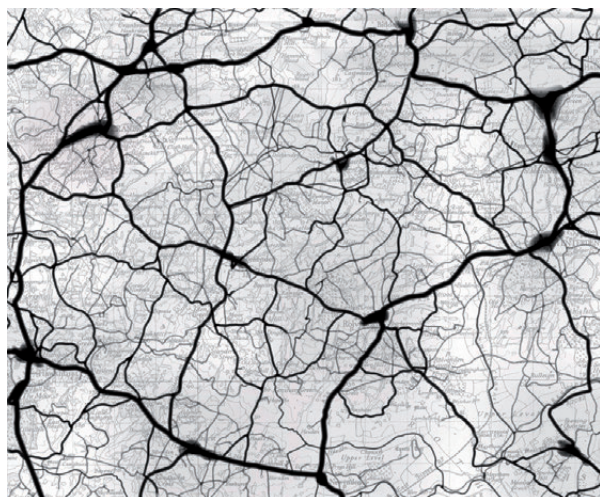
**Figure 4:** Liverpool in the 1970s. The population halved when the port collapsed in 1971, as it failed to adapt to a new transport revolution





In lowland Britain a simple illustration of networks and human activity shows hamlets and villages interconnected with a myriad of bridleways and tracks and with main arteries and towns at node points (fig 5).

This map of a typical rural area is very similar to a neuron map of a human brain (fig 6) where there are main links and thousands of secondary links. The potential intelligence of a human brain from the interaction between cells is absolutely colossal but we use only a tiny fraction of our potential. The more intelligent people use more connections in their neuron network. Humans have always been collective animals and operate throughout history in distinct “tribal” groupings often of about 150 (Dunbar’s number). The interaction between different tribal groupings has powered the great bursts of creativity of different civilisations and inventions. The meetings of humans create trillions of interfaces, like the neuron map of the brain. The rural hamlets and villages in figure 5 were connected easily with a growing pattern of byways and tracks. They allowed people to interact beyond their immediate neighbours and know more. Some of the villages grew into towns where a close knit plethora of interactions became a greater powerhouse fuelled by its collective intelligence.



**Figure 5:** Connections between villages, west Kent



**Figure 6:** The human brain - connections between neurons



## Cities

The purpose of cities throughout the world is now changing fast. Many are now going through the pain of industrialisation which we have already experienced. British cities have emerged from that with a new purpose which is primarily as a place for human interactions. Our cities have become more and more great nerve centres creating economic, cultural and social values.

Through ten centuries the British city has responded with remarkable fluidity to the different demands made on it for political control and exchange of goods and ideas. The industrial revolution fitted into the mediaeval and Georgian city, often uncomfortably (fig 7), and the population explosion somehow got absorbed. The unplanned sprawls of the 20th century created by the revolution in transport from the growth in private car ownership generated nowhere places and disconnects (fig 8). The 20th century theorists' attempts to use this revolution creatively did not often lead to the successes they hoped for, but at least we now realise the inherent difficulties of too much mobility by car which consumes significant physical areas of cities and destroys good human scale public spaces. Our amazing inventiveness in general in creating new ideas like the motor car is often not matched by our inventiveness in how to use them creatively for positive benefits so that the secondary impacts do not nullify the primary value. For instance, the great freedom that a car provides (in theory when there's no congestion) is counterbalanced by the isolation of its user from others. When walking in the street or travelling by public transport in good cities there is often pleasure and value in seeing and meeting people and in the happy accident of bumping into a distant acquaintance that leads to an exchange of news. When driving a car a happy accident is not likely to happen!



Figure 7: Manchester, 1855







**Figure 8: Staples Corner, London**

And it is this interchange from many different sources that fuels our collective intelligence, like neurons in the brain firing off against each of the other billions of neurons creating our individual human intelligence. Of course much of the interchange is of no long-term account and like dreams are sifted out but the retained nuggets form our individual intelligence in all its complexities and illogicalities.

The collective intelligence of a society, whether it is in a small tribal group of 150 or a great city of millions, is formed in a similar way. Each of us acts like a neuron connecting in planned and unplanned ways to other humans, not just with words but with all the many less obvious ways of human communications and experiences from great cultural events to football matches, political meetings, shopping expeditions to walks in the park. The list is long and human society wonderfully complex.

To engineers and transport authorities the act of moving is seen primarily as a function for specific reasons that can be easily defined. It is much more than that. It creates an essential part of our intelligence both individually and as a society: I move, therefore I think. The new revolution in electronic “movement” is thought by some to counter the need for physical human movement but the opposite has occurred as humans interact in many subtle ways. Our desire to move physically and meet each other has not been diminished. The human eye is dynamic and far different from an electronic screen. We communicate with all our senses. But humans, unlike computers, need to have times where we switch off and don’t move (fig 9).





**Figure 9**

Accumulated wisdom provides expressions like “pause for thought”, “stop and think”, “sleep on it”. We are beginning to be aware of the negative impacts of continuous electronic movements of data into our minds. We need time to daydream as well as sleep.

Physical infrastructure for movement can be created quickly for journeys on foot and bicycle but planning for cars, trains and airports is longwinded and needs much greater confidence in the future. Knowing the real long-term purpose of what we plan to build is hard to gauge by conventional economic and engineering logic. It is even more difficult in a world where the rate of change is accelerating. But a wider view coming from understanding the rationale and experiences and history offers a good perspective in the purpose now of the physical transport infrastructure which we already have and its successes and failures. That understanding gives us a wise base to debate how we should plan for the next generations.





## Revolutions in Transport

Mankind's inventions long ago of the dugout canoe and the wheel with the later domestication of beasts of burden led to a slow evolution of transport over thousands of generations. But within just 150 years from 1835 at least six major inventions in transport have totally changed all our lives.

The industrial revolution which has now affected the whole world has its origins in the inventiveness of a relatively small number of people. The Lunar Society (fig 10) came together from 1765 in an area of Britain with all the necessary sources of power, water and coal, and iron ore at their feet. That inventiveness was in an educated society with the beginnings of a scientific base from the genius of Newton and Hooke. The ten or so key players<sup>2</sup> were able to travel easily by relatively short land and river journeys. The revolution the canals and particularly the railways created led to the astonishing connection of every town in Britain and a colossal increase in human interaction, helped too by the Penny Post. The railway train, almost unknown in 1835, was everywhere by 1845 (fig 11) and today's railways have a close family likeness. It led to a massive increase in collective knowledge and ideas and other Western countries followed suit.



**Figure 10:** James Watt was a member of the Lunar Society in Birmingham



**Figure 11:** The Great Western Railway, 1845



The movement pattern of Britain was revolutionised and allowed many more people to see things and interact with each other. The staggering statistics from the Great Exhibition of 1851 are impressive, not just for the 3 million cups of tea and coffee drunk and 2 million buns eaten but that a third of the population of England came to see the Crystal Palace in Hyde Park. For many it was their first journey to London and their first train ride. This revolution in transport began to emancipate the bulk of the population and it has continued ever since. The bicycle's invention and wide spread use in the late 19th century meant that rural societies were no longer isolated tribes (fig 12). Young men and even women ranged further afield. Industrial workers were no longer constrained by living in the shadow of their factory within walking distance and humans interacted more widely spreading ideas and knowledge (as well as the gene pool). Connectivity increased. Knowledge increased. Ideas spread.

The motor car developed from a new-fangled idea in the 1890s (fig 13) but a car designed in 1910 is the clear relative of today's cars (fig 14). Maritime technology has changed at a slower rate since iron hulls and steam power were introduced, but the great change in international travel for all was the introduction about 1960 of jet airliners (fig 15) and the management of airlines which created cheap flights. They created a rapid increase in international travel. The passenger traffic by ocean liners transferred almost completely from slow ships (fig 16) to fast aircraft between 1960 and 1970 and the total number of journeys made escalated. The planes of today have, like cars and trains, a recognisable inheritance. The fifth rapid revolution in transport was less obvious to many of us. Containerisation of freight from c.1970 opened up the whole world to different centres of manufacturing and low priced goods (fig 17).

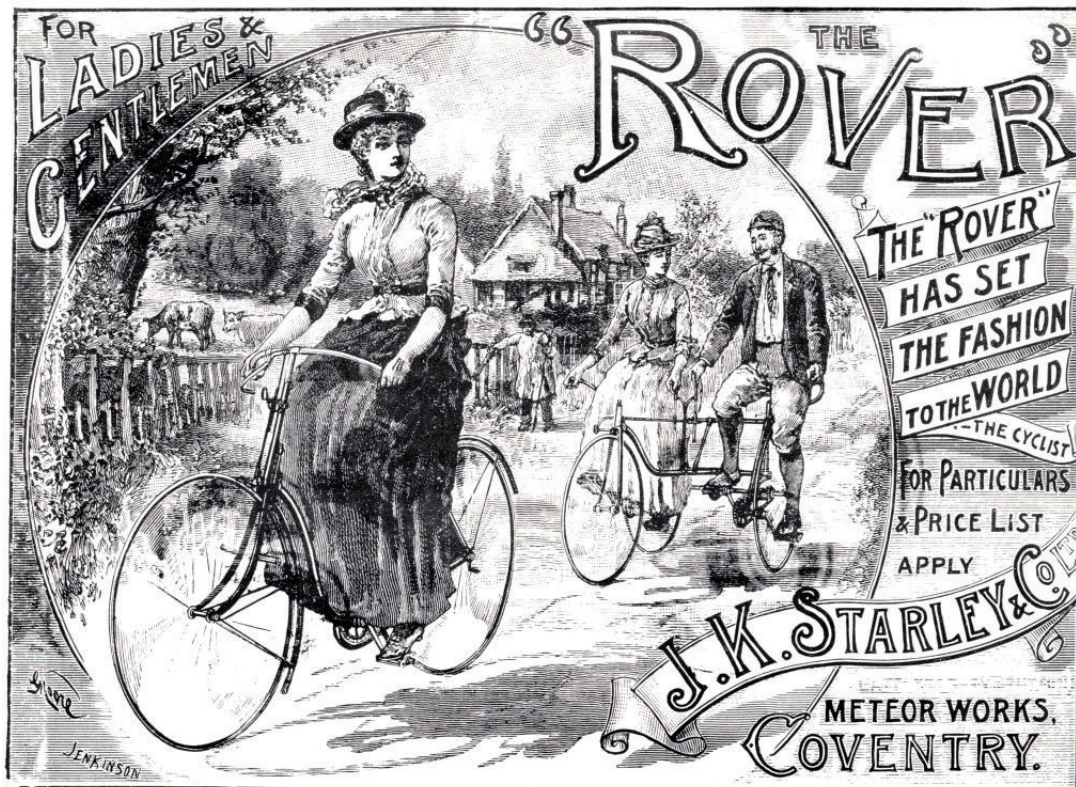


Figure 12: 1895 advert for the aptly named machine that increased the range







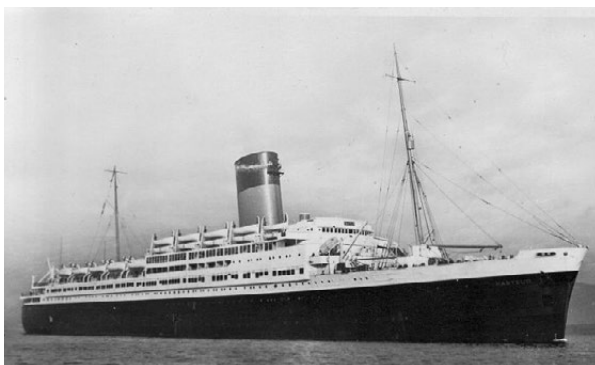
**Figure 13:** Vauxhall's Light Car, 1903, 5hp, top speed 25mph



**Figure 14:** Rolls Royce, 40/50hp, designed in 1910 (1920 model), top speed 75mph



**Figure 15:** Boeing 707, introduced in 1958



**Figure 16:** 1960 transatlantic passenger liner



**Figure 17**





We are now well into the sixth revolution – the electronic – which is not the movement of people or goods but of data. It has created yet another major expansion of human interaction. Will it settle down into a steadier development pace like trains, cars and planes have done or will it keep on surprising us?

What changes at a much slower pace is of course us as the humans who invent these new technologies and for whom they are intended to serve. We take a long time to learn how to manage them in the best way for us. 100 years after their invention, cars are only in the last few decades being treated as a threat to the quality of our lives and not just the giver of great and magical freedom of movement. There is an awareness just emerging now of the similar balances we need to make in our current love affair with electronic communication. How can we use it best to enhance our lives and not damage us? And how actually do we humans function? What do we want our technology to do for us? How do we relate to each other using all our senses? We are remarkably ignorant about how we ourselves function and have forgotten the importance of our ancestral nature.

But what has come from these six recent revolutions in transport which affect how we interact with each other is a colossal explosion in the number of interfaces. The tribal number, always deeply rooted in human nature, of societies of 150 people whether in mediaeval villages or in our local communities is not now the only regular base. For the vast majority of us who have a zest for knowledge and are inquisitive, we now have as well as our small group of real friends and our 'tribe' of colleagues, the additional range of many more people and their ideas and knowledge. The arithmetic of interaction is far from linear. Ten people may have many thousands of possible ways of interacting. A thousand people, trillions.

A thousand people is a number most of us can just cope with of recognisable faces, even if the names are forgotten. The collective intelligence of that big grouping increases just like a human brain of an intelligent person has more interactions between neurons.

Research on the economic activity of cities shows that it increases per person by 15-20% as a city doubles in population<sup>3</sup>. More importantly the less tangible and hard to measure cultural and creative value of a city increases even faster with numbers of humans interacting if it has the right quality of place for interaction. As with growing food crops with the right fertility and climate so it is with growing ideas in cities of good quality for human interaction.



## Britain's Future

We are fortunate to live on an island which is large enough to hold a substantial number of people and with an easy topography and wonderful landscape, a benign climate, a rich cultural heritage and political tolerance and stability. We live reasonably close to each other. Even before the revolution in transport by railways the ease with which we could interact was high compared to other countries using coastal shipping or rivers as well as land journeys. Our maritime position created an easy facility to connect and trade with the whole world. Few other nations were so well sited and equipped with generous harbours.

Future technical revolutions which create a big impact are very difficult to predict. In science and technology what is already under way is the very beginning of awareness of how the human mind works. That, with a continuing development of medical science and artificial intelligence, may lead to sudden shifts in how societies are shaped.

Transport is now likely to continue in its steady evolution – driverless cars are a further step forward from horseless carriages but are not a radical revolution. Electronic communication will continue at a fast pace to expand our access to knowledge and ideas so our individual and collective intelligence accelerates way beyond our human ability to grasp the benefits as well as the risks. Perhaps our future is not a joyful and ever expanding progression but will be punctuated by regressions from unforeseen failings in technology or wars or damaging climate change. The robustness and resilience of how we organise society is more important than ever and resilient transport is fundamental to this. Increasing technical sophistication can be problematic, not only with its resilience but in its ability to respond easily to change. However, assuming Britain is not knocked backwards, the human demands and desires for more physical interaction will continue to grow. The desire for transport by all means will grow.

The history and especially the geography and connectivity of Britain on a world scale has created a different balance of city scales than in other countries (Fig 18). London is without doubt a world city which is under global influence to grow in its status and population. Throughout the world big cities are growing bigger and are often becoming very different places from their smaller siblings. Many of these smaller cities then struggle to maintain their status, especially when their economic and cultural purpose has moved on as industries fade. British regional cities have also experienced this but have the good fortune to be not only places of great urban quality from their history but are also close geographically to their neighbours so their economic and cultural development can now be strongly related. The range and character of our smaller towns is wide, from remote hamlet to market town, regional capital to seaside town. Our individual choice can be met and yet each of our settlements are in physical reach, as well as electronic, of many other places of different character. The pattern and location of our lives can now be very different if we choose compared to the strong geographical ties of previous generations whose means of transport were much fewer.



Figure 18



## London

London has rapidly shifted its purpose from the capital of an Empire and a manufacturing and trading city to a role as one of the most sought after World Cities where its cultural and creative values are pre-eminent alongside its economic and political base. Its population grows fast not just within its current boundaries but in its colossal regional population from Peterborough to Portsmouth and Swindon to Southend served by a great legacy of a network of railways and roads. London's governance shifted wisely in 1889 from individual boroughs to an overall strategic body with the London County Council (LCC). That too enlarged its boundaries in 1965 to form the Greater London Council (GLC) and in 2000 it was resuscitated as the GLA with a strong Mayor. That ability to plan strategically benefited transport in particular.

Because London has the good fortune to be able to control much of its local transport infrastructure it has, under the imaginative guidance of Transport for London in the last decade, recognised the importance of all means of transport from the highly sophisticated and expensive Crossrail 1 and 2, to the seemingly ordinary issue of making it easier and pleasurable to walk and cycle. We need to recognise that the "ordinary" such as an "ordinary means of transport" like walking, cycling and buses is an essential and very large part of the healthy metabolism of city life. The balance between big showy projects, medium scale and the ordinary is the key. There is a parallel with the growing recognition of ecology in our lives of the essential and important part that "ordinary" bugs and beetles play in the natural world. They matter as much as the great oak trees.

In its understanding of how London as a whole works Transport for London has recognised that the missing patterns in its inheritance were the myriads of lateral and local centre movements as work and social patterns continue to shift from the radial tidal flows to the central areas to a very much more complex and multi-layered and messy pattern connecting the many different node points or neurons. Other cities too are multipolar and are growing in complexity in their patterns of movement.

This complex pattern in which different remote parts of the population now interact creates economic activity and cultural exchange with more options for each person and each business. In arithmetic terms the possible combinations leap by trillions. In human terms of course it is a very much slower increase in interaction but the impact is measurable in the economic figures and, although difficult to measure, is colossal in cultural and social terms.

Within the greater London metropolis there are areas which are brilliantly connected with many other places and which attract activity. This can in the extreme, like a chemical reaction, cause overheating with a loss of quality. Other areas are poorly connected. In these areas it is often associated with deprivation and lack of vitality of its businesses and cultural institutions. There are no standard formulae to address this and each place needs individual understanding of its qualities and weaknesses. The wide ranges in the ease or difficulty of connectivity repeat throughout Britain with profound impacts on human lives.





## The Emerging Map of Britain

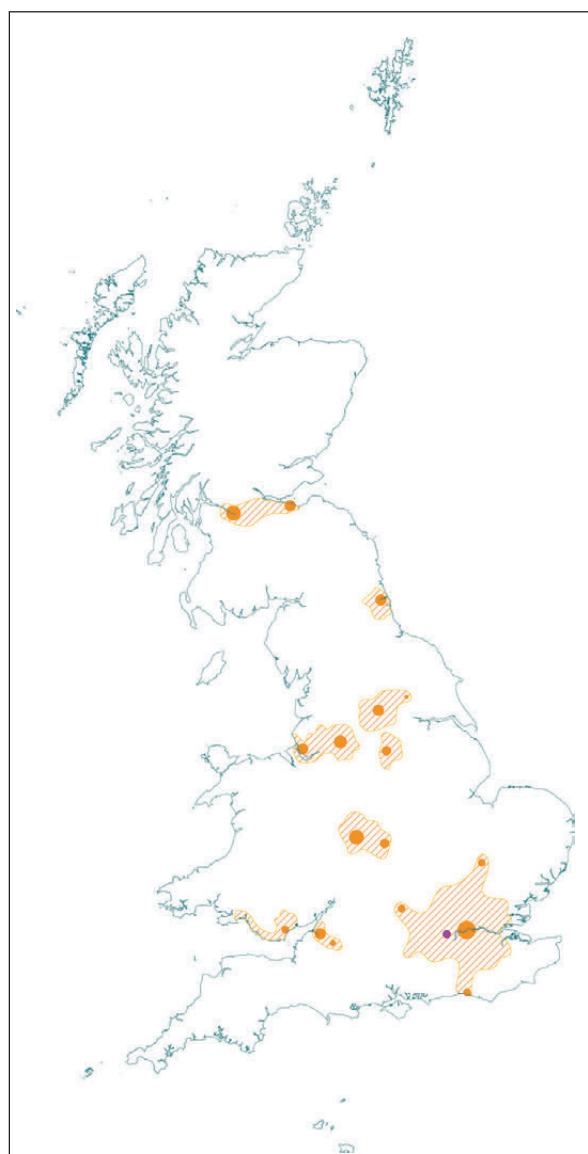
Britain's global history was shaped by its superb connections by sea. We may have recently lost much of our affinity for ships, but our fortunate geography still gives us many good international ports as well as ferries to mainland Europe and one valuable rail link. Britain still has significant value in its primary position in its routes by air though this may be damaged by political inaction on airport capacity. Our only world status airport, Heathrow, connects well with the developed world but not with the new emerging economies. It is at full capacity. Good connectivity on a world scale is as essential to our collective intelligence and ideas as well as the more easily measureable economic figures. Countries, like cities, compete with each other as economic and cultural powers. Britain's great strength and unique purpose in the 21st century is that it has a creative and intelligent population living close to each other, democratically, in a landscape of high quality and in enjoyable towns and cities with rich cultures.

Because Britain's role in the world shifted rapidly away from its industrial and imperial purpose we now need to be clear about its new purpose. It comes increasingly from the creative interaction from all of us, both electronically and physically. No other country is so well placed to do this.

Fast broadband everywhere should have been easy to achieve (but so far hasn't!). Physical transport infrastructure is much more difficult.

The greater London region has responded well to the rapid change in its position in the world aided by its beneficial inheritance of movement patterns. Other great British city regions need creative help with their strategic movement patterns and connectivity to unlock their considerable potential.

Manchester and Leeds and their neighbours have understood the need for the traditional municipal authorities to recognise that their future is not as the separate entities created several generations ago but as well linked great city-regions. Civic pride in one's city now needs to leap old administrative boundaries and embrace as well a bigger cooperative. It is a positive step forward. The West Midlands, the cradle of the Industrial Revolution, needs to be radical again in its strategic planning.



**Map 1: 2015 City-Regions**

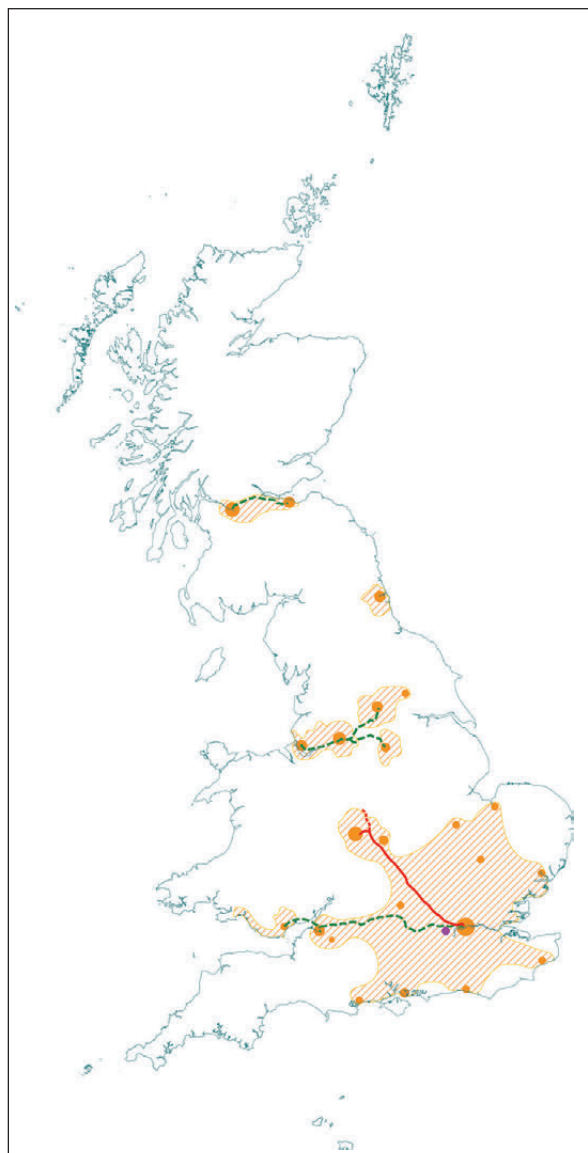


The real map of Britain that is emerging is one of great city-regions Edinburgh - Glasgow, Tyneside, the Northern Power House from Liverpool to Hull, the West and the East Midlands, Bristol - Cardiff and the greater South East centred on London. (Map 1.)

These city-regions then begin to spread and merge so that a map of Britain by 2050 (Maps 2 and 3) shows that much of Southern Britain from Burnley to Brighton is a highly interactive population of 50 million plus people set in a landscape of high quality. How we as humans respond to this of course is difficult as there is a great desire to relate to our own place – house, street, community, town, city – and not to some vast anonymous area. But already many of us already have families and friends and business and social acquaintances spread widely geographically and our task of balancing our local place and community with a much wider canvas becomes more challenging.

The balancing act too by Government on how this mega-region of Southern Britain relates to both other emerging city regions and the individual and separate urban centres like Norwich and Shrewsbury, Inverness and Exeter. Britain is fortunate in that it has a complete range of type and scale of human occupation from hamlets to world cities but some, especially small towns (fig 19), are struggling to identify their purpose in the changing map of Britain especially where a major economic driver has declined. Many of these less dynamic local authorities are isolated, not just geographically but in their understanding in their governance and knowledge of how to position themselves on the changing economic and cultural map.

The physical infrastructure we need to serve this new set of interactions has to take into account the change in the nature of our actual journeys. Even more important is of course the great fixity in the pattern of our daily lives and how we chose to allocate the 24 hours of a daily cycle. Just as we have always allocated seven or so hours to sleep and suffer serious consequences if we reduce or increase it significantly, travel time too has a long history of an allocation of between one and two hours a day with occasional joy in spending even more time on the move. Too much time every day travelling can be unsettling; too little time leads to the feeling for most of us of being “cooped



**Map 2: 2025 Expanding southern region with HS2 to Birmingham, electrification of GWR, Trans-Pennine and Glasgow to Edinburgh**

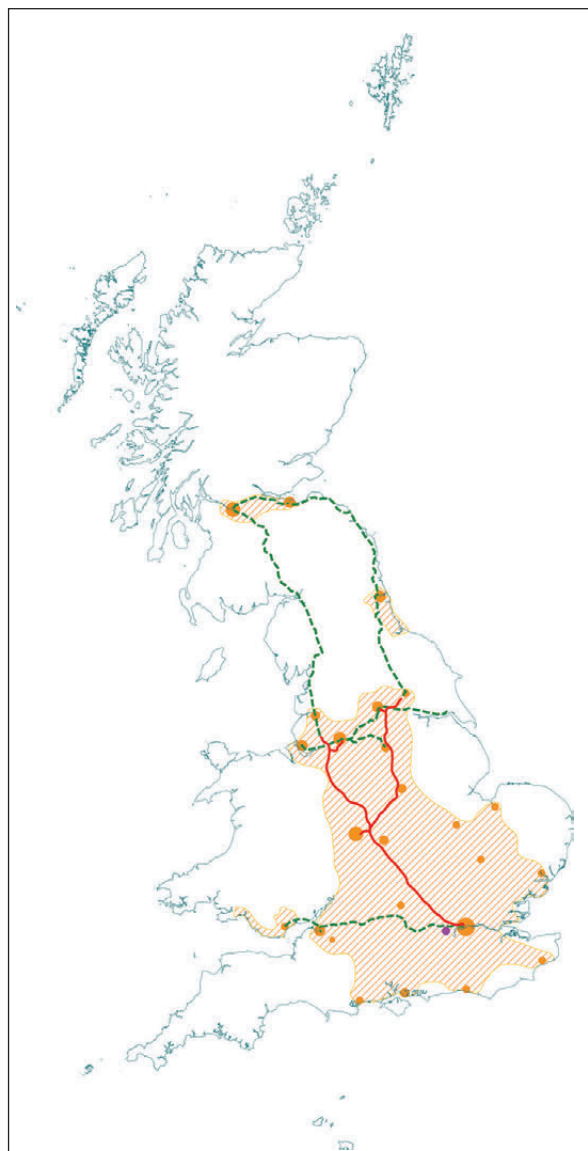


up”, with “cabin fever”. Transport planning needs to recognise better that the quality of the whole journey matters more to us than the fast speed on one leg. We can enjoy spending time moving!

What we have not yet fully recognised are the new links we need for the rapidly emerging new economic centres. The great intellectual power houses of major universities and their spin-off industries are akin to the 19th century industrial cities. Good physical links between them, and especially to airports and other world universities create major benefits.

Our journeys are now complex interactions of different modes. Most journeys are no longer simple but are made up from using different modes with poorly integrated interchanges. The supremacy of driving a car in 1920 say from one’s own house in a city direct, and without too much congestion, to one’s own reserved place outside an office or a shop have long gone. There is still the modern parallel of driving from far flung suburbs to out of town workplaces and shopping centres but it is an isolating and joyless experience.

The road map of Britain developed over many centuries with each community connecting with those it chose to and then generating upgraded routes later. Political imposition imposed new arterial routes on the complex web. The motorways built in the post-war period outside cities have been a great success (fig 20) and connect to the older and still viable network so that the two systems were compatible. They were however damaging within the cities. The private car and the roads in theory allow for a multiplicity of different possibilities in connectivity if it weren’t for two major problems. Congestion can only be solved by land consuming roads which even on a Los Angeles model has not worked and in a small



**Map 3: 2035 South Britain as a mega-city region**



**Figure 19**





country like Britain is impossible. The second problem is journey time where our daily time allocation might take us only 100 miles or less. Will new technology change this? The development of automated driving of cars, now in its infancy and with many hurdles to leap before it becomes established, has the potential benefit of reducing the space needed by cars when moving from its extremely low level of efficiency now (fig 21). But even when fully developed the space efficiency for people's movement is many times worse than the most efficient ways of using space in a crowded country with highly regarded landscapes and townscapes that are already eroded too much by provision for cars and vans. For short distances in cities walking, cycling and buses and trains are remarkably efficient (fig 21) – many more people can move freely and with many permutations of total journey by those means especially if the various means are part of an integrated whole. Railways and Metros are even more efficient in space terms for suburban and inter urban movement between node points but with fewer easy permutations of total pattern and a reliance on secondary distribution at each end. Each of the five modes has values. The private car is ideal as the enabler of complex routes in low density and far flung places; walking and cycling are equally ideal for the complex high density local journeys. Railways have begun to be taken into our acceptance again but the bus and coach are still waiting to be more than second class means of transport. Yet buses are a vital part of our future in cities and coaches provide a greater number of options for longer routes. High quality vehicles and information may help to uplift their low social status.

Railways in the 1960s were disdained by the public, investment was negligible and half the network was shut. The surviving lines are now experiencing a significant renaissance in passenger use and carry more than ever before despite the smaller network. Britain created the world's first railway age. We are now entering belatedly a welcome new railway age. There is a need for significant



**Figure 20: Motorways (blue) and selected trunk roads (green)**

investment in rail especially on Cross Country services which are poor and slow. The main arteries radiating from London with further improvements already on the way like the electrification of the GWR to Bristol and Cardiff and the Midland line to Leicester and Derby will soon provide an enormous boost to those cities' economies. The existing rail map is like Britain's road map of 1960 with the equivalent of a few A roads with fast movement interrupted by slow traffic and many low quality B roads. The proposal for a brand new line where all movement is at high speed (HS2) is welcome and as necessary as were the motorways built in the 1960s which segregated out the slowest movers.

The demand for links in the canal and railway building eras was from the high commercial values of transporting bulk goods of coal and iron ore and bales of wool and cotton. The demand for links for creative human exchange are far less calculable. With new fast rail connections such as Crossrail and Thameslink in London and in future better links like Glasgow - Edinburgh and Manchester - Leeds the likelihood is that actual numbers will be even higher than forecast. The Javelin fast services (70% of the trains on High Speed One at St Pancras) have given a remarkable boost to the economy of towns in Kent despite the antiquated traditional distributor rail lines off the main line.

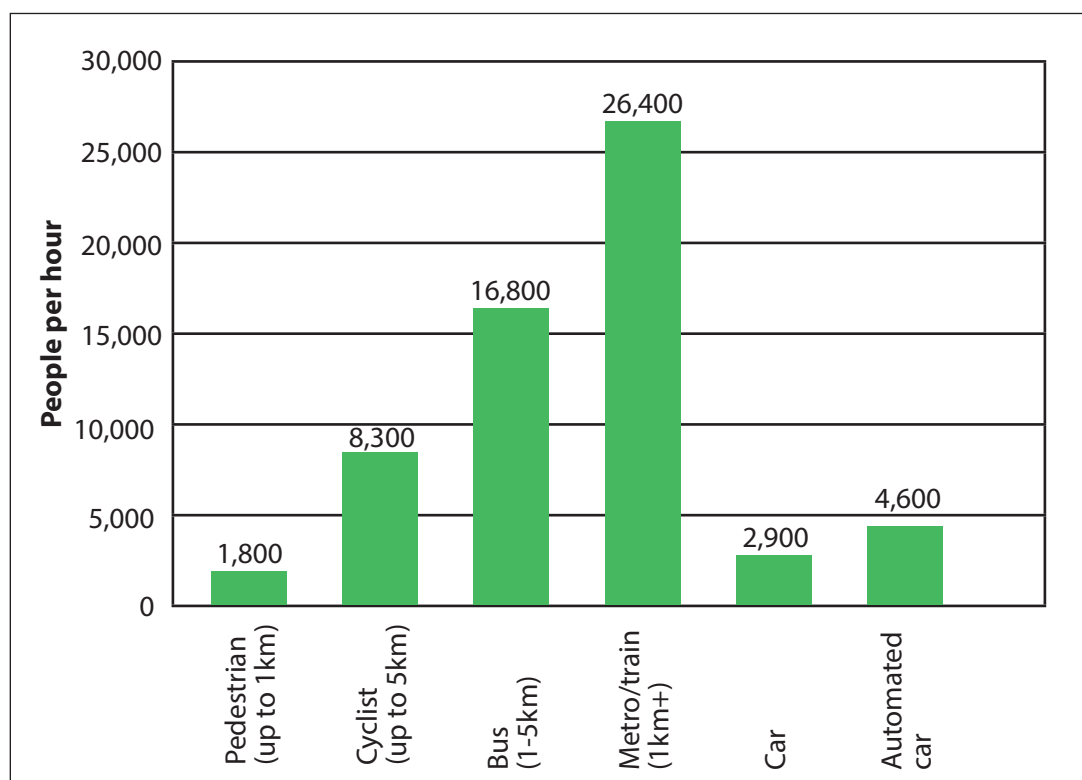


Figure 21: One-way travel capacity for 3m width



Our various modes of transport have evolved rapidly over only a few generations but we now consider them as ordinary. Human inventiveness will present us with new possibilities but what and when are unknown. What we are remarkably poor at doing is integrating our ideas and creations, especially with movement. Nearly all of our personal movements involve a number of different “modes”. Even the simple act of walking is one where we may change our shoes!

The next major break-through in transport could easily come from a change in attitude in the management of the integration between modes to create easier total journeys on a multiplicity of desire lines. We have the electronic technology for this but not yet the management connections across different institutions. The economic and social gains from smoother total journeys will be high.

Britain’s future in the world, and where it can shine strongly, is in the recognition of the remarkable qualities it has already and how to fully harness them. Its qualities are unique – its landscape, its climate and its large population of many different cultures and backgrounds living close to each other. Transport so far has been a much neglected part of our future. Good transport provides the essential connectivity between each of us. This is the key to our collective intelligence and our continuing success as a society.







Princes Street, Edinburgh



"Only connect"  
EM Forster, 1910



## Author Profile

Alan Baxter CBE BSc MICE FStructE Hon. FRIBA is an Engineer with a wide range of interests in the built environment and infrastructure. His firm Alan Baxter Limited encompasses urban designers, transportation engineers, civil and structural engineers, historians and landscape architects. His projects range from collaborating as Structural Engineers with Architects on new buildings such as the Everyman Theatre which won the Stirling Prize in 2014 to the care of historic buildings. He is much involved in infrastructure projects like the electrification of the Great Western Railway and Midland Mainline and is the masterplanner for replanning stations like London Victoria and Bristol Temple Meads. His interest in how cities work is expressed in major studies on York and Oxford and other towns where better movement patterns relevant to their historic pattern are critical to their future. With colleagues he founded the Independent Transport Commission in 2000 and continues as a Trustee and Treasurer.

His offices in Farringdon, London EC1 not only house his firm but 80 or more interacting organisations, including the ITC, many of whom are involved in cities, buildings, transport and human behaviour.

[www.alanbaxter.co.uk](http://www.alanbaxter.co.uk)

## Endnotes

1. The ITC, conscious that too little is known about the drivers of human movement, has commissioned the Why Travel? project. This study, drawing from all fields of human knowledge, is helping to reshape our understanding of why we travel. It has resulted in an educational pack, a website and a major publication is in preparation. For details go to [www.whytravel.org](http://www.whytravel.org)
2. The Lunar Society met from 1765 to 1813. Its members included Matthew Boulton, James Watt, Josiah Wedgwood, Erasmus Darwin, Joseph Priestley, James Keir and William Murdoch.
3. Geoffrey West, Santa Fe Institute, reported 30 June 2012 in the Economist.

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## Image credits

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