Economic Effects of a Brisbane - Melbourne Inland Railway

Working Paper

Like some other freight-oriented rail investments, the inland railway has been advocated partly on the grounds that it will stimulate the economies of some rural regions. Examined in this paper are the effects of inland railway on the agricultural and mining industries of northern New South Wales and southern Queensland.

Bureau of Transport and Communications Economics

WORKING PAPER 18

Economic effects of a Brisbane–Melbourne inland railway

ISSN 1036-739X
ISBN 0 642 24518 5

This publication is available free of charge from the Manager, Information Services, Bureau of Transport and Communications Economics, GPO Box 501, Canberra, ACT 2601, or by phone (06) 274 6846, fax 274 6816 or by email *vrichard@email.dot.gov.au*

Printed by the Department of Transport, Canberra

FOREWORD

This working paper forms part of a research project being conducted by the Bureau of Transport and Communications Economics (BTCE). The project is an investigation into certain issues in measuring the benefits of investment in transport infrastructure. The focus of the project is on:

- possible benefits from increased employment; and
- benefits often claimed to be significant but understated by benefit-cost analyses, especially;
  - cost savings from business logistic responses to improvements in infrastructure (for example, substitution of transport for inventory);
  - rural regional development benefits; and
  - the indirect benefits that an item of transport infrastructure provides to non-users of that infrastructure.

To determine the adequacy of current methods for measuring these benefits, and to set directions for improvements, the BTCE is conducting a literature review as well as case studies of infrastructure investment projects. The case studies are mainly concerned with the regional development effects.

The pilot case study for this project examined the regional development effects of two highway bypasses in rural New South Wales. The study found that the reduction in traffic improved the environments of the bypassed towns, stimulating local economic development—particularly in one of the towns, which had become more attractive to tourists. The study further found that this stimulus has a net benefit to society which was not valued in the original benefit-cost analysis of the bypasses. However, the evidence was insufficient to conclude that the original benefit-cost analysis had underestimated economic benefits, since evidence was lacking on the accuracy of its traffic projections and other key assumptions. For full or abbreviated descriptions of the study, see BTCE 1994a and 1994b, respectively.

The proposed inland railway between Brisbane and Melbourne would be a far larger investment than the bypasses examined in the pilot study. For this reason, and because the investment would be in a different mode of transport, the present case study involves somewhat different issues than did the pilot study. In particular, the effects of lower freight costs on regional development is a key issue here, whereas they were considered too small to warrant analysis in the bypass study.

A BTCE report on the benefits of investment in transport infrastructure will be released in mid-1996. Other outputs from this same project include a brief discussion of the issues (BTCE 1994c) and a critique of studies using national economic models to evaluate transport investments (BTCE 1995). The critique provided input for a report to AUSTROADS on methods for estimating the economic effects of road investments (Kinhill Economics and Allen Economics forthcoming).

The research reported in this paper was undertaken by Peter Collins, Albert Ofei-Mensah, and David Luskin (Project Leader), each of whom contributed to the drafting, and was edited by Belinda Jackson. The analysis of the implications of the inland railway for agriculture draws heavily on a report prepared for the BTCE by the Australian Bureau of Agricultural and Resource Economics (ABARE). Substantial inputs of data and technical advice were provided by the staff of Queensland Rail and associated consultants. Assistance was also provided by staff of the National Rail Corporation, the State Rail Authority of New South Wales, the Queensland Department of Transport, and the Australian Automobile Association. The BTCE thanks all these organisations and their staff, whose views may differ from those expressed in this report.

David Luck
Research Manager
Land Branch

Bureau of Transport and Communications Economics
Canberra

March 1996

CONTENTS

FIGURES

BOXES

TABLES

ABSTRACT

The benefits and costs of rail investments are sometimes evaluated from the perspective of society as a whole. Some general issues in such evaluations are considered in this paper by means of a case study of a proposed inland railway between Brisbane and Melbourne.

Like some other freight-oriented rail investments, the inland railway has been advocated partly on the grounds that it will stimulate the economies of some rural regions. Examined in this paper are the effects of inland railway on the agricultural and mining industries of northern New South Wales and southern Queensland. It is found that these effects will be small and unlikely to add much to the overall benefit from the inland railway. The explanation for this finding hinges on several considerations that have been emphasised in the literature on the transport and regional development, but which have not been fully appreciated in policy debates.

As well as helping to give these considerations their due, the analysis in this paper provides a comparison between measures of total benefit. Several studies of rail investments have focussed on the potential for rail to attract market share away from road freight, and have used as measure of benefit the savings in the operating costs of these two modes combined. It is shown in this paper that an alternative simple measure of benefit is better grounded in economic theory.

KEY FINDINGS

LIMITED REGIONAL DEVELOPMENT EFFECTS

The proposed inland railway would provide some inland areas of northern New South Wales with direct rail access to Queensland and improve access to and from the Darling Downs in southern Queensland. Transport costs for agricultural and mining producers in these regions would decline slightly in consequence, providing a *small* stimulus to production. These producers would benefit nearly as much, however, without adjusting their production patterns. Many other studies of transport infrastructure investments have also found regional development effects to be small, and often for the same reasons. These reasons are the following:

The transport network is already so extensive that even a large investment in new infrastructure results only in marginal changes to transport costs. In the analysed regions, grain is one of the major agricultural commodities produced and its distribution system makes extensive use of the rail network. For producers in these regions, however, the inland railway would reduce grain transport costs by less than 3 per cent.

Transport costs are a small proportion of total revenue. For grain produced in the studied regions, transport costs amount to only around 12 per cent of revenue. The reductions in grain transport costs resulting from an inland railway are thus equivalent to a price increase of under one per cent.

Producers often view different modes of transport as poor substitutes. For example, road transport attracts the large bulk of horticultural freight because of its advantages over rail in speed, flexibility and product handling. By itself, the proposed inland railway would do little to overcome the disadvantages of rail for horticultural freight; and hence do little to stimulate horticultural production.

Natural constraints may limit the development of a region's resource-based industries. Natural resource endowments may limit the potential for expansion of established agricultural and mining industries in a region. For example, the supply of irrigation water currently limits the level of cotton production in northern New South Wales and southern Queensland. Furthermore, the inland railway may not provide the anticipated boost for the establishment of relatively new resource-based industries in the study regions. The regions' climate or natural resource endowments may either not suit these new industries or suit the established industries much better.

ECONOMIC MERIT OF THE PROJECT

From our limited analysis, the proposed inland railway emerges as an investment of uncertain economic merit for implementation in the near future. The inland railway would increase the gross operating surplus of the rail sector by reducing unit operating cost and by increasing demand for rail freight services. However, based on partial information supplied by Queensland Rail, this benefit would not fully offset the cost of the investment. Benefits to users of rail services might tilt the balance in favour of the project, but the orders of magnitude obtained in this paper leave it unclear whether they would be large enough.

Also unclear from our results is whether the inland railway makes more economic sense than investing a similar amount in the existing coastal railway, which would make the proposed inland railway partly redundant.

CHAPTER 1 INTRODUCTION

In Australia and many other countries, investment in transport infrastructure is commonly subject to tests of public interest. The benefit to society depends on how the investment affects regional development for two reasons. First, if the investment favours the economies of disadvantaged regions, people may perceive that it has led to a fairer distribution of well-being. Second, inter-regional shifts in production may benefit the nation by lowering production costs. For example, a classic response to better transport services is consolidating warehouses and manufacturing plants. While producers may close some regional facilities in the process, the scale economies achieved in the remaining facilities reduce production costs.

The regional development effects of transport infrastructure are debated often, partly because of the difficulties in estimating them. Fortunately, much can be learned from case studies of actual investments. When investments are proposed, a review of case study evidence may help place bounds on the likely magnitude of regional development effects. A review may also guide decisions on what further analysis of regional development effects is warranted. Budgetary constraints and the high cost of research make informed decisions essential.

This paper reports a case study for a BTCE research project on transport infrastructure investments. The project examines claims that benefit-cost analyses of such investments usually understate the economic benefits, including benefits arising from regional development effects. This study of the proposed inland railway between Brisbane and Melbourne addresses some general issues about the regional development effects of transport infrastructure investments — what these effects include; whether they are significant; and whether they contribute much to the overall benefit of the investments. The analysis abstracts from concerns about income distribution which are highly subjective and difficult to express quantitatively.

One attraction of the inland railway for case study purposes is that it would be a major project costing around \$1.3 billion. To put this in perspective, total capital expenditure on roads in Australia amounted to \$3 billion during

1993-94. Furthermore, the new railway would provide a much shorter and faster link between Brisbane and Melbourne than the current coastal railway.

Another attraction is that proponents of the inland railway have emphasised its regional development implications. Davidson (1995) predicts a stimulus to resource-based industries in rural northern New South Wales and southern Queensland, where the inland railway would have its biggest impact on regional accessibility. In this paper, the likely effects of the inland railway on the mining and agricultural sectors are analysed (chapter 3), with a focus on these regions. The analysis of the agricultural sector draws heavily on a report prepared for the BTCE by the Australian Bureau of Agricultural and Resource Economics (ABARE). Regional development implications outside agriculture and mining are briefly touched on.

Our analysis extensively uses information provided by Queensland Rail (QR), including the technical specifications for the inland railway. QR has also identified some investments in upgrading the coastal railway for comparison with the inland railway. The benefits and costs of these alternatives are compared in this paper. However, an analysis of regional development effects of the coastal investments is omitted, since it would probably add little to the general insights about regional development effects obtained from the analysis of the inland railway. For other reasons as well, the analysis in this paper does not constitute a definitive benefit-cost analysis of the investment options considered. For the most part, the analysis accepts as given the traffic information and cost estimates supplied by QR. Additionally, some of the more complex issues, such as the possibility of running double-stacked trains on the inland railway, are not analysed in depth.

Readers should also note that the measures of costs and benefits in this paper are not comparable to some measures of costs and benefits appearing in other studies of rail investments. Each investment option is viewed in this paper from the perspective of the net benefit to society. Other studies of rail investments usually provide financial analysis of the net benefit to the investors, sometimes supplemented by a societal benefit-cost analysis. A financial analysis of the net benefit to the investors is beyond the scope of this paper, and would require investigation into complex tax provisions. There are also differences between the measures of societal benefit in this paper and those in some other rail investment studies. In its study of rail investments for the National Transport Planning Taskforce, the BTCE (1995b) counted only the benefits from savings in operating costs for rail services and ignored any increases in rail traffic induced by the investments. The present study measures benefits more broadly to include the benefits that customers might realise from improved quality of service and from increasing their use of rail services. Overlooking these differences in scope would exaggerate the attractiveness of investments considered here, compared to those examined in the earlier BTCE study.

In this paper, the total benefit from each investment is divided into two components:

- the benefit to users of rail services; and
- the increase in rail gross operating surplus (gross of taxes and subsidies).

The benefit to users of rail services is estimated separately for certain agricultural users (chapter 3) and for all other users (chapter 4). Total benefits and costs of each investment are then compared in chapter 5. The measures exclude possible benefits in reduced accidents, pollution and road congestion due to diversion of freight traffic from road to rail. These and other complications, such as fuel excise taxes, are discussed at the end of chapter 5.

CHAPTER 2 THE PROPOSED INLAND RAILWAY AND COASTAL INVESTMENT ALTERNATIVES

THE PROPOSED INLAND RAILWAY

QR has proposed the creation of an inland standard gauge railway between Brisbane and Melbourne, as well as some complementary investment in connecting lines (QR, pers. comm. 1995). The inland railway would use existing lines for most of its length, with stretches of new line in Queensland and New South Wales (figure 2.1). Some upgrading would be involved for the stretches of existing branch lines in New South Wales. The QR proposal also includes some upgrading of existing lines in New South Wales that would connect the inland railway with Sydney (the lines running to Sydney south from Werris Creek and north from Cootamundra). If implemented, the proposed investment would significantly affect traffic patterns over a large part of the eastern states' rail network.

The sections of new line would be constructed to a standard capable of carrying interstate freight trains at 115 kilometres per hour without any upgrading of rolling stock. With additional expenditure on rolling stock, however, some of these new sections could carry freight trains at 160 kilometres per hour. This study has only considered benefits that will be attainable with the current rolling stock because cost estimates for new rolling stock were not provided by QR.

The QR proposal distinguishes two options for the existing branch lines in New South Wales that would form a part of the inland railway. The enhanced option provides for the upgrading of these lines to a standard that would allow interstate freight trains to travel at 115 kilometres per hour, the same speed as on new lines. The basic option would permit speeds on the existing lines of only 100 kilometres per hour.

BOX 2.1 THE PROPOSED INLAND ROUTE

From Brisbane the new route will go to the west of Toowoomba, onto Millmerran and to the east of Goondiwindi, making a connection with the NSW standard gauge network at a point near Boggabilla. The existing route south of Boggabilla that goes via Moree will be followed to Bellata/Narrabri. It is proposed that a new line will be built from Bellata to Coonamble via Wee Waa. The existing line from Coonamble via Dubbo, Parkes, Cootamundra and Albury Wodonga will complete the inland rail link between Brisbane and Melbourne The Narrabri-Sydney line via Maitland and Newcastle and the Cootamundra-Sydney line via Goulburn would both have to be maintained as part of an inland network. These lines would be required to carry Brisbane-Sydney traffic and Melbourne-Sydney traffic respectively.

Source Queensland Rail 1995.

The proposed investment would cost an estimated $1 269 million under the basic option. The Brisbane-Melbourne line accounts for almost all of this with only $5 million required to upgrade the connecting lines with Sydney. The enhanced option is estimated to cost an extra $189 million for a total cost of $1 458 million.

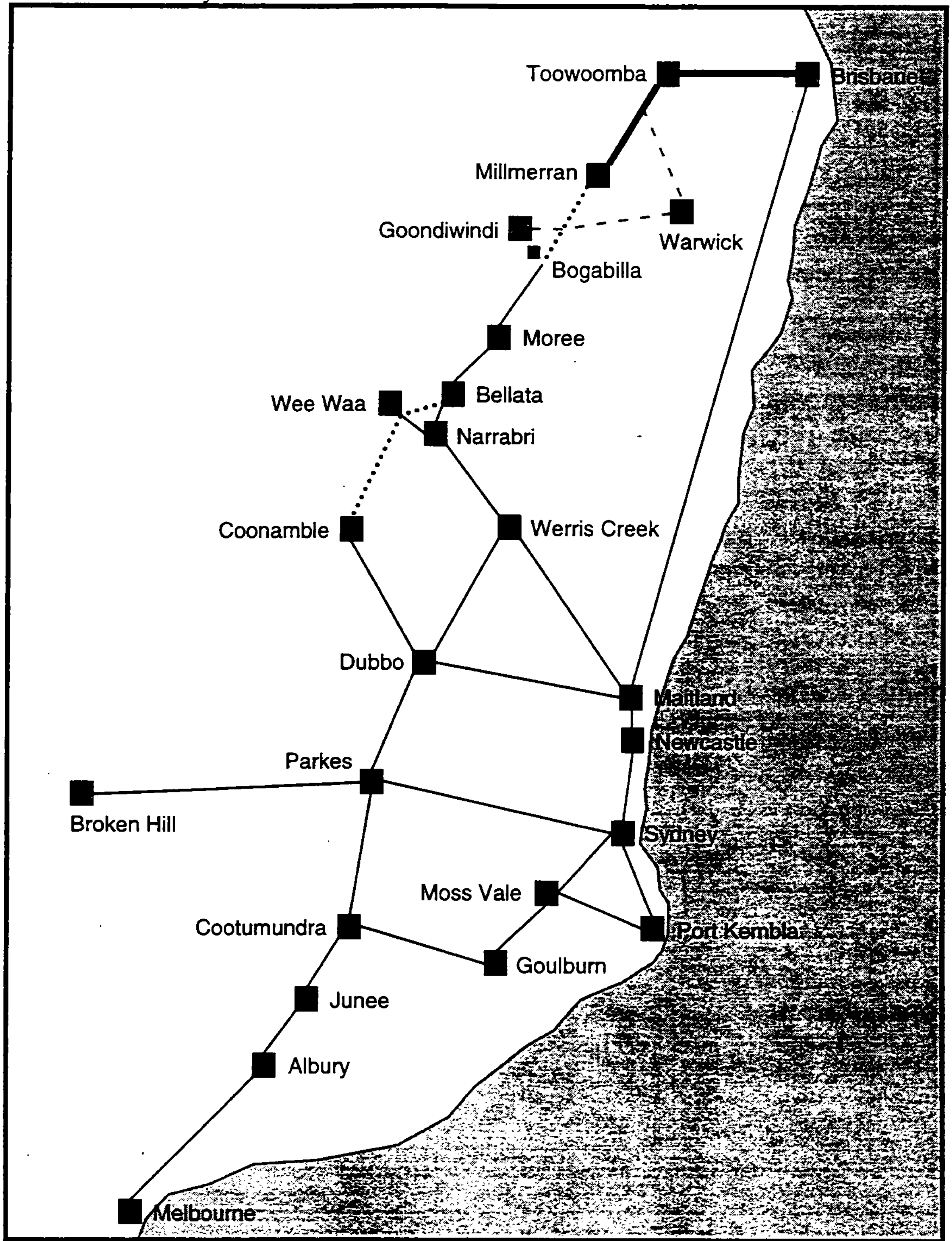
Effects on Freight Transport

The proposed investment program would reduce transit times and operating costs per tonne for many rail freight services. QR has estimated these effects using information on track and train characteristics. The estimates of operating cost per tonne accord reasonably well with alternative estimates derived by the BTCE (chapter 5). At the same time, certain discrepancies were uncovered which would require further investigation for a comprehensive benefit-cost analysis.

QR also examined the impacts of the proposed investment on the reliability of rail freight services, but their measures of these impacts were too subjective and inadequately explained to be reported here.

Based as they are on 1994–95 data, all the estimates of operating cost and time savings indicate the saving that would have been realised in 1994–95 had the proposed investment been in place. However, the estimates can also be taken as rough indications of the savings that might be realised in later years.

Figure 2.1 The east coast rail network: sections that would be affected by the inland railway.



——— Proposed dual gauge track following existing narrow gauge routes in Queensland

\- - - - Current narrow gauge route in Queensland that would not be incorporated into the proposed railway

········ Proposed new standard gauge track in New South Wales and proposed new dual gauge track in Queensland along new routes

——— Existing standard gauge track in New South Wales and Queensland

Note This diagram is not drawn to scale

Source Based on QR 1995

The improvements in transit time and reliability would allow more intensive use of rolling stock, thereby reducing the rolling stock needed for a given freight task (as already mentioned, we abstract from possible upgrades of rolling stock to exploit the speed potential of the new railway). On the other hand, the investments would also increase the demand for rail freight services (as discussed in chapters 3 and 4) which, by itself, would increase requirements for rolling stock. Determining the net effect of the investments on the rolling stock requirements would require investigation of complex network issues. Since QR has not yet attempted this, the present analysis excludes capital costs of rolling stock.

The highest volume freight services that would be affected by the proposed investment would operate solely within the eastern states. For these services, the largest reductions in transit times and operating costs per tonne would be realised on freight going the full way between Brisbane and Melbourne (table 2.1). The rail distance between these cities would be 182 kilometres shorter than the current 1 940 kilometre coastal route. A time saving would result from the shorter distance and faster train speeds. This saving, estimated to be around 10 hours, would contribute to an operating cost saving of around $5.60 per tonne. The actual savings could be larger because the estimated transit time for the current coastal route excludes congestion delays in Sydney.

TABLE 2.1 ESTIMATED TRANSIT TIMES AND OPERATING COSTS FOR THE PROPOSED INLAND RAILWAY AND THE CURRENT COASTAL ROUTE

	Current route		*Proposed inland route*			
			Basic option		*Enhanced option*	
Link	*Transit time (hrs)*	*Operating cost ($ per tonne)*	*Transit time (hrs)*	*Operating cost ($ per tonne)*	*Transit time (hrs)*	*Operating cost ($ per tonne)*
Capital City Origin-Destination Pairs						
Brisbane–Melbourne	33.00	23.16	23.00	17.56	21.85	17.30
Brisbane–Sydney	19.00	12.73	18.00	13.82	17.60	13.11
Brisbane–Adelaide	54.00	36.08	45.00	23.38	35.00	22.90
Brisbane–Perth	87.00	66.57	78.00	46.57	69.00	45.63
Sydney–Melbourne	14.00	11.38	13.75	11.40	13.75	11.40

Source Queensland Rail 1995.

Savings would also be realised for freight trains traversing part of the new Brisbane–Melbourne railway, including trains connecting with other rail lines. Trains operated between Sydney and Brisbane would gain an inland alternative to the current coastal route, since the new railway would connect at Werris Creek with the line running south to Sydney (figure 2.1). Adopting the inland route would reduce travel time between Sydney and Brisbane by about an hour, since it would avoid the poor track alignments along the coastal route. However, the inland route would be 168 kilometres longer than the 980 kilometre coastal route, and this would increase operating cost by an estimated 9 per cent.

According to QR estimates, the inland railway would provide the largest savings in transit times and unit operating costs for the services between Brisbane and Adelaide/Perth. These services carry relatively small volumes of freight. The assumption is that the Broken Hill line remains open, allowing these services to either connect with the inland railway at Parkes or, if the inland railway were not built, to continue using the current route via Parkes and Sydney. Under this assumption, the inland railway would reduce the distance between Brisbane and destinations to the west of Parkes, such as Adelaide and Perth, by 397 kilometres. By comparison, the distance reduction would be significantly smaller between Brisbane and Melbourne, as would the saving in operating cost per tonne. However, the smaller per tonne saving would apply to a much larger volume of traffic. Hence, the saving in total operating cost would be much larger between Brisbane and Melbourne than between Brisbane and Adelaide/Perth.

The track between Melbourne and Sydney, by contrast, would be virtually unchanged by the proposed investment apart from minor upgrading of the connecting line running south from Sydney. Even so, transit times and reliability of services between Melbourne and Sydney would improve because QR has assumed that Brisbane-Melbourne traffic would no longer use the coastal railway. Among other things, this diversion would relieve congestion in the Sydney area. The QR estimates of transit times and operating cost savings do not reflect the benefits of this reduced congestion and in this regard, are conservative.

The inland railway would significantly improve port access for agricultural producers in northern New South Wales and southern Queensland (on the Darling Downs). Producers in northern New South Wales would have direct access to the Port of Brisbane rather than having to use more distant ports in New South Wales or the road link to Brisbane. The proposed railway would also considerably shorten the rail distance between the Darling Downs and Brisbane.

AN ALTERNATIVE PROPOSAL: UPGRADING THE COASTAL ROUTE

For comparison with the proposed inland railway, QR has mooted a basic and an enhanced option for investment along the coastal railway between Brisbane and Melbourne.

The basic coastal option would entail minor improvements beyond those already made under the *One Nation* program. These improvements—the lengthening of passing loops north of Maitland and the replacement of rails on some sections of track between Albury and Melbourne—would cost around

$94 million. They would remove around 45 minutes from the 33 hours it currently takes to travel from Brisbane to Melbourne (table 2.2).

TABLE 2.2 ESTIMATED TRANSIT TIMES AND OPERATING COSTS FOR THE COASTAL ROUTE

	Current route		*Proposed coastal route*			
			Basic option		*Enhanced option*	
Link	*Transit time (hrs)*	*Operating cost ($ per tonne)*	*Transit time (hrs)*	*Operating cost ($ per tonne)*	*Transit time (hrs)*	*Operating cost ($ per tonne)*
Capital City Origin–Destination Pairs						
Brisbane–Melbourne	33.00	23.16	32.25	23.16	25.00	20.50
Brisbane–Sydney	19.00	12.73	18.50	12.73	13.00	10.78
Brisbane–Adelaide	54.00	36.09	53.50	36.09	48.00	33.79
Brisbane–Perth	87.00	66.58	86.50	66.58	81.00	63.31
Sydney–Melbourne	14.00	11.38	13.75	11.38	12.00	10.77

Source Queensland Rail 1995.

The enhanced coastal option involves major new construction on large sections of the route, costing around $1.6 billion. Construction of a new line to replace much of the existing coastal route south of Coffs Harbour would account for most of this expenditure ($1 billion). The costing of this new section of track allocates some of the costs of land resumption and earthworks to a new road project along the same route. In the absence of a new road being constructed, the construction costs for the new track would be much higher.

Compared to the basic coastal route, the enhanced coastal route between Brisbane and Melbourne would be 124 kilometres shorter, reduce the transit time by around 7.25 hours and operating costs by around $2.66 per tonne. Nearly all of these savings would be made on the Brisbane–Sydney link, where most of the upgrading would occur.

The estimates of transit time savings from the coastal investments may be too high. As with the inland railway, the estimates of transit times do not allow for delays that result from congestion on the Sydney suburban network. However, unlike the investments for the inland railway, the coastal investments may aggravate these delays by increasing of interstate freight traffic that passes through the Sydney area.

EFFECTS OF THE INVESTMENTS ON RAIL FREIGHT CHARGES

QR foresees that the investments would cause small reductions in rail freight charges per tonne. The QR working assumption, adopted here, is that the charge per tonne would decline in proportion to the rail distance. As mentioned above, the inland railway would shorten the rail distance between Brisbane and Melbourne by 9 per cent and by proportionately less (if at all) for other origin–

destination pairs within the eastern states. The rail distance would decline by 15 per cent between Brisbane and Adelaide/Perth, but relatively little rail freight traffic flows between these cities. Some distance reductions would also result from the coastal investments. An exception to the pricing assumption was made for traffic between Brisbane and Sydney, which would travel a 17 per cent longer distance along the inland railway than on the current coastal route. The longer distance would imply a proportionate increase in the charge per tonne, under the pricing assumption used for the other origin-destination pairs. Since QR considered an increase in the charge per tonne implausible, we have assumed that the inland railway would have no effect on the charge per tonne for Brisbane-Sydney traffic.

In reality, the investments would affect rail freight charges rather differently from what QR has assumed. While the reduction in operating costs would encourage service providers to lower charges, the increased demand for rail freight services would do the opposite, making an increase in charges conceivable. Even where charges decline, they would not necessarily do so in proportion to the change in distance.

IMPLEMENTATION OF THE INVESTMENTS

The assumption in this paper is that the investment will be implemented as soon as possible. Construction is assumed to commence in 1996-97 and to take five years.

For the inland and enhanced coastal options, which each would cost between \$1.2 billion and \$1.6 billion, a five year construction period is consistent with assumptions for other rail investments of a similar scale. A study of the proposed rail link between Alice Springs and Darwin put the cost at \$1 billion and the construction period at five years (BTCE 1993a). However, the actual construction period is hard to estimate for any rail project, and QR has not supplied estimates for the options being considered here. The basic coastal option would cost much less than the other three options (an estimated \$94 million) and would probably take less time to construct. How much less time is unclear, so we assumed a uniform construction period for all options. On its own, this simplification will cause the attractiveness of the basic coastal option to be understated.

The assumption in this paper that investments are implemented as soon as possible puts aside the question of optimal timing of investments. Thus, no consideration is given to staged investment strategies such as gradually implementing a basic option and then slowly upgrading to the enhanced standard. Staged strategies of this sort might be preferable to immediate implementation.

Organisational details of the investments, such as sources of funding and the organisations that would operate the rail services, are also ignored in this paper. Scenarios for these details would be highly speculative, given that major reforms to the rail sector are currently being considered. These reforms would establish a single national authority, Track Australia, which would own most of the rail infrastructure. Operation of freight services over this infrastructure would be left to other organisations, and competition between operators would be encouraged. Increased competition would presumably reduce rail freight charges.

CHAPTER 3 USER BENEFITS IN NORTHERN NEW SOUTH WALES AND SOUTHERN QUEENSLAND

The proposed inland railway would reduce freight costs for farm commodities, especially those from northern New South Wales and southern Queensland. The savings in freight costs would, in turn, affect farm production patterns and profits. These effects are analysed in this chapter and quantified where possible. Also considered are the implications of the inland rail link for development of coal reserves in south east Queensland. Briefly touched on in this chapter are other regional development possibilities, including the establishment of a passenger service between Toowoomba and Brisbane along the inland railway.

THE AGRICULTURAL REGIONS SELECTED FOR ANALYSIS

The farming areas that would be most affected by the inland railway produce mainly broadacre commodities—cereal grains, wool and beef. These areas fall within three regions identified in an annual ABARE survey of broadacre farms, called the Australian Agricultural and Grazing Industry Survey (AAGIS).[1] One of the regions, AAGIS region 321, corresponds to the Eastern Darling Downs in Queensland (figure 3.1). To the south and slightly to the west of it, in New South Wales, lies AAGIS region 121 (figure 3.2). Both this region and the Eastern Darling Downs produce substantial amounts of cotton in addition to broadacre commodities. They also have sizeable poultry (meat and eggs) and feedlotting industries centred near Tamworth and Toowoomba. The feedlotting enterprises raise cattle, a broadacre commodity, but are excluded from the AAGIS survey because they use intensive rather than extensive (broadacre) production techniques. Further south in New South Wales is the third farming region having special relevance to the inland rail proposal, AAGIS region 122. This region has some horticultural production along the Macquarie river and small areas of dryland cotton in the north western areas of the region. In all three regions under consideration, a large proportion of farms produce more than one product.

1. AAGIS obtains information from a large sample of broadacre farms—that is, farms mainly engaged in extensive livestock grazing and cropping activities. It excludes farms specialising in other activities, such as horticulture and cotton growing. ABARE (1995) describes the survey in detail.

Figure 3.1 AAGIS regions in Queensland

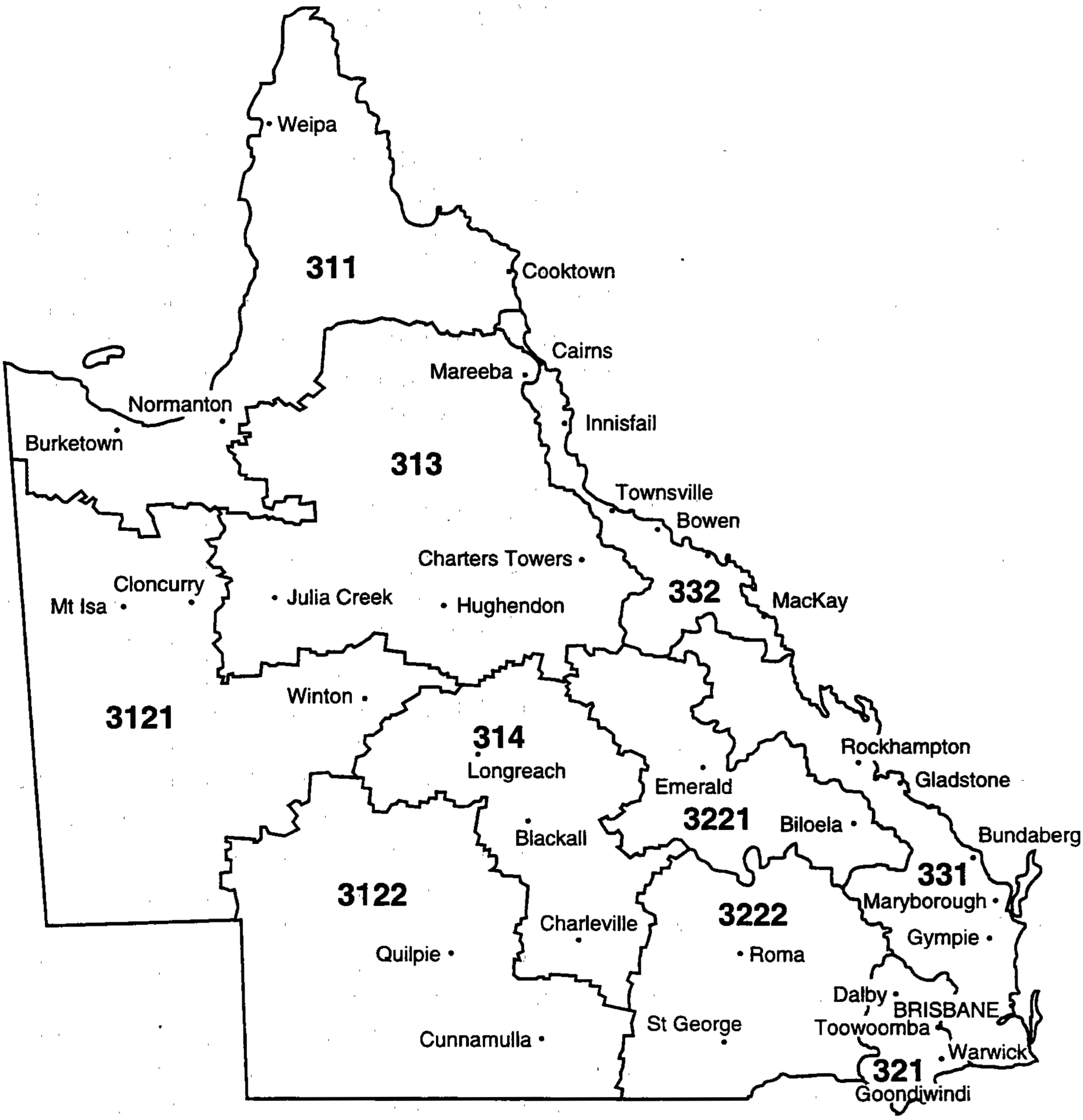
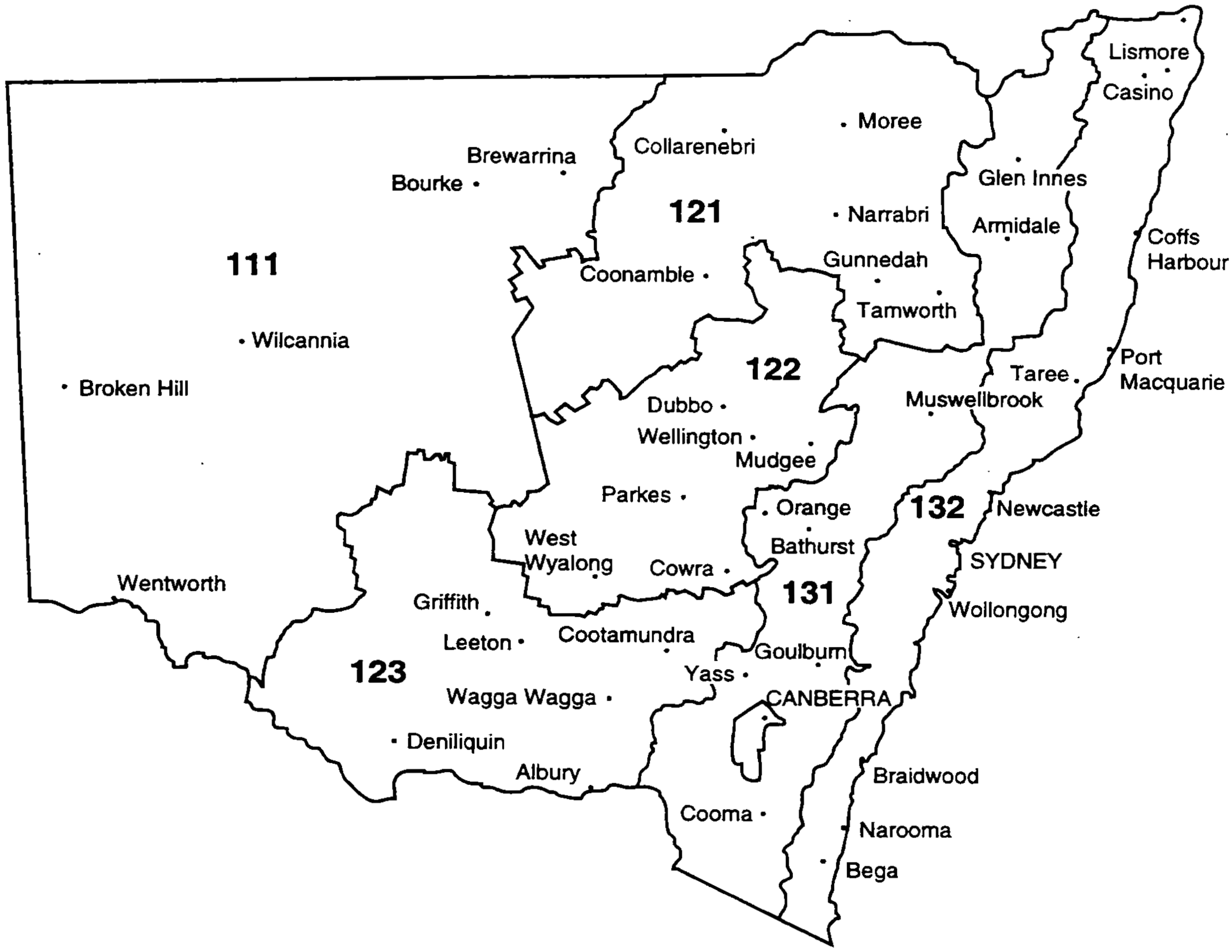


Figure 3.2 AAGIS regions in New South Wales



BENEFITS FOR GRAIN PRODUCERS

Transport cost reductions for existing grain production

Of the farming activities undertaken in the identified regions, grain production would probably benefit most from the proposed inland railway. Production of grain exceeds that of any other commodity on a tonnage basis and grain distribution systems make proportionally more use of rail transport than the distribution systems for other commodities. For this reason, the likely impact that the proposed railway would have on grain transport costs is considered first.

The Eastern States Grain Transport Model and its use in this study

The average cost saving for grain transport in each region was estimated with the *Eastern States Grain Transport Model*. This is a linear programming model that identifies the least cost path for a given quantity of grain to travel from farms to domestic and foreign destinations. The model measures grain quantity in wheat tonne equivalents, a measure that standardises the bulk to weight ratio for different types of grain to that of wheat. For the main types of grain, this measure is calculated by multiplying tonnes of barley by 1.2, tonnes of oats by 1.5 and tonnes of sorghum by 1.07. The grain is transported by road, rail and sea through a network of silos, subterminals and export ports. The pathways chosen are determined by charges faced in various parts of the transport and handling chain. Port terminal charges incorporate Australian Wheat Board port differentials. These differentials are premiums or discounts paid to producers for delivering their wheat either to a given port, or to the silo groupings that are classified as the receival zones or hinterlands of a given port.

In this study, three scenarios for the rail network were analysed:

(i) current rail links only (the base case);

(ii) current rail links plus the proposed inland railway without the new link between Coonamble and Bellata; and

(iii) scenario 2 plus the proposed new link between Coonamble and Bellata.

Grain freight rates for rail

The inland railway should lead to a reduction in rail charges for moving grain between some production areas and a port. Currently the charge for the 501 kilometre haul from Moree to Newcastle is around $22.00 per tonne (or approximately 4.4 cents per net tonne-kilometre) (ABARE unpub.). In scenarios two and three, QR has assumed that the charge for the 509 kilometre haul between Moree and Brisbane would be around $20.36 per tonne (or 4.0 cents per net tonne kilometre). QR has also assumed that the net tonne kilometre charges between centres on the Darling Downs and Brisbane would remain unchanged. The distance reduction between these centres and Brisbane, however, would mean that the price per tonne for these origin destination pairs would be less than the current price. The largest reduction in distance and price would be the 22 per cent reduction for trips between Goondiwindi and Brisbane.

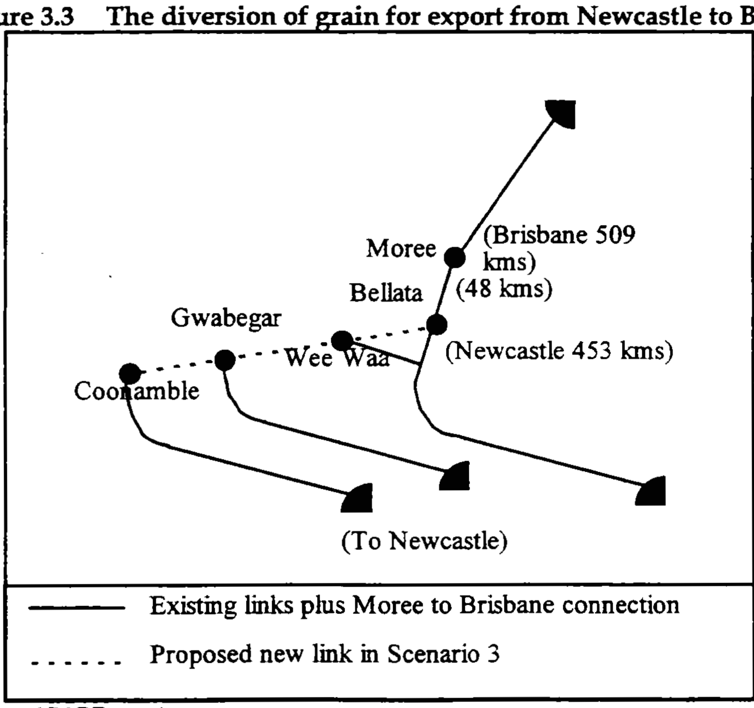
The reorganisation of the grain transport task

The proposed railway and the associated freight rates for grain would alter the least cost pathways for the grain transport task. A large part of the reorganisation would involve the redirection of grain flows from areas north of Moree toward Brisbane and away from the Port of Newcastle and domestic markets in Tamworth (figure 3.3). Some of this diversion would draw grain traffic away from road haulage since it would affect grain that currently goes to Tamworth by road.

When grain flows are diverted north to Brisbane on the new rail link and away from Tamworth, part of the domestic demand centred on Tamworth would be supplied by rail from the region around Walgett. Grain that would come from this region by rail to supply domestic demand at Tamworth currently flows to Newcastle by rail. B-doubles would transport more grain into the Tamworth region by road from the Werris Creek grain storage facility.

The additional link from Bellata to Coonamble (scenario 3) would not significantly alter the flow of grain to domestic nodes or through ports for export. The cheapest pathway for delivering grain from points near the new link would still be east into Tamworth by road, and south along existing rail lines into Newcastle.

Figure 3.3 The diversion of grain for export from Newcastle to Brisbane



Source ABARE unpub.

The regional cost savings to producers for transporting a tonne of grain

Despite leading to a substantial reorganisation of the grain transport task, the proposed railway would only reduce grain transport costs by a small amount (table 3.1).

TABLE 3.1 ESTIMATED SAVINGS TO FARMERS FOR GRAIN TRANSPORT AND ESTIMATED GRAIN FLOWS THROUGH EXPORT PORTS

	Unit	*Scenario 1* Current links only	*Scenario 2* Current links plus the inland Qld–NSW link	*Scenario 3* Scenario 2 plus Coonamble–Bellata link
Savings in transport and handling costs				
NSW region 121				
average transport cost	$/tonne	38.29	37.60	37.50
saving	$/tonne	..	0.69	0.79
per cent of base	%	..	1.80	2.06
NSW region 122				
average transport cost	$/tonne	43.29	42.85	42.85
saving	$/tonne	..	0.44	0.44
per cent of base	%	..	1.02	1.02
QLD region 321				
average transport cost	$/tonne	25.63	24.92	24.92
saving	$/tonne	..	0.71	0.71
per cent of base	%	..	2.77	2.77
Grain exports from				
Brisbane	000 t	824.50	1176.40	1176.40
Newcastle	000 t	233.10	38.00	38.00
Port Kembla	000 t	1406.90	1245.30	1245.30

.. not applicable

Source ABARE unpub.

After the addition of the inland New South Wales-Queensland link to existing links (scenario 2), the largest cost saving of around 2.8 per cent would occur in the Darling Downs (region 321). This is much less than the 22 per cent freight charge reduction between Brisbane and Goondiwindi because the 2.8 per cent is an average for the whole region and the cost saving for other centres in the region would be smaller. This smaller saving results from a combination of the following factors:

- the proposed changes would not shorten the rail distance between other centres and Brisbane by as much as that between Goondiwindi and Brisbane;
- some of the grain grown in the region would not go to Brisbane for export but to the domestic demand node at Toowoomba;
- road transport is used to transport grain from the farm gate to grain handling facilities and the cost of road transport is assumed not to change; this means that even for Goondiwindi producers the cost saving will be somewhat smaller (in percentage terms) than the rail charge reduction; and

- in other areas, road transport may be used for a greater proportion of the grain's journey between the farm gate and its destination.

The next largest saving would occur in the northern New South Wales region (region 121) where the average cost would fall by around 1.8 per cent while the smallest saving would be a reduction of around 1 per cent in the central New South Wales region (region 122). This saving would be realised in the northern part of the central New South Wales region.

The addition of the Coonamble–Bellata link to the inland route (scenario 3) would only lead to an additional cost saving of around 10 cents per tonne in the northern New South Wales region (region 121).

Strategic price setting behaviour by ports

The Port of Newcastle may cease to export grain if its throughput declined by 84 per cent. This estimated effect of the inland railway results from the assumption that port authorities do not change the price they currently charge. To maintain throughput, however, the Newcastle Port Authority may reduce its charges. Sensitivity analysis indicates that a reduction of between 25 and 50 cents per tonne would allow the Port of Newcastle to maintain its throughput.

The total saving to producers whose grain may be diverted would be unchanged if the Newcastle Port Authority adjusted its charges by just enough to maintain its current grain throughput. If this occurred, the grain paths eventually used may diverge from those estimated by the model.

Costs savings for the transport of fertiliser to broadacre producers

Fertiliser is a vital input used in grain production and around 57 000 tonnes is used annually in each of the regions being analysed (regions 121, 122 & 321). Almost all fertiliser used in these regions is currently trucked in from Brisbane. The major supplier is the firm of Incitec, which estimates that it has around 70 per cent of the total market in these regions (ABARE unpub.). It imports some pre-mixed fertiliser into these regions from its mixing plants in Brisbane. It also imports bulk shipments of the main fertiliser components to its mixing plant in Moree.

The cost of transporting fertiliser from Brisbane to Moree is currently around $27 per tonne. Incitec management advised ABARE that if a $5 per tonne saving could be achieved on this then they would transfer almost all the bulk fertiliser from road to rail transport (ABARE unpub.). The QR advised freight rate for fertiliser from Brisbane to Moree on the proposed railway is $20 per tonne. This would most likely result in around 80 000 to 100 000 tonnes of fertiliser being transported by rail at a considerable savings of up to around $7 per tonne in

Moree. The savings to growers in areas to the North and South of Moree would be smaller because those areas are closer to Brisbane and Sydney respectively. Savings of this magnitude, however, would only amount to around 2 per cent of fertiliser costs to producers (or around $140 per farm). Nevertheless, an aggregate saving of around $1.16 million a year in fertiliser costs would result.

The economic benefit of the rail link to the broadacre sector

A reduction in grain transport costs would lead to increased profits on existing broadacre farm production. Lower grain transport costs, however, would also be expected to make grain production relatively more profitable than other broadacre farm activities. A broadacre producer wanting to maximise profits would therefore be expected to grow more grain and reduce production of other commodities such as wool and beef. The magnitude of these changes was estimated with the *Australian Broadacre Agriculture Supply Response Model.*

The Australian Broadacre Agriculture Supply Response Model and its use in this study

This model estimates the combination of wool, lamb, mutton, beef and crop production on broadacre farms that would maximise farm cash income with a given capital stock and subject to a fixed land area constraint.[2] Farm cash income is defined as revenue minus operating costs. The model may therefore be used to forecast the change in commodity production and farm incomes that may result from a predicted change in commodity prices.

The responsiveness of production to changes in a commodity's own price and the prices of other commodities is measured by own and cross-price elasticities of supply. Estimates of these elasticities for the northern New South Wales region are presented in table 3.2.

To estimate the change in broadacre farm production patterns in northern NSW and the Darling Downs, the cost saving per wheat tonne equivalent was assumed to be passed on to broadacre producers in these regions as a price increase for grains. The cost savings for other principal commodities such as wool and meat were not considered sufficient to warrant inclusion (see later discussion of these commodities).

The broadacre supply response

We find that the inland railway would have its biggest impact on broadacre production patterns in the northern New South Wales region (region 121). There, other things being equal, the reduction in the cost of grain transport

2. A detailed description of the model framework is contained in Kokic, Beare, Topp and Tulpule (1993).

TABLE 3.2 OWN AND CROSS–PRICE ELASTICITIES OF SUPPLY FOR THE NORTHERN NEW SOUTH WALES REGION 121 1993–94

Percentage changes in production resulting from a 1% change in the price of:

	Wool	*Beef*	*Lamb*	*Wheat*	*Winter crops*	*Summer crops*
Wool production	0.24	-0.53	-0.31	-0.39	-0.28	-0.10
Beef production	-0.31	0.85	-0.18	-0.49	-0.16	-0.16
Lamb production	-0.34	-0.36	1.31	-0.26	-0.21	0.00
Wheat production	-0.10	-0.25	-0.06	1.83	-0.21	-0.11
Winter crops production	-0.23	-0.34	-0.14	-0.32	2.32	-0.14
Summer crops production	-0.24	-0.28	0.00	-0.47	-0.25	1.54

Source ABARE unpub.

would cause grain production to increase by 16 060 tonnes in the first year of the railway's operation (table 3.3). A smaller increase of some 5 530 tonnes would occur in the central New South Wales region (region 122). Overall, grain production would increase by around 21 000 tonnes in the first year of the railway's operation. Slightly smaller increases would occur in each of the next four years. Estimated decreases in wool production would be minimal and amount to around 70 tonnes over both regions. The estimated decreases in beef production would be marginally smaller over both regions. Although there would be some changes to the type of grain crops grown in the Darling Downs region (region 321), aggregate production would remain virtually unchanged. The opening of the additional link between Bellata and Coonamble (scenario 3) would have virtually no effect on farm production in all regions.

TABLE 3.3 ESTIMATED EFFECTS OF THE INLAND RAILWAY ON THE GRAIN AND WOOL PRODUCTION (SCENARIO 2)

Scenario 2	*Change in quantity of grain crops sold*		*Change in quantity of wool sold* [a]	
	(% change)	*(tonnes)*	*(% change)*	*(tonnes)*
Region 121				
Year 1	0.67%	16060	-0.09%	-38.7
Year 2	0.66%	14230	-0.08%	-35.4
Year 3	0.60%	13140	-0.08%	-32.1
Year 4	0.58%	13500	-0.08%	-32.5
Year 5	0.58%	13870	-0.08%	-32.2
Region 122				
Year 1	0.35%	5530	-0.07%	-31.2
Year 2	0.34%	5030	-0.06%	-27.2
Year 3	0.30%	4530	-0.06%	-25.7
Year 4	0.32%	5030	-0.06%	-24.7
Year 5	0.31%	5030	-0.06%	-24.7

a. Changes to wool production are shown because its production levels are reduced the most when grain production is increased.

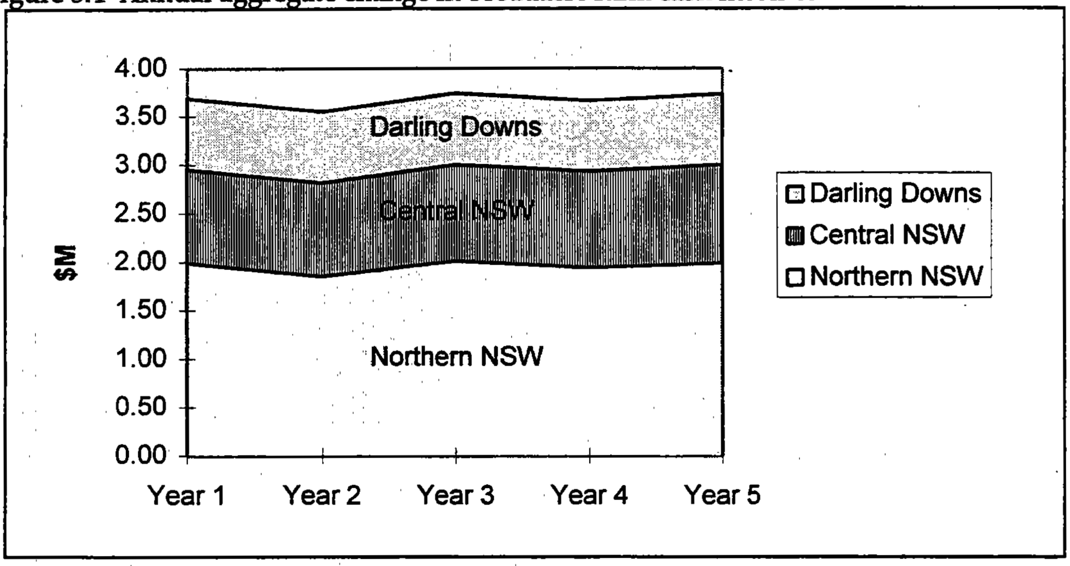
Source ABARE estimates prepared for BTCE.

The impact of the proposed inland railway on broadacre farm incomes

It is estimated that the reduction in grain and fertiliser transport costs from the cross-border standard gauge rail link (scenario 2) would result in a total increase in farm cash incomes of around $3.7 million in the first year of the railway's operation (figure 3.4). In the following four years, estimated increases of between $3.6 million and $3.7 million would occur. The opening of the additional link between Bellata and Coonamble (Scenario 3) would have virtually no effect on farm incomes.

In the longer term, the opening of the proposed railway may increase broadacre farm incomes in the three regions by around $3.6 million per year.

Figure 3.4 Annual aggregate change in broadacre farm cash incomes



Source ABARE unpub.

The limited size of regional development benefits for broadacre producers

The extra profit earned by broadacre producers from the regional development effect of the railway is a minor component of the total benefit of the railway for these producers. The proposed new railway would be likely to induce only a small increase in grain production which in turn would result in a profit increase of around $0.01 million in year one. This represents less than half of one percent of the total benefit that accrues to broadacre producers in that year. The reasons for this are:

- grain transport costs only amount to around 12 per cent of the amount of revenue earned from grain. This means a 10 per cent reduction in transport cost for a tonne of grain is only equivalent to a price increase of just over 1 per cent;
- the estimated transport cost reductions for a tonne of grain in the three regions analysed were 2.8 per cent, 1.8 per cent and 1 per cent. These

reductions are equivalent to small price increases of around 0.3 per cent, 0.2 per cent and 0.1 per cent;

- even if grain production was extraordinarily responsive to price movements, only small production increases would result from price increases of this magnitude. With the largest own price elasticity for grains being 2.3, the estimated production increases in response to the estimated cost reductions are minimal; and
- the cost of producing each additional tonne of grain tends to rise as production levels increase. This means that the small profit margin on the first extra tonne of grain produced becomes even smaller until, for additional tonnes, extra production becomes unprofitable.

BENEFITS FOR COTTON GROWERS

The Australian cotton industry is located along the river systems in northern New South Wales and southern Queensland and over 95 per cent of Australia's cotton is produced under irrigation. The industry may be divided into 10 separate production regions according to the river system on which they are located (see figure 3.5).

The cotton growing regions most likely to benefit

The cotton growing areas most likely to benefit from the inland railway are the Gwydir region which is centred on Moree, and the MacIntyre region which is centred on Goondiwindi. The Gwydir region is projected to account for 24 per cent of cotton lint production and the MacIntyre region 19 per cent by 1999-2000 (table 3.4). Most of this lint is produced for overseas markets.

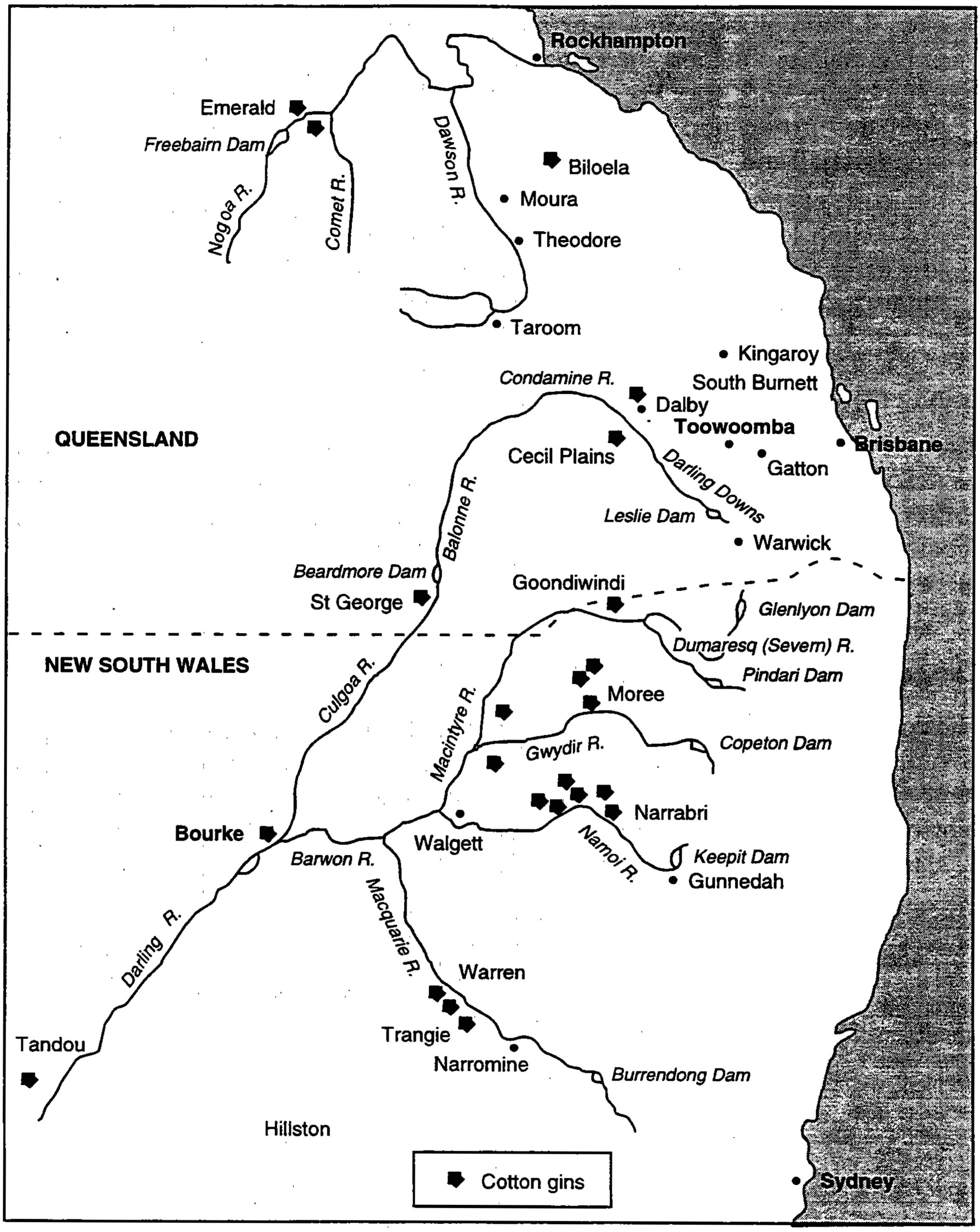
TABLE 3.4 PROJECTED PRODUCTION AND INPUT USE IN SELECTED REGIONS AND FOR THE AUSTRALIAN COTTON INDUSTRY IN 1999-2000

		Gwydir	*MacIntyre*	*Australia*
Cotton lint production	('000 tonnes)	139	40	584
Cotton seed production	('000 tonnes)	201	58	847
Fertiliser use	('000 tonnes)	24	7	104
Herbicide use	('000 litres)	553	152	2389
Insecticide use	('000 litres)	2388	670	10126
Other chemical use	('000 litres)	174	48	1137

Source ABARE unpub.

The Namoi region around Narrabri and Wee Waa is too far south to benefit from the proposed rail link with the freight charges advised by QR (see below). It is expected that cotton from this region would continue to be transported by rail to Sydney for export.

Figure 3.5 Cotton growing regions of New South Wales and Queensland



Source ABARE unpub.

Transport cost reductions for cotton producers

Freight saving on cotton lint

At present, transporting cotton from Moree (in the Gwydir region) to Brisbane would cost around $12.50 per bale.[3] Around $4.50 of this represents a charge for the road leg from Moree to Goondiwindi and the rest ($7.98) represents a charge for the rail leg from Goondiwindi to Brisbane. These are, however, notional prices because little if any Gwydir cotton is transported to Brisbane along this road/rail link in a normal season. Alternatively, the cost of transporting cotton by road train from the Gwydir region to Brisbane is around $10.50 per bale and the cost of transporting cotton from the Gwydir region to Sydney by rail is around $11.30 per bale.

Transporting cotton from Moree to Brisbane along the proposed inland railway would cost $9.52 per normal density bale.[4] This is based on the freight rate expected by QR. The proposed railway would thus result in a freight cost saving of $2.96 per bale compared to the existing road/rail link to Brisbane, $0.98 per bale compared to the road train link to Brisbane, and $1.78 per bale compared with the Moree–Sydney rail link.

Reductions in freight charges of this magnitude are unlikely to attract all Gwydir cotton output onto the inland railway for transport to Brisbane. This is because there are advantages in flexibility and timeliness with road transport to Brisbane for at least some shippers, especially those whose gins will not be located on the rail line. Furthermore, there are currently problems with the availability of containers and shipping space at the port of Brisbane. These problems may make it difficult to increase the quantity of cotton shipped through that port. Nevertheless, if the problems with the port of Brisbane can be overcome, it is estimated that around three quarters of Gwydir cotton would ultimately be transported by rail to Brisbane if the proposed standard gauge rail link was established. In all, the total annual freight cost savings on cotton movements from the Gwydir region are estimated to be around $873 000 in 1999–2000.

For growers in the MacIntyre region, the freight savings are estimated to be around $1.75 per bale. This would result in an aggregate saving for these growers of around $851 000 in 1999–2000.

Freight savings on cottonseed

Most of the cottonseed produced in the Gwydir region is processed in the Moree and Narrabri oilseed processing plants. ABARE considers it unlikely that

3. This assumes that the cotton is transported as normal density bales in twenty foot containers.

4. The container price is $400 per twenty foot container.

the proposed inland railway would result in more cottonseed being moved from the Gwydir region to Brisbane for processing or for export. The proposed rail link is therefore most unlikely to result in significant freight savings for Gwydir cottonseed.

Freight savings on chemical inputs for cotton production

QR advised that the freight rate would be $20 per tonne for the transport of fertiliser from Brisbane to Moree on the proposed inland railway and 3 cents per litre for pesticides, herbicides and other crop chemicals. At present, the bulk of these chemicals are trucked from Brisbane.

The advised freight rate represents an average freight saving of $7 per tonne for the transport of fertiliser to Moree compared with existing road transport. The annual freight savings on fertiliser inputs in the Gwydir region in 1999–2000 are projected to be $171 000.

With the movement of pesticides, herbicides and other crop chemicals, the average freight savings offered by the proposed inland railway is one cent per litre for the Gwydir region which represents a total annual freight saving of $27 000.

In the case of the MacIntyre region, the unit freight saving offered by the proposed rail link is assessed to be $4.05 per tonne for fertiliser and 0.4 cents per litre for other crop chemicals. In 1999–2000, the costs savings accruing to MacIntyre cotton producers are assessed to be $79 000 on fertiliser movements and $11 000 on farm chemical movements.

The change in profit for cotton growers

The supply response by cotton growers

The freight savings on cotton lint and chemical inputs would most likely have a negligible effect on the quantity of cotton produced in the Gwydir and MacIntyre regions. Most cotton crops are irrigated and it is the availability of water, not the current transport infrastructure that is constraining further increases in cotton production.

If more water became available to irrigate cotton crops, it is likely that cotton production would increase, even without the proposed railway. The higher volume of production would increase the magnitude of the user benefits that would accrue to cotton growers as a result of the railway. In these circumstances, these extra benefits should not be attributed to the rail project as regional development benefits, but as a cost reduction on production that would have occurred even if the proposed railway was not built.

The economic benefit of the proposed railway to cotton growers

The total increase in profits for cotton growers is estimated to be around \$2.01 million in 1999–2000. This profit increase is comprised entirely of a cost saving of around \$1.07 million on existing production in the Gwydir region and of around \$0.94 million in the MacIntyre region.

THE IMPLICATIONS FOR OTHER COMMODITIES

The proposed inland railway would have little effect on the profitability of the livestock and horticultural industries, the other agricultural sectors to which the railway may be relevant. Benefits for coal production in the Surat and Moreton basins would also be small.

Benefits for horticultural producers

The proposed railway may be relevant for the horticulture industry in two ways. First, there is the issue of whether lower transport costs would stimulate horticultural production in northern New South Wales, and second, an economic benefit may accrue to established growers in north Queensland who ship product to southern markets in Sydney and Melbourne. Some produce is also shipped north to Queensland from southern suppliers.

Prospects for production in northern NSW

It is possible that the rail link could lead to increased horticultural production in northern New South Wales but the major constraint on this is availability of water. Hence, any increase in horticultural production would be at the expense of cotton which is a highly profitable crop that provides a high return to irrigated water. It is expected that this competition would prevent any significant increase in horticultural cropping in this region.

Benefits for growers in established growing regions

It is estimated that approximately 70 per cent of the fruit and vegetables produced in Queensland are transported interstate. Approximately 50 per cent of this goes to the Sydney–Newcastle region and the remainder goes mainly to or through Melbourne. There is also a reverse flow of fruit and vegetables from the south into Queensland.

Over time, the transport of fruit and vegetables by rail has given way to road transport because of the latter's superior speed, product handling and flexibility of pick up and delivery. It is estimated that the overall percentage of fruit and vegetables transported out of Queensland by rail is now quite low, approximately in the range of 5 to 7 per cent. There are a few commodities, however, that are relatively compatible with rail transport. For example, around 15 per cent of bananas, and 20 to 30 per cent of Queensland melons and pumpkins that are transported to Melbourne go by rail.

The proposed railway is most likely to benefit Queensland's two most important production areas, Bundaberg and Burdekin-Bowen, and southern producers who currently ship produce to Queensland. If rail transport could provide a service that is more competitive with road haulage in terms of speed, product handling and flexibility, it is estimated that there would be an increase in the volume of fruit and vegetables transported by rail of around 5 per cent. This would lead to around 40 000 tonnes of fruit and vegetables being transported by rail from Queensland to Melbourne and to the Sydney-Newcastle region in a year. Similarly, around 23 000 tonnes of fruit and vegetables could be expected to flow back into Queensland from the south per year.

It is estimated that this would result in an annual benefit to growers of around $0.71 million. Most of this would probably be realised from the cartage of the less perishable commodities such as pumpkins and potatoes.

This benefit estimate overstates the benefit that should be attributed to the proposed railway. The new railway alone would not allow rail to recapture business in the transport of fruit and vegetables that it has lost to road haulage in recent times, although the improved transit times will help. To prevent the current drift away from rail transport and achieve the estimated gains, additional investment is required to improve rail's product handling and flexibility in pick up and delivery.

Implications for the livestock industry

Road transport is preferred by producers for many transport tasks associated with the livestock sector. The particular transport tasks in this sector where road haulage dominates are:

- the movement of wool bales and livestock (particularly in New South Wales) from properties to selling centres;
- the movement of feeder steers and feed grain from suppliers to feedlots; and
- the movement of feed grain from suppliers to poultry farms and eggs from the farms to packing cooperatives, warehouses and direct to points of sale.

Road haulage has a considerable advantage in these tasks because of its ability to provide a more timely and direct delivery service than rail over these relatively short hauls.

Industry sources believe that road will continue to dominate these transport tasks. However, there is some potential, for feed grain currently imported by road into northern New South Wales from Brisbane to be transported by rail on the proposed rail link. The proposed railway could also provide an opportunity to move livestock by rail from Queensland to selling centres in New South Wales. In both cases, however, it is likely that the tonnages involved would be small.

Rail may be advantageous during a drought when farmers move livestock long distances. These stock, mainly cattle, generally move north or south depending on seasonal conditions and feed availability. Drought can also increase importation of grain to feedlots in the northern New South Wales region and the Darling Downs. Considerable tonnages of barley were moved from Victoria and South Australia during the recent drought of 1994 and 1995. Historical data suggests that on average, a drought as severe and widespread as the 1994 and 1995 drought may be expected every nine years in Australia. Droughts of lesser severity and scope may be expected in two years out of every 10.

Around 75 000 tonnes or 35 per cent of the meat produced for export markets is transported by rail to Sydney, the major shipping port with container facilities. There is clear potential for some meat from Forbes, Dubbo, Gunnedah and perhaps Wagga to be moved by rail for export through the Port of Brisbane. This option would increase flexibility and reduce risks associated with port closures; however, no significant cost savings would be involved.

Implications for the development of south east Queensland coal reserves

There are large coal reserves to the west of Brisbane in the Surat and Moreton basins. The coal in these deposits is a lower quality coal than that mined in the Bowen basin or the Hunter valley as it has a lower calorific value. It does, however, have a lower sulphur and ash content, making it a more environmentally friendly product.

The development of these reserves is currently retarded by a lack of demand for this coal and inadequate transport to a port. Most steaming coals are used for power generation and significant quantities are exported. The power generating equipment used in power stations is specific to a particular fuel type and to some degree this extends to different grades or types of coal. Furthermore, different coal types (brands) become known and accepted by power station operators who are reluctant to use unknown brands. These factors will make it difficult for the south east Queensland coal to break into established overseas markets, particularly in the short to intermediate term. This predicament is compounded by the plentiful supply of well known and accepted coal brands currently used as fuel in power stations.

Notwithstanding this, niche export markets may open up for some of this coal and allow some development to occur. The other development possibility may be for domestic power production in Queensland. Proposals have been put forward to build a power station close to these reserves, but to date, none have been approved. However, even if approval is granted, these stations would probably be too close to the reserves to necessitate transport of coal along the new railway.

Congestion on the rail network within Brisbane is an even more binding constraint on future development. The current rail route from Ipswich to the port uses this network, and the high level of suburban train traffic places an upper bound on the number of coal trains that may pass over this network in a day. QR is uncertain of the extent that the proposed investment would overcome this constraint. This may continue to limit future development of these coal reserves, but, a cost saving on the small amount of coal that currently comes from the Wilkie Creek mine would result from of the improved Toowoomba range crossing.

THE POSSIBILITIES FOR OTHER SECTORS

Passenger services between Toowoomba and Brisbane

The proposed upgrading of the line between Brisbane and Toowoomba would open the possibility of operating a passenger rail service between these cities. The establishment of such a service is a part of the Queensland government's urban transport strategy but it is not feasible on the current track. Before such a service could be provided on the new track, additional capital expenditure would have to be made to electrify the track to Toowoomba such that double stacked freight wagons could also use this route. A park and drive station may also have to be constructed at the junction of the proposed freight route and the branch line to Toowoomba.

Careful consideration would have to be given to the economic merits of this expenditure. In Queensland, both urban and country passenger rail services incur substantial operating deficits, with fare revenue covering only about 25 per cent of operating costs in 1993–94 (BTCE 1996). If a rail passenger service between Brisbane and Toowoomba were to incur a similar operating deficit, it would need to be established that a deficit of such magnitude is warranted on economic grounds. That is, benefits that the rail service provider could not capture, such as reduced road congestion for example, would have to exceed the operating deficit. It would also need to be established that rail could provide such a service more efficiently than a bus service.

If the future provision of a rail passenger service was not a consideration, the line to Toowoomba would not have to be a double track and could be built for a reduced capital cost.

Implications for secondary industries in rural regions

The inland railway could either stimulate or inhibit development of secondary industries in the rural regions through which it passes. The railway would stimulate development by reducing freight costs for products exported from these regions. But the railway would also reduce freight costs for products imported into these regions from elsewhere, and this would have mixed effects on regional development. Better access to imports could threaten local producers of competing products. Alternatively, it could benefit some local producers by reducing the cost of obtaining imported inputs.

Even if the proposed railway were, on balance, to stimulate the development of certain rural regions, much of the apparent benefit would simply be a transfer from other regions. The net benefit to society would therefore be much lower than the apparent benefit to the rural region in which the industry relocates.

CHAPTER 4 USER BENEFITS

The proposed inland railway would benefit users of freight transport services for a wide range of commodities. The benefits associated with several commodities used or produced by agriculture were examined and partially estimated in chapter 3. We do not analyse in the same depth the user benefits associated with the many other commodities that would be carried on the inland railway. In this chapter, we place some rough bounds on the possible magnitude of these benefits conditional on the assumptions about rail traffic levels made by QR. Bounds on user benefits are likewise calculated for the alternative coastal investment options. Readers are forewarned that the QR assumptions about traffic levels are highly conjectural and that any errors in these assumptions will bias our calculations.

The investments under consideration would reduce transit times and improve the reliability of rail freight service (see chapter 2). Reduced transit times benefit customers by bringing forward the time when the freight is put to profitable use at the destination. Reliability of service refers in large part to the predictability of transit time, which matters more to some customers than does the transit time as such. These customers may tolerate long trips, but they want to know with some certainty when their freight will be collected and delivered. When the time of pick up or delivery deviates from the schedule, customers can incur costs for several reasons: loss of sales, longer waits for trucks picking up freight, the need to hold higher stocks, and disruption to production schedules.

Under the QR assumptions, the investments would also benefit freight service customers by reducing charges for rail freight, albeit modestly (see chapter 2).

The 'upper bounds' approach in this chapter avoids some difficult problems in placing money values on user benefits. Consider first the problems in estimating user benefits from reductions in rail freight charges. If the charge reductions were to have no effect on demand for rail freight, the estimation task would be simple. The benefits to users would be the reduction in total charges on the existing volume of rail freight. More realistically, though, demand for rail freight would increase. The now cheaper rail freight services would draw some business away from road transport (diverted traffic). There could also be an induced increase in the total tonnage carried by both road and rail (generated traffic). The larger the induced increase in traffic — be it diverted from road or generated — the larger the indication of benefit to users. (Put another way, a large induced traffic effect indicates that people have been able to take real advantage of the cheaper prices.) The difficulty is estimating the amount of induced traffic. Studies based on Australian and overseas data have produced rather mixed evidence on the sensitivity of rail freight demand to changes in price, and generalisations are hazardous. (This issue is discussed in further detail below.)

Service quality improvements pose greater challenges for estimating user benefits than do reductions in charges. QR has provided estimates of rail transit times under the scenarios relevant to the present study, but only very impressionistic information on the reliability of service. Moreover, even with sound measures of reliability and other service attributes, how much customers value improvements in service quality is hard to estimate. Demand responses to the improvements provide some indication, as they will be small unless customers value the improvements significantly. However, research on how customers value and react to better quality freight service has not advanced enough to contribute to the present analysis.

The approach in this chapter is to accept the QR assumptions about how the proposed investments will affect demand for rail freight, and to tease out the implications for user benefits. The framework for analysis formalises the intuitive notion introduced above that large demand responses are indications of large user benefits. The other elements of the framework are presented in layman's terms below. For technical details of the framework, see appendix 1.

FRAMEWORK FOR ESTIMATION OF USER BENEFITS

The framework for estimating user benefits entails four key assumptions. The first three assumptions discussed are plausible approximations to reality, albeit with elements of exaggeration. The last two assumptions are more speculative.

Assumption 1: Road outperforms rail transport in freight service quality.

Road transport typically has the edge over rail transport in reliability, speed and flexibility of scheduling (BIE 1995); a finding supported by QR estimates of transit times. For example, carrying freight between Brisbane and Melbourne takes 20 hours by road compared with 33 hours or more for rail.

Corollary: Road freight transport is more expensive than rail freight transport

If rail provides inferior freight service to road, it must charge a lower price to attract business. The data on prices examined below are consistent with this proposition.

Assumption 2: Service quality has a lower value for existing rail freight than for the new rail freight that will be attracted by a reduction in rail freight charges.

Service quality is generally valued more for freight which goes by road than for freight which goes by rail. This follows from assumption 1. Customers choosing the mode offering better service quality (road) over the cheaper mode (rail) will tend to be those customers placing a high value on service quality.

If a reduction in charges for rail freight were to affect demand simply by diverting business from road, it follows that service quality should be valued more highly for induced than for existing rail freight. This is assumption 2. If some induced traffic is not diverted from road, being instead a net addition to land freight traffic or a diversion from other modes, the basis for assumption 2 could be strengthened or weakened. However, the assumption would still seem fairly safe, since most of the traffic induced by a reduction in rail freight charges is likely to be diverted from road.

Assumption 3: The investments in railways will not affect the price or quality of competing road freight services.

By reducing demand for road freight services, the rail investments might depress road freight charges. But with profit margins in the road freight industry already meagre, there is not really much scope for prices to fall. A significant reduction in prices would lead, before long, to massive contraction of the industry and undersupply.

It is unlikely that improved service quality in the rail freight sector would cause the road freight industry to make significant improvements to its service quality. Indications are that the Australian road freight industry is highly efficient by world standards (BIE 1994). Without a major technological advance, this would make it difficult for the road industry to make significant improvements in response to a challenge from rail.

Assumption 4: Road transport will continue to outperform rail transport in freight service quality even with mooted investments in place.

The investments being considered would reduce, but not eliminate, rail's slowness relative to road, according to QR estimates. In nearly all cases, the estimated transit times with investment are greater for rail than for road, and sometimes by a wide margin. For Melbourne–Brisbane container traffic, the estimates are 25 hours for rail under the enhanced inland investment option, versus 20 hours for road. Moreover, the estimates tend to understate rail's relative slowness, since the rail transit times are only for the line haul between terminals. The time involved in moving freight to and from the terminal can add significantly to total rail transit time. Road freight services are sometimes 'door-to-door', in which case they avoid passing through terminals. Even when this is not the case, road freight terminals are typically closer to the points of pick-up and delivery than are rail freight terminals, in the case of nonbulk freight (BTCE 1995c).

As mentioned in chapter 2, lower rail transit times could be attained if the mooted investments were supplemented with investment in new types of rolling stock. QR considers that these supplementary investments could pass economic assessment and could overcome rail's drawbacks in service quality. These investments are excluded from present consideration, since QR has provided no estimates of their costs and effects.

Without investment in new types of rolling stock, road would probably remain superior to rail in overall quality of freight service. In addition to retaining its speed advantage, road would still offer greater flexibility in scheduling.

Assumption 5: Demand curves for rail freight are linear.

A demand curve represents the relationship between the price of a good or service and the quantity demanded. For each origin-destination pair, a demand curve can be drawn for rail freight.

Without any solid information on the nature and degree of curvature, the assumption of straight-line demand curves is fairly natural. Furthermore, such an assumption has precedent in benefit-cost analyses of road investments, where linear demand curves are standard for estimating the generated traffic benefit.

ASSUMPTIONS ON RAIL FREIGHT TRAFFIC

For analysing the effects of the investments on freight traffic, QR has considered hypothetical cases where the investments were in place in 1994-95. Based on actual traffic levels in that year and other information, QR has made assumptions about the traffic levels that would have flowed in the hypothetical scenarios.

Data on actual freight tonnages by origin and destination came mainly from a database created by the Centre for Transport Policy Analysis at the University of Wollongong. QR aggregated 39 regions in the database into 12 regions and selected origin-destination pairs of regions that would be affected by the investments (appendix 2). The BTCE had previously updated the traffic figures in the Wollongong database from 1998–89 to 1994–95 by assuming, for each mode, that all traffic flows had grown at the overall national rate. For certain origin-destination pairs which had grown at substantially different rates, QR adjusted the BTCE figures.

Almost all the traffic induced by the investments would be diverted from road according to the QR assumptions. This shows up in table 4.1, which sums the QR assumed traffic levels across origin–destination pairs. For most origin–destination pairs, QR derived the induced increases in rail's share of the freight market with a procedure that allows for the separate influences of improved transit time and reliability (box 4.1). QR perceives the diverted traffic as comprising mainly container freight. Shifts between rail and air freight were omitted from the analysis, since most air freight is too time-sensitive to make rail a feasible option. Substitution toward rail from sea transport, on the other hand, might warrant consideration in a full-fledged benefit-cost analysis.

TABLE 4.1 RAIL FREIGHT TRAFFIC 1994–95: SUMMARY OF QUEENSLAND RAIL ASSUMPTIONS

	Investment option notionally in place in 1994–95			
	Coastal		*Inland*	
Variable	*Basic*	*Enhanced*	*Basic*	*Enhanced*
Freight ('000 tonnes)[a]				
actual (1994–95)	9799	9799	9799	9799
Investment-induced (QR assumptions)				
diverted	476	2363	1772	2705
generated	0	0	156	156
Total	10275	12162	11727	12660
Rail market share (%)[b]				
actual (1994–95)	33	33	33	33
with investment	35	41	40	43

a. Totals across origin–destination pairs that would be affected by any of the investments being considered; see text.

b. Rail share of total road and rail freight tonnages.

Source BTCE estimates compiled from QR data.

The northern New South Wales region, which includes Moree, was a special case in the QR analysis of traffic for two reasons. First, the inland railway would introduce rail service between this region and Brisbane, rather than simply improve an existing rail service, as would be the case with other origin–destination pairs. Second, QR recognised that rail freight from northern New South Wales would consist mostly of commodities like wheat, for which transit time is not a critical issue. For these reasons, the QR analysis of induced traffic to and from northern New South Wales did not use the procedure described in box 4.1, which assigns a central role to transit time improvements.

BOX 4.1 BASIS FOR QUEENSLAND RAIL ASSUMPTIONS ABOUT DIVERTED TRAFFIC

QR based its assumptions on a simple estimation procedure, which recognises two causes of traffic diversion from road to rail: reductions in rail transit time and improvements in rail service reliability.

Transit time

For each origin–destination pair, QR posited a maximum for rail's potential share of total rail and road freight. The maximum share depended on haul length, ranging from 40 per cent (with a 1000 km haul length) to 80 per cent (with a 4000 km haul length. The reduction in transit time due to a rail investment was assumed to bring rail's market share closer to the maximum. QR calculated this increase above the current market share as follows:

$$\frac{\textbf{(Reduction in rail time)}}{\textbf{(Current rail time-Road time)}} * \textbf{(Maximum market share-Current market share)}$$

Reliability

Improved reliability due to a rail investment was assumed to give another boost to rail's market share. QR's estimate of this effect was subjectively determined. The revised market shares, incorporating the effects of both transit time and reliability changes, were not constrained to be less than the 'maximum' market shares. However, the maximum shares were exceeded only for a few origin–destination pairs and not by much.

For the inland railway scenarios, the QR traffic figures have been adjusted to avoid double counting the user benefits estimated in chapter 3 for the agricultural sector. Specifically, for certain origin–destination pairs, tonnages have been excluded for the following commodity categories: fruits and vegetables; other horticulture/food; wheat and other grains; cotton; and fertilisers.

These tonnages flow mainly from northern New South Wales and southern Queensland. Excluding them from the QR traffic figures reduces both actual and diverted traffic by about 20 per cent and reduces generated traffic between northern New South Wales and Brisbane to a mere 44 kilotonnes.

Under the enhanced option, QR expects the proposed inland railway to increase freight traffic by around 50 per cent between Brisbane and Melbourne and by around 39 per cent between Melbourne and Sydney. The latter increase in demand mainly reflects QR's expectation of a more reliable service between Melbourne and Sydney. QR expects most of the track between these cities to become less congested once the Brisbane–Melbourne freight trains do not have to use the coastal railway.

QR expects that the largest contribution to the traffic induced by the inland railway would stem from Melbourne-Brisbane traffic under the basic option (33 per cent), and from the Melbourne-Sydney traffic under the enhanced option (23 per cent).

QR also assumes that the inland railway would attract all rail freight traffic between Brisbane and Sydney away from the current coastal route. Although the diversion of traffic inland would raise operating costs according to table 2.1, it could benefit rail service operators by attracting more business. QR reckons that the superiority of the inland route in transit time and reliability would increase demand by 18 per cent under the basic option, and 42 per cent under the enhanced option.

The coastal investments are assumed to increase traffic substantially under the enhanced option, but not under the basic option (which would cost far less). Counting all the origin-destination pairs that would be affected, the assumed increases amount to 24 per cent and 5 per cent, respectively. The flows between Brisbane and Sydney are the most important source of the increase (with a 30 per cent share), followed by flows between Melbourne and Sydney (about 25 per cent).

ASSUMPTIONS ABOUT FREIGHT SERVICE PRICES

Rail freight charges are set in our analysis at 4 cents per net tonne-kilometre (ntkm), a rule of thumb suggested by QR. For road freight, the assumed charge is 6.9 cents per ntkm, which is the truck operating cost per ntkm suggested by information in DOT (1995). The operating cost figure includes a normal return to truck capital, based on typical rates of return for capital in general, and the costs of driver time (an imputed cost for owner-operators). Competition in road freight services, including freedom of entry by new companies, is probably sufficient on most routes to keep rates of profit on a par with other industries over the long run. If this is true, the charge for road freight services should approximate the operating cost in a typical year.

In the currently depressed market for freight services, the charges prevailing on many routes are well below the charges assumed in this study. The BTCE obtained information from the National Rail Corporation on rail and road freight charges for capital city pairs, as at December 1994. For the pairs relevant to the present study, the road freight charge averaged 4.7 cents per ntkm. (The weights for averaging were each pair's share of total traffic in ntkms.) The rail freight charges averaged between 2.1 and 3.5 cents per ntkm, according to the type of container — less in each case than the 4 cents per ntkm assumed here.

Using freight charges above current levels makes sense because the depressed conditions are likely to be temporary.[5]

Data on rail distances, for converting charges per ntkm to charges per tonne, were supplied by QR. Data on road distances were supplied by the Australian Automobile Association.

The resulting estimates of charges may overstate the price competitiveness of rail freight, since the to-and-from terminal costs are probably greater for rail than for road freight, as argued above. Adding the costs of moving freight to and from terminals was not possible with the available data.

ESTIMATION OF USER BENEFITS

The framework in this chapter for estimating user benefits incorporates the rail traffic data supplied by QR, adjusted in the case of the inland railway to exclude traffic in the special agricultural commodities for which estimates of user benefits were presented in chapter 3. For the commodities remaining after these exclusions, our framework is aimed at providing upper–bound estimates of user benefits. Reinforcing this upper–bound interpretation is the omission from our freight charge estimates of the costs of moving freight to and from terminals. This omission overstates the benefit to road freight customers of switching to rail, since it overstates the savings in freight charges due to rail being cheaper.

TABLE 4.2 USER BENEFITS FROM RAIL INVESTMENTS: SUMMARY FOR BASE YEAR 1994-95

($ million)

Commodities transported	*Investment option notionally in place in 1994-95*			
	Coastal		*Inland*	
	Basic	*Enhanced*	*Basic*	*Enhanced*
Special agricultural[a]			6.2	6.2
Other	13.1	61.9	42.4	56.1
Total (all commodities)	**13.1**	**61.9**	**48.6**	**62.3**

a. Special commodities carried between certain origins and destinations: fruits and vegetables; other horticulture; wheat and other grains; cotton and fertilisers.

Source BTCE estimates based on QR data.

The estimates of user benefits in table 4.2 carry the same temporal interpretation as the assumed traffic volumes. They indicate the benefits that freight customers would have realised from the rail investments in 1994–95 had the investments been in place then. For the special agricultural commodities, the temporal interpretation is approximate, since the estimates of benefits relate

5. For rail, the weighted averages we have calculated might understate current changes somewhat since they relate only to intercapital services. For shorter hauls, rail charges tend to be higher (see BIE 1995).

to some notional year with average levels of production. The benefits for this category of freight would comprise only about 12 per cent of the total benefits from the inland railway, according to table 4.2.

For the commodities other than the special agricultural commodities, the estimates of user benefits in table 4.2 can be decomposed into the benefits from two sources: the reductions in rail freight charges and the improvements in rail service quality. Our framework allows diverted traffic to result from either source, even though QR attributed all this traffic to improved service quality (see box 4.1). Recognising both sources adds some realism. Recall, however, that the assumed reductions in rail freight charges are modest and confined to a few origin–destination pairs. The improvements in service quality, rather than the reductions in charges, thus account for the bulk of the user benefits indicated in table 4.2 for the 'other' commodity category.

The upper-boundedness of the estimates of user benefits arises mainly from an optimistic assumption about the value of service quality improvements. The assumption is that the improvements will have the same value for existing rail freight as for rail freight induced by the investments. In reality, the value will probably be smaller for existing rail freight, as was argued above (assumption 2).

Along with an upper-bound estimate of user benefits, our estimation framework implies a lower-bound estimate for the elasticity of demand for rail freight services. The elasticity of demand measures the responsiveness of demand to a change in price. With the new infrastructure in place, the value of this lower bound is around 1.4 for most origin-destination pairs. This implies that the amount of freight that people desire to send by rail will change by around 1.4 per cent if the freight price for rail changes by one per cent. (The quantity change and the price change will be in opposite directions, so if the price increases, demand for rail freight services will decline and vice versa.) This conflicts somewhat with the common belief that demand for rail freight transport is relatively unresponsive to price changes (price inelastic) — that is, that elasticity is less than 1.0. However, Oum et al (1992), in their careful review of international research on price elasticities of transport demand, found evidence contradicting this belief and concluded that generalisations are impossible. (For a review of the more limited Australian literature on this subject, see Luk and Hepburn 1993.)

The current structure of the rail freight industry in Australia adds further plausibility to our lower-bound on the elasticity of demand. For most origin-destination pairs, a single company has a near monopoly — the National Rail Corporation, in the case of inter-state services. If demand were price inelastic under current conditions, these companies would not be setting prices consistent with their objectives, which are to maximise profits. An inelastic demand means that the company can raise revenue by raising price, since demand will fall proportionately less than the price will rise. And with demand lower, costs of providing the service would decline, leaving the company clearly better off. For profit maximisation, demand would have to be elastic at the chosen price.[6]

6. One could estimate the post-investment prices on the assumption of linear demand curves and profit maximisation by a monopolistic service provider. Button (1993) describes such an approach to estimating benefits of investments, with the additional assumptions of no price discrimination and of parallel shifts in the demand curves. However, Button rejects this approach as too restrictive. In this study, we have accepted the QR assumptions about post-investment prices.

CHAPTER 5 ECONOMIC EVALUATION

The preceding analysis has provided some of the elements for a rudimentary benefit-cost analysis of the mooted investments: the costs of the investments and the benefits to freight service customers (user benefits). Several estimation tasks remain before an indication of net benefit can be derived. First, since some benefits will accrue to the rail industry rather than its customers, the effect of the investments on the industry's operating surplus needs to be estimated. Calculations can then be made of the total benefits that would have been realised in the base year, 1994-95, had the investments been in place then. Second, the estimates of total benefits in the base year need to be extrapolated over the economic life of the investments. Third, the discount rates and economic life spans need to be chosen. These tasks are discussed below.

RAIL OPERATING SURPLUS

A simple accounting relationship can decompose the effects of the investments on rail operating surplus (revenues minus operating costs). One of two positive components in this relationship is the saving in total operating costs on existing rail freight traffic. The other positive component is the gain in operating surplus due to induced traffic; this is positive because the charge for an additional tonne-kilometre exceeds the cost of providing it. These positive components far outweigh the negative one, which is the loss of revenue on existing rail freight traffic due to the reductions in freight charges assumed to result from the investments (chapter 2).

The QR estimates of unit operating costs, which enter the calculations of rail operating surplus, seem rather low in relation to the base year, 1994-95. A study of the proposed railway between Darwin and Alice Springs predicted operating costs of about 1.3 cents per ntkm, assuming the adoption of world best standards for track, rolling stock and operation (including double stacking of trains; Travers Morgan 1995). The investments considered in the present study would not achieve world best standards and would be made on routes that have large sections with more difficult operating conditions than on the flat and straight route between Darwin and Alice Springs. Yet the QR estimates of unit operating costs average only 1.2 cents for the base case and as little as 1.0 cents for the investment scenarios.

Because of our doubts about the QR estimates of unit operating cost, we derived alternative BTCE estimates to recalculate the changes in operating surplus. The BTCE estimates include an allowance for the variable costs of track maintenance, whereas the QR estimates do not. Partly for this reason, the BTCE estimates are significantly higher and more consistent with available evidence on rail operating costs. All the same, the choice between BTCE and QR estimates of unit operating costs has little effect on the estimated changes in operating surplus due to the inland railway (table 5.1). The choice matters most for the basic coastal investment: using the BTCE estimates rather than QR's estimates reduces the estimated gain in operating surplus by 60 per cent. Even in this case, however, using the BTCE estimates would not alter our conclusions about the merits of the proposed investment. From here on, we use the QR estimates of unit operating costs since much of the other key information in our analysis comes from QR.

TABLE 5.1 EFFECTS OF RAIL INVESTMENTS ON RAIL OPERATING SURPLUS 1994–95: DETAILS OF CALCULATIONS

	Base case	*Rail investment hypothetically in place in 1994–95*			
		Coastal		*Inland*	
Variable		*Basic*	*Enhanced*	*Basic*	*Enhanced*
Freight task ('000 ntkm)	8449306	9083002	10837097	10896184	11683137
QR-based calculation[a]					
operating cost (c/ntkm)	1.242	1.238	1.124	1.061	1.046
total cost ($m)	104.95	112.45	121.78	115.65	122.16
revenue ($m)[b]	337.97	363.32	433.48	418.44	446.73
operating surplus ($m)	233.02	250.87	311.70	302.79	324.57
incremental surplus ($m)	..	17.85	78.68	69.76	91.54
BTCE-based calculation[b]					
operating cost (c/ntkm)	2.637	2.417	2.353	2.361	2.221
total cost ($m)	222.83	219.50	254.98	257.24	259.50
revenue ($m)	337.97	363.32	433.48	435.85	467.33
operating surplus ($m)	115.14	143.82	178.50	178.60	207.83
incremental surplus ($m)	..	28.68	63.36	63.47	92.69

.. not applicable.

a. Based on QR or BTCE figures for operating cost (c/ntkm) as indicated.

b. Calculated on freight rate of 4 c/ntkm for all traffic except, in the inland investment scenarios, for traffic between Sydney and Brisbane, for which the assumed rate was 3.3 c/ntkm. (See discussion of charges in chapter 2.)

Source Based on QR data.

The estimated gains in rail operating surplus, based on the QR operating cost data, exceed the estimates of total user benefits presented in chapter 4. Nevertheless, the user benefits comprise at least 40 per cent of the estimated total benefits from each investment. These figures, which are based on table 5.2, should be interpreted carefully, given the limitations of our estimates. (In particular, remember from chapter 4 that the procedure for estimating user benefits was designed to set upper bounds.) It does seem likely, however, that both user benefits and the gain in rail operating surplus would be significant components of the total benefit.

TABLE 5.2 BENEFITS FROM RAIL INVESTMENTS: ESTIMATES FOR BASE YEAR 1994–95
($ million)

	Rail investment option notionally in place in 1994–95			
	Coastal		*Inland*	
Benefits	*Basic*	*Enhanced*	*Basic*	*Enhanced*
Operating surplus	17.9	78.7	69.8	91.5
User benefits	13.1	61.9	48.6	62.3
Total benefits	**31.0**	**140.6**	**118.4**	**153.8**

Source BTCE estimates based on QR data.

OTHER ASSUMPTIONS

The assumptions that remain to be introduced are open to dispute, so alternative assumptions are tried later in this chapter.

Time frame

The investments are assumed to generate benefits for thirty years, and to have no residual value at the end of this period. While assumptions about project life and residual value are inherently speculative for most infrastructure investments, economic lives of several decades are normal for evaluations of investments in rail track and signalling. As mentioned in chapter 2, the construction of rail investments is assumed to take the five years from 1996–97 through to 2000–01. Benefits would thus be realised from 2001–02 though 2030–31.

Real construction costs are assumed to remain constant over the five-year construction period. Thus, the cost incurred during each year equals one-fifth of the total project cost estimated by QR.

Discount rate

Our preferred real discount rate is 11 per cent per annum. QR, which was corporatised recently, uses an 11 per cent real discount rate for its own investment appraisals. In addition, as discussed below, there is research which suggests the use of real discount rates of around 10 to 11 per cent for Australian investments with typical levels of risk.

Freight growth rate

Rail freight traffic has been projected out from the base year (1993–94) at a 3 per cent annual growth rate in all scenarios. This accords with forecasts of long-run annual growth rates in rail freight on the Sydney-Brisbane corridor (3 per cent) and on the Sydney-Melbourne corridor (2.7 per cent), in BTCE (1993b and 1994d).

Freight charges and costs

Freight charges and rail operating costs per ntkm have been estimated from near-current data, as discussed in chapter 3. Freight charges are assumed in this study to increase in the future at the general rate of inflation, leaving them unchanged in real terms. For the base case scenario (none of the mooted investments adopted), the same assumption is made about rail operating costs. For the investments scenarios, real operating costs decline for rail freight in 2001–02, when the investments come on stream, and remain constant thereafter. All charges and costs are measured at 1994–95 prices.

The static assumptions about real charges and operating costs can be challenged. Real charges for road freight declined by almost 50 per cent in Australia throughout the 1970s and 1980s, and, although the rate of decline has eased since 1985, the trend may well continue. The future spread of B-doubles and other trailer combinations throughout the Australian truck fleet will reduce real freight rates by allowing heavier loads per truck. Additionally, the spread of improved communications technology will allow better route scheduling. These factors underpinned the assumption in BTCE (1995d) that real freight rates will decline by 15 per cent between 1992-93 and 2014–15. Adopting this sort of scenario for the present analysis would reduce our estimates of benefits from the rail investments. This has not been done, since we do not have comparable scenarios for real costs and charges in the rail sector. With knowledge of all the relevant trends, estimates of net benefits could be either larger or smaller than those reported here.

RESULTS OF THE EVALUATION

For each investment, we present three measures of economic merit:

- the net present value (NPV), which is the present value of benefits minus the present value of costs;
- the benefit-cost ratio (BCR), which is the ratio of the present value of benefits to the present value of costs; and
- the internal rate of return (IRR), which is the hypothetical discount rate at which the NPV is zero.

When the IRR exceeds the discount rate actually used in our calculations, 11 per cent, the NPV is positive and, conversely when the IRR is less than 11 per cent, the NPV is negative. The IRR may be seen as a break-even rate of return.

The results indicate that the inland railway would generate benefits that just cover the costs under the basic option and that exceed costs by a modest 15 per cent under the enhanced option. The enhanced coastal option turns out to be marginally nonviable. Only the basic coastal option, which would cost far less than any other option ($94 million versus $1 278 million or more), has an estimated BCR substantially greater than 1.0.

TABLE 5.3 ECONOMIC PERFORMANCE INDICATORS FOR RAIL INVESTMENT OPTIONS

	Rail Investment Option			
	Coastal		*Inland*	
Indicator	*Basic*	*Enhanced*	*Basic*	*Enhanced*
Present value of benefits ($m)	227	1033	857	1118
Present value of capital costs ($m)	62	1071	845	971
Net present value ($m)	165	-39	12	147
Benefit-cost ratio	3.63	0.96	1.01	1.15
Internal rate of return (%)	27	11	11	12

Note Discount rate assumed is 11 per cent per annum.

Source BTCE estimates based on QR data.

Sensitivity analysis

Our uncertainty about the 'correct' values for the discount and traffic growth rates has led us to consider the sensitivity of our findings to the use of alternative values. The following discussion also examines the sensitivity of our findings to the use of two alternative measures of benefit: the change in rail operating surplus (without user benefits added); and the change in the combined operating costs of road and rail freight.

Variation in discount rate

The discount rate was varied above and below the 11 per cent figure used for the above analysis. DOF (1991) recommended a discount rate of 8 per cent for benefit-cost analyses of general government investments, unless more appropriate project-specific rates can be ascertained. Previous BTCE studies have often favoured this rate of 8 per cent for evaluating transport investments (for example, BTCE 1995e). State road authorities have tended to set their standard discount rate even lower, with Queensland using 6 per cent (AUSTROADS 1994). The choice of 11 per cent in the present study is consistent with a careful reading of the DOF handbook. DOF based its recommended discount rate of 8 per cent on the 'presumption that many activities in the general government sector are characterised by less than average market risk in the sense that their returns are not significantly increased or decreased when economic activity is strong or weak'. DOF cites the benefits of defence programs as an example. Importantly, DOF implies that that for investments with more typical levels of risk, the discount rates should be in the order of 10–11 per cent. Indeed, real discount rates greater than for 11 per cent are often applied for risky commercial investments (Dixit 1992). The relative risk of the rail investments considered here is difficult to assess, although their very long economic lifespans suggests a large risk premium, making a discount rate of 13 per cent conceivable. A discount rate of 15 per cent was used for a benefit-cost analysis of possible closure of the Tasmanian railway system (BTCE 1991).

For sensitivity analysis, we have used the discount rates of 6, 8 and 13 per cent. Discounting reduces the value attached to benefits or costs arising in the distant future compared to those incurred sooner. The use of the high discount rate (13 per cent) undermines the case for the investments because the costs of the investments precede the benefits. For the basic coastal option alone, benefits are now estimated to exceed costs. Only at the low discount rates of 6 and 8 per cent do the estimated benefit-cost ratios exceed 1.0 per cent for all investment options. This latter finding calls for careful interpretation. Conditional on discount rates in this low range being appropriate, the findings suggest that implementing any one of the investments might be economically warranted. The upper-bound aspect to our estimates of user benefits militates against the stronger inference that the investments are economically warranted. A serious mistake would be inferring that both the coastal and inland investments should go ahead, since these investments have been analysed independently. Their combined effects would not equal the sum of their effects when each is undertaken without the other.

A higher freight growth rate

For illustration, the traffic growth rate of 3 per cent per annum used in the above calculations was replaced with the arbitrarily more optimistic rate of 6 per cent. This change of assumption raises the estimated benefits of the investments, resulting in benefit-cost ratios above 1.5 in each case.

Even with this optimistic traffic growth assumption, the internal rate of return estimates are not unusually high compared with estimates from other studies of transport infrastructure investments. The estimates are 32 per cent for the basic coastal option and about 16 per cent for each of the three larger investments (table 5.4). Investments in urban freeways and arterial roads allegedly have internal rates of return averaging between 40 and 50 per cent, according to estimates in Allen Consulting (1993).

Alternative measures of benefit

Our estimates of total benefit are basically upper-bounds, since the user benefits were largely estimated within an upper bound framework.

A lower bound estimate of total benefit can be derived from the estimated gain in rail operating surplus. Because it excludes user benefits, the gain in rail operating surplus itself defines a lower bound, albeit one which is too pessimistic. To serve as a measure of social benefit, the change in the operating surplus should not include the revenue loss on existing traffic due to the assumed charge reductions. This revenue loss is neither a cost nor a benefit to society; it is simply a transfer of money from the rail authority to its customers.

Even with this adjustment, however, the gains in rail operating surplus would, by themselves, not justify any of the investments except the basic coastal option, using our estimates and preferred discount rate (table 5.4).

An even more conservative measure of benefit was used in the analysis of rail investments for the NTPT report (BTCE 1995b). Since induced traffic was not estimated in that analysis, benefits were measured by the reduction in operating cost on existing rail traffic. In the present analysis, the estimated gains in rail operating surplus arise mainly from the induced traffic. If benefits were measured as in the NTPT report, the benefit-cost ratios for all the investments considered here would be well below 1.0.

Another measure of benefit is the change in the total operating costs (OC) of land freight services (road and rail). Studies of the Darwin to Alice Springs railway and other rail investments have used this measure, which does not recognise induced traffic other than that diverted from road (BTCE 1993a, 1988). For simplicity, our calculation of this measure counts all induced traffic as being diverted from road, since little other induced traffic appears in our scenarios.

Replacing our upper-bound measure of benefits with the measure based on total land freight operating costs makes each of the investments look more advantageous (compare tables 5.4 and 5.3).

The rather surprising conclusion which this comparison suggests is that a popular measure of benefit — the change in land freight operating costs — exaggerates the benefits of the investments. Intuitively, this measure could either exaggerate or understate benefits by neglecting service quality issues. For existing traffic, it understates benefits by failing to value improvements in service quality. For diverted traffic, it overstates benefits, provided that rail freight services do not match the quality of road freight services even after investment (assumption 3 in chapter 4). The diversion of traffic from road to rail will, on this assumption, entail a loss of service quality, which offsets the savings due to rail being cheaper than road to operate. Given these opposing biases, it is impossible to be completely general about the overall direction of bias. With an additional assumption about demand curves, however, the change in land freight operating costs turns out to exaggerate the investment benefits. The assumption is that demand curves post-investment are either linear—a natural guess in the absence of much information about curvature — or convex in curvature (see appendix 1 for proof).[7]

TABLE 5.4 SENSITIVITY TESTS: CHANGES IN DISCOUNT RATES, TRAFFIC GROWTH RATES, AND BENEFIT MEASURES

	Rail Investment			
	Coastal option		*Inland option*	
Sensitivity test[a]	*Basic*	*Enhanced*	*Basic*	*Enhanced*
Discount rate of 6%				
net present value ($m)	442	1067	933	1375
benefit-cost ratio	6.91	1.83	1.93	2.19
Discount rate of 8%				
net present value ($m)	294	464	432	709
benefit-cost ratio	5.24	1.39	1.46	1.66
Discount rate of 13%				
net present value ($m)	113	-223	-143	-64
benefit-cost ratio	2.93	0.78	0.82	0.93
Higher freight growth rate				
net present value ($m)	310	623	539	840
benefit-cost ratio	5.95	1.58	1.64	1.87
internal rate of return (%)	32	15	15	17
Benefits = adjusted change in GOS[b]				
net present value ($m)	69	-362	-251	-217
benefit-cost ratio	2.1	0.66	0.7	0.78
internal rate of return	19	8	8	9
Benefits = change in OC road & rail[c]				
Net present value ($m)	167	163	58	196
Benefit-cost ratio	3.68	1.15	1.07	1.2
Internal rate of return	27	12	12	13

a. Each test is conducted independently of the others; for example, when the traffic growth rate is raised to 6 per cent, the discount rate remains at 11 per cent.

b. Change in rail gross operating surplus, excluding effect of price reductions on revenue from existing rail freight (see text).

c. Change in total operating costs for road and rail freight combined.

Source BTCE estimates based on QR data.

COMPLICATIONS — EXTERNALITIES, ACCIDENTS, TAXES AND HIDDEN COSTS

Our estimation of benefits and costs omitted several factors already mentioned, such as rail congestion delays. Discussion now turns to several other omitted factors, namely:

7. This proof holds in cases where the freight charge does not increase.

- the effects of the investments on accident costs;
- the effects of the investments on costs of pollution, road congestion and pavement damage;
- the differences between private and societal costs that arise from fuel excise and other taxes; and
- possible hidden costs.

Incorporating some of these complications into our analysis, such as the effects of the investments on road congestion, would require far more research than has been possible for this paper. Others, such as fuel excise taxes, are more tractable, but dealing only with these complications could distort our results further. The following discussion shows the dangers of selective focus and the risks of exaggerating benefits like reductions in road congestion through superficial analysis. Overall, it suggests a need to treat cautiously any claims that the above-mentioned omissions have caused significant underestimation of net benefits.

Accident costs

The mooted investments could well improve transport safety. The accident costs from a given rail freight task would decline because of the shortening of distances and, in the case of the inland railway, the bypassing of populated areas. In addition, some freight business would switch to rail from the more dangerous road transport.

Attempts to place money values on safety benefits encounter serious problems in valuing the avoidance of pain and suffering. BTCE (1992, 1995f) estimated the costs of transport accidents in Australia using the common method known as the 'human capital' approach. Property damage and lost production due to death or incapacitation accounted for most of the estimated costs. Pain and suffering costs were measured, for non-fatal accidents only, by court awards for general damages (which includes pain and suffering of the victim, loss of amenities of life, and loss of expectation of life). An alternative method of estimating accident costs, the 'willingness to pay' approach, has been widely regarded as having greater theoretical validity than the human capital approach, particularly in relation to fatal accidents. The idea is that people are willing to pay up to a certain amount, depending on their income and attitudes, to achieve a given reduction in their risk of specified accidents, and that the benefits of improved transport safety are best estimated from these subjective valuations. This willingness to pay approach is much more difficult to apply than the human capital approach, and often gives larger estimates of safety benefits. (For further discussion of these approaches, see BTCE 1992.)

Although the BTCE saw its estimates of accident costs as lower-bounds, the estimates would probably have to increase substantially to imply large safety benefits from the investments considered here. Suppose, for illustration, that rail freight accidents were halved over the portions of the network that would be affected by the three larger investments (that is, excluding the basic coastal option). The BTCE estimated rail accident costs in 1993 for passenger and freight operations combined. Even if all these costs were attributable to freight operations, which is an extreme assumption, the estimate works out to only about 0.11 cents per ntkm.[8] Applying this figure to the hypothetical halving of rail accident rates implies benefits of between 6 and 8 per cent of the total benefits in table 5.2. Similarly, using BTCE estimates on road accident costs would imply relatively small safety benefits from modal diversion induced by the investments. BTCE (1993b) estimated accident costs for articulated trucks travelling the Hume highway, taking figures on per accident cost from its earlier study (BTCE 1992). For 1990, the estimated cost of accidents is 0.20 cents per ntkm. The current figure would not necessarily be higher, since road accident rates are declining on a national basis. Accepting the figure of 0.20 cents per ntkm would require increasing our estimates of investment benefits by at most 4 per cent to incorporate safety benefits from modal diversion.

Road congestion and air pollution

Atmospheric emissions from freight vehicles have some effects resembling road congestion in being concentrated near heavy traffic. In contrast, the contribution of these emissions to the phenomenon of global warming, known as the 'greenhouse effect', is not a localised effect.

The investments being considered would not necessarily relieve road congestion or problems with local air quality. The effects in the capital cities are the main concern, since these problems are much less serious elsewhere. The ambiguity as to the direction of these effects follows from the reasoning in BTCE (1995c). Briefly, most intercapital rail freight will require distribution by road to or from the urban rail terminals, which are mostly located in the inner city. Consequently, a modal shift from road to rail will replace distribution by road from the outer suburbs (where the National Highway meets the urban area) with distribution by road from the inner city. Since congestion and air pollution are most severe in the inner city, the modal shift might aggravate these problems. Preconceptions about depollution effects can arise easily by ignoring these considerations, since, as a general rule, trucks do emit more pollutants into the air than do trains, per tonne-kilometre of freight.

8. For government railways, the estimated costs of accidents was $69 million. Rail freight tonne-kilometres in 1993–94 totalled 60.5 billion, as reported in BTCE (1995d).

The proposed investments would, on the other hand, probably reduce land transport's contribution to the greenhouse effect. Emissions of gases having this effect, measured in carbon dioxide equivalents, are about twice as large for a tonne-kilometre of rail freight as for a tonne-kilometre of road freight. The investments would reduce these emissions through modal diversion and by shortening of rail distances between Brisbane and most other capital cities. They would thus reduce the cost to Australia of having to take special measures to reduce its emissions of greenhouse gases. The avoided costs are hard to quantify, but the BTCE is investigating the least-cost strategies to achieve possible targets for reducing greenhouse gas emissions from Australian transport, and will publish its findings in mid-1996.

Taxes and road damage costs

Payments of fuel excise are not costs to society in themselves, only transfers of income between segments of society (from industry to government). For this reason, benefit-cost analyses sometimes deduct the fuel excise from measures of vehicle operating cost and less often, from measures of construction cost. Other taxes and government charges related to transport may warrant similar adjustments.

Taxes and government charges imposed on trucks have been estimated at 28.7 cents per kilometre, with respect to articulated trucks with six axles (DOT 1995). Since a normal load for such trucks is 16 tonnes, this translates to about 1.8 cents per ntkm. Deducting these taxes and charges from our estimates of operating costs per ntkm would substantially reduce our estimates of net benefits from the proposed rail investments. But some element of these taxes and charges could be taken as representing road damage costs from trucks, and these costs would need to added to our estimates of operating costs. The cost of pavement damage per truck ntkm would vary greatly, but a representative figure would be about 0.85 cents (BTCE 1993b). Thus, accounting for pavement damage and taxes and charges in combination would reduce our estimate of truck operating cost to the order of 0.9 cents per ntkm. This would still cause a significant reduction in our estimated benefits.

Similarly, some taxes and government charges on rail freight transport should be deducted from our estimates of rail freight operating costs. This would have two opposing effects on our estimates of benefit from the rail investments. The benefits on existing traffic would be reduced, since savings in highly taxed inputs, such as fuel, would be valued less. However, the benefits on traffic diverted from road would increase since the measured cost of expanding rail traffic would be lower (appendix 1). The BTCE (1995b), in its study of rail investments for the NTPT, found that excluding fuel excise from rail operating costs gave rise to a small reduction in estimated benefits on existing traffic. However, induced traffic and taxes or charges other than fuel excise were not considered. In the same study, the BTCE also excluded the fuel excise component of rail construction costs, which was assumed to be 9 per cent.

Hidden costs

Investments in transport infrastructure often have costs that are not estimated up front. The costs of disruption to existing infrastructure services due to construction activity is one of them. Another is the cost to society of government subsidies (explicit or disguised), which investments in transport infrastructure often attract. Like the tax payments mentioned above, the subsidy payments themselves are transfers rather than costs to society. But the subsidies can create societal costs through the economic effects of taxes that finance them. An increase in income taxes, can discourage work effort, savings and investment. The cost to Australian society of an additional dollar of income tax revenue has not been conclusively quantified, though estimates range up to 40 cents (DOF 1991).

CHAPTER 6 CONCLUDING COMMENTS

The case study reported in this paper examines two important questions:

- do regional development effects contribute much to the overall benefit from transport infrastructure investments? and
- would the inland railway proposed by QR provide a positive net benefit to society?

Our analysis provided little to support an affirmative answer to the first question. The regions likely to receive the largest economic stimulus from the proposed inland railway are the Darling Downs in Queensland and nearby regions of New South Wales. Of the major agricultural activities currently undertaken in these regions, grain production would gain the most because of its heavy reliance on rail transport. The modelling in this paper indicated that the savings in freight costs would stimulate grain production in these regions, but only slightly. The profits from the added grain production were found to comprise a minuscule proportion (well under one per cent) of the total benefit to the growers. The benefit to the growers would consist almost entirely of transport cost savings on their current volume of production. The benefit from the induced increase in grain production looks even less significant when compared to the total benefits of the inland railway, including those associated with commodities other than grains.

For other agricultural or mineral commodities, the analysis in this paper found that the inland railway would provide virtually no stimulus to production. Constraints on water supply in the above-mentioned regions would preclude any significant expansion to the cotton and horticultural sectors. The inland railway would improve access from certain coal reserves in southeast Queensland to the Port of Brisbane, but the coal in these reserves is not the conventional type for export markets. Even if niche markets could be created abroad, the coal would have to pass through a capacity constrained rail network within Brisbane to reach the port. Substantial investment in this network may be needed to accommodate a large increase in the amount of coal passing through.

Similar findings abound in the literature on transport and economic development. (For reviews of this literature, see Slater 1992 or Rietveld 1994.)

What the findings show is that, in highly developed economies like Australia, transport infrastructure investments often have minor effects on regional development, for the reasons given below.

Because the transport network is already so extensive, even large investments in new infrastructure often produce marginal changes in transport costs.

> The inland railway between Brisbane and Melbourne, which would cost over $1 billion to create, provides some examples of this. It would provide grain producers with better access to the Port of Brisbane, but the resulting reduction in transport cost per tonne would be under 3 per cent.

Transport costs are generally not that large a component of total production costs.

> Freight costs from producer to purchaser typically account for about 10 per cent of the price that Australians pay for a domestically produced commodity (CIE 1995). For a particular transport mode, the proportion is smaller.

Producers often view different modes of transport as poor substitutes.

> This would, for example, sharply limit the benefit of the proposed inland railway for horticultural producers. As discussed in chapter 3, road transport attracts the large bulk of horticultural freight because of its advantages over rail in speed, flexibility and product handling. The inland railway, by itself, would do little to overcome the drawbacks of rail.

Natural constraints can limit the development of a region's resource-based industries.

> Agriculture and mining underpin much of the rural economy in Australia and utilise a diverse range of natural resources. Insufficient attention to the diversity of these resources and the natural constraints on their supply can create unrealistic expectations of regional development effects. As we have seen, insufficient attention to the diversity in grades of coal could inflate expectations about development of coal reserves resulting from the proposed inland railway. Similarly, land input in agriculture is heterogeneous. Transport improvements that be might be thought to encourage the emergence of relatively new agricultural industries in a region may fail to do so appreciably because land characteristics give the region a substantial comparative advantage in more established forms of agriculture. Partly for this reason, the analysis in this paper has found that the proposed inland railway would be unlikely to stimulate horticulture in the traditional cotton-growing areas of northern New South Wales. (Some proponents of the inland railway had seen this shift into horticulture as a possible source of benefit.)

For many industries outside mining and agriculture, the expectation of minor regional development effects from transport infrastructure investments is more difficult to justify, since natural resources play a smaller role in determining the regional distribution of activity. In theory, the regional location decisions in some manufacturing industries could be sensitive to changes in transport costs, even when transport costs form a small share of total costs. Davidson (1995) speculated that, by improving transport access for rural southern Queensland and northern New South Wales, the proposed inland railway would create new manufacturing opportunities in these regions — both for the established engineering and agricultural equipment industries, and for new industries, such as a wool scour and gas-based fertiliser plant. Such effects have not been investigated in this paper, and some preliminary analysis might be in order to determine how much attention they warrant. One question for such an analysis is whether rail transport would be attractive for a particular industry, or whether the industry resembles horticulture and many others in having a strong preference for road transport. If the industry appears to be accepting of rail transport, there is the follow-up question of whether regional expansion of the industry would generate a significant benefit to society. Perhaps an illustrative calculation could help determine whether this is likely to be so, or whether, as was found in this paper's analysis of regional development effects in agriculture, the benefit to society would be minuscule compared to the transport cost savings on existing traffic. In any such calculation, the measure of benefit to society should not be confused with measures of local increases in production, since, as was noted in chapter 3, some of the local increase can represent a diversion of production from elsewhere.

As to the second question raised above, the proposed inland railway emerges from our analysis as an investment of uncertain merit for implementation in the near future. The cost of the investment would be partly offset by an increase in the gross operating surplus of the rail sector: rail operating costs would decline while traffic would increase. But the estimates of operating cost savings and traffic volumes supplied by QR imply that this source of benefit would not suffice to justify the project economically. Thus, whether the project is economically warranted would seem to depend critically on the magnitude of the benefits to users of rail services. However, the orders of magnitude obtained in this paper leave it unclear whether the benefits to users would tilt the balance in favour of the project. This ambiguity remained despite the upper bound character of our estimates of user benefits. Also unclear from our results is whether the inland railway makes more economic sense than the enhanced coastal investment option, which would make the proposed inland railway partly redundant.

Additional research might clarify the merits of the proposed inland railway for implementation either in the near or more distant future. Clearly, there is scope for improvement in the data supplied to the BTCE by QR. It bears repeating that the estimates of time and operating cost savings from the inland railway are conservative insofar as they abstract from congestion delays in Sydney. This consideration, taken alone, suggests that the attractiveness of the inland railway may have been understated in this paper.

Current BTCE work toward developing a new rail operating cost model may assist any future evaluations of the inland railway. However, like other 'off the shelf' models of operating cost, the model being developed is too general to capture all the important features of the rail network that should be considered in a benefit-cost analysis. For evaluating the inland railway and alternative coastal investments, the effects on track maintenance costs would need to be carefully investigated, particularly as the inland railway might allow downgrading of the coastal line between Brisbane and Sydney to local traffic standards.

In addition to refining the estimates of operating costs, such evaluations should measure the effects of the investments on rolling stock capital costs, which have not been considered here.

Another issue that may warrant further attention is the possibility, ignored in this paper, that the inland railway could carry double-stacked trains. Realising this possibility would require some additional investment to that outlined in chapter 2, to deal with low vertical clearances in places along the inland route, particularly within the Brisbane area. With this additional investment, double-stacked container trains could serve the Port of Brisbane at Fisherman's Island. In comparison, raising the low vertical clearances within Sydney to accommodate double stacked trains could be prohibitively expensive.

The inland railway also holds prospects for synergies with investments in rolling stock and in passenger rail service (between Brisbane and Toowoomba), which might call for investigation.

Future evaluations of the inland railway should estimate benefits to users of the rail services, not just the benefits to the rail sector. Additional research on how freight transport customers react to changes in price and non-price attributes of rail and other modes would assist the evaluation of rail investments generally. The BTCE is currently undertaking a research project to examine the relative importance which rail freight customers assign to various service quality attributes. Statistical modelling of freight customer decisions, which has not been widely undertaken in Australia, would be a useful extension to this analysis. Such modelling could help predict both the changes in demand stemming from a proposed rail or road investment and the base-case levels of demand for the 'no-investment' scenarios. It could also indicate how much users value improvements in price or service quality. One reason why little modelling of this sort has been undertaken in Australia is the paucity of data on the service quality of freight transport.

APPENDIX I A COMPARISON OF BENEFIT MEASURES

INTRODUCTION

In this study three measures of social benefit have been presented. The first, *the economic benefit* (*EB*), is the benefit rail users' gain from improved service quality and reduced prices (user benefits or *UB*) plus the change in the rail operating surplus (*OS*). This measure most correctly measures the economic benefits of a project but it is often not used because of the unavailability of the requisite data. For some sources of user benefits, such as improved reliability, an agreed definition of reliability has not even been formulated.

The second measure is based on *the change in the rail operating surplus* (*OS*). This measure is smaller than the first and provides a lower–bound estimate of a project's social benefits. It equals the *OS* estimate plus the loss of revenue on existing traffic due to the assured price reductions. This revenue reduction is added back into the *OS* estimate because it is not a loss to society, but a transfer from the rail operation to consumers.

The third measure is *the savings in the total operating costs of road and rail freight services* (*OC*). The size of this measure relative to the economic benefit measure (*EB*) is not obvious and an investigation of this issue is presented in the remainder of this chapter. In a somewhat surprising result, the savings in the combined operating costs proved to be unambiguously larger.

THE SIMPLE CASE

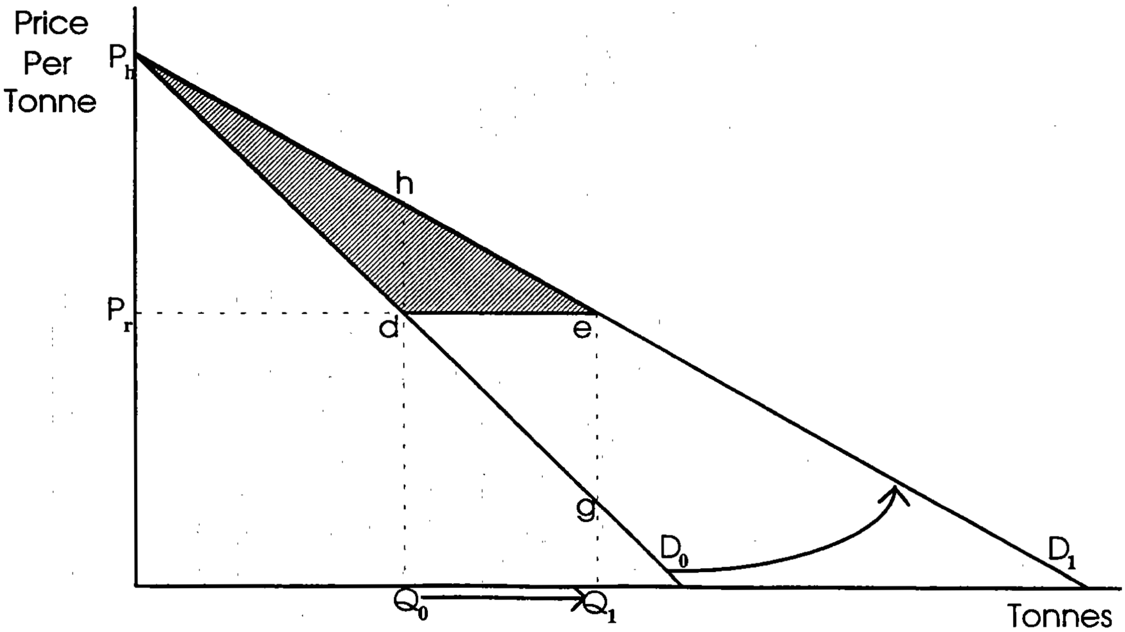
Suppose a rail investment improves rail service quality while the price of the rail service is held constant. The resulting increase in demand for rail freight services can be represented as an upward shift in the demand curve. We have QR estimates of the change in rail freight volumes due to the investments considered here, but we do not know the exact nature of the shift in the demand curve. Since the estimate of the benefit to freight service customers depends on the nature of the shift, two cases are considered below. In each case, it is assumed that the 'after' demand curve is linear; the 'before' demand curve is also drawn as linear, but allowing it to be non-linear would not affect our conclusions.

Rotation of the rail services demand curve

If most of the increase in demand is business attracted from road, the demand curve should become flatter at the same time that it shifts up, as in the case of a rotation of the demand curve (D_0 to D_1 in figure I.1). This is because available evidence suggests that current users of rail services place a lower value on service quality than current users of road transport. Presently, road transport generally provides a higher quality service than rail for a higher price. Road transport customers are prepared to pay this premium for the higher quality service; rail customers are not. It follows that if road customers were to use rail, they would be willing to pay more for an improvement to the rail service than the current rail customers. The willingness to pay of current marginal users is represented by the vertical distance between the two rail demand curves at the initial quantity (the distance *dh* at Q_0). The higher willingness to pay of new users is this vertical distance at quantities greater than Q_0 (at the new quantity, Q_1, it is *eg* which is greater than *dh*).

If it is assumed that even after the investment, rail service quality would not match the quality of road service, customers would be unwilling to pay more than the price of road (P_h) to use rail. If the price of rail (P_r) exceeded that of road (P_h), all freight would travel by road. In other words, the intercept of the demand curves can be no higher than P_h, which is the intercept in the diagram below.

Figure I.1 **User benefits from a quality improvement with price unchanged and a rotation of the demand curve.**



Total economic benefit (EB)

The first measure, total economic benefit, is:

$EB = UB+OS$

The first component, the benefit to users, is equal to the area bounded by the two demand curves and the price line (the triangle P_h d e). This is equal to:

$UB = 1/2*dQ*(P_h-P_r)$

where $dQ = Q_1-Q_0$

The second component of the economic benefit, the change in operating surplus, is found as follows:

$OS = Q_0*(C_{r0}-C_{r1})+dQ(P_r-C_{r1})$

where C_{r0} is the initial operating cost per tonne and C_{r1} is the operating cost after the improvement.

Therefore:

$EB = [1/2*dQ*(P_h-P_r)]+[Q_0*(Cr_0-Cr_1)+dQ(P_r-Cr_1)]$

Operating cost savings (OC)

The more often used measure of the combined savings in the operating costs of rail and road transport operations (*OC*) is:

$OC = Q_0*(C_{r0}-C_{r1})+dQ*(C_h-C_{r1})$

which is the sum of cost savings made from freight being diverted from road to rail, where C_h is the per tonne operating costs of road transport, and cost savings on existing rail freight.

The size of EB compared with OC

In a highly competitive industry such as road transport, it is reasonable to assume that the price charged for output approximates the marginal cost of production. Therefore, $P_h = C_h$ and the difference in size between *EB* and *OC* is:

$EB\text{-}OC = dQ*1/2*(P_r-P_h)$.

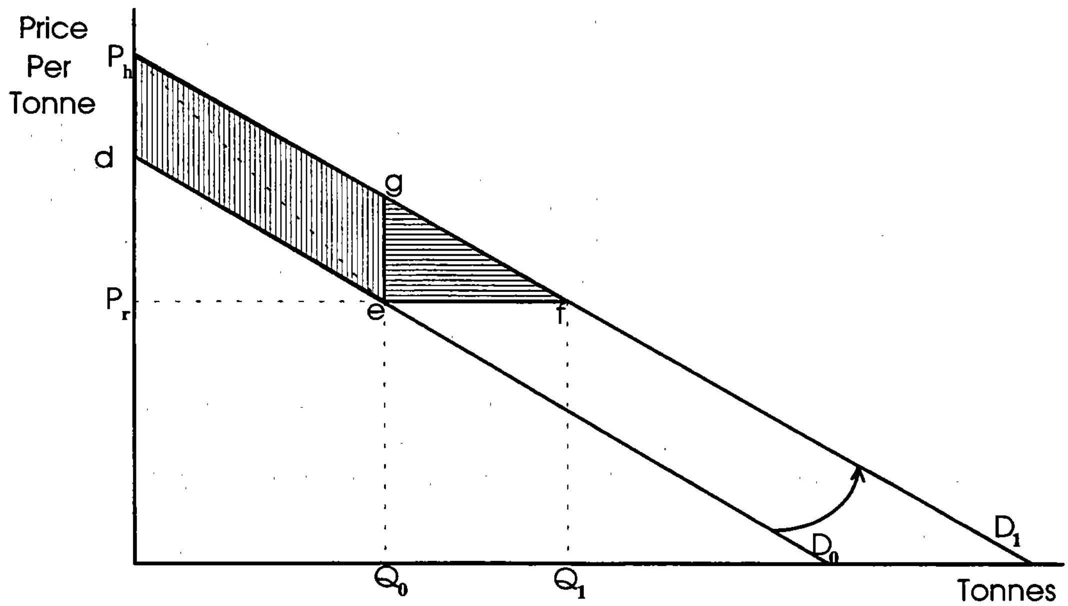
Since $P_r < P_h$, *EB* is unambiguously smaller than *OC*.

A parallel shift of the rail services demand curve

Suppose now that the new demand curve is parallel to the old one and again has P_h as an intercept. The user benefit implied by these demand curves will be an upper–bound on user benefits, conditional on the information about the quantities and prices, and the assumptions made above about linearity and service quality. It is an upper–bound partly because a parallel shift implies, by the constant vertical distance between the demand curves (that is, the distance P_h d would equal $e\,g$ in figure I.2), that all customers value service quality equally. It has been argued, however, that new rail customers would value rail quality improvements more than existing customers. We do not know the size of this valuation difference; only that as it becomes smaller, the benefit that users obtain from a quality improvement becomes larger for given values of Q_0 and Q_1. Additionally, the demand curve shift approaches a parallel one. Also underlying the upper–bound interpretation is the assumption that the new demand curve has a price intercept equal to P_h. This is the maximum value that the intercept can take; assuming smaller values would reduce the user benefit estimate.

This upper–bound estimate is represented by the parallelogram $P_h\,d\,e\,g$ plus the triangle $e\,f\,g$ (figure I.2) and it exceeds the user benefit in the rotation case by the triangle $P_h\,d\,e$.

Figure I.2 User benefits from a quality improvement with price unchanged and a parallel shift of the demand curve.



It is found by:

$$UB = Q_0 * I + 1/2 * (Q_1 - Q_0) * I$$

$$= 1/2 * I * (Q_0 + Q_1)$$

where I is the vertical distance (*e g*) between the demand curves. To obtain an expression for I in terms of price and quantity, we use two alternative expressions that define the slope of the demand curve. The slope, b, can be found as follows:

$$b = I/dQ.$$

Alternatively, the slope may be found as:

$$b = (P_h - P_r)/Q_1$$

and therefore:

$$I = (P_h - P_r) * (dQ/Q_1),$$

and

$$UB = 1/2 * (P_h - P_r) * (dQ/Q_1) * (Q_0 + Q_1).$$

The expressions for OS and OC remain unchanged and thus:

$$EB\text{-}OC = UB + OS - OC$$

$$= UB - (P_h - P_r) * (Q_1 - Q_0)$$

$$= 1/2 * (P_h - P_r) * (dQ/Q_1) * (Q_0 + Q_1) - (P_h - P_r) * (Q_1 - Q_0)$$

$$= (P_h - P_r) * dQ * [1/2 * ((Q_0 + Q_1)/Q_1) - 1]$$

$$= (P_h - P_r) * dQ * [1/2 * (Q_0 / Q_1) - 1/2]$$

$$= (P_h - P_r) * dQ * 1/2 * [(Q_0 - Q_1)/Q_1].$$

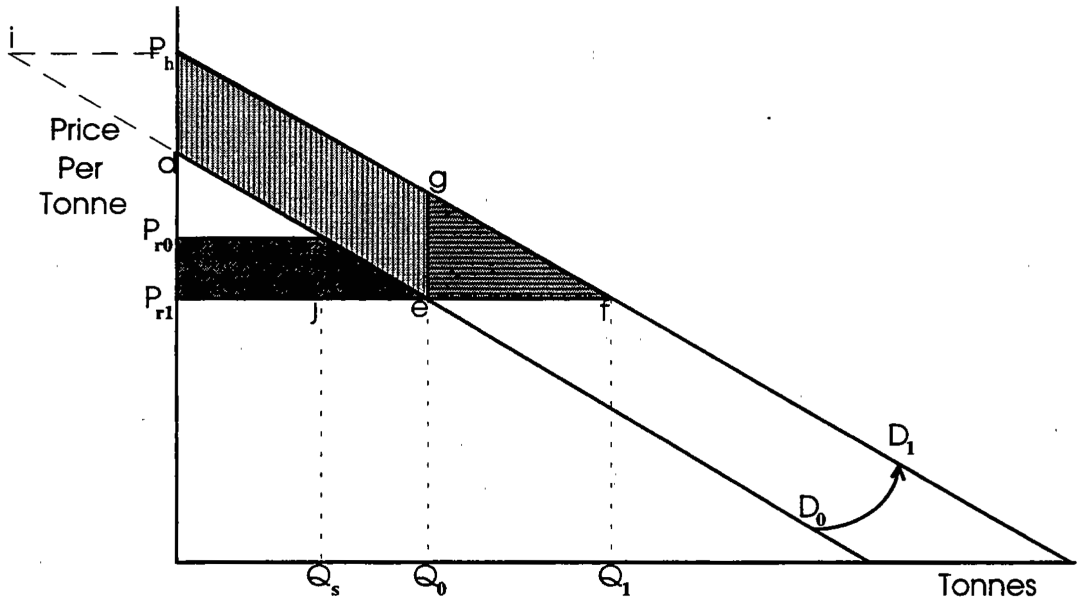
Since $Q_0 < Q_1$ and $P_h > P_r$, EB is again unambiguously less than OC.

EXTENSION OF THE SIMPLE CASE

A service quality improvement (parallel shift) and a price reduction for the rail service.

When a service quality improvement is associated with a price reduction, the increase in consumer surplus (*UB*) will have an additional component (the trapezoid $P_{r0}\,P_{r1}\,e\,n$ in figure I.3).

Figure I.3 User benefits from a quality improvement with a price reduction and a parallel shift of the demand curve.



The new component consists of benefits that arise from the price reduction (*PB*) and this is added to the benefits that arise from the service quality improvement (*QB*) and thus:

$UB = QB+PB$

$= QB-dP_r*Q_s-1/2*dP_r*(Q_0-Q_s)$

where dP_r is the new price (P_{r1}) less the initial rail price (P_{r0}), Q_s is the initial freight quantity and Q_0 is the quantity of freight that would travel on the unimproved rail service at the reduced price (P_{r1}).

The change in operating surplus is now affected by a price reduction as well as a change in operating costs and freight quantity.

Therefore:

$OS = Q_s*(C_{r0}-C_{r1})+dQ(P_{r1}-C_{r1})+dP_r*Q_s$

and

$EB = QB-dP_r*Q_s -1/2*dP_r*(Q_0-Q_s)+ Q_s*(C_{r0}-C_{r1})+dQ(P_{r1}-C_{r1})+dP_r*Q_s$

where $dQ = Q_1 - Q_s$.

Again assuming $P_h = C_h$, the savings in the combined operating costs of road and rail will now be as follows:

$OC = Q_s*(C_{r0}-C_{r1})+dQ*(P_h-C_{r1})$.

Therefore:

$$EB\text{-}OC = -[1/2*dP_r*(Q_0-Q_s)]+QB+[(P_{r1}-P_h)*(Q_1-Q_s)]$$

$$= -[1/2*dP_r*(Q_0-Q_s)]+QB+[(P_{r1}-P_h)*(Q_1-Q_0)]_+[(P_{r1}-P_h)*(Q_0-Q_s)]$$

$$= -[1/2*dP_r*(Q_0-Q_s)]+[(P_{r1}-P_h)*(Q_0-Q_s)]+QB+[(P_{r1}-P_h)*(Q_1-Q_0)].$$

Since $dP_r <0$ and $(P_{r1} -P_h)> 1/2*dP_r$, $-[1/2*dP_r*(Q_0 -Q_s)]+[(P_{r1} -P_h)*(Q_0 -Q_s)]<0$. The absolute value of $[(P_{r1}-P_h)*(Q_1-Q_0)]$ is the area of the parallelogram i P_h e f and this is clearly larger than the area that represents benefits to users from the improved service quality ($QB = P_h$ d e f). Since $P_{r1}<P_h$ and $Q_1>Q_0$, $[(P_{r1}-P_h)*(Q_1-Q_0)]<0$ and $QB+[(P_{r1} -P_h)*(Q_1 -Q_0)]<0$. Therefore, *EB* is again unambiguously smaller than *OC*.

DIFFERENT FUNCTIONAL FORMS FOR THE DEMAND CURVE

The above result also holds for demand curves that are convex to the origin. User benefits for a quality improvement are smaller for these demand curves than linear curves. Where the demand curves are concave to the origin, the result may still hold but there could be cases where it will not. User benefits for concave curves will be larger than for linear curves and *a priori*, it is uncertain whether this larger user benefits will lead to *EB* to being larger than *OC*.

APPENDIX II RAIL FREIGHT TRAFFIC ESTIMATES

The regions used in this paper for measuring rail freight flows are aggregations of more detailed regions, as shown in table II.1. The more detailed regions are those in a transport database maintained at the University of Wollongong. The BTCE, in collaboration with QR, chose the aggregations most suitable for this study.

TABLE II.1 ORIGIN/DESTINATION REGIONS FOR ANALYSIS OF RAIL FREIGHT TRAFFIC

Regions	*Subregions*
Sydney	Sydney, Gosford, Bomaderry, Moss Vale
Newcastle	Broadmeadow
Wollongong	Wollongong
Coffs Harbour	Casino, Coffs Harbour, Wauchope
Moree Albury	Moree, Dubbo
Albury	Albury, Culcairn, Griffith, Wagga, Parkes, Orange
Melbourne	Melbourne, Geelong, Morwell, Shepparton, Wangaratta
Brisbane	Brisbane, Beaudesert, Nambour, Bundaberg
Toowoomba	Toowoomba, Charleville
Adelaide	Adelaide, Nuriootpa, Mt Barker, Wallaroo, Loxton, Murray Bridge
Whyalla	Whyalla
Perth	Perth, Bunbury, Albany, Narrogin

Note The subregions are the detailed regions in a transport database maintained by the University of Wollongong (Centre for Transport Policy Analysis). These detailed regions were aggregated by QR and BTCE into the broader regions in this table. Each broader region has been given the name of one of the component subregions.

The estimation of actual freight flows in 1994–95 was discussed in chapter 4. The detailed estimates are presented in table II.2. As in the other tables below, freight flows are measured on an origin/destination basis. (Freight flows measured on a corridor basis would, of course, be different. Freight flowing on the Melbourne–Sydney corridor includes, in addition to freight originating in one of these cities and terminating in the other, freight moving along this corridor between other origin/destination pairs, such as Melbourne/Brisbane). For some combinations of origin and destination among the 12 aggregated regions, the rail investments considered in this paper would have no real effect on rail services — for example, no improvements would be made to the rail line between Melbourne and Perth. For some other combinations, the volume of traffic is too small to warrant analysis.

Based on the estimates of actual rail freight volumes and other information, QR estimated the rail freight volumes that would have flowed in 1994–95 had any of the mooted investments been in place. The estimates of these hypothetical traffic volumes are shown in tables II.3 – II.6. As discussed in chapter 4, certain agriculture freight had to be netted out of the traffic volumes to avoid double counting of benefits from the inland railway. Estimates of the actual traffic flows in 1994–95 thus adjusted are presented in table II.7 for comparison with the tables relating to the inland railway. No such adjustments to traffic volumes were needed for the analysis of the coastal investments, so tables II. 3 and II.4 are not entirely comparable with tables II. 5 and II.6.

TABLE II.2 RAIL FREIGHT TRAFFIC FLOWS 1994–95

('000 tonnes)

From/to:	*Syd*	*Newc*	*Woll*	*CoffsH*	*Moree*	*Albury*	*Melb*	*Bris*	*Toow*	*Adel*	*Whyall*	*Perth*	*TOTAL*
Sydney	-	-	-	175	285	-	600	663	-	-	-	-	1723
Newcastle	-	-	-	25	46	-	281	206	-	-	-	-	558
Wollongong	-	-	-	-	-	-	335	300	-	-	-	-	635
Coffs Harbour	217	27	-	-	1	7	40	-	-	-	-	1	293
Moree	389	626	3	2	-	76	13	-	-	-	-	-	1109
Albury	-	-	-	11	1	-	67	70	-	-	-	-	149
Melbourne	700	7	48	-	1	234	-	567	-	-	-	-	1557
Brisbane	663	26	8	5	-	1	301	-	583	79	-	45	1711
Toowoomba	-	-	-	-	-	-	-	1831	-	-	-	-	1831
Adelaide	-	-	-	-	-	-	-	100	-	-	-	-	100
Whyalla	-	-	-	-	-	-	-	70	-	-	-	-	70
Perth	-	-	-	-	-	-	-	63	-	-	-	-	63
Total	**1969**	**686**	**59**	**218**	**334**	**318**	**1637**	**3870**	**583**	**79**	**0**	**46**	**9799**

\- denotes origin–destination pairs for which the rail investment would have no real effect on rail services.

Source Centre for Transport Policy Analysis, University of Wollongong for 1988–89 estimates which were updated by BTCE and QR; see chapter 4.

TABLE II.3 RAIL FREIGHT TRAFFIC FLOWS 1994–95, ASSUMING BASIC COASTAL INVESTMENT OPTION IN PLACE

('000 tonnes)

From/to:	*Syd*	*Newc*	*Woll*	*CoffsH*	*Moree*	*Albury*	*Melb*	*Bris*	*Toow*	*Adel*	*Whyall*	*Perth*	*TOTAL*
Sydney	-	-	-	175	285	-	650	739	-	-	-	-	1849
Newcastle	-	-	-	25	46	-	304	226	-	-	-	-	601
Wollongong	-	-	-	-	-	-	363	311	-	-	-	-	674
Coffs Harbour	217	27	-	-	1	7	40	-	-	-	-	1	293
Moree	389	626	3	2	-	76	13	-	-	-	-	-	1109
Albury	-	-	-	11	1	-	67	82	-	-	-	-	161
Melbourne	758	8	51	-	1	234	-	620	-	-	-	-	1672
Brisbane	728	28	8	5	-	1	324	-	583	86	-	47	1810
Toowoomba	-	-	-	-	-	-	-	1831	-	-	-	-	1831
Adelaide	-	-	-	-	-	-	-	106	-	-	-	-	106
Whyalla	-	-	-	-	-	-	-	104	-	-	-	-	104
Perth	-	-	-	-	-	-	-	65	-	-	-	-	65
Total	**2092**	**688**	**60**	**218**	**334**	**318**	**1761**	**4084**	**583**	**85**	**0**	**48**	**10275**

\- denotes origin–destination pairs for which the rail investment would have no real effect on rail services.

Source QR estimates based on estimates of actual traffic flows in Table II.2 and other information.

TABLE II.4 RAIL FREIGHT TRAFFIC FLOWS 1994–95, ASSUMING ENHANCED COASTAL INVESTMENT OPTION IN PLACE

('000 tonnes)

From/to:	*Syd*	*Newc*	*Woll*	*CoffsH*	*Moree*	*Albury*	*Melb*	*Bris*	*Toow*	*Adel*	*Whyall*	*Perth*	*TOTAL*
Sydney	-	-	-	175	285	-	900	1009	-	-	-	-	2369
Newcastle	-	-	-	25	46	-	422	298	-	-	-	-	790
Wollongong	-	-	-	-	-	-	503	392	-	-	-	-	894
Coffs Harbour	217	27	-	-	1	7	40	-	-	-	-	1	293
Moree	389	626	3	2	-	76	13	-	-	-	-	-	1109
Albury	-	-	-	11	1	-	67	96	-	-	-	-	175
Melbourne	1050	11	72	-	1	234	-	837	-	-	-	-	2205
Brisbane	884	35	11	5	-	1	492	-	583	119	-	57	2187
Toowoomba	-	-	-	-	-	-	-	1831	-	-	-	-	1831
Adelaide	-	-	-	-	-	-	-	132	-	-	-	-	132
Whyalla	-	-	-	-	-	-	-	110	-	-	-	-	110
Perth	-	-	-	-	-	-	-	68	-	-	-	-	68
Total	**2540**	**698**	**86**	**218**	**334**	**318**	**2436**	**4772**	**583**	**119**	**0**	**58**	**12162**

\- denotes origin–destination pairs for which the rail investment would have no real effect on rail services.

Source QR estimates based on estimates of actual traffic flows in Table II.2 and other information.

TABLE II.5 RAIL FREIGHT TRAFFIC FLOWS 1994–95, ASSUMING BASIC INLAND INVESTMENT OPTION IN PLACE

('000 tonnes)

From/to:	*Syd*	*Newc*	*Woll*	*CoffsH*	*Moree*	*Albury*	*Melb*	*Bris*	*Toow*	*Adel*	*Whyall*	*Perth*	*TOTAL*
Sydney	-	-	-	175	263	-	695	786	-	-	-	-	1919
Newcastle	-	-	-	25	23	-	325	255	-	-	-	-	628
Wollongong	-	-	-	-	-	-	388	349	-	-	-	-	737
Coffs Harbour	217	27	-	-	1	7	40	-	-	-	-	1	293
Moree	289	476	3	2	-	76	13	611	-	-	-	-	1470
Albury	-	-	-	11	1	-	67	86	-	-	-	-	165
Melbourne	811	8	56	-	1	234	-	889	-	-	-	-	1999
Brisbane	771	30	9	5	182	1	538	-	583	157	-	60	2338
Toowoomba	-	-	-	-	-	-	-	1831	-	-	-	-	1831
Adelaide	-	-	-	-	-	-	-	168	-	-	-	-	168
Whyalla	-	-	-	-	-	-	-	108	-	-	-	-	108
Perth	-	-	-	-	-	-	-	71	-	-	-	-	71
Total	**2088**	**541**	**68**	**218**	**471**	**318**	**2067**	**5154**	**583**	**157**	**0**	**61**	**11727**

\- denotes origin–destination pairs for which the rail investment would have no real effect on rail services.

Source QR estimates based on estimates of actual traffic flows in table II.2 and other information.

TABLE II.6 RAIL FREIGHT TRAFFIC FLOWS 1994–95, ASSUMING ENHANCED INLAND INVESTMENT OPTION IN PLACE

('000 tonnes)

From/to:	*Syd*	*Newc*	*Woll*	*CoffsH*	*Moree*	*Albury*	*Melb*	*Bris*	*Toow*	*Adel*	*Whyall*	*Perth*	*TOTAL*
Sydney	-	-	-	175	263	-	900	1009	-	-	-	-	2347
Newcastle	-	-	-	25	23	-	422	298	-	-	-	-	767
Wollongong	-	-	-	-	-	-	503	392	-	-	-	-	894
Coffs Harbour	217	27	-	-	1	7	40	-	-	-	-	1	293
Moree	289	476	3	2	-	76	13	611	-	-	-	-	1470
Albury	-	-	-	11	1	-	67	96	-	-	-	-	175
Melbourne	1050	11	72	-	1	234	-	837	-	-	-	-	2205
Brisbane	884	35	11	5	182	1	492	-	583	119	-	57	2369
Toowoomba	-	-	-	-	-	-	-	1831	-	-	-	-	1831
Adelaide	-	-	-	-	-	-	-	132	-	-	-	-	132
Whyalla	-	-	-	-	-	-	-	110	-	-	-	-	110
Perth	-	-	-	-	-	-	-	68	-	-	-	-	68
Total	**2440**	**548**	**86**	**218**	**471**	**318**	**2436**	**5383**	**583**	**119**	**0**	**58**	**12660**

\- denotes origin–destination pairs for which the rail investment would have no real effect on rail services.

Source QR estimates based on estimates of actual traffic flows in Table II.2 and other information.

TABLE II.7 ADJUSTED RAIL FREIGHT TRAFFIC FLOWS 1994–95

('000 tonnes, excluding for special agricultural freight)[a]

From/to:	*Syd*	*Newc*	*Woll*	*CoffsH*	*Moree*	*Albury*	*Melb*	*Bris*	*Toow*	*Adel*	*Whyall*	*Perth*	*TOTAL*
Sydney	-	-	-	175	285	-	600	542	-	-	-	-	1602
Newcastle	-	-	-	25	46	-	281	206	-	-	-	-	558
Wollongong	-	-	-	-	-	-	335	300	-	-	-	-	635
Coffs Harbour	217	27	-	-	1	7	40	-	-	-	-	1	293
Moree	389	626	3	2	-	76	13	-	-	-	-	-	1109
Albury	-	-	-	11	1	-	67	70	-	-	-	-	149
Melbourne	700	7	48	-	1	234	-	535	-	-	-	-	1525
Brisbane	613	26	8	5	-	1	271	-	583	79	-	45	1631
Toowoomba	-	-	-	-	-	-	-	473	-	-	-	-	473
Adelaide	-	-	-	-	-	-	-	100	-	-	-	-	100
Whyalla	-	-	-	-	-	-	-	70	-	-	-	-	70
Perth	-	-	-	-	-	-	-	63	-	-	-	-	63
Total	**1919**	**686**	**59**	**218**	**334**	**318**	**1607**	**2359**	**583**	**79**	**0**	**46**	**8208**

a. special agricultural freight described in chapter 4 for the inland options.

\- denotes origin–destination pairs for which the rail investment would have no real effect on rail services.

Source QR estimates based on estimates of actual traffic flows in table II.2 and other information.

REFERENCES

ABBREVIATIONS

ABS	Australian Bureau of Statistics
ABARE	Australian Bureau of Agricultural and Resource Economics
AGPS	Australian Government Publishing Service
AN	Australian National Railways Commission
BIE	Bureau of Industry Economics
BTCE	Bureau of Transport and Communications Economics
CIE	Centre for International Economics
DOF	Department of Finance

Allen Consulting Group Pty Ltd 1993, *Land Transport Infrastructure: Maximising the Contribution to Economic Growth,* Report to the Australian Automobile Association, Canberra.

AN 1993, *Alice Springs to Darwin Railway: A Review of Economic Benefits and Costs,* AN, Adelaide.

ABARE 1995, *Australian Commodities,* vol. 2, no. 1.

——, (unpub.), Economic evaluation of the agricultural benefits of an inland rail link between Brisbane and Melbourne, a study carried out by ABARE for the BTCE 1995.

ABS 1995, *Australian National Accounts Capital Stock 1993-94,* Catalogue no. 5221.0, ABS, Canberra.

AUSTROADS 1994, *A Survey of Current Procedures for Infrastructure Project Appraisal in Road Authorities,* Road System Management Program (Project RSM 3.A.21) AUSTROADS, Sydney.

BIE 1995, *Rail Freight 1995 International Benchmarking,* Report 95/22, AGPS, Canberra.

—— 1994, *International Performance Indicators Overview 1994*, Report 53, AGPS, Canberra.

BTCE 1996, *Analysis of the Rail Deficit*, Information Paper 40, BTCE, Canberra.

—— 1995a, *Evaluating Transport Investments with National Economic Models: Australian Experience with ORANI*, Working Paper 13, BTCE, Canberra.

—— 1995b, *Adequacy of Transport Infrastructure: Rail*, Working Paper 14.2, BTCE, Canberra.

—— 1995c, *Adequacy of Transport Infrastructure: Multimodal*, Working Paper 14.6, BTCE, Canberra.

—— 1995d, *Greenhouse Gas Emissions from Australian Transport: Long Term Projections*, Report 88, AGPS, Canberra.

—— 1995e, *Evaluation of the Black Spot Program*, Report 90, AGPS, Canberra.

—— 1995f, *Costs of Rail Accidents in Australia - 1993*, Information Sheet 7, BTCE, Canberra.

—— 1994a, *The Effects on Small Towns of Being Bypassed by a Highway: A Case Study of Berrima and Mittagong*, Working Paper 11, BTCE, Canberra.

—— 1994b, 'Life after a highway bypass: How do small towns fare?' *Transport and Communications Indicators*, September Quarter, pp. 1, 23-25, BTCE, Canberra.

—— 1994c, 'Public investment in transport infrastructure: Roads to riches?' *Transport and Communications Indicators*, December Quarter, pp. 1, 21-23, AGPS, Canberra.

—— 1994d, *An Economic Evaluation of Sydney — Brisbane Transport Corridor*, A discussion paper, BTCE, Canberra.

—— 1993a, *A Review of the Alice Springs to Darwin Railway Project*, BTCE, Canberra.

—— 1993b, *An Economic Evaluation of Sydney — Melbourne Transport Corridor*, A discussion paper, BTCE, Canberra.

—— 1991, *The Future of the Tasmanian Railway System: A Cost-Benefit Assessment of Options*, Report 69, AGPS, Canberra.

—— 1992, *Social Cost of Transport Accidents in Australia*, Report 79, AGPS, Canberra.

—— 1988, *AN-Westrail Integration: An Assessment of Options,* Report 63, AGPS, Canberra.

Button, K.E. 1993, *Transport Economics,* (2nd edition) Edward Elgar, Hants, England.

CIE 1995, 'The role of transport in the economy' *Building for the Job: Commissioned Work, Volume 2: Economic Studies,* National Transport Planning Taskforce, AGPS, Canberra.

Davidson, K. 1995, *An Inland Standard Gauge Rail Link to Brisbane: Outline of Proposal and Options,* study commissioned by Queensland Transport (Southern Region), Davidson Transport Consulting, Brisbane.

DOF 1991, *Handbook of Cost-Benefit Analysis,* AGPS, Canberra.

Department of Transport 1995, *Taxes and Charges Paid by the Road Transport Industry,* final report, SCOT working party, Canberra.

Dixit, A. 1992, 'Investment and hysteresis' *Journal of Economic Perspectives,* vol. 6, no. 1, pp. 107-132.

Kinhill Economics and Allen Economics (forthcoming) 'Economic effects of investment in road infrastructure' report to AUSTROADS (Project RSM 3. C. 20 stage 2) AUSTROADS, Sydney.

Kokic, P., Beare, S., Topp, V. 1993, *Australian Broadacre Agriculture: Forecasting Supply at the Farm Level,* ABARE Research Report 93.7, ABARE, Canberra.

Luk J. and Hepburn S. 1993, *A Review of Australian Travel Demand Elasticities,* Working Document No: TE 93/004, The Australian Road Research Board.

McGinnis, M.A. 1990, 'The relative importance of cost and service in freight transportation choice before and after deregulation' *Transportation Journal,* vol. 30, no. 1, pp. 12-19.

Oum, T. H., Waters, W. G. and Yong, J. S. 1992, 'Concepts of price elasticities of transport demand and recent empirical evidence' *Journal of Transport Economics and Policy,* vol. 26, pp. 139-54.

Rietveld, P. 1994, 'Spatial economic impacts of transport infrastructure' *Transportation Research, Part A,* vol. 28A, no. 4, pp. 329-341.

Slater, D.W. 1992, 'Transport and economic development: A survey of the literature' in *Directions,* vol. 3, Royal Commission on National Passenger Transportation, Ottowa.

Travers Morgan 1995 (in association with Macquarie Corporate Finance Ltd & BHP Engineering) *Alice Springs to Darwin Rail Link Report*, report to the Committee on Darwin, Sydney.

Queensland Rail 1995, personal communication to the BTCE, proposal regarding an inland railway between Brisbane and Melbourne.

ABBREVIATIONS

AAGIS	Australian Agricultural and Grazing Industry Survey
ABS	Australian Bureau of Statistics
ABARE	Australian Bureau of Agricultural and Resource Economics
AN	Australian National Railways Commission
BCR	Benefit cost ratio
BTCE	Bureau of Transport and Communications Economics
CIE	Centre for International Economics
DOF	Department of Finance
IRR	Internal rate of return
NPV	Net present value
NRC	National Rail Corporation
NTKM	Net tonne-kilometre
NTPT	National Transport Planning Taskforce
OC	Operating costs
QR	Queensland Rail
SRA	State Rail Authority