Governance and Funding of National Road Networks: Three case studies

John Smith

July 2016

RAC Foundation

The Royal Automobile Club Foundation for Motoring Ltd is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

RAC Foundation
89–91 Pall Mall
London
SW1Y 5HS
Tel no: 020 7747 3445
www.racfoundation.org

Registered Charity No. 1002705

About the author

John W. Smith is an independent consultant with wide experience of transport and regulatory economics. He was author of the RAC Foundation's 2009 report 'Governance and Administration of National and Local Roads in GB' and co-author of the RAC Foundation 2011 report 'Providing and Funding Strategic Roads: An International Perspective with Lessons for the UK'

His early career was in the Government Economic Service (GES) where he started as a transport economist working on project appraisal. His subsequent areas of work included local government finance, environmental protection and water privatisation.

After leaving the civil service, he then spent 12 years in the privatised water and rail sectors first as regulation director at Anglian Water, and then with Railtrack.

As a member of the Competition Commission between 2005 and 2013 he worked on a number of high profile merger cases, market inquiries and regulatory appeal cases.

He is an associate of Indepen Consulting Ltd.

Acknowledgements

The author would like to thank David Bayliss and other individuals who offered a peer review of this report, as well as Anneka Lawson and the RAC Foundation for their assistance in preparing the report for publication.

Disclaimer

This report has been prepared by John Smith on behalf of the RAC Foundation. Any errors or omissions are the author's sole responsibility. The report content reflects the views of the author and not necessarily those of the RAC Foundation.

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List of Abbreviations

ADF	Autoroutes de France
AFITF	French Transport Infrastructure Financing Agency
APRR	Autoroutes Paris–Rhin–Rhône (a SEMCA)
ARAFER	Autorité de régulation des activités ferroviaires et routières
AREA	La Société des autoroutes Rhône-Alpes
ASF	Autoroutes du Sud de la France (a SEMCA)
BRH	Bundesrechnungshof, the German Federal Audit Office
CDC	Caisse des Dépôts et Consignations
CNA	Caisse Nationale des Autoroutes
CPTC	California Private Transportation Company
DIR	directions interdépartementales des routes
DIW Berlin	German Institute for Economic Research
FCA	French Competition Authority
FHWA	Federal Highway Administration (USA)
FTA	Federal Transit Administration (USA)
FTIP	Federal Transport Infrastructure Plans
HGV	heavy goods vehicle
HOT	high-occupancy toll
HOV	high-occupancy vehicle
HTF	Highways Trust Fund (USA)
IPO	initial public offering
OECD	Organisation for Economic Co-operation and Development
ORR	Office of Rail and Road
P3	public–private partnership (in the context of California)
PPP	public–private partnership
RAB	regulatory asset base
sanef	Société des Autoroutes du Nord et de l'Est de la France (a SEMCA)
SEMCA	Société d'Economie Mixte Concessionnaire d'Autoroutes
SHS	State Highway System (California)
STMB	Société du Tunnel du Mont Blanc
TEN-T	Trans-European Transport Network
VED	Vehicle Excise Duty
VIFG	Association for Transport Infrastructure Financing (Germany)
VMT	vehicle-miles travelled
WEF	World Economic Forum

Foreword

The Government's decisions to create Highways England as an arms' length company, establish the Road Investment Strategy, with clear obligations for Highways England to deliver and a five-year funding settlement, and to dedicate income from vehicle excise duty to a new Roads Fund signal a welcome recognition of the importance of our national road network for the country's economic health.

That said, these are early days for the new framework. We have yet to see the detail of how the Roads Fund will function. Work is gearing up to develop the second Road Investment Strategy – RIS 2 – for the five years from 2020. Highways England is getting to grips with its route strategies and strategic studies. And the new National Infrastructure Commission is getting down to business.

Meanwhile, we know that other countries with similarly extensive national road networks have been wrestling with problems familiar to the UK – underinvestment, a backlog of maintenance spending, and pressures from traffic growth. So we decided to commission John Smith to take a look at the lessons that might be learned from the experience overseas: France, Germany and California in the USA.

Different countries have adopted different approaches to raising money for road investment. Two aspects stand out. The first is the varying stances they have adopted toward securing private finance. Is this wholly off the agenda for Highways England? Of course, even the cleverest private finance deals need to be funded – be that through general taxation or by users. The other is in the growing appetite for user-charging. France has a long-established system of motorway tolling. California is exploring an annual road improvement charge, which looks to have similarities to our soon-to-be hypothecated vehicle excise duty. Germany is an illustration of how hard it can be to introduce specific user charges to existing networks.

Big networks carrying high volumes of heavy traffic are expensive to maintain. Inadequate funding leads to a build-up of maintenance. Uncertain funding undermines long-term planning. Big infrastructure programmes need to be planned in decades not year-by-year, with an eye to broader development goals, and a recognition of the long lead times for major engineering projects. Get them right and these elements become mutually reinforcing. But the cornerstone is adequacy and certainty of funding shielded from the Government's other spending pressures; something that the new Road Fund promises, though what we still await is the legislation that will guarantee it.

Steve Gooding
Director
RAC Foundation

1 Introduction

This study compares approaches to the governance and funding of road networks in three countries – France, Germany and the USA.

In choosing which European countries to focus on, regard was given to the lengths of their road networks, the variety of approaches to funding that can be seen, and governance; consideration was also given to the role of private sector, including the issue of tolls. As can be seen from Table 1.1, France has the longest total road network in Europe and the third-longest motorway network. Germany has the third-longest total road network – after France and Spain – and for many years had the longest motorway network in Europe, which by 2010 had been overtaken by Spain. In France, the private sector has played a key role in the development of the motorway network, much of which is operated under concession contracts, with toll revenues.

Table 1.1 Length of total road networks in Europe, by category, ranked by size of total network (kilometres, 2012)

	Motorway	National roads	Regional/secondary roads	Other roads[a]	Total
France	11,465	9,784	377,965	666,343	**1,065,557**
Spain	14,701	15,110	135,784	501,053	**666,648**
Germany	12,879	39,604	178,034	413,000[b]	**643,517**
Italy	6,726	19,861	153,588	73,555	**253,730**
UK	3,756	49,038	122,966	245,189	**420,949**
Sweden	2,013	13,507	82,988	177,974	**276,482**
Belgium	1,763	13,229	1,349	138,869	**155,210**
Netherlands	2,666	2,525	7,778	125,230	**138,199**
Austria	1,719	9,997	23,640	88,759	**124,115**
Greece	1,659	9,299	30,864	75,600	**117,422**
Ireland	900	4,513	11,631	78,958	**96,002**
Finland	810	12,522	13,565	51,213	**78,110**
Portugal	2,988	6,505	4,791	63,900[b]	**14,284**
Denmark	1,195	2,596		70,318	**74,109**
Luxembourg	152	837		1,891	**2,880**

Source: EU (2015: 77, Table 2.5.2)

Note: (a) The definition of road types varies from country to country; the data is therefore not comparable – "other roads" sometimes includes roads without a hard surface.

(b) The figures for Germany and Portugal 'Other roads' have been taken from European Road Federation Yearbook 2014–15 for end of year 2011, as no figures are available for 2012.

(c) Countries selected for this study have been shaded.

The growth in the length of the motorway network since 1990 in France, Germany, Spain and the UK is shown in Table 1.2.

Table 1.2 Comparative growth in length of European motorway networks (kilometres, 1990–2012)

Year	France	Germany	Spain	UK
1990	6,824	10,854	4,976	3,212
1995	8,275	11,190	6,962	3,408
2000	9,766	11,712	9,049	3,586
2005	10,798	12,363	11,432	3,665
2010	11,392	12,819	14,262	3,686
2012	11,465	12,879	14,701	3,756
% growth	68.0%	18.7%	195.4%	16.9%

Source: EU (2015: 76, Table 2.5.1)

Spain has seen by far the fastest expansion in the size of its motorway network, followed (some distance behind) by France. Both Germany and the UK have seen their networks grow by less than 20% since 1990.

When it comes to the USA, although the national situation is touched on in this paper, by way of a summary of the federal structure and the role of the Federal Highway Administration, significant differences exist across state administrations in relation to road infrastructure and its financing, and with these in mind, this study focuses on a single state – California. It has the largest population of any US state – 38.8 million in 2014 (US Census Bureau, 2014) – and it also represents the world's eighth-largest economy.

California has the second-longest total highway network of any US state and the second-longest interstate system, in both cases being second only to Texas.

Comparative lengths of road network across eighteen US states with the longest total road networks are set out in Table 1.3, showing the breakdown by functional road type.

Table 1.3 US public road lengths by functional category, ranked by size of total network (miles, 2013)

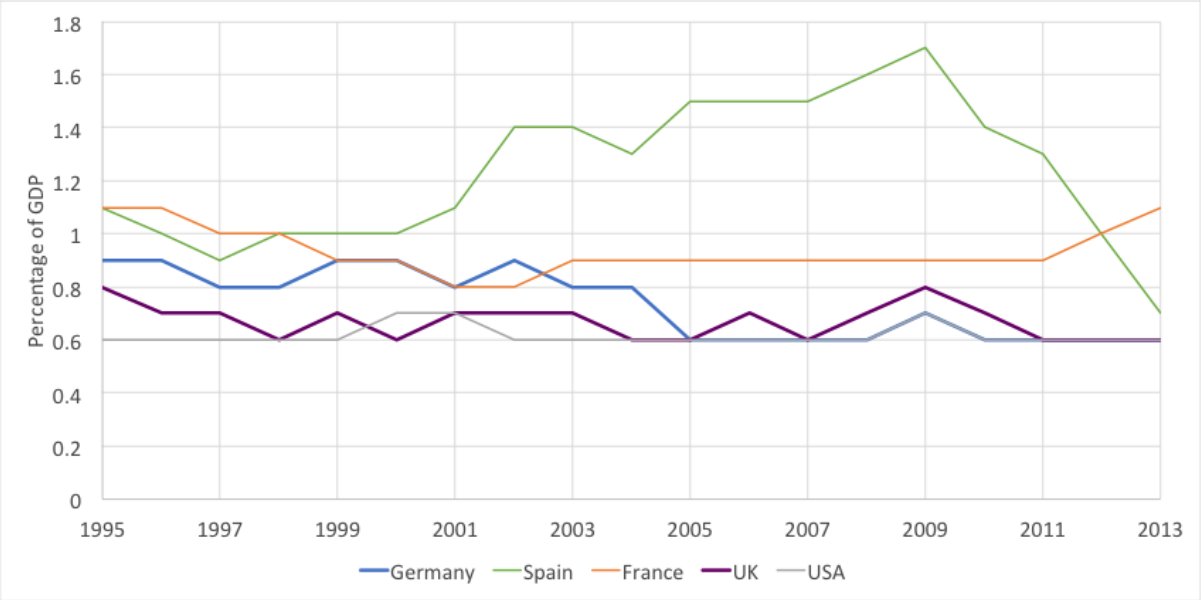
State	Interstate	Other principal[a]	Major and minor collectors	Local	Total
Texas	3,415	33,280	65,154	211,378	**313,228**
California	2,451	30,002	32,223	110,313	**174,989**
Illinois	2,185	14,771	22,169	106,583	**145,708**
Kansas	874	9,688	33,698	96,427	**140,687**
Minnesota	914	13,686	30,408	93,759	**138,767**
Missouri	1,379	10,487	25,109	94,925	**131,900**
Georgia	1,247	14,329	23,037	90,006	**128,620**
Ohio	1,574	11,253	22,869	87,602	**123,297**
Michigan	1,244	15,008	24,458	81,431	**122,141**
Florida	1,495	13,590	14,560	92,442	**122,088**
Pennsylvania	1,857	13,762	19,847	84,470	**119,936**
Wisconsin	743	12,910	23,501	77,990	**115,145**
New York	1,724	14,601	20,737	77,666	**114,728**
Iowa	782	9,778	31,629	72,240	**114,429**
Oklahoma	933	8,417	25,490	78,100	**112,940**
North Carolina	1,255	10,018	17,351	77,579	**106,202**
Alabama	1, 002	9,716	22,386	68,733	**101,837**
Arkansas	656	7,441	21,061	72,499	**101,656**
US total, all states (incl. Puerto Rico)	**47,575**	**417,232**	**803,807**	**2,846,848**	**4,115,462**

Source: US Department of Transportation (2015a)

Note: (a) This includes other freeways and expressways

Figure 1.1 shows trends in total transport infrastructure investment, expressed as a percentage of GDP, across the four European countries presented in Table 1.2 (France, Germany, Spain and the UK) and the USA over the period 1995–2013. Spain has exhibited the highest rates of spending over this period – up to 1.6% of GDP – although this has fallen sharply over the past five years. The earlier figures reflect the expansion of their motorway and high speed rail networks. The USA has shown consistently the lowest rate of investment spend – around 0.6% of GDP – with spending in Germany falling to a similar level from 2005. The trajectory of spending for the UK is, for the most part, slightly above that of the USA, and also Germany in more recent years.

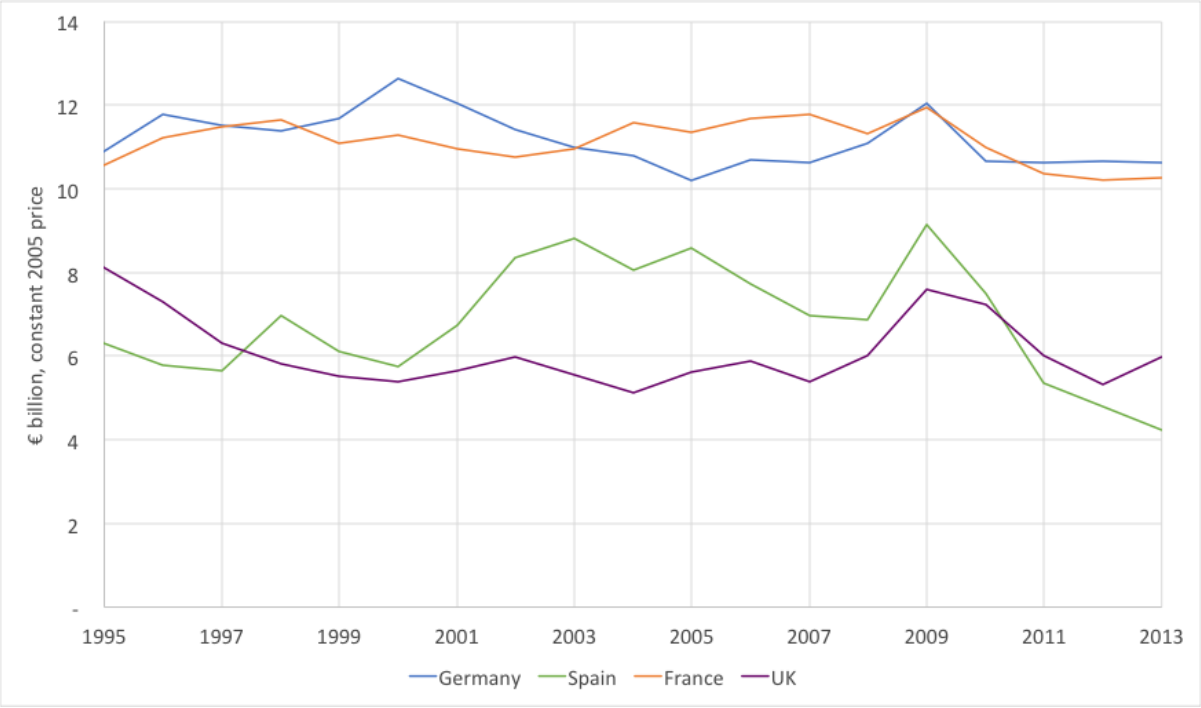
Figure 1.1 Total inland transport infrastructure investment as a percentage of GDP (1995–2013)



Source: OECD (2015a)

Figure 1.2 reveals the trends in road infrastructure investment in constant 2005 prices across the four European countries over the same period. France and Germany show the highest levels of spending, reflecting their larger motorway networks, with the UK having the lowest. As with the Figure 1.1, the figures for Spain show a steep decline after 2009.

Figure 1.2 Road infrastructure investment (1995–2013)



Source: OECD (2015b)

Against this background, the current study considers the current challenges facing road administrations in France, Germany and California and the ways in which these are being addressed in each case. Despite the challenges identified in this study, the quality of road infrastructure in all three countries, along with Spain, is perceived to be well above that of the UK, according to the World Economic Forum (WEF) rankings, as shown in Table 1.4.

Table 1.4 Comparative populations and World Economic Forum rankings for the quality of roads

Country	Population (million) 2014	Ranking 2015–16
France	63.9	7th
Spain	46.5	11th
Germany	81.1	13th
USA	319.0	14th
UK	64.5	29th

Source: WEF (2015a)

Among the issues covered in the study are the following:

- the respective responsibilities of national (or federal), state and local governments;
- the approaches used for planning the development and improvement of national networks;
- the structure and organisation of national highway companies and funding agencies, and their governance arrangements;
- forms of road taxation and the use of dedicated road funds; and
- the role of private finance, concession contracts and tolls – and how successful these are.

The study takes place in the context of major changes in the governance and funding of the strategic road network in England, with the setting up in 2015 of Highways England as a government-owned company, delivering a major investment programme, and operating within a regulatory framework similar to those governing regulated utilities. After decades characterised by a 'stop–start' approach to road investment, Highways England now operates within the framework of a five-year Road Investment Strategy and a Statement of Funds Available from its sponsoring department.

However, this roads programme is to be funded on a conventional public-sector basis, with no role for private finance, despite the fact that public–private partnerships (PPPs) were used for a number of major road schemes undertaken by its predecessor, the Highways Agency, including the upgrading of the M25. While the precise reasons for this are unclear, it reflects a general loss of appetite in the present administration for PPP procurement, given the complexity of contractual

arrangements and the problems experienced with PPPs in some sectors, such as hospitals.

Since April 2014, a HGV levy has been levied on all vehicles at, or over, 12 tonnes gross weight using UK roads, raising £192.5m in its first year. The intention was for all HGVs to contribute to maintenance costs of the road network. For UK registered vehicles offsetting reductions were made to Vehicle Excise Duty (VED). Another development in the UK in 2015 was the commitment in the Chancellor's Summer Budget to reinstating, for the first time since the 1930s, a dedicated road fund based on the proceeds of road taxation. Thus, in future, vehicle taxes will be used to fund improvements to the road network – although the practicalities have still to be worked through.

The new regime put in place in England is also designed to raise performance standards and make Highways England more responsive to the needs of road users. Transport Focus – previously Passenger Focus, whose role has been extended from representing the interests of rail passengers – will have a key role in this, working in parallel with the Office of Rail and Road (ORR), which is responsible for monitoring performance and efficiency.

The structure of the report comprises the three case studies, followed by a comparative assessment which considers how similar the challenges being faced in these three nations are to those found in the UK, and what lessons we might usefully learn from this overseas experience. In the present context, the question is to what extent the current reform programme in England could benefit from adopting practices seen elsewhere.

2 Case Study: Governance and Funding of the French Road Network

2.1 Introduction

France, with a population of 66.2 million in 2014, is one of the two largest countries in the European Union, second only to Germany. However, its road network is the longest in Europe at 1,065,557 km, more than 60% longer than its German equivalent.

The French road network is made up of the following categories (EU, 2015: 77, Table 2.5.2):

- motorways (autoroutes): 11,465 km;
- main or national roads (routes nationales): 9,784 km;
- regional or departemental roads: 377,965 km; and
- local and municipal roads: 666,343 km.

Central government has responsibility for motorways and national roads, while regional roads are the responsibility of the 22 regional *départements.* All other roads belong to the municipalities.

The majority of French motorways are tolled and operated under private concession contracts. In fact, France has led the way in the use of the private sector to develop its motorway network.

France has a reputation for the high quality of its transport infrastructure, although this has declined in relative terms over recent years. In the *WEF Global Competitiveness Report 2015–16* (WEF, 2015a: 171), France is ranked seventh for the quality of its roads and sixth for its rail infrastructure. In the 2009–10 report, it was ranked second for the quality of its roads, with its rail network coming fourth.

This fall in ranking is also reflected in the WEF's 'Travel & Tourism' rankings, which are based on the views of industry leaders in the aviation, travel and tourism industry. In the *WEF Travel & Tourism Competitiveness Report 2015* (WEF, 2015b: 149), France is ranked fourth for the quality of its roads, having previously held first position in the 2011–12 report.

2.2 Development of the motorway network

In the 1950s, a dedicated road fund was first established, and in 1955 a law was passed which allowed, for the first time, toll financing of motorways. Initially, this was through companies in which the state was the major shareholder; these were known as Sociétés d'Economie Mixte Concessionnaires d'Autoroutes (SEMCAs). One of the first major developments was the construction of the Mont Blanc road tunnel from 1959 to 1965 by the Société du Tunnel du Mont Blanc (STMB), in which the government was the majority shareholder (ATMB, 2016; CNA, undated).

In the 1970s, the French government also allowed private companies to compete for concession contracts under which they were responsible for the construction, operation and maintenance of motorways. Four such private companies were set up between 1970 and 1973.

Some of these companies subsequently became loss-making during the 1980s and were taken over by the state. At the same time, the government attempted to strengthen the SEMCAs through injecting equity capital. A new public authority, Autoroutes de France (ADF), was established in 1983 with responsibility for managing the SEMCAs.

In 1994, in order to speed up completion of the motorway building programme, some consolidation of SEMCAs was brought about – three regional operating units were created, and their financial position was strengthened through the government taking direct stakes in them.

In addition, a form of regulatory regime was introduced, with five-year planning agreements between the state and the operating companies, specifying what they were expected to deliver in relation to works and investment, toll rates, financial objectives and performance standards.

Later reforms, in 2001, were intended to increase competition for new motorway concessions and allow new players to enter the market. SEMCA management structures were aligned more closely with those of private sector enterprises to allow them to compete on equal terms. Shares in ASF (Autoroutes du Sud de la France), one of the major SEMCAs, were sold by the government through an initial public offering (IPO), and dividends that had previously been paid to the state were in future to be allocated to transport infrastructure and channelled through a new body, the French Transport Infrastructure Financing Agency (AFITF), a dedicated agency for developing infrastructure established in 2004. This process of selling equity stakes through IPOs was extended to other concession operators, thereby strengthening their financial structures.

In 2005, the government announced that the three main SEMCAs – ASF, APRR (Autoroutes Paris–Rhin–Rhône) and Sanef (Société des Autoroutes du Nord et de l'Est de la France) – were to be fully privatised through a bidding procedure. The successful bidders were Vinci for ASF, an Eiffage–Macquarie consortium for APRR and a consortium led by Abertis for Sanef. The sale proceeds amounted to €14.8 billion, of which almost two thirds went to government and one third to ADF.

The four largest operators of the French motorway network – the three SEMCAs already mentioned, plus Cofiroute (see below) – operate on a regional basis and manage the following size of networks (ASFA, 2016):

- Autoroutes du Sud de la France (ASF): 2,703 km (1,679 miles)
- Autoroutes Paris–Rhin–Rhône (APRR) – 1,868 km (1,161 miles)

- Société des Autoroutes du Nord et de l'Est de la France (Sanef) – 1,388 km (862 miles)
- Compagnie Industrielle et Financière des Autoroutes (Cofiroute) – 1,100 km (683 miles)

While these constitute the four largest concessions, according to the Federation of French Motorway Companies (ASFA), there are now some 20 toll road concession operators. However, there has been consolidation within the sector with the principal operating groups typically managing more than one concession. In addition to APRR, the Eiffage-Macquarie consortium also own Societe des Autoroutes Rhone-Alpes (AREA). The Vinci Group, in addition to ASF, now owns a number of other concession companies including Escota (Societe Esterel-Cote d'Azur Alpes) and Cofiroute, which is one of the four listed above. The Vinci group is now the biggest concession operator with responsibility for managing a network of some 4385km.

Each concession operates on the basis of five-year contracts under a similar model to that used for regulated utilities in the UK. These specify the improvements to be made and the service levels to be delivered and, on this basis, the annual increases in toll rates that are allowed during the contract period.

2.3 Financing

In 1963, during the reform programme, a new body called the Caisse Nationale des Autoroutes (CNA) was established to facilitate the financing of motorway construction. After determining the financing requirements of concession operators, the CNA draws up a borrowing programme, based mainly on bond issues. With its high credit ratings, it is able to operate in the primary bond market without French government guarantees and is also able to draw on funds made available by the European Investment Bank. In addition, it can borrow from Caisse des Dépôts et Consignations (CDC), a state-owned group which invests in development and infrastructure projects using national savings funds.

For long-term investments such as motorways, CNA raises funds with maturities exceeding ten years. In this way, French motorway concessions have access, through a public agency, to long-term funding at favourable rates.

2.4 The growth and development of the motorway network

In the 22 years between 1990 and 2012, the length of the French motorway network grew from 6,824 km to 11,465 km – a 68% increase. (In contrast, over the same period the UK motorway network increased by only 544 km, from 3,212 km to 3,756 km, representing a 17% increase).

Much of the development in France has come through private concession contracts and has been funded by toll revenues. In 2011, approximately 75% of French autoroutes were operated on this basis. (A notable exception is Brittany, where

private concession contracts do not apply and motorways are all operated by the regional government, without tolls).

The growth of the French network over this period raises the question of the approach used for planning network development.

France, for many years, drew up national infrastructure plans by mode of transport, which included national road master plans. The last of these, made in 1992, specified the main corridors for development of the network up to 2015 – including intercity toll motorways and linkages within the network which were planned to be toll free. The objectives included fluid traffic flow, improving access to poorly served areas, and providing effective international links.

Since 2002, multimodal plans for public passenger and freight services have become the basis for transport planning up to 2020. They include service plans for the different regions, and are based on specified objectives related to levels and quality of service. Key principles include a European approach to the development of networks – recognising the importance of international transport corridors – and a multimodal methodology.

A further key component consists of planning contracts between the French state and the regions, although major infrastructure projects such as motorways and TGV lines (train à grande vitesse – the French high-speed passenger trains) continue to be planned centrally. Other schemes are co-financed by government and the regions.

Since 2000, it appears that investment in roads has been reduced in favour of rail and public transport in urban areas and subregions, reflecting the multimodal approach and the wish to rebalance modal split (OECD, 2005).

It is clear, then, that France has well-developed systems for planning transport infrastructure based upon contracts between government and the regions.

The state's financial contribution to road investment schemes is undertaken through AFITF, which derives its income from the following sources: contributions from the state; fees paid by highway concession operators; a special tax on highway concessionaires; 40% of the fines resulting from penalty systems; and income from investments and loans. AFITF also benefited from the proceeds of the privatisation of highway concession companies in 2006.

As far as departmental roads are concerned, councils have powers to impose departmental taxes – including taxes on motor vehicles – and the ability to raise loans (Boring, 2014).

2.5 Maintenance of national roads

The maintenance and management of the national road system, outside concession contracts, is undertaken through local agencies – termed *directions interdépartementales des routes* (DIR) – of which there are 11 and which operate under the authority of the Ministry of Ecology, Energy and the Sea.

Maintenance is financed by a combination of national budget contributions and co-financing by local and regional government, and by the AFIFT.

2.6 Recent developments

In 2014, the French Government announced a €3.6 billion stimulus package to expand the motorway network. Under this, motorway operators would have to agree to bear the costs of upgrading the network in exchange for an average three-year extension of their concessions. At the same time, the Government sought to freeze road toll tariffs for 2015 and revise contract terms, which were seen as too generous. These developments followed a request by the French National Assembly's Finance Committee for the French Competition Authority (FCA) to undertake a review of the sector.

Reporting in September 2014, the FCA observed that France has 11,882 km of motorways, 9,048 km (76%) of which are operated under concession contracts by 19 operators (FCA, 2014). The seven largest highway concession companies make up 92% of the revenues generated from the motorway network. Since 2004, the operators had experienced rising revenues as a result of traffic growth, and higher toll rates which appeared to be largely disconnected from trends in their costs. The FCA noted the exceptional profitability of toll road concession operators, who benefit from a monopoly position and guaranteed income, and recommended better regulation of concession operators in favour of users and the state.

Among its recommendations, the FCA proposed that if profitability increases above current levels, highway operators should have to reinvest more of their earnings or share them with government. It also proposed setting up an independent regulatory authority for the sector to monitor compliance with contractual obligations.

The subsequent attempt by the Government to freeze tariffs led to a legal appeal by operators to France's highest administrative court on the basis that the Government had exceeded its powers. However, after a year of negotiations, the dispute was resolved. Macquarie announced in April 2015 that it, and other motorway operators, had reached agreement in principle to amend their contracts. The freeze on tolls in 2015 is to be made good via supplementary increases in the period 2019–23. Capital works with a value of €720 million will be carried out on the networks for Autoroutes Paris–Rhin–Rhône (APRR) and La Société des autoroutes Rhône-Alpes (AREA) over the next five years. They include new interchanges and road widening schemes. It should be noted that AREA is 98.2% owned by APPR.

Motorway operators will make payments to AFITF which amount to a total present value of €800 million. In addition, they will put €200 million into a fund for green transport projects. The new contracts will also include safeguards against future adverse interventions (Macquarie Atlas Roads Limited, 2015). At the same time, the Government has set up a new regulatory authority for rail and road activities (ARAFER, Autorité de régulation des activités ferroviaires et routières) to strengthen the monitoring of motorway concession contracts. Like its UK counterpart ORR, its remit covers both road and rail. Indeed, one part of its work will involve joint working with ORR on the conditions for access to and pricing of the Channel Tunnel.

2.7 Conclusions

In general, the French concession model has delivered a very high-quality autoroute network, considered to be one of the best in the world. There has been a long history of development going back to the 1950s, with a staged approach to private sector involvement leading to full privatisation in 2005. Indeed, the motorway financing arrangements allowed for under the 1955 law appear to have enabled France to build a modern motorway network without direct contributions from central government funds. In part, this has been facilitated by innovative approaches to financing, which included the setting up of a special body – CNA– to provide low-cost bond finance for concession operators.

However, in recent years, concession operators have seen revenues from traffic growth and higher tolls increasing much faster than their costs. Steps are now being taken to strengthen the regime for regulating concession contracts. The 2014 French Motorway Plan will see a further €3.2 billion being invested in the network over the next five years, financed by concession operators in return for extending the length of concessions.

In addition, France has well-developed systems for the long-term planning of transport infrastructure, now on a multimodal basis and including national, departmental and municipal road infrastructure. While concessionaires are responsible for maintenance and management of the highways for which they have concessions, the state maintains and manages existing national roads through the DIR (local agencies which are co-financed by the state), local authorities and AFITF.

In 2014, the French Government introduced a heavy goods vehicle (HGV) tax on vehicles using national roads which are not the subject of concession contracts. The proceeds of this eco-tax, calculated on a per-kilometre basis and based upon vehicle weight and size, will contribute to the financing of transport infrastructure.

3 Case Study: Governance and Funding of the German Road Network

3.1 Introduction

Germany has a population (in 2014) of 80.9 million – the largest of any country in the European Union. With a total road length amounting to approximately 643,000 km, it has the second-largest network after France.

Germany claims to be Europe's number one transit country, with a high volume of vehicle traffic passing through its roads on what forms a key component of a Trans-European Transport Network (TEN-T), given the country's location at the heart of Europe. Goods traffic makes up the main component of this transit traffic, while federal trunk roads carry more than half of total national road traffic.[1]

As of 2011, the German major road network comprised 231,000 km of roads, made up the following components (EU, 2015: 77, Table 2.5.2):

- motorways (Autobahnen): 12,879 km;
- federal roads (*Bundesstraßen*): 39,604 km;
- roads owned and maintained by federal states (*Länder*): 86,346 km; and
- district and local roads: 91,688 km.

The remainder of the network comprises city roads and roads which are privately owned, totalling a further 413,000km.

Motorways and federal roads in Germany are owned and financed by the Federal Government but are managed by the states. Indeed, the states are responsible for project planning, construction and operation of federal roads on behalf of the Federal Government. There is no national road operator equivalent to Highways England.

In the *WEF Global Competitiveness Report 2015–16* (WEF, 2015a: 179), Germany was ranked 13th for the quality of its roads, which represents a decline from fifth position in 2010–11.

3.2 National infrastructure planning

Plans for developing the autobahn network started in the 1920s, with construction of the first segment (Cologne–Bonn) beginning in 1929. Under the Third Reich, the construction programme for an autobahn network got underway in 1933, in a period before car ownership became widespread, with Hitler taking a personal interest in the programme. During the Second World War it proved to be a key asset, initially for the German army and subsequently for the Allied forces.

[1] Source: German Mission to the United Nations in Vienna: Information Note on Federal Motorways, January 2016

After the war, the German government developed the autobahn network in West Germany and, following reunification in 1989, there has been a unified approach to further development.

It is also the case that President Eisenhower, having been inspired by what he saw of the German autobahn network in operation during the Second World War, took steps after the war to develop road building in the USA – leading, ultimately, to the construction of the interstate network.

In Germany, the Federal Government is currently responsible for planning and funding the strategic road network comprising motorways and trunk roads, as well as railways and inland waterways. It produces Federal Transport Infrastructure Plans (FTIPs), generally for 10 to 15 years, which are approved by the Federal Parliament, with schemes assessed and prioritised on cost–benefit criteria. The FTIPs, which are subject to public consultation, are based upon traffic forecasts for both passenger and goods traffic – in the case of the latest one, on forecasts up to 2030. The plans are also subject to public consultation.

While the Federal Government has overall responsibility for funding the network, the 16 federal states, or *Länder*, carry out project planning, construction and operation of the federal road network through their own administrative organisations.

3.3 Recent developments

There has been concern for some years over the funding of federal roads, and also over their classification since, although designed for long-distance traffic, today they carry a substantial volume of regional traffic. In some cases, states have been able to convert regional roads to federal status and so claim federal funding (Gühnemann, 2006: 5).

Following the report of a High Level Commission (the Pallmann Commission) on the future financing of transport infrastructures, a new transport infrastructure funding agency –the Association for Transport Infrastructure Financing (VIFG) – was set up in 2003 with the tasks of financing and financial management of construction, maintenance and operation of the transport infrastructure for which the Federal Government is ultimately responsible. Although accountable to the Federal Ministry of Transport, it is not bound by public accounting rules and so has greater flexibility than most public agencies.

As far as roads are concerned, three main sources of financing are available: the public budget, motorway tolls from HGVs, and private finance through the use of PPPs. The main recommendations of the Pallmann Commission, which were accepted by the Federal Government, involved the following principles:

- a gradual transition from tax-financed to user-financed infrastructure;
- the introduction of distance-based road user charges and HGV tolls; and

- the ring-fencing of revenues collected through the toll system to be used for road investment.

Since 2005, HGVs using the federal motorway network have been subject to a toll charge, based upon motorway renewal costs attributable to HGVs. This was extended in 2012 to also cover use of some of the main federal routes. The toll rate is mileage-related and is differentiated according to numbers of axles and the emission class. The charge is raised by a satellite-based automatic toll collection system, which is able to measure the number of kilometres driven.

VIFG became the body through which revenues collected via tolls are reinvested in the network – essentially a form of dedicated road fund – although there have been offsetting reductions made to contributions from the public budget.

Between 2004 and 2010, federal rail and waterway projects were also given part of the revenues collected through the HGV tolls; since 2011, however, 100% of the revenues have been used for road investment. HGV toll revenues in 2012 totalled €4.4 billion, although after allowing for toll system operating costs, the net figure available for investing in the network was around €3.2 billion. The investment requirement for the federal road network was estimated to be a minimum of €8 billion per annum, with the remainder to be funded through the federal budget (VIFG, 2013; 2016: 4)

From October 2015, the toll has been extended to all HGVs over 7.5 tonnes, having previously applied only to vehicles over 12 tonnes. This extension is estimated to yield an extra €0.3 billion for investing in the network, on either new capital projects or road maintenance.

The German Government also attempted to introduce a road toll for cars using the Autobahn network, but its introduction has had to be postponed from 2016 as a result of a challenge by the European Commission on grounds of discrimination against foreign vehicles. This is because, while all cars would have been subject to an annual toll fee of €130, German vehicles would have received a €74 refund through a reduction in their vehicle licence fee. It is estimated that the toll would have yielded annual revenue of €500 million, which would have been used for road investment. The Commission instead favours distance-based user charges which better reflect user and polluter pay principles (BBC, 2015 & European Commission, 2015).

A second source of procuring road schemes is through the use of PPPs. VIFG has been charged with establishing a competence centre for PPP in transport and economic procurement. Three main models have been developed:

- **The A-Model**: under this, a private operator is charged with building, financing, operating and maintaining sections of motorways for a period of 30

years. In return, it receives a payment per user from the government – effectively a form of shadow toll.

- **The V-Model (V = Verfügbarkeit = availability)**: this is a PPP model where a private operator builds, finances and operates sections of motorways and is paid by a compensation based on defined levels of availability of the motorway section.
- **The F-Model**: under this model, the private operator not only builds, finances, and operates bridges, tunnels and multi-lane federal roads as part of a 30-year concession, but is given the right to charge road users – including light trucks and cars – a toll rather than receiving payment from VIFG. Toll rates are subject to authorisation.

The F-Model was adopted in 1994 as a means of building, operating and maintaining bridges, underpasses and tunnels. However, it appears to have had mixed success, both because bidders were concerned about taking on demand risk where forecasts turn out to be optimistic, and because road user charges have proved unpopular with road users. Debate continues about implementing further schemes using this model.

The first A-Model pilot projects were awarded in 2005 as a means of extending the capacity of motorways from four to six lanes. By 2012, seven A-Model pilot projects had either been awarded or completed, and tenders were expected for five other projects. The first four projects were carried out as pilot projects and subjected to an evaluation process. Some of these incorporate shadow tolls based upon numbers of vehicles using the new lanes, or upon availability charges. The latter are generally designed to optimise the availability of road space, with payments typically based upon the numbers of carriageway lanes open, by time of day, and other performance measures. Similar payment mechanisms were used for PPP schemes procured by the Highways Agency, the predecessor of Highways England.

An interim report appeared to show the economic viability of these projects to be higher than those based upon conventional procurement methods.

A second batch of projects followed these pilot schemes, and then a ‘new generation’ of PPP schemes was launched in April 2015 involving 600 km of motorways and investment of €7 billion. A full list of the A-Model and V-Model projects and their current status is set out in Table 3.1.

Table 3.1 A-Model and V-Model public–private partnership projects on German highways

	State	Road specification	Status as reported at December 2015
Pilot Projects			
1.	**Bavaria**	A8: AS Augsberg-West – AD München-Allach	Construction completed
2.	**Thuringia**	A4: State Border Hesse/Thuringia – AS Gotha	Construction completed
3.	**Lower Saxony**	A1: AD Buchholz – AK Bremen	Construction completed
4.	**Baden-Württemberg**	A5: Malsch – Offenburg	Construction completed
Second Phase of Projects			
5.	**Bavaria**	A8: AK Ulm-Elchingen – AD Augsburg-West	Construction completed
6.	**Thuringia**	A9: AS Lederhose – State border Thuringia/Bavaria	Construction completed
7.	**Schleswig-Holstein**	A7: AD Bordesholm – AD HH Northwest	Under construction
8.	**Bavaria**	A94 Forstinning – AS Marktl	In tender
9.	**Lower Saxony**	A7: AD Salzgitter – AS Göttingen	In tender
10.	**Baden-Württemberg**	A6:Wiesloch-Rauenberg – Weinsberg	In tender
11.	**North Rhine-Westphalia**	A1/A30: Münster – AK Lotte/Osnabrück – Rheine	In preparation
12.	**Hesse**	A44: Diemelstadt – Kassel-Süd	In preparation
13.	**Rhineland-Palatinate**	A61/A650/A65: Worms-Landesgrenze Rheinland – Pfalz/Baden-WürttembergA7: AD Salzgitter – AS Göttingen	In preparation
Third Phase: New Generation Projects			
14.	**Brandenburg**	A10/A24 (AS Neuruppin (A24) – AD Pankow/State Border BB (A10))	In tender
15.	**Bavaria**	A3 (AK Biebelried – AK Fürth/Erlangen)	In pipeline
16.	**Thuringia**	A4 (AS Gotha – State Border TH/SN)	In pipeline

	State	Road specification	Status as reported at December 2015
17.	**Baden Württemberg**	A6 (AK Weinsberg – AK Feuchtwangen/Crailsheim)	In pipeline
18.	**Bavaria**	A8 (Rosenheim – Federal Border D/A)	In pipeline
19.	**Hesse**	A49 (AK Kassel-West – A5)	In pipeline
20.	**North Rhine-Westphalia**	A57 (AK Köln/Nord – AK Moers)	In pipeline
21.	**Lower Saxony**	E233 (AS Meppen (A31) – AS Cloppenburg (A1))	In pipeline
22.	**Thuringia**	B247 (Bad Langensalza – A 38)	In pipeline
23.	**Schleswig-Holstein / Lower Saxony**	A20 (Elbquerung)	In pipeline
24.	**Lower Saxony / Hamburg**	A26 (Hamburg (A1) – Rübke (including Hafenquerspange))	In pipeline

Source: VIFG (2015: 9–11)

In general, there has been support for the use of PPP models – they are seen to be an efficient procurement method and by utilising private finance, they allow earlier implementation of projects than would be possible under conventional public funding, which is subject to budgetary constraints. This is different from the system which applies in the UK where, having regard to International Reporting Standards (IPRS), if the state retains control of the asset then the financing costs remain on the public accounts (HM Treasury, 2007a; 2007b). One reason for the difference could be that, as noted earlier, VIFG is not bound by public accounting rules.

It is also the case that in Germany, PPP concession operators receive HGV toll revenues as part of the funding mechanism – effectively a form of user funding. Lessons appear to be been learned from the different models which have been applied. The PPP model is also now being extended to some municipal and state roads, with pilot projects underway.

At the same time, there has also been some criticism of PPPs in Germany. A report by the German Federal Audit Office (BRH, short for Bundesrechnungshof) in 2014 criticised plans for motorway construction procured through PPP as set out by the Minister of Transport and Digital Infrastructure. The report finds that five out of the six motorways built using PPP arrangements have resulted in additional costs of almost €2 billion (World Highways, 2016).

3.4 Levels of investment in the network

In the past few years, there have been a number of reports commenting on the adequacy or otherwise of investment in Germany's transport infrastructure. A 2014 article in the Financial Times reported on concerns about the condition of parts of the German transport network caused by insufficient maintenance and repair (Jones, 2014). The roads in the far west of Germany were thought to be particularly bad. Figures from 2013 indicate that half the nation's bridges, 20% of motorways and 40% of federal roads were in need of repair.(*Source: Fedemac article, February 2016).*

Although investment in the country's transport network – both public and private – has been running at around €35 billion annually, the FT article argued that this needed to increase. It went on to note that, in a recent report, the International Monetary Fund called on the Government to boost spending on transport infrastructure by 0.5% of GDP – or €14 billion over the next four years. As shown in Figure 1.1, German spending on transport infrastructure as a share of GDP has been consistently lower than in both Spain and France since 2003 and has followed the same trajectory as the USA since 2005 – investing a lower or equal share of GDP to that of the UK.

DIW Berlin (the German Institute for Economic Research), a German think tank, had reported that, at state and municipal level, there had been an underspending on transport infrastructure of more than 40% over the period 2006–11, with an investment shortfall of almost €4 billion in the maintenance of transport infrastructure. Twenty percent of highways and 41% of major national roads had exceeded a 3.5 rating, which is considered to be a 'warning value' (Kunert & Link, 2013: 12, 14, 15).

While views on the scale of the problem vary, there is general agreement that more must be spent and that the maintenance backlog should be addressed. Government investment in infrastructure as a percentage of GDP is, at around 1.5% (Financier Worldwide, 2013), one of the lowest in Europe – second only to Spain – and very much lower than that of countries such as Japan and the USA (Jones, 2014).

In April 2015, the Expert Commission (2015) published a report on behalf of the Federal Minister for Economic Affairs and Energy with the title *Increasing Investment in Germany*. This was against the background of perceived weakness in the country's investment performance, with a three percentage point gap between Germany's investment level and the Organisation for Economic Co-operation and Development (OECD) average. The report noted that a central weakness had been insufficient maintenance of public infrastructure over recent decades.

The report by the Expert Commission contained a number of recommendations for improving public infrastructure, both at local and federal level, to ensure that the German transport system has appropriate capacity and functionality. In particular,

the Commission proposed establishing a public infrastructure company for federal trunk roads. The company would be responsible for construction, maintenance and management of the network, financed mainly from usage charges (but without putting additional burdens on car users) and have the capacity to borrow, without the need for government guarantees.

The authors of the report stress that there will be no privatisation of the federal network. The form of the infrastructure company is for consideration, although it is envisaged that the public sector should hold a majority stake.

The experience of other countries – Austria, France and Switzerland – regarding different organisational structures, will be reviewed as part of the process.

Further recommendations are proposed in the report related to the mobilisation of additional private finance. The report notes that the vast majority of infrastructure projects in Germany are delivered through conventional public-sector methods, under which the public sector bears nearly all the risks. However, under PPPs, some of the risks are transferred to private investors. The report goes on to propose two models for further examination. The first involves a public infrastructure fund administered by the federal and state governments. Private institutional investors would be able to invest in the fund at their own risk. The second involves a 'citizens' fund', in which individual savers would invest with the prospect of better returns than other investments, such as savings deposits. This model is seen as promoting citizen participation.

The 2016 Federal Transport Infrastructure Plan

In response to growing pressures, both internationally and domestically, the Federal Government announced, in March 2016, a Euros 264bn transport infrastructure plan (FTIP) for the period up to 2030. Around 70% of the funds will be for infrastructure maintenance and almost half will be allocated to the road network, with the remainder to railways (41%) and waterways (9%).

Capacity enhancement on the road network will focus on the removal of bottlenecks and strengthening major arteries and junctions (*Source: Federal Ministry of Transport & Digital Infrastructure)*. North Rhine Westphalia and Bavaria will, together receive almost one third of the funding. The plan represents a 50% increase in spending over the previous plan published in 2003 and it is claimed to be the biggest transport infrastructure plan (FTIP) seen in Germany.

The Federal Government have also announced plans to extend, from 2018, the HGV toll scheme to all federal highways, as part of their policy of extending the user pays principle and of moving away from funding infrastructure through general taxation. The plan will add some 40,000 km to the tolled road network and generate extra revenue of some Euros 2bn.

3.5 Conclusions

There is now general recognition of the problem of underinvestment in the national road network in Germany, which is part of a broader pattern in German infrastructure. The new FTIP, with planned investment in transport infrastructure of Euros 264bn in the period up to 2030 – representing a 50% increase in spending over the 2003 plan – is an attempt to address some of these problems.

However, the problems are not new. In the early years of this century, following the report by the Pallmann Commission, a number of new approaches to funding infrastructure were considered, leading to the setting up of VIFG, as a new transportation funding agency. Subsequent developments have seen the introduction of toll charges for HGVs which have recently been extended in scope to cover all vehicles over 7.5 tonnes, and of the use of PPPs under three alternative models.

The Pallmann Commission proposed a gradual transition from tax-financed to user-financed transport infrastructure, but apart from the extension of HGV tolls, this has been occurring relatively slowly in the case of roads. Road user charges are not popular with motorists and problems have been experienced with a number of privately-financed toll road schemes procured, under the F-Model of PPP where bidders are required to take on demand risk.

However, with the setting up of VIFG, a system now exists for handling payments from tolls and for channelling this into investment in federal roads – effectively a form of road fund. Moreover, unlike the situation in the UK, the public accounting treatment of PPP means that there are financial benefits from using this method of procurement for new schemes. PPP for highways are viewed as allowing earlier implementation of projects than would be possible with public funding – although there has also been some criticism on value-for-money grounds by the BRH.

Following the recent report of the Expert Commission, there is further interest in additional ways of mobilising private finance, and in the possibility of establishing a public infrastructure company with responsibility for construction, maintenance and management of federal trunk roads – which could have some parallels with Highways England.

A major question over the coming years is how far tolls can be extended to provide additional revenue capable of funding the backlog of underinvestment in the network and of accommodating forecast traffic growth. Following the launch of the new FTIP, in March 2016 the Federal Government announced its intention to extend HGV tolling to all federal highways from July 2018 – in a further move towards adoption of the user pays principle to transport infrastructure funding. (*Source: Federal Ministry of Transport & Digital Infrastructure)*. The next steps could see the toll on HGVs extended to cover light trucks in the range 3.5 to 7.5 tonnes and a new annual road user charge for car drivers, although its introduction has been postponed because of legal action by the European Commission on grounds of discrimination against

foreign drivers. Unlike tolls on the French autoroute network, the proposed user charge for car drivers using the autobahn network would be a standard annual charge unrelated to levels of usage.

Overall, there does now appear to be a strong commitment by the Federal Government to shift funding of the national road network away from general taxation towards the user pays principle.

4 Case Study: US and Californian Highways

4.1 US Federal Highways: background

The USA is the third-largest country in the world by land area and is also the third-largest in population terms (with 318.9 million inhabitants in 2014). It also has the longest road network of any country, comprising (in 2013) 6,623 million km (4,115 million miles) (Economist, 2016).

There has been a long history of road development in the USA dating back to the 1930s, when plans were first formulated for a national system of interstate and defence highways. A Bureau of Public Roads was first established and then, in 1944, the Federal-Aid Highway Act called for the designation of a 'National System of Interstate and Defense Highways' up to 40,000 miles in length. The network was to connect the main metropolitan areas, cities and industrial areas, with links also to Canada and Mexico.

However, the real start of the interstate system came about through the 1956 National Interstate and Defense Highways Act, which was championed by President Eisenhower after he saw, at first hand, the value of the German autobahn network, first for German and then Allied forces in the second world war.

Although Eisenhower originally wanted the system to be wholly federally funded, pressure from the states led to the federal government funding 90% and the states covered the remaining 10%. At the same time, a Highways Trust Fund (HTF) was established to provide a dedicated funding source, using revenues from federal fuel and vehicle taxes.

Construction of the interstate system continued over a period of 40 years, using funds distributed across states by the federal government, with the programme reaching completion in 2002. The total length of the system in 2014 ran to 47,662 miles (76,705 km), which includes some toll roads and other roads built without federal funding. However, it is worth noting that toll revenues can only be used to retire bonds or to fund operating and maintenance costs arising from the facility from which the toll revenues are generated.

At national level, the Federal Highway Administration (FHWA), established under the 1976 Federal-Aid Highway Act, has led the way in developing the highway network and funding major programmes for construction, maintenance and surfacing. However, because fuel taxes have not been increased since 1994, and as a result of vehicles becoming more fuel-efficient, the funding available from this source has declined in real terms. In recent years, attempts to augment the fund have become a source of political contention in Congress, with a series of short-term stopgap measures being implemented to prevent the federal government running out of funding for infrastructure projects.

This funding issue is playing out against a backdrop of deteriorating conditions in the country's transport infrastructure. Back in 2009, the FHWA reported that approximately 12% of the nation's road bridges were "structurally deficient" and 14.5% were "functionally obsolete". In its 2013 Report Card (ASCE, 2013a), the American Society of Civil Engineers estimates that 32% of America's major roads are in poor or mediocre condition, costing motorists who travel on these surfaces an estimated US$67 billion every year in extra repairs and operating costs.

In the case of California, 34% of its major roads are in poor condition and 11% of the state's bridges are structurally deficient (ASCE, 2013b). It is estimated that driving on roads which are in poor condition costs Californian motorists US$17 billion a year in extra vehicle repairs and operating costs.

Faced with these difficulties, California and a number of other states have taken steps to increase their transport budgets and make their programmes less susceptible to the vagaries of Congressional budgeting decisions. In 2015 there were a number of state transport funding initiatives aimed at improving roads and bridges, including increases in state fuel and sales taxes, and the issuing of highway bonds. The situation is made less difficult by the fall in fuel prices, which in turn makes it easier for states to increase local fuel taxes.

One effect of these developments at state level, over time, could be to align HTF expenditures more closely with revenues, and as a result make the Fund more sustainable.

The USA is ranked 14th in the 2015–16 WEF competitiveness rankings for the quality of its roads – one place below Germany (WEF, 2015a: 361). This represents an improvement on its position in 2010–11 when it was ranked 19th.

4.2 Highways in California

California is the most populous US state, with an estimated 38.4 million citizens. In economic terms, it is the world's eighth-largest economy. There are almost 33 million registered vehicles in California, 40% more than in Texas, the next highest state in terms of vehicle numbers.

The California Department of Transportation (Caltrans) has responsibility for planning, operating and maintaining the State Highway System (SHS), which comprises interstate freeways ('controlled access' routes) and state routes.

The total length of the public road network in California in 2013 was 174,989 miles which was made up as follows:

- interstate: 2,451 miles;
- other principal and minor arterials: 30,002 miles;
- major and minor collectors: 32,223 miles; and
- local roads: 110,313 miles.

Of the total, 15,104 miles are owned by the state highway agency, Caltrans. A further 15,018 miles in parks, forests and reservations are owned by federal agencies. The remaining roads are operated and maintained by a mix of regional agencies and local government.

California drivers travel 330 billion vehicle-miles each year on the state roads, the highest of all the states and more than Florida and New York drivers combined (Brown, 2015: 8). Table 4.1 compares highway vehicle-miles travelled (VMT) in 2013 for the six states with the highest VMT scores – in ranked order, also showing the per-capita VMT- for which California appears lower down in the rankings.

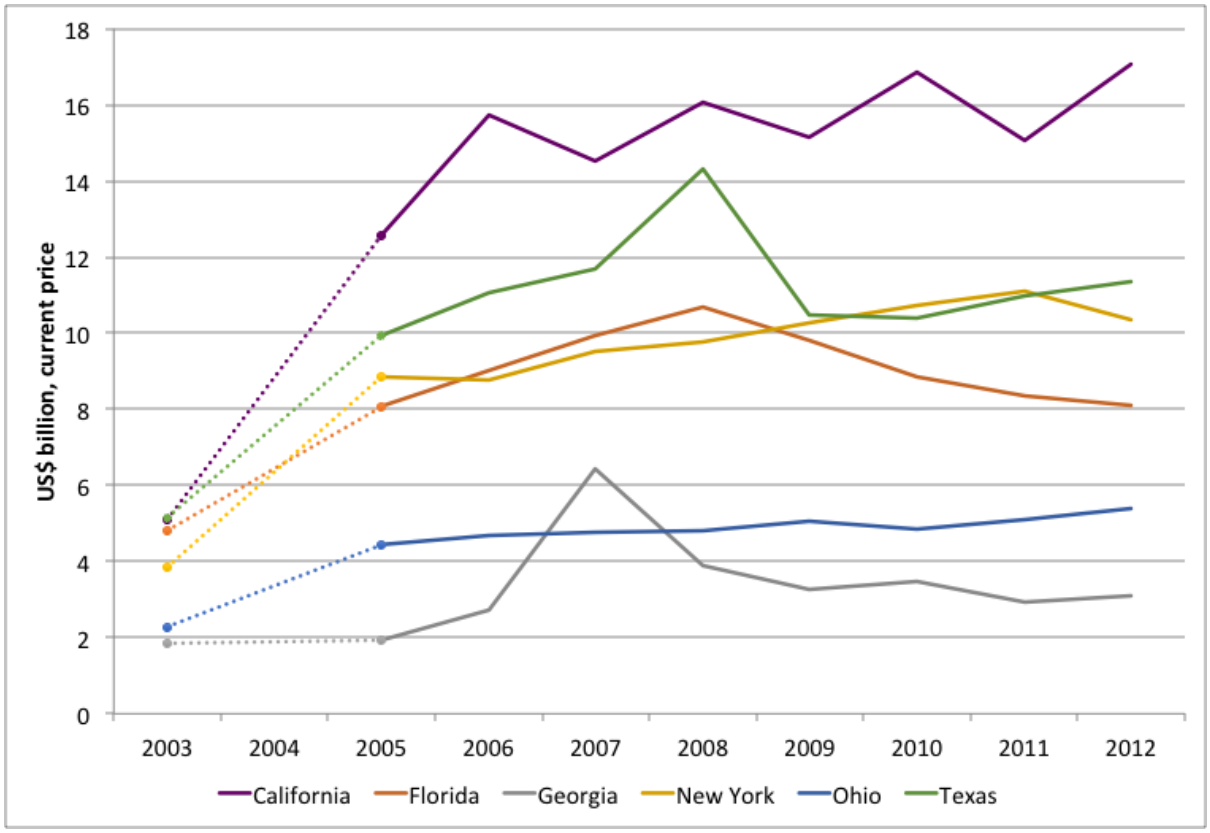
Table 4.1 Highway vehicle-miles travelled (VMT) (2013)

State	Total VMT (millions)	Ranking Total VMT (millions)	Estimated population	VMT per capita	Ranking VMT per capita
California	329,534	1st	38,431,393	8,575	5th
Texas	244,525	2nd	26,505,637	9,225	4th
Florida	192,702	3rd	19,600,311	9,832	2nd
New York	129,737	4th	19,695,680	6,587	6th
Ohio	112,767	5th	11,572,005	9,745	3rd
Georgia	109,355	6th	9,994,759	10,941	1st

Source: US Department of Transportation (2015b)

Figure 4.1 compares trends in highway transport expenditures across these six states from 2005 to 2012, and shows California as having the highest rate of spend, on an upward trend, and at values that exceed those in Texas- even though Texas has a considerably more extensive road network (see Table 1.3).

Figure 4.1 Highway transport expenditures in six US states (2003–2012)



Source: www.rita.dot.gov/bts/publications/state_transportation_statistics

Note: (a) No data available for 2004.

4.2.1 Background

The development of the current highway network in California generally follows the pattern seen across the USA. The building of freeways and expressways was started in the 1940s, followed by the rolling out of the national system of interstate highways from the 1950s.

At state level, the California Department of Transportation has responsibility for planning and funding the operations and maintenance of its roadways, together with rail and public transport schemes. It was renamed Caltrans in the 1970s to reflect its wider responsibilities. In the 1990s, Caltrans began to focus on more efficient use of highways and their integration with other transport modes. It is also works in partnership with the FHWA and the Federal Transit Administration (FTA).

Caltrans is responsible for planning, designing and constructing the SHS to meet the needs of road users. Metropolitan Planning Organizations, regional transport agencies and local government retain responsibility for regional and local roads.

The transport system in California receives funding from a variety of sources. In 2015/16, an estimated US$28 billion of funding will come from various levels of government. Regional and local governments provide **half** of the state's transport

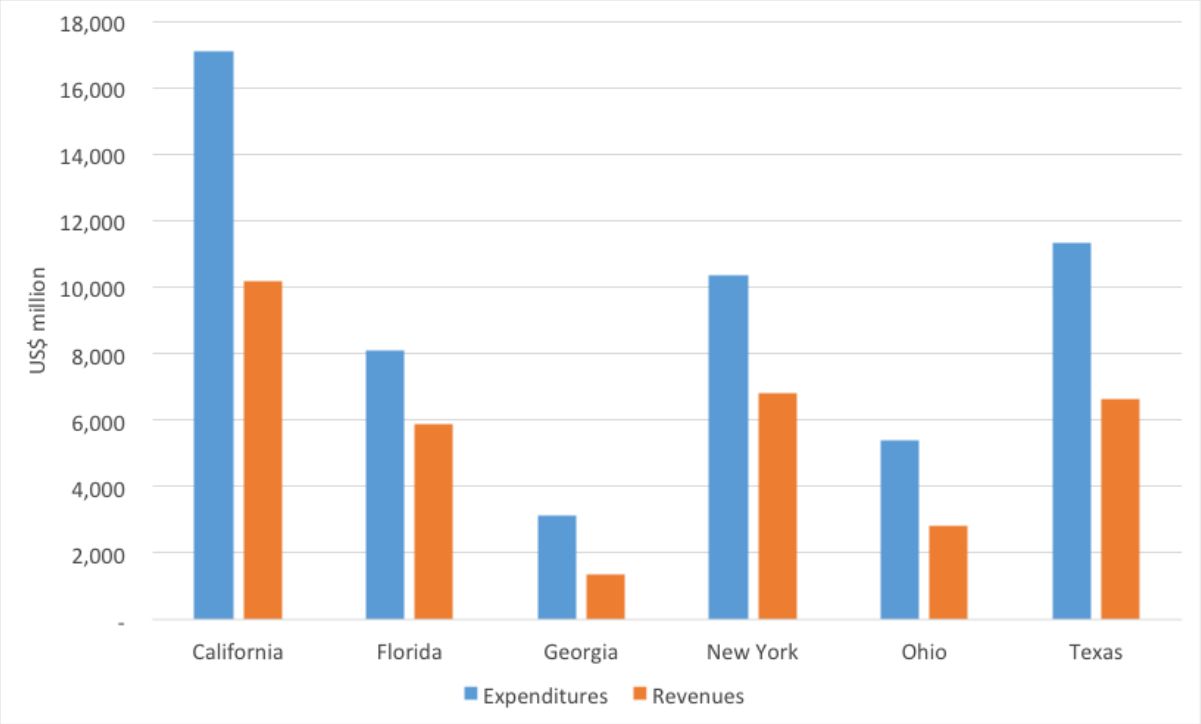
funding – this is derived from local sales taxes, public transport fares and property taxes. Approximately **one quarter** of the funding comes from federal government and is based on federal taxes on diesel and petrol ('gasoline' in the USA). The remaining **quarter** comes from state government and is supported by various state revenues, but mainly by taxes on petrol and diesel, and vehicle weight fees (Legislative Analyst's Office, 2015).

Around 60% of the total funding is used to support local public transport systems and to rehabilitate and maintain local roads.

Fuel taxes include federal and state elements. For gasoline tax, there is the base federal excise tax of 18.4 cents/gallon which has been unchanged since 1994; a state-based excise tax of 18 cents/gallon (also unchanged since 1994); and a price-based excise tax of 12 cents/gallon. All figures are for 2015/16 (Caltrans, 2015).

Figure 4.2 and Table 4.2 compare highway expenditures and revenues across the six states. For California, 40% of highway expenditure was not met by revenues in 2012 – a similar percentage to Texas but lower than that of Georgia.

Figure 4.2 Highways expenditures and revenues by state and local government for six states (2012)



Source: US Department of Transportation (2015c, 2015d)

Table 4.2 Highways expenditures and revenues by state and local government for six states (2012)

State	Expenditures	Revenues	Shortfall (%)
California	17,080	10,176	40.4%
Florida	8,110	5,887	27.4%
Georgia	3,110	1,368	56.0%
New York	10,368	6,799	34.4%
Ohio	5,409	2,834	47.6%
Texas	11,348	6,631	41.6%

Source: US Department of Transportation (2015c, 2015d)

The transport funding arrangements in California – and other US states – are complex by European standards, but what is evident is that the proceeds of both state and federal fuel taxes are used for transport funding. By contrast, in the UK, the proposed road fund will comprise only revenues from vehicle excise tax. The much larger fuel duty receipts – £27 billion – are part of general taxation revenues and not earmarked for roads or transport investment.

4.2.2 Infrastructure planning

As in other parts of the USA, much of the SHS in California was built in the 1960s and 1970s. The population has continued to grow, and with it the VMT on the network. At the same time, the increase in international trade has led to a substantial growth in use of the network by trucks (HGVs)

Taken together with funding constraints, this has led to a deferred maintenance backlog. Caltrans' annual budget allows US$2 billion for repair and preservation work on the SHS, based upon revenues from gasoline tax, but this is recognised as falling well below the estimated US$8 billion annual spending that is needed[2].

The state produces Five-Year Infrastructure Plans to address needs across all types of infrastructure. Although the 2015 Plan places increased priority on addressing maintenance backlogs across all asset categories, including schools and colleges, the vast majority of funding – over 90% – is for the state's transportation system. Currently, on the highway network, it is estimated that 564 bridges are in a distressed condition and that others do not meet modern standards for weight, clearance or seismic safety. The Sacramento Transportation Authority has argued that California should follow 11 other states which, since 2013, have adopted new user-based charging to address their transport needs.

Against this background, in September 2015, Governor Brown announced a Transportation Funding Plan which would provide an estimated US$36 billion in funding over the next decade, with the emphasis on repairing and maintaining the

[2] Sacramento Transportation Authority statement, July 2015

state's existing transport infrastructure and also on repaying outstanding loans. Of the total package, US$16 billion would be used for highway repairs and maintenance and US$13.5 billion for local roads.

The aim is that, within ten years, 90% of roadways will be brought up to 'good condition'. Caltrans would be required to report annually to the California Transportation Commission on progress in meeting performance targets (Brown, 2015: 1).

The investment would cover both state and local schemes. State investments include highway and bridge repairs, and improvements to freight corridors. Local investments include road repairs and additional funding for public transport and rail services. A number of reforms were also proposed, including the extension of public–private partnerships (abbreviated in this context to 'P3').

Funding for the programme would come from a new US$65 annual road improvement charge for all vehicles, plus increases in fuel tax – a 6% increase per gallon for petrol and an 11% increase for diesel. Although the Transportation Funding Plan has received strong support, it has to be approved by the state legislature. Elements of the programme were included in the Governor's 2016/17 transportation budget.

These developments are very much in line with what we are seeing in other parts of the USA, with many states taking steps to increase their transport budgets and put them on a more stable and predictable footing. The American Road & Transportation Builders Association reported in May 2015 that 25 states had enacted transport funding legislation, with a further 16 in the process of doing so. Details by state were set out in a submission to the House Committee on Ways and Means and the Senate Committee on Finance in connection with hearings in June 2015 on Long-Term Financing of the Highway Trust Fund.

The longer-term aim is to align HTF expenditures with income from road users through gasoline and road taxes. There is general recognition of the need to address the substantial backlog of deferred maintenance expenditure on the nation's core transport infrastructure.

4.2.3 Other developments: public–private partnerships (P3s)

The backlog of deferred maintenance expenditure in California has been growing for many years. However, it has led to some innovative solutions. One such case has been that of Presidio Parkway, the Doyle Drive replacement project linking the Golden Gate Bridge with the city of San Francisco.

Doyle Drive is a section of Route 101 which winds 1.5 miles along the northern edge of San Francisco, connecting the San Francisco Peninsula to the Golden Gate Bridge and the North Bay. It was built in 1936 (as one of Franklin D. Roosevelt's New Deal projects) but, after 75 years, had reached the end of its useful life. It was

viewed in 2009 as structurally and seismically deficient (Presidio Parkway, 2015; undated).

In 1993, *USA Today* reported that the elevated Doyle Drive, with its narrow lanes and lack of barriers between opposing traffic flows – was the fifth most dangerous bridge in the USA[3]. Following extensive consultation, the design for Presidio Parkway was agreed in 2009, and US$122 million in federal stimulus funding from the American Recovery and Reinvestment Act of 2009 allowed construction to begin (SFCTA, 2016).

Work on **Phase I** of the project was started in 2008, with construction being completed in 2012. It was delivered through a traditional design–bid–build model. It involved replacement of a bridge on Highway 1 north of the MacArthur tunnel, and construction of a new southbound viaduct along Highway 101 and a new southbound Battery Tunnel.

Phase II, which involved construction of a northbound High Viaduct and Battery Tunnel, the Main Post Tunnels, and new interchanges, was delivered through the state's first P3 under the new Senate Bill – SBX2 4 – legislation for a design-build demonstration program. The developer, Golden Link Concessionaire, was chosen to design, build, finance, operate and maintain under a 30-year concession. The rationale for adopting the P3 model was to reduce costs, in part by the transfer of risks of cost overruns to the concession operator, as well as to free up state funding for other uses. P3 in the USA would appear to have the advantage of off-balance-sheet financing.

The new Doyle Drive was officially opened to traffic in July 2015, and is due for project completion in 2016. The total capital cost of the project is US$857 million – with US$496.3 million for Phase I and US$360.5 million for Phase II.

Funding for the $496m costs of Phase 1 came from a mix of federal grants and funding under the American Recovery and Reinvestment Act; from state programmes, local partnerships and sales taxes and also bridge tolls.

Funds for Phase 2 also come from a mix of federal, state and metropolitan transportation authority sources. These have been used to make a single 'milestone payment' of $185m to the concessionaire upon project completion and an annual payment of $91m to defray costs of a federal loan. The operator will also receive annual availability payments over the 30 year concession.

The overall scheme has been a collaborative effort led by Caltrans, the San Francisco County Transportation Authority and the FHWA with federal funds contributing to the costs.

[3] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.183.3717&rep=rep1&type=pdf

The on-time delivery of the project (in particular Phase II) has been seen as a success, and it remains to be seen how far use of the P3 model will be extended to other major schemes. Certainly, Governor Brown's Transportation Funding Plan envisages the wider use of P3.

4.2.4 Toll roads

Provision for private toll roads in California goes back to a 1989 statute that allowed Caltrans to enter into agreements with private operators for the development, construction and operation of four demonstration schemes "at private sector expense without the use of state funds".

The first of these was State Route 91 in Orange County, a ten-mile, four-lane toll facility opened in December 1995 and added within the median of an existing eight-lane freeway originally opened in 1968. It was America's first toll road to have variable congestion pricing according to time of day and traffic volumes. It was also the world's first fully automated toll road using electronic transponders to collect tolls. Drivers are given the option of choosing between less-congested tolled Express Lanes or, avoiding a toll charge by using the original freeway.

The project was developed in partnership between Caltrans and California Private Transportation Company (CPTC), a private consortium including a major French toll road operator (Cofiroute). Before opening, CPTC transferred ownership of the facility to the State of California, which then leased it back to CPTC for a 35-year operating period.

In 2002, the Orange County Transportation Authority purchased the toll road from CPTC. This was to give it the freedom to further expand the roadways to accommodate traffic growth from new development in the Riverside area – something it was unable to do under the terms of the PPP contract with CPTC.

Another more recent toll road is the ten-mile long South Bay Expressway (part of SR125, the State Route 125 highway), which opened in November 2007. Tolls are collected by means of FasTrak electronic transponders mounted in vehicles.

Two other proposed schemes – State Route 57 in Orange County and Mid-State Tollway in Alameda and Contra Costa Counties – were abandoned; in the latter instance due to political opposition.

Currently, the largest network of toll roads in California is in Orange County, comprising 51 miles and making up 20% of the County's highway system. Orange County argues that toll roads are better for everyone, since they relieve commuter traffic on congested freeways and arterial roads.

It remains to be seen whether Governor Brown's new Transportation Funding Plan will provide a renewed impetus to the construction of toll roads.

4.2.5 High-occupancy vehicle lanes

A further feature of the Californian SHS has been the development of high-occupancy vehicle (HOV) lanes, together with high-occupancy toll (HOT) lanes or Express Lanes. HOV lanes are designed to encourage motorists to double up or carpool by providing a dedicated fast lane, whereas HOT lanes provide free-flowing conditions to those who pay the toll.

The original HOV lane network has, over the years, become more congested and this has led Caltrans to explore a number of options. These include raising the occupancy requirements of vehicles using these lanes from two to three persons (from HOV2+ to HOV3+) and the conversion of HOV lanes into HOT lanes.

There have been a number of conversions to HOT lanes from HOV lanes in California – part of a wider pattern across the USA, including states such as Florida, Georgia, Texas and Washington. The advantages of converting HOV lanes to HOT lanes are that they generate a new source of revenue and provide a means of reducing congestion on parts of the network.

In California, it falls to Caltrans to approve proposals from regional and municipal authorities for new HOV and HOT lanes.

4.2.6 Conclusions

As in other US states, in California transport funding initiatives are being put forward to address a serious backlog of deferred maintenance spending on the highway network and to facilitate the development of new highway capacity. The most recent of these involves proposals from Governor Brown for an increase in state gasoline tax and an annual registration fee for vehicle owners to fund improvements in California's transport system.

We have recently seen near-completion of the state's first P3 road scheme under the SBX2 4 legislation – Phase II of Presidio Parkway – which is the first scheme to be built under the Senate Bill X2 4 legislation for a design-build demonstration program. The scheme appears to have been both innovative and successful. California also has a history of toll roads – although their scope appears to be limited – together with the use of HOV lanes, more of which are now being converted to HOT lanes.

Caltrans, as the state transport authority, oversees multimodal transport within the state and also works in partnership with federal authorities – including the FHWA. Governor Brown's Transportation Funding Plan envisages investment of US$36 billion over the decade up to 2025/26, covering both local and state networks.

5 A Comparative Assessment: What We Can Learn

The principal themes emerging from this comparative study are as follows:

- addressing historic underspending on infrastructure maintenance and renewal;
- the use of dedicated road or trust funds as a source of funding road infrastructure;
- the role of private finance, including public–private partnerships (PPPs), in meeting investment challenges;
- other innovative approaches to private finance;
- the challenges of moving from tax-financed to user-financed infrastructure, with the extension of user charging and tolls;
- the role of user charging and tolls across different countries and states;
- infrastructure planning and a long-term perspective; and
- the need for an effective regulatory system for private concessions.

Each of these themes is now discussed.

5.1 Addressing the problems of past underinvestment

The road reforms seen in England come at a time of major change in two of the countries studied. In both Germany and California (and the USA more generally) action is being taken to tackle the problems of past underinvestment in the road network, reflected in the condition of roads and bridges. In California, for example, 34% of its major roads are assessed as being structurally deficient, as are 11% of its bridges (ASCE, 2013b).

In both California (as well as other US states) and in Germany, there appears to be a determination to tackle the problems of historic underinvestment in the road and transport networks through a combination of additional motoring taxes and tolls, PPPs and other initiatives.

In Germany, there have been calls for government to boost spending on transport infrastructure which, as a percentage of GDP, is among the lowest in Europe. The new Euros 264bn Federal Transport Infrastructure Plan announced in March 2016 represents an attempt to address some of the maintenance backlogs. In 2015, the report of the Expert Commission proposed the establishment of a public infrastructure company for federal trunk roads, for the construction, maintenance and management of the federal network – with responsibilities comparable to those of Highways England. Hitherto, it is the states who have managed these roads on behalf of the Federal Government.

In California, Governor Brown has announced a Transportation Funding Plan (Brown, 2015) to provide an estimated US$36 billion in funding over the next decade for repairing and maintaining the state's transport infrastructure (including public

transport services). The aim is to bring 90% of roadways up to 'good' condition within ten years. It is proposed that funding for the programme would come from a new annual road improvement charge for vehicle owners, plus increases in fuel tax. These developments follow a similar pattern to other US states and are a consequence of the decline in federal funding.

While much of the emphasis in Germany and California is on making good a large maintenance backlog and making bridges and infrastructure sound, for Highways England, the focus is more on extending the capacity and capability of the existing strategic road network. This expansion is to be carried out through a £15 billion programme of schemes up to 2019/20, comprising developments such as 'smart motorways' and expressways. Where the experience of Germany and California in relation to maintenance backlogs has more resonance is in relation to regional and local roads in England (and the UK), which make up 97% of the network by length and which do not have a dedicated funding source and where potholes are a growing problem.

5.2 The use of dedicated road funds

At the heart of this debate over financing is the question of a dedicated road fund. The 1950s saw the establishment in the USA of a Highways Trust Fund (HTF) using revenues from fuel and vehicle taxes to fund development of the interstate highway network. However, federal fuel taxes have remained unchanged since 1994. The challenge now is to put the fund on a more sustainable basis, aligning revenues more closely with spending needs. State initiatives to increase fuel and sales taxes could have the effect of bringing this about over time.

In France, a dedicated road fund was established back in 1955 when provision was also made for toll financing of motorways. Fees and taxes paid by motorway concession companies are now put into a specialist transport infrastructure financing body – the French Transport Infrastructure Financing Agency (AFITF).

In Germany, revenues collected through tolls, most notably through the heavy goods vehicle (HGV) toll charge, are reinvested in the network through the Association for Transport Infrastructure Financing (VIFG), a funding agency. The revenues from the HGV toll are substantial – a net figure of Euros 3,2bn in 2012 since increased by an estimated Euros 300m from extension to all vehicles over 7.5 tonnes. This will be further increased by an estimated Euros 2bn from 2018 when the HGV toll is extended to all federal highways. These figures compare with the much smaller yield of less than £200m from the UK HGV toll in its first year (2014/15).

In the UK, the Chancellor announced in the 2015 Summer Budget the reinstatement of a dedicated road fund in the UK for the first time since the 1930s, together with reforms to motoring taxation, whereby cars first registered from 1 April 2017 will be charged VED according to the carbon dioxide (CO_2) emissions of the vehicle in the first year, with a flat Standard Rate of £140 applying in all subsequent years – except

for zero-emission cars which will see no charge. All cars registered before 1 April 2017 will remain in the current VED system which is based on CO_2 bands. The money raised will go into a ring-fenced road fund, with the proceeds in England being used for Highways England.

The new road fund in the UK is to be based upon proceeds from VED, effectively a form of access charge for use of the network. In contrast, in California, it is fuel duties which provide the major source of revenue to fund maintenance and improvement of state – as well as local – transport infrastructure and these relate to levels of usage of the network. Governor Brown's proposals for a new road improvement charge and increases in fuel taxes are a logical extension of this approach. In the UK, fuel duties are treated as part of general tax revenue and not earmarked specifically for investment in roads or transport.

The new road fund in the UK can be seen as an important step, given that the Treasury has generally resisted the idea of hypothecated taxes. However, the yield of VED in 2014 was £6.1 billion compared with the much larger sum of £27 billion raised from fuel duty. It is also unclear whether there will be a specialist agency for distributing the road fund proceeds and also whether revenues from the HGV levy will constitute part of the fund.

The current proposals for a road fund in the UK will formalise a form of access charge for use of the network. The system in California, based on fuel taxes, is more a form of usage charge related to miles travelled, as is the HGV levy in German which is also distance related.

5.3 The use of private finance

A strong theme that emerges from both Germany and California is the mobilisation of additional sources of private finance. In Germany, there is keen interest in the use of PPPs, with three models being tried, one of which involves the use of road user charges (tolls). Similarly, in California, part of a major new road scheme linking the Golden Gate Bridge with the city of San Francisco, replacing 80-year-old life-expired infrastructure, has been delivered using a P3 (PPP) model, and the Transportation Funding Plan envisages the extension of this model to other schemes.

In both Germany and California, the use of PPPs is generally viewed as an effective means of procurement, both on value-for-money grounds and because it allows earlier implementation of schemes than is possible with conventional state funding. In Germany, the infrastructure financing body (VIFG) has established a competence centre for PPP in transport and economic procurement.

What is most striking in this regard, is the contrast between the three countries studied compared with the UK – and specifically England – where the major investment programme now being undertaken by Highways England is being funded

entirely by conventional public-sector methods, in much the same way as it would have been in the 1970s.

This raises two main questions:

- Why, in the context of a major programme of investment in the strategic road network in England, has the PPP model, which was traditionally used for around 25% of schemes by value undertaken by the former Highways Agency, now been abandoned?
- Why, in these other countries, does private finance through PPP appear to be treated as 'off-balance-sheet', while in the UK, under the Treasury's interpretation of International Financial Reporting Standards (where, through the concession contract, the government retains ultimate control of the infrastructure asset) the investment remains on the government's balance sheet and therefore does not allow the potential financial benefits of PPP to accrue?

It would be interesting to compare these accounting rules with those applied by the German transportation infrastructure financing agency (VIFG), with its established competence centre for PPP transport procurement, and the recent launch of a new generation of PPP road schemes.

In the context of the current scale of investment proposed under the Roads Investment Strategy, together with major upgrades for rail, and High Speed 2, one has to question whether reliance upon traditional public sector funding is sustainable. One of the clear messages that comes from these case studies is that other countries have recognised the need for more user-funded infrastructure investment, through the extension of distance-based user charges and the use of tax revenues from road users to fund improvements.

5.4 Innovative approaches to private finance

In France, specialist financial support is available to concession operators through the Caisse Nationale des Autoroutes (CNA), a public body which is able to borrow at favourable rates on the bond market, and also to draw on funds from the European Investment Bank.

In Germany, we see an arm's-length transport infrastructure funding agency (VIFG) to facilitate the construction and operation of motorway and transport infrastructure on behalf of the Federal Government. It is through the VIFG that revenues from the HGV toll are invested in the road network.

VIFG also has a strong commitment to developing PPP models for procuring highway projects. Three PPP models are currently being used and tested in Germany, and the recent Expert Commission report *Increasing Investment in Germany* has proposed two further financing models – an infrastructure fund

administered by federal and state governments into which private institutional investors would be able to invest at their own risk, and a ‘citizens’ fund’ which provides opportunities for individual savers to invest in infrastructure schemes.

5.5 Moving from tax-financed to user-financed infrastructure

In Germany, it was the Pallmann Commission which set out the three principles of:

- a gradual transition from tax-financed to user-financed infrastructure;
- the introduction of distance-related user charges and HGV tolls; and
- the ring-fencing of revenues collected through tolls to be used for road investment.

Progress has since been made in extending charges for HGVs and, from 2011, utilising all the revenues for road investment. However, a proposal to introduce a new annual road user charge or toll for cars using the autobahn network has been stalled because of a challenge by the European Commission on grounds of discrimination against foreign drivers. Nevertheless, there appears to be a strong commitment by the Federal Government to shift increasingly towards funding based upon the user pays principle.

In France, much of the motorway network has been built and financed through toll revenues under concession contracts, thereby minimising the need for direct contributions from government funds. An HGV levy has also now been introduced for vehicles using national roads which are not operated as concession contracts with tolls.

In California, as in other US states, the proceeds of federal and state fuel taxes from petrol and diesel are used for transport funding.

In the UK, the HGV levy was introduced in 2014 for vehicles at or above 12 tonnes in weight, which in its first year raised £192 million in receipts, £47 million of which came from foreign-registered vehicles. For UK-registered vehicles, VED was reduced by a similar amount, with the result that the net increase in revenues was much smaller. The yield of the HGV levy in the UK is a small fraction of that raised by the equivalent HGV levy in Germany. There also seems little appetite at present to extend user charges more generally.

It was in March 2012 that the then Prime Minister, David Cameron, in a speech on infrastructure at the Institute of Civil Engineers, called for innovative approaches to the funding of our national roads to enable investment to be increased, and congestion thereby reduced. He went on to contrast the position of other infrastructure, such as water (which is funded by the private sector) with roads, which rely on public finances. It is this key element which appears to be missing from the major reform programme for roads that we have seen implemented since then, and the feature which most differentiates us from the approach being taken in the three countries studied.

Although the Highways England model of a government-owned company might evolve over time to allow a role for private finance, with something like a conventional RAB- -regulatory asset base- utility model, there are a number of hurdles to be overcome in terms of accounting rules.

5.6 User charges and tolls

By way of contrast, in France, the development of the motorway (autoroute) network since the 1950s has involved private finance, through tolls, initially with regional operators in which the state was a major shareholder, through to full privatisation in 2005. Shares in these companies (SEMCAs, Sociétés d'Economie Mixte Concessionnaires d'Autoroutes) were sold, with proceeds channelled through AFITF.

The concession model has similarities to that for privatised utilities in the UK, with five-year contracts which set out the improvements to be made and specify service levels.

In contrast, a more cautious approach to tolls has been taken in both Germany and California. In Germany, the main recent development in usage charges has involved an HGV toll for users of the autobahn network, recently extended to all vehicles over 7.5 tonnes in weight, with the proceeds being used, for both capital projects and road maintenance. It is now planned to extend from 2018 this to cover all federal highways. The proposal for an annual road toll for motorists using the autobahn network remains on hold, pending a decision by the EU Commission. In relation to conventional tolls, difficulties have been encountered in progressing road schemes using the F- Model version of PPP under which road user charges are extended to all vehicles.

In California, although provision for private toll roads was allowed under a 1989 statute, the extent of the private toll road network appears to be limited and largely concentrated in Orange County, which currently has a toll road network comprising 51 miles.

Where California – along with other US states – has been more innovative has been in applying the concept of high-occupancy vehicle (HOV) lanes, many of which are now being converted to high-occupancy toll (HOT) lanes as the HOV network has become more congested over the years. In England, a version of the HOV lane concept was tried, unsuccessfully, on the M4 some years ago.

5.7 Long-term infrastructure planning

All three countries have well-developed systems of transport infrastructure planning, and also, in the case of France, five-year contracts with motorway concession operators.

However, one feature that emerges from this study is the long time horizon needed to develop national road networks. France started on its programme of toll-financed

motorways back in the mid-1950s and, in the USA, the system of interstate highways was rolled out over a period of 40 years, largely through funds provided by the federal government using the HTF. Germany also has a long history of federal 'masterplans' and currently runs a system of 15 year Federal Transport Infrastructure Plans (FTIPs) covering roads, railways and waterways.

Indeed, a common feature of transport planning in all three case studies is a multi-modal approach with account taken of the roles played by different modes.

The national network in the UK has been rolled out in a more piecemeal way, and only now, for the first time, do we have a 5 year Road Investment Strategy for the strategic network in England. In part that may be explained by our much smaller geography, but, more generally, we have not seen a long-term strategic joined-up approach to the development of our transport infrastructure networks.

Nor, with the exception of devolved administrations and some city regions, do we in the UK have strong regional bodies with responsibility for major parts of the national network. In Germany, the states have responsibility for planning, operation and construction of federal roads on behalf of the Federal Government. In California, while Caltrans has overall responsibility for planning, designing and constructing the State Highway System, metropolitan and regional transport agencies also play an important role.

The same is true in France, where the state maintains and manages, through regional agencies, those national roads which are not the subject of concessions and other roads are the responsibility of *départements* and municipalities, which are able to levy local taxes, including those on motor vehicles.

Our structure of government in the UK is much more centralised. Local authorities, with responsibility for regional and local roads, which constitute the vast majority of the network by length, receive none of the proceeds from either VED or fuel taxes. Most of their central government funding is also general in nature, for the purpose of financing all local authority services, although some specific funding has, in recent years, been available for pothole repairs and improving 'pinchpoints'.

Our local authorities, with their granular structure, have also lacked the borrowing powers available to larger regional authorities in the countries studied in this report.

5.8 Regulation of private concession operators

The French model of motorway concessions has recently come in for criticism from the French Competition Authority on account of the profits of the concession companies and their ability to exploit their monopoly position. Following negotiations with the Government, this has led to concession operators agreeing to fund a €3.2 billion plan for upgrading the network in return for three-year extensions to their contracts.

At the same time, the French Government has set up a new regulatory authority, ARAFER, to strengthen the monitoring of concession contracts. It has responsibility for regulating tolls and the procedures in place for awarding contracts.

In England, as part of the reforms involved in setting up Highways England, the remit of the rail regulator has been extended to monitor the performance of Highways England and the consumer body – Transport Focus – has a new 'watchdog role' on behalf of road users. These are positive developments, which lead to a more effective relationship between the road infrastructure provider and road users. This could potentially provide a model for other countries to follow.

5.9 Conclusions

While the individual circumstances vary, there are aspects of the developments taking place in Germany and California, as well as from the experience of France, which are relevant in the context of the reforms taking place in England and the UK.

The importance of investment in transport infrastructure is increasingly recognised – with measures being taken in Germany and California (and the US, more generally) to address maintenance backlogs and the problems of 'creaking infrastructure' and for further investment in the French autoroute network taking place through amending concession contracts. In the UK, we see a growing emphasis on infrastructure investment with the establishment of the National Infrastructure Commission.

Linked to this, is recognition of the importance of long-term infrastructure plans – with a long history of national infrastructure plans in France and Federal Transport Infrastructure Plans in Germany, with a 15 year horizon. In California, the regime of Five Year Infrastructure Plans in California is now being extended to 10 years under Governor Brown's 2015 transportation plan.

In England, Highways England operates within the framework of its first 5 year Roads Investment Strategy for the strategic network with planned investment of £15bn up to 2020 – parallel to the 5 year High Level Output Statement for the rail network. At the same time, with major schemes such as Crossrail 2 and HS2 there is growing recognition of the need for longer-term strategic planning of our transport networks.

In both Germany and California, governments are keen to raise more from users to fund the necessary increases in infrastructure investment, and to rely less upon general taxation. This contrasts with the situation in the UK, where major investment programmes for road and rail investment are being financed through conventional government funding, from general taxation.

In Germany, with the extension of user charging for HGVs and potentially car drivers, a major source of ring-fenced funding for road investment has been established. In California, where federal and state fuel taxes, and other vehicle

taxes, are all used for transportation funding, Governor Brown has proposed an increase in gas and diesel taxes, as well as a new annual 'road improvement charge' for vehicle owners.

The principle of a dedicated Highway Trust Fund was established in the US in the 1950s as a means of financing development of the interstate highways system. Although the principle of road funds is well established in all three countries studied in this report, it takes different forms. In Germany, the HGV toll charge first introduced in 2005, and since extended in scope, is based upon vehicle characteristics (including emissions) and kilometres driven. A Government proposal for introducing an annual charge for users of the autobahn network and major roads is currently stalled following legal action by the European Commission.

In California, the main form of taxation for road users is via state and federal gas and diesel (fuel) duties which are based upon use of the network as well as vehicle characteristics. The proceeds are all used for transportation spending. In France, the distinctive feature is user tolls paid for use of the autoroute network, which have been used to fund expansion of the network.

In the UK, we now have the prospect of our own Road Fund based upon annual proceeds from vehicle excise duties (some £6n) but fuel duties – by far the largest component of motoring taxation – will continue to be treated as part of general tax revenue. The proceeds of the HGV levy in the UK are relatively small (£192m in its first year) because of offsetting changes made to VED for UK registered HGVs. It is also unclear whether the proceeds will form part of the road fund.

While we observe a general trend in Germany and California towards more reliance upon user charges, this is taking the form of general charges for use of the network, rather than route tolling of the kind we see in France. The principle of motorway tolling seems much more acceptable in France than in the other countries studied.

The other major difference from the UK in both Germany and California is the perceived attractions of PPP or P3. This method of procurement is seen as a way of taking schemes forward more quickly, by overcoming public expenditure constraints. There are also a variety of payment mechanisms that can be uses for concessionaires under these arrangements, including shadow tolls and availability charges. While we have had extensive experience of PPP procurement for road schemes under the Highways Agency, it is surprising that, in the context of the current RIS, this method of procurement appears to have been abandoned.

The UK accounting treatment for PPP arrangements appears to remove any financial gain to the public sector, but there remain issues concerning value for money and the use of incentive mechanisms under DBFO (design, build, finance and operate) concession arrangements. It is unclear why PPP (and P3) is viewed as a more attractive option for financing road schemes outside the UK – this raises

questions about what we might learn from the experience of PPP procurement for road schemes in Germany and California.

Another feature in both France and Germany is the use of dedicated funding agencies. In France, the Caisse Nationale des Autoroutes (CAN) was set up specifically to facilitate the financing of motorway construction by raising bond finance on behalf of concession operators, as well as drawing on funds from the European Investment Bank. A French Infrastructure Financing Agency (AFITF) was set up in 2004 as a dedicated agency through which state contributions to road investment schemes are channelled.

In Germany, the VIFG was set up as a body through which toll revenues, such as the HGV toll, are re-invested in the network. In addition, it is responsible for procuring road schemes on behalf of the federal government through PPP arrangements, and has established a PPP competence centre. In Germany, there are further proposals for setting up a public infrastructure fund to be administered by both federal and state governments.

In the UK, other than the devolved administrations, we have no comparable financing bodies and it remains to be clarified how the proposed road fund is to be administered, or indeed, whether other tax proceeds such as the HGV levy or crossing toll revenues, will be added to the fund over time.

If, in future, Highways England were to have a revenue stream and borrowing powers, then financing bodies of the kind we see in France and Germany could potentially play a valuable role.

Finally, in all three countries we have studied there is a strong regional government structure; more partnership arrangements between federal and state/regional governments; and regional governments with stronger tax raising powers than we see in the UK. In the UK, we have yet to develop an effective framework for financing and managing regional and local roads.

Thus, in conclusion, we are seeing measures to tackle the investment backlogs in both Germany and California and a general move away from reliance upon tax-financed to user financed infrastructure. While attitudes to road tolls vary, in Germany, usage related HGV tolls are providing an important source of funding for road investment and in California increases in state fuel taxes and, potentially, a road improvement charge are being used to fund improvements. In England, the £15bn RIS relies entirely on Government funding plus, in future, proceeds from VED via the new road fund. An important limitation of VED is that it is an access charge and unrelated to levels of usage of the network.

Over the last four years, we have seen substantial progress on reforms to governance and planning development of the strategic road network in England, and commitment to major programmes of improvement through the RIS, in parallel with

larger programmes of investment for the rail network. However, the reliance upon conventional public sector funding for the RIS, in a period of public expenditure constraint, raises important questions as to whether user charging in some form should play a larger role. There are the questions of whether the scope of the proposed road fund should be extended to include a share of fuel taxation, reflecting usage of the network; and also whether private finance through PPP procurement could play a useful role as it appears to do in Germany and California. Comparison with Germany also raises questions as to whether the full potential of the HGV levy is being realised. Finally, there are outstanding issues of governance and funding of regional and local road networks currently managed by local authorities.

The experience of the countries studied in this report indicates that, despite the substantial progress in road reforms we over the past few years, on the issues of financing, road taxes, and the development of a proper road fund, we still have a long way to go.

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