

Recognising the total value of railways

ECONOMICS Almost all railways generate economic and societal benefits, but these are rarely recognised in monetary values. It is up to governments to define public as opposed to commercial or private benefits. If it is deemed logical to have a viable railway, then the government needs to work out a way to pay for these benefits, says David Burns.



The German federal government has provided substantial grants for the *Länder* to support public transport, leading to a significant revitalisation of regional rail services. But the government is now asking why federal funds should pay for what is clearly a regional benefit.

In a perfect world, governments would have a transport policy that treats all modes equally, and ensures a high level of co-ordination between them. But the world is not perfect, and few governments have such a co-ordinated policy. In fact, most administrations either consciously or unconsciously favour roads, because politicians seldom know much about railways and believe there are more votes to be gained from backing road transport.

In recent years — particularly in Europe — there has been a lot of discussion about the ‘external costs’ which different transport modes impose on society: pollution, accidents, noise, energy consumption, and so on. The search for equal treatment depends on finding ways in which these costs can be ‘internalised’ and reflected in the charges paid by the users.

Conversely, different modes also bring economic and societal benefits which are not always internalised to the advantage of the operator. An efficient and prosperous railway can bring many benefits to the communities through which it passes, or which it connects to other regions. Such benefits have a monetary value, which could significantly increase rail’s financial viability, and perhaps encourage greater use through better services and lower tariffs.

Defining economic benefits

With high levels of fixed infrastructure cost, railways are by nature expensive to build, operate, and maintain. Each route needs to generate sufficient revenue to cover its costs and, if it is privately owned, it should also be profitable enough to give the

shareholders a reasonable rate of return.

In the 19th century, when railway companies essentially held a monopoly on surface transport, they could — and often did — charge high tariffs to ensure good profitability. Those that could not make enough money went bankrupt, or were taken over by a more viable company or by the government.

Now, in most market sectors, rail faces much stronger competition. In general it also suffers from a degree of inconvenience, as its routes seldom go door-to-door. Today’s railways are lucky if they can cover their operating costs from revenue. Successful companies may also cover maintenance and renewals, but seldom the full construction cost and capital amortisation.

However, a railway can bring many

advantages to the community that do not necessarily result in a direct financial return. Often these include multiplier effects: less traffic congestion reduces the need for new highway construction, at the same time improving safety, the health of the population and the environment. During construction and operation, railways can generate jobs, and these in turn create more employment as the money is spent on goods and services. It should however be noted that highway construction can also create similar employment benefits. Railways support industrial development which also creates direct and indirect employment, ranging from shopkeepers to city administrators.

In comparison to road and air, a railway has the capacity to handle large volumes, using less energy per unit of transport. It is safer and generally has less environmental impact. Rail can carry passengers at higher speeds than road, and its freight hauling capacity can support the development of industries that may not be practical with other modes. The existence of a good rail service, especially in urban

environments, can significantly enhance property values.

Discounting ancillary activities, a railway will earn the majority of its revenue from passenger tickets and freight charges. It does not benefit directly from reduced road congestion, or from the knock-on benefits of encouraging rail-served industries. Indeed, to be competitive, railways often have to price their services at below their fully-allocated costs.

Table I lists 13 basic categories of economic benefit that can be generated by encouraging greater use of rail, and the player(s) to which the value of such benefits primarily accrues. Each of these categories presents its own challenges in terms of quantifying the benefits and monetising them to the advantage of the railway. This can be demonstrated by looking at some examples.

Increased passenger travel. As roads become more congested, passenger trains have an increasing economic benefit. A new line, especially for high speed trains, will almost never cover its construction cost purely from revenue. Yet the railway is required to

Table I. Categories of economic benefit that can be generated by railways

Benefits	Railway	Government	Population
Increased passenger travel	X	X	X
New industries	X	X	X
Industrial expansion	X	X	X
Lower cost freight transport	-	X	X
Increased community income	-	X	X
Increased land value	-	X	X
Reduced land-take for roads	-	X	X
Reduced road congestion	-	X	X
Reduced road maintenance	-	X	X
Value of time savings	-	-	X
Energy savings	-	X	X
Reduced pollution:			
Noise	-	-	X
Water	-	-	X
Particulate emissions	-	-	X
Gas emissions	-	-	X
Improved transport safety	-	X	X

borrow money that it will never be able to pay back. As the interest payments accrue, the railway's losses become so high that the government has to take over or restructure the debts, as in the case leading to the break-up of Japanese National Railways. The Channel Tunnel is another example, except in this case it was the banks and shareholders that bore the losses.

Many governments require their railways to carry categories of passenger at a discount — to encourage rail use, provide support for poor or disabled people, or for other political reasons. Cheap fares certainly provide an economic benefit, but how many governments properly compensate the operator? As a result, in these cases the railway's profit and loss account shows an artificially poor viability for its passenger activities.

The European Union has attempted to tackle this by requiring member states to negotiate formal contracts for the operation of unremunerative passenger services, but it has not always proved easy to agree the level of compensation. And even where contracts have been agreed, some governments have failed to make the payments in full.

Relieving road congestion. Turning to the freight sector, a typical North American double-stack container train will have a capacity of 480 TEU, which translates to about 300 lorry loads. A typical '18-wheeler' requires



The British and French governments refused to compensate the value of any economic benefits generated by the Channel Tunnel. As a result, its construction cost has been largely funded from the losses incurred by the original shareholders and the banks that lent money for the project.



Photo: John Kirk

Rail service is essential to support large mines, yet these may not generate sufficient volumes to justify the construction of a new railway. However, the mining jobs and royalty payments create secondary and tertiary benefits, so perhaps the community should subsidise construction of the railway?

as much road space as 10 cars, so one train frees capacity for up to 3000 cars. On a busy urban road such an increase would be of considerable value, whereas in a rural area it might not. So, should the city pay for the economic benefit that it gains?

Take the Chicago Region Environmental & Transportation Efficiency Program. The major railways with terminals in Chicago developed a plan of work that could eventually cost US\$4bn to permit more efficient handling of rail traffic through the region. The first phase of CREATE would cost US\$1.5bn, bringing an estimated economic benefit of US\$3.9bn. The railways, city and the state of Illinois agreed to contribute US\$240m, and

requested US\$1.275bn from the federal government. Unfortunately, the legislators failed to recognise that tackling a local problem would have a national benefit, and only provided a grant of US\$100m.

Increased land values. Rail investment can cause significant increases in property values, but the property owners benefit and the railways generally do not, unless they own the property. One way to address this would be to increase property taxes or introduce a transfer tax when the property is eventually sold. The economic benefit can then be transferred to the railway. However, there are very few instances where this happens.

To keep a balanced view, it should be noted that a railway may have little economic value if it passes through an area where there are good roads and little traffic. It can also be considered to have a distinctly negative benefit if it passes too near your 'back yard'!

Today there are few industries that are totally dependent on rail transport, but there are many where rail access can be considered a significant advantage. These include mining, steel making, power generation, and automotive and cement manufacturing.

Access to rail can encourage a company to consider certain locations for new plants. The potential economic benefits to the community, in terms of jobs created and extra taxes collected, are such that financial incentives are often offered by the community or state to encourage a manufacturer to move in. But how often is the 'value' of the railway in this decision-making process properly compensated?

Although it can be argued that the railway will gain revenue, it may face the expense of constructing sidings to serve the plant. The manufacturer might have an option to locate the facility where new track is not required, so if a site is chosen that requires new sidings, maybe the community should pay for them. While rail freight is generally priced lower than road, there are some shippers who request the construction of a dedicated siding but have no intention of using it. The threat of shipping by rail gives them leverage when negotiating rates with road hauliers, so the siding has an economic value to the shipper and a negative value to the railway.

Time savings and pollution. In the economic benefit calculations used to justify construction of a new line or improvements to a railway, the value of the time saved by passengers and

road users is usually considered. This can result in double-counting, since the value may already be reflected in a higher ticket price. But if that is not the case, how does the benefit go towards paying for the railway? How should the railway be compensated for enabling drivers to travel on less congested roads?

One of the frequent arguments for rail — particularly in recent years — is that its carbon footprint is around 30% or less of that of the equivalent road journey. This may be true, but how does the economic benefit translate into a payment to the railway operator? Should carbon trading or a carbon tax become popular, it may be possible to assign an economic value to such benefits. But it is difficult to imagine a power station paying the railway to subsidise freight transport at the same time as it is looking to negotiate competitive rates for delivering its coal.

Road tyre wear and the accompanying dust (estimated at 1 million tonnes per year in the USA alone) is resulting in an increase in medical problems, allergies, and water pollution. The cost is currently borne by health services and insurance companies, but can we imagine these organisations paying the railways to encourage more people to take the train or ship freight by rail?

According to the American Association of State Highway & Transportation Officials, a standard 18-wheeler operating at its maximum legal weight (36.2 tonnes) inflicts damage on the road surface equivalent to 9600 cars. Today in Italy and France, we are starting to see more enlightened private motorway operators investing in rail freight services as a means of reducing wear and tear on their roads. But who will do the same for publicly-owned roads?

Identifying who can pay

The main problem is that there is seldom any necessity to pay the railway for the economic benefits that it generates. So the railway has to understand the benefits and argue for the payments. Finding the money will be different from case to case, but can be loosely grouped into several different categories.

Commuter rail. When commuters require travel in reasonable comfort, (and not packed like sardines), without taking into account the benefits mentioned earlier, it would

usually cost less to provide a bus service. However, the buses would require free-flowing roads. Commuter rail is attractive to the local government, as it avoids the need to build more roads. The usual way to encourage rail use is to subsidise the fares, in some cases by more than 50%. If commuter rail is sufficiently successful in emptying the roads, everybody would be riding buses because the bus ticket would be cheaper. But for convenience, people might then go back to travelling in their own cars!

The satirical magazine *The Onion* once observed pointedly that ‘we persist in building expensive rail systems because “98% of US commuters favour public transport for others”’.

It is usually argued that car drivers should pay, because they benefit from a less congested highway. A fuel tax is a typical mechanism, but that penalises everybody for the benefit of a few commuters. Congestion charging is a better mechanism, but that requires a very strong government (Singapore), staunch public support (Stockholm), or a strong personal commitment from local politicians (London).

In some cases central government directly subsidises commuter transport. But individual cities gain the majority of the economic benefit, so it could be argued that the city should pay. This is perhaps best reflected by the French tax on employment to subsidise local transport provision. However, city governments seldom

have enough money to meet all their spending commitments, and rail transport is rarely top of the priority list.

Another enlightened approach is to make the stations into centres for living, working and entertainment, promoting the use of rail and generating funds to support the operation, as with the profitable private railways in Japan. These are essentially real estate companies that have connected their holdings using commuter railways, generating traffic and property revenues at the same time.

Light rail. A ‘start-up’ light rail network is considerably more expensive than a bus rapid transit alternative. Yet there is strong evidence that car drivers will switch to a tram but would not be attracted by a bus. Where light rail replaced bus rapid transit in Dallas, for example, there has been a 300% increase in ridership. But what about the economic benefits? Should the city pay for reduced road congestion and better urban mobility?

New line investment. When a railway has to compete with other modes, such as road, water or pipeline, the market limits the freight rates it can charge. Building a new line at even the low cost of US\$1m per route-km, would require about 5 million net tonnes of traffic a year to justify the investment on a purely financial basis. Unfortunately, there are few locations where railways can be built so cheaply. New construction can cost 15 to 20

A fruitless industrial park

Six years ago, the city of Yudu in China’s Jiangxi province established a large industrial park. As a major component of its publicity to attract industries, it advertised widely that a new railway was to be built through the city.

Two years after the opening of the railway, the industrial park is now almost full, with 98 companies. Yet the railway is getting almost no freight traffic from any of these industries.

One of the major reasons that the manufacturers gave for locating in the city was because the railway would ensure that Yudu would not get ‘left off the map’, and there would be a pool of employees and good city services. Actually making use of the railway was evidently not part of their decision-making process.

The basic conclusion is that the railway must aggressively seek out traffic. It should have participated in the industrial development, to ensure that rail-oriented companies would locate there. This is the opposite of the classic ‘if we build it, they will come’ approach. ↩

The Dallas light rail network has encouraged regeneration of the city centre, with a dramatic increase in real estate values in the areas around stations. The cost of the investment was split between grants from the federal government and a 1% sales tax across the whole metropolitan area.

times as much, and such a line could need to be carrying as much as 100 million net tonnes a year soon after it opens.

New railways undoubtedly bring an economic benefit to the community they serve. So should the communities contribute to the cost of construction? Chinese Railways’ freight tariffs



include a construction surcharge to finance new lines, reflecting the idea that such projects benefit the whole country. Unfortunately, the surcharge is now so large that it is discouraging companies from shipping freight by rail.

To raise additional funds CR is now requiring the states through which new lines will be built to cover the land acquisition and resettlement costs. If cities wish to have stations with more than basic facilities, they must pay the difference. However, in most cases, these supplementary payments still fall far short of the necessary amount needed to offset the extra costs. Clearly other forms of payment are needed to reflect the wider economic benefits.

In the case of Yudu (p661), the city has clearly benefited from having a new railway, although the railway has not. Can it be made to contribute? Probably not, unless the railway had approached the city during the design phase and could wield the threat of adopting an alternative route.

While the concept of a beneficiary contributing towards the cost of constructing or maintaining a railway is good, it can be difficult to implement fairly.

The concessioning fallacy: A number of national governments have concluded that concessioning their country's railway, or selling it at a nominal price, is a solution to the funding dilemma. But in most cases such governments are naïve in thinking that private companies will come with baskets of money to invest.

Even though the government may hand over the assets for a nominal amount, the cost of operating, maintaining and renewing the railway is seldom covered by the revenue — let alone the costs of upgrading or addressing any maintenance backlog. What the government has failed to consider is that the economic benefit of the railway is usually much greater than the financial benefit. To be financially viable, the railway usually needs some form of support.

The European model of vertical separation allows governments to take over the cost of providing and maintaining rail infrastructure, working on the theory that lorry operators do not provide equivalent capital investment for the road network. But infrastructure typically only amounts to around 20% of a railway's operating costs, so even if the train operator gets free access, it still may not generate enough revenue to invest, or make a profit to

compensate its shareholders.

System improvements. Investment in an existing railway can range from catching up on deferred maintenance to a major upgrading of infrastructure and rolling stock to boost capacity or quality of service. Sometimes financial contributions are available in the form of tax credits, low-interest loans or outright grants. These can be allocated for specified tasks or as a general payment. In several countries, grants are available for building or improving rail access to a manufacturer's facility on the understanding that the company will use rail in preference to road (RG 12.07 p784).

In the past most large private freight railways in the USA rejected government money, because they feared unacceptable conditions would be attached. Today the railroads are faced with a trucking industry that is very efficient and competitive, earning revenues 10 times greater than rail. Market competition means the railways cannot increase tariffs to generate sufficient funds for major improvements. With huge investment in extra capacity needed to meet the projected demand for rail services over the next 30 years, some railroads are now seeking government grants and low-interest loans.

The Alameda Corridor in Los Angeles (panel) provides an interesting example where a collaborative venture has brought benefits, contrasting with the CREATE experience in Chicago.

Operating support. It is sometimes appropriate to subsidise freight operations. A railway needs to earn a minimum amount of revenue per km to pay for operations and maintenance of an existing line. With market-constrained tariffs, each line would typically need to carry at least 1 million net tonnes a year to be financially viable.

But what if traffic is insufficient? Sometimes a shipper will agree to pay a premium to maintain service. If they do not, somebody else will need to subsidise the line, or it will eventually go out of business. In more progressive communities, the city or the state may provide a subsidy to reflect the economic benefit of keeping the line in operation.

This model is typified by many of the short lines in the USA today, which are either supported by their largest customers or by the local community in some form.

In the passenger sector, by far the

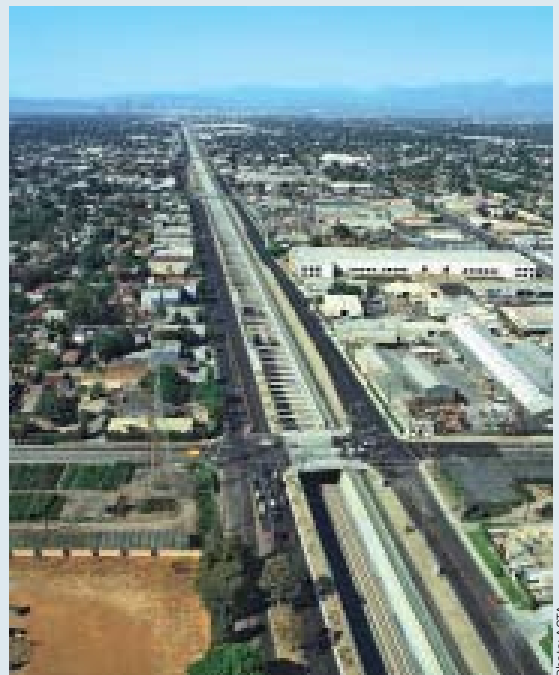


PHOTO: ACTA

The 'national tax' on wagons and containers using the Alameda Corridor in Los Angeles has been so successful that the state has started to add extra charges to fund local benefits, such as low-emission trucks. But these additional charges could result in the ports losing market share.

Local benefit — national tax

The Californian ports of Los Angeles and Long Beach together form one of the largest container terminals in the world. The rail connection between the port and the rest of the USA ran through the suburbs of Los Angeles, crossing many roads at grade. This created considerable traffic congestion, and restricted the movement of trains.

The railway companies, port authority and the city jointly created the Alameda Corridor Transportation Authority to develop and build a 32 km segregated rail corridor, about half of which runs in a trench 10 m below street level. Total project cost was \$2.4bn.

Grants came from nine different sources, ranging from \$0.6m to \$150m, which met about 13.5% of the total construction cost. The rest was raised through a variety of bonds and loans that must be repaid. It was agreed that every container using the corridor would be charged \$15/TEU loaded and \$8/TEU empty. Wagons are charged \$8 each.

These payments are essentially a tax on any goods bought and sold in the USA that move through the two ports. In effect, this is a national tax, equivalent to about 0.5% of the total rail tariff, to pay for a substantial economic benefit which mainly accrues to the residents of Los Angeles. <<

most common method of paying for economic benefits is through what is commonly referred to as a Public Service Obligation payment. This formula is also occasionally used to maintain freight services on lightly-used lines.

There is no standard format for PSO contracts — the local government determines what it wants the rail service to achieve, what proportion of passenger or freight-km is appropriate for each mode, and

determines the service pattern and tariff structure. From this, the level of support can be determined.

The authority will then either negotiate with the local railway or request tenders from competing train operators. While there are many variations, the contracts that seem to work best are those with strong financial incentives and penalty clauses.

Public-private partnerships

One approach which seems to be increasingly popular is some form of public-private partnership. A public-sector body (at whatever level) enters into a joint venture agreement with one or more private partners. Based on its asset and/or financial contribution, the public body becomes an equity partner in the concession company.

But for various reasons the track record of PPPs so far has not been very good. The problems appear to include a lack of analysis by the public entities before the deal is signed and exaggerated proposals by the private sector on the theory that the benefits can be renegotiated after the contract is awarded.

Whilst it is called a partnership, in many cases the state or community seems to have agreed to participate in funding an infrastructure project without taking partial ownership in the resulting assets.

Making the case for payment

In reality, few governments are going to be knocking on the doors of the railways offering money to reflect



To improve rail access to the port of Wilmington, the state of Delaware formed a PPP with Norfolk Southern to fund reconstruction of the abandoned Shellpot bridge, with the railway paying a toll per wagon. Based on traffic since reopening, the state should make about an 11% annual rate of return as well as the economic benefits from increased business in the port, making it a sound investment.

Photo:

economic benefits. It is up to the railways to identify the benefits and put their request to the government bodies in a meaningful way. But to make a good case, the railway must have addressed at least the following six points.

1. Know your costs. Identifying construction costs is usually straightforward, but it is difficult to determine fully-allocated operating costs, and this increases exponentially with the size of the railway. It is fundamental to have an accurate accounting system that takes into consideration the responsibilities and relationships between departments.

2. Understand the competition. Knowing what effect any improvements in price and services will have on the competition is critical. This requires a detailed understanding of the competing modes, including their cost structures and pricing strategies.

3. Environmental impact. Rail

offers many environmental advantages, but it is important to evaluate their economic impact. This must include every aspect from greenhouse gas emissions to the cost of tyre dust. But such impacts are very difficult to quantify, and this type of knowledge is seldom found within a railway administration.

4. Identify business development.

It is essential to have a good understanding of potential industrial and business development that is happening or could take place within a reasonable distance of the railway. This must include any multiplier effects, but it should be remembered that the business could just as easily be located elsewhere.

5. Develop and justify. An understanding of financial analysis and transport economics is necessary so that comprehensive reports can be drawn up in a form that can be readily publicised. Good communications are essential when seeking contributions from public-sector bodies.

6. Dedicated staff. Developing the business justification, political arguments, and publicity requires a knowledgeable and specialist team including lobbyists who know the 'workings' of the government. A survey of some larger railways that have successfully argued for economic contributions shows that they have a dedicated team of 20 people or more. The employment cost can be negligible compared to the potential contributions.

There are cases where the government recognises a need for an economic benefit payment. Some are structured as a 'negative concession' whereby operators bid against an annual payment from the government. Even in such cases the bidders really need to have done their homework with the same degree of expertise.

Managing the money

One of the major problems with economic benefit payments can be how the public money is accounted for in practice. Subsidy payments or grants can go to the wrong place. Since money is fungible, it can be easily diverted into another investment that management thinks will make a better return.

Will the traffic actually come off the road, or will the projected new jobs be created? The railway may have its new line from which it is making additional revenue, but the impact on



Photo: David Luejig

The economic benefit of one double-stack train can be the equivalent to the road maintenance cost of about 2.7 million cars. Yet competition means that rail freight rates are typically only 75% of the equivalent lorry rate.



Photo: JR Central

Japan's Shinkansen network, perhaps the busiest and most successful high-speed railway in the world, has never generated sufficient revenue to pay off its construction costs. Although revenue on the Tokaido Shinkansen between Tokyo and Osaka initially outpaced costs, supporting the 1969 decision to build the Sanyo extension, subsequent lines never reached the same level of profitability.

society may not be as much as anticipated. There is enough evidence to show that in some cases the lack of economic impact is the fault of the railway, but how does the government reclaim the money?

When a private entity is involved, there is another major question. To what extent should shareholders benefit from taxpayers' money? Clearly shareholders are entitled to some proportion, because without the railway the economic benefits would not have been generated. But as with all private companies, the shareholders should also take some of the risk. The fair attribution of risk is a complex question, especially in PPPs, and can really only be judged on a case-by-case basis. Once again, good analysis and financial transparency are essential.

Any public money given to a railway to pay for economic benefits must be clearly and contractually defined. There should be penalties for failure to achieve the true purpose. And this should apply whether the government is giving public money to a private operator or a state-owned railway. Transparency is everything. ❏

Benefits and risks

When it was privatised in 1996, the British infrastructure company Railtrack concluded it needed to borrow large amounts of money to fund track renewals and improvements. But to be able to borrow on the commercial markets at a low rate of interest, Railtrack needed to show it was profitable. To do this, it used revenue from track access charges (in effect government subsidy payments to the train operators) to increase shareholder dividends.

Senior executives at Railtrack did not understand the need to maintain the railway in good condition, and many engineers left the company. In the end, the Hatfield derailment in October 2000 revealed the extent of deterioration of the track. With the company demanding more financial support, the government engineered its downfall and Railtrack's shareholders saw the value of their investments collapse.

The UK infrastructure has now been taken over by Network Rail, a nominally private company. But NR has no shareholders, and initially relied on government guarantees to get low interest rates in the market. It also receives substantial direct grants from the government to keep down the level of track access charges. ❏