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REVIEW OF THE WATERWAYS FREIGHT FACILITIES GRANT SCHEME

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ABSTRACT

TWEDDLE, G & NASH, CA (1993). Review of the waterways freight facilities grant scheme. *ITS Working Paper **402***, Institute for Transport Studies, University of Leeds.

The main purpose of the study has been to review the workings of the Waterways Freight Facilities Grant Scheme (Section 36 Grant). Views of industry and institutions regarding the use of canals for the movement of freight were obtained in a series of interviews, together with information on the workings of the Grant Scheme. Case studies were used to test the effect of possible changes to the Grant Scheme.

During the period of the study the ramifications of the progress of the Rail Privatisation Bill through Parliament meant that the situation regarding the Section 8 Grant (the equivalent grant for rail freight facilities) has become somewhat fluid. Major revisions, extending the scheme to cover lorry miles saved on motorways, have been announced; an additional grant to cover track costs is also proposed for rail, but the method of application or assessment is not yet clear.

In order to encourage more traffic to switch to using waterway in the medium term, we recommend that:

-Section 36 Grants should be extended to cover the high quality road network (including motorways), and that a higher valuation should be placed on the benefits than in the case of Section 8 grants, reflecting the higher benefits of water transport relative to rail.

-That a new "waterways operating grant" should be available to operators of waterway craft, also at a higher rate per tonne kilometre than the proposed rail track costs grant.

-That the reduction in road accidents and congestion be taken into account when valuing the benefits of inland waterway transport.

Even with these revisions, however, we conclude the Section 36 grants will have a modest effect, in general only diverting traffic to water where this does not involve transhipment. Also, few waterway flows offer the sort of long run contracts necessary to justify a grant. As a result, we conclude that, Section 36 Grants will have limited success in satisfying the Department of Transport's overall objective of causing goods to be moved by inland waterway as opposed to road "where this would be in the interest of any locality or of some or all of its inhabitants".

In our view a more successful method of achieving the Department's objective in the long term would be to encourage firms receiving or despatching commodities suitable for carriage by inland waterway to locate in premises alongside the canal network. This is even more important where the company is engaged in the import of raw materials. Such a method would require changes to the guidelines on planning and industrial development.

KEY-WORDS: Physical distribution, water transport, environment.

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REVIEW OF THE WATERWAYS FREIGHT FACILITIES GRANT SCHEME

1. FREIGHT FACILITIES GRANTS-BACKGROUND TO THE SCHEME

The Freight Facilities Grant Scheme was introduced under the Railways Act 1974, Section 8. Initially it applied only to movements which switched modes from road to rail but became applicable to inland waterways (including those operated by British Waterways) following passage of the Transport Act 1981, Section 36.

The objective of the grant was to purchase local environmental benefits by the removal of heavy lorries from local roads through towns and villages. The method of evaluation was based on the number of lorry movements over these minor local roads, and roads through towns. At that time, the main benefits were considered to be relief from noise and visual intrusion.

In 1983 the definition of sensitive road was extended, a notable inclusion was roads through National Parks and AONB's of whatever category. In 1991 most other roads were included, except motorways and rural dual carriageways. Currently it is proposed to include these from 1994.

Valuation of a sensitive lorry mile has not been given scientific assessment. The basis is to set a rate and see how many firms apply. Though the rate varied over the years, by 1991 it was 34 pence per sensitive lorry mile having been as high as 47 pence at one time. From 1992 the rate was increased substantially to £1.00 per lorry mile (£1.50 in the case of urban roads) but this figure is now discounted over the period of the grant, so this gives an equivalent value under the previous scheme of about 60 pence, depending on the vehicle movements in the early years of a particular scheme.

If motorways are included at some time in the future it is likely to be at a rate of between 10 pence and 20 pence. Given that it is a politically driven discretionary grant the initial rate may be as low as 3 pence (Table 1), and this will be adjusted depending on the number of applicants and the funds available. If the rate per mile is low the inclusion of motorways may not be of great benefit to waterway transport where most movements are short distance on a limited network, whereas rail may benefit because of longer hauls. The introduction of inter-modal rail systems may be a major beneficiary.

While the main benefits from removal of lorries from urban roads are probably in terms of noise and visual intrusion, in the case of the trunk road and motorway network many of these benefits have already been purchased by the construction of new roads avoiding towns. In the case of vehicle emissions the position is different. These are related to distance and become more important for inter-urban movements. If the value of the grant had a more scientific basis it would allow for waterway having a lower level of emissions compared to road than does rail, and therefore a higher rate of grant may be justified.

The same can be argued for noise, where rail can pose problems with heavy freight trains travelling through urban areas at night. Waterway vessels are quieter and, in general, do not operate at night. As the commercial waterway network has been duplicated by the motorways, the Aire and Calder Navigation by the M62 and the South Yorkshire by the M18, The Gloucester and Sharpness Canal

by the M5, the Manchester Ship Canal by the M56, a differential rate for switching traffic to water would help such short distance movements. Should a scheme with alternative rail and waterway proposals ever arise, the differential would also serve to rank the proposals so that best value for money in terms of environmental benefits may be obtained.

The Treasury argue that they already recover road vehicle environmental costs as part of the allocation of road track costs (1991 DTp). In theory they add 30% to the estimated track costs of HGV's as a whole, though for the average 38t GVW artic in the year 1991/92 this was only 20.4%. However, the tax system currently tends to overcharge the costs of providing motorways and trunk roads and undercharge those on minor roads, leading to a paradox whereby the margin is highest on motorways and negative on minor roads (Table 1).

It is widely accepted that inland waterway transport is the mode which is kindest to the environment. Some work has been undertaken in various countries to place a value on these benefits, though we are not aware of any such work in the U.K. As operating patterns vary between countries, the Department of Transport (DOT) should undertake a study to determine the external costs of various modes of transport, as well as accident and congestion costs in the U.K.

Table 1: Environmental Portion of Road Track Costs
(38t GVW artic, 2+3 axle configuration).

	Total	M	T	P	O
% by road class	100	45	36	15	4
Revenue (£)	11,782		4,242	1,767	471
Costs (£)	9,781		2,894	1,567	1,235
Environment (£)	2,001		1,348	200	(-764)
" /km (p)	2.22	3.00	4.16	1.48	-21.22
" /m (p)	3.57	4.83	6.69	2.38	-34.15

Since they were introduced, there have only been seven Section 36 Grants. The take up rate of the rail equivalent (Section 8) is much greater, the waterway grant forming about three per cent of the total number of grants, and about the same percentage of the total value of grants awarded. However, where waterways have a significant network as in the Yorkshire and Humberside region, they carry over 10% of the traffic moved by rail, though as statistics on waterborne traffic include the flows on the River Trent, it is not possible to determine the precise figure. This may indicate that the grant scheme is under-performing in its application to a more environmentally friendly form of transport.

Although the take up rate for the rail grant is greater, it has been concentrated mainly in the aggregates sector, which accounts for 40% of the total (Nash and Tweddle 1988). The quarry companies saw Section 8 as a specific opportunity to gain financial support for the movement of aggregates from the Mendips and Leicestershire to the South East. Other relatively long distance flows also exploited the grant opportunity, most being an in-house movement between production site and distant depot. The chances of this combination of circumstances are small in relation to general merchandise, and Section 8 has had little impact on this sector.

2. THE BULK FREIGHT MARKET IN YORKSHIRE AND HUMBERSIDE

Arguably the most important network of commercial waterways in the U.K. is located in the Yorkshire and Humberside region. The major canals are the Aire and Calder, and the Sheffield and South Yorks, together with a number of links and branches. In addition the rivers Ouse and Trent allow the navigation of coastal vessels as far as Selby and Gainsborough respectively, and canal barges to York and Nottingham. Barges operating in tidal waters must have a 'Humber load line' (a greater proportion of freeboard than canal craft) and a minimum of two man crew.

Most coastal vessels handle traffic destined for carriage by sea, and trade with European countries as well as the rest of the U.K. But what is the volume of traffic available for carriage by barges within the region? Using a combination of published data, and the results of private correspondence with the Department of Transport (DoT) we have compiled Table 2 showing the volume of commodities by NST chapter which move within the region.

Table 2: Commodity Movement in Yorks and Humber Region
(Millions of tonnes lifted per year).

NST chapter	Commodity	Road 1990	Rail 1989	Waterway 1989
0	Agric. product	7.55	-	
1	Food & drink	16.90	-	
2	Coal & coke	7.42	18.94	
3	Petroleum prod.	5.12	0.93	
4	Ores	1.66	4.40	
5	Iron & steel prod.	7.81	0.80	
6	Crude minerals	33.66	0.67	
7	Fertilisers	0.77	-	
8	Chemicals	5.12	0.02	
9	Machinery & misc	41.34	-	
	Dry bulk			7.62
	Bulk liquid			1.11
	Other			3.03
0-9	Total	127.35	25.76	11.76

Source: Derived from *The Transport of Goods by Road in Great Britain 1990*. DTp, London. Private correspondence with the DTp. *Waterbourne Freight in the UK 1989*, DTp/MDS-Transmodal, Chester.

Note: The figures for waterborne traffic are for the ports within the Humber region which differs from the standard economic region, mainly by inclusion of the River Trent. Of the total 3.25m tonnes was internal, the balance being coastwise, foreign, or one-port traffic.

The volume of intra-regional road traffic in Yorkshire and Humberside forms 73% of the total despatched by road, a percentage only exceeded by the geographically larger Scottish Region at 90%. Of the total intra-regional traffic a large proportion moves in bulk, or in a form suitable for carriage by modes other than road. What statistics alone cannot determine is the proportion of traffic which is easily accessible to the canal network, for it is the cost and delay imposed by transferring between modes which makes inland waterway movement less attractive than road.

There are examples of traffic moving direct from origin to destination by waterway. The 2 mtpa of coal from Kellingley Colliery to Ferrybridge 'C' power station being a good example of movement by barge having a competitive advantage. However, such opportunities are few and far between. Nevertheless, coal forms an important element of the dry bulk traffic movements in the region, while petroleum products are another major traffic.

In order to identify the competitiveness of inland waterway we need to assess routing of individual flows, and the requirements in terms of handling equipment for three different cases:

a) Origin to destination direct by waterway. In these circumstances competition is on an equal footing, provided distances are comparable and the infrastructure charging is carried out on an equitable basis.

b) Where one or both ends of a route are remote from a waterway, then transhipment is required. This will put waterway at a disadvantage, but may be minimised if the origin is located on a canal and the destination is a distribution depot. Aggregates and oil traffic are both moved by barge to inland depots, which act as combined break bulk points and distribution hubs.

c) Canal used to extend water transport inland, with or without transhipment at the port. Thus a small ship can reach an inland destination direct from sea transit, or goods can be transhipped into barges at an estuary port from a large vessel for onward transit.

Although much of the British Waterways network in Yorkshire and Humberside (including the Rivers Ouse and Trent) is considered to be commercial waterway, it is only the main line of the Aire and Calder together with the South Yorkshire Navigation which have locks of reasonable size, which together with a draught of 2.5 to 3.0 metres allow barges of 640 or 700 tonnes capacity to pass (Table 3). As is the case in other parts of the country, restrictions on branch canals severely restrict access to the main network. The draught on the rivers in the region vary depending on the state of the tide.

The various dimensions, mainly the result of numerous companies being involved in the original construction of canals, means that barges of maximum dimensions have a very restricted route availability. In turn this impacts on vessel utilisation, although this is offset by much lower unit operating costs.

Table 3: Waterway Barge Capacity
(Recommended maximum dimensions)

Route section	Length	Beam (metres)	Draught	Capacity (tonnes)
Humber/Trent System				
Goole-Rotherham	61.0		2.5	700
Goole-Leeds Lock	60.8	6.1	3.0	640
Leeds Lock-Basin	43.5		2.3	250
Castleford-Wakefield	42.6	6.1	2.1	200-250
Knottingley-Selby	24.3		1.8	80-90
Wakefield-Greenfield Lock	17.5	5.4	1.8	70
Keadby-Bramwith	18.8		2.2	80-90
		5.4		
River Trent-tidal	subject to		section of	river
River Ouse-tidal	"	5.0	"	"
River Humer-tidal	"		"	"
River Ouse to York	40.9	4.3	2.4	250-300
River Trent to Nottingham	42.4		1.8	180
		5.2		
		tide and		
		"		
		"		
		7.4		
		5.7		

Source: Lockmaster Maps and British Waterways

3. WATERWAY USERS

In order to gain a better understanding of why firms use waterway transport, and what they think are the main impediments to transferring more of their traffic, a series of meetings has been held with various sectors of the industry. These included firstly, manufacturers who send, or have the potential to send, or receive goods by water. Some would only consider direct sea shipments to or from ports such as Selby.

Secondly, firms who act as intermediaries, handling traffic at wharfs and jetties along the waterways, or act as agents for the chartering of craft. Thirdly, operators of barge fleets who actually move the traffic on the waterway. The views of other organisations, including the Department of Transport (DoT) were also sought.

In order to allow the companies interviewed to be frank, we promised confidentiality. The following is a general view expressed by these sectors as a whole.

3.1 THE CONSIGNORS

Without doubt, the greatest restriction to the use of waterway for the domestic movement of freight is the limited network, and short length of haul. If an additional transhipment is required to allow water transport to be used then canal becomes an uneconomic proposition. The relatively small size of barge in use in the U.K. (compared to Europe) means that a long distance would be required in order to reduce overall unit costs to a level where the additional transhipment costs could be absorbed.

It is felt that, while a more liberal Freight Facilities Grant could help, it would encompass few flows which require additional transhipment. This means that canal freight is limited to those firms with premises alongside the canal, and which have direct traffic moving between them. Alternatively, where the final delivery of a bulk product to a customer is made as a small consignment, such as oil to domestic or small industrial users, or aggregates to small building projects, there is a benefit in breaking bulk close to the consumer. Local distribution depots can then be established along the canal and are served by barge.

Until about ten years ago, the duty on some oil products (which is a significant proportion of the total value) was not payable until the final delivery was undertaken. There was thus a cash flow advantage in having stock holding depots close to customers. Now that duty is generally payable on despatch from the refinery, the reverse situation applies, and as small depots require refurbishment, closure tends to result. There are also some concerns regarding the difficulties which would result from a spillage of some oil products on a waterway where it would be difficult to contain, though the locks on canals may be used to assist containment.

Planning restraints have also encouraged the use of water, where it is used to extend the capacity of operating units whose road despatches are restricted. However, as the real cost of road transport falls, alternative sources of supply become more effective and the waterside source becomes the marginal producer. As the relative profitability falls, the water connected site may close, and the product may be delivered by road direct from more distant sources of supply.

In more than one instance we found firms which had premises close to the waterway, but not close enough. They had not initially considered the use of canal transport, and because the current operations would mean a very short road movement (only 100 yards in one case) and transhipment to barge, switching modes was not attractive even with grant. It is in this area that a liberalised Grant scheme may have some effect. However, a more positive approach may be to offer a capital or operating grant at the planning stage of a new development, if water transport is to be used for a period for some or all of the traffic. This would encourage firms to locate at waterside sites, and incorporate appropriate handling systems from the outset. It is a long term measure, whereas Section 36 grants can encourage change of mode in marginal cases, but will only be effective if their scope is broadened.

A waterway traffic of the future may be the movement of domestic and industrial waste. As disposal sites close to the large conurbations fill, more distant locations will become the best alternative. There are also voids alongside the canal where extraction of materials has been undertaken and planning permission may be gained, at least at some locations for disposal to take place. For these sites to become attractive on economic grounds, low cost water transport could provide an impetus,

though it would be necessary to develop transfer stations adjacent to the canal in order to minimise handling costs.

Until recent years small ports situated on tidal waterways, such as Selby and Gunness, had experienced a reasonable level of trade. Much of the traffic comprised of supplies of raw materials purchased on the Continent (mainly Rotterdam) for use by small and medium sized companies. The object was to avoid the cost and disruption of using the ports in the Dock Registration Scheme such as Hull.

Since this scheme was disbanded the relative costs of using these ports is making them more attractive. As a result some firms are now proposing to import direct deep sea shipments into the larger British ports, using the much lower seafreight rates which result from accepting a larger consignment to counterbalance longer hauls within the U.K. Unfortunately the tendency is for the final leg to be by road; many of the firms are not located along the waterways.

There is a fairly optimistic view regarding water transport of coal. These surround the supply of imported and coastwise coal, and to a lesser extent oil products, by waterway from the point of importation to electricity generating stations, a few of which are situated alongside or close to inland waterways. While undertaking these series of meetings with consignors, it became apparent that a detailed feasibility study has been undertaken into the movement of coal in large barges from the Humber ports to Drax, and trials have been made to other stations in the Aire/Trent group. Another future movement is of 'fuel' to an oil fired station using the Manchester Ship Canal (MSC).

In cases where cargoes are transferred from ship direct to barge, the wharfage charged is generally half that for unloading to dock. At Goole, which was originally a port operated by the waterways, there was no charge for transhipment to barge, but the imposition of a charge by Associated British Ports (ABP) has had an effect on the traffic moved inland by barge.

3.2 WHARF AND TERMINAL FACILITIES

In the past, many working wharves were located along the bank of canals in city centres. In many cases these became derelict as industry either closed or moved to less expensive industrial estates on the outskirts of towns. Some of the buildings have been converted into waterside office and residential developments (as in Leeds and on the River Ouse at York), which bring income to British Waterways and other land owners, but not water borne traffic.

There remains an ample supply of suitable sites along the canal network for new industrial development to take place, should it be required. In addition current users of the waterway system generally have facilities for their own traffic which are under utilised, mainly because of declining traffic.

A number of independent wharves are operated along the waterway system. They offer a variety of 'common user' facilities covering loading and discharge of vessels and craft, storage, break bulk, and transhipment between modes (including ship to barge). The network of BW depots is now operated by an independent company on a similar basis. The quantity of canal traffic handled is small, most of these terminals have capacity to handle much greater quantities received by water, as well as land available for development. Currently many of them rely on revenue from the storage of

commodities delivered by road vehicles.

It is difficult, though not impossible, for terminal operators to gain a Section 36 Grant. Few of their customers are willing to make long term commitments to use facilities over a period of years, one of the conditions of gaining a grant. Many consignors are not prepared even to provide a letter of intent to move traffic by water, and without a back to back contract the operators investment in facilities is at risk as well as any grant which may be provided.

3.3 THE BARGE OPERATORS

A major problem of the competitive situation of inland waterway is the unit cost of barge operation in the U.K. About one third of the operating costs of a typical 600 tonne barge are accounted for by the crew. Unlike other modes of transport, including barge operation on the Continent, where labour costs have been contained as the size of the unit of carriage increases over time, lack of infrastructure development, in particular the dimensions of locks, means that water transport becomes steadily less competitive.

As a result there has been little investment in new craft for a long period, and the general condition of the fleet is poor reflecting the age of the craft. New buildings are normally only undertaken against a contract by the larger barge operators, such as for the movement of coal, oil products and effluent on the Aire and Calder. One of the larger operators is planning to purchase a second hand push-tow tug from Holland to move up to 5000 tonnes on the MSC. This is a very large capacity system by British standards, and the tug is actually capable of handling up to 14,000 tonnes. The fact that the Dutch owners wish to replace the tug with one capable of pushing up to 22,000 tonnes demonstrates the scale differences between British and Continental operating practice and infrastructure development.

Many of the barge companies have sold their craft to former employees, who are now owner operators. It is difficult to forecast how long these small businesses can last, as at the current level of rates few will be able to purchase new equipment.

Some countries on the Continent have introduced scrap and build schemes, with financial support from government sources. Although this is partly aimed at a reduction in overcapacity in the industry, it encourages retention of experienced staff using modern craft. Redundant barges can be purchased for use in the UK nevertheless, the availability of suitable used equipment from the Continent is limited. This is partly due to the small size required for operation on British canals, but also because silting results in barges grounding. Foreign craft are not considered to be strong enough to withstand this practise, and in any case have to be modified to use smaller locks.

Freight Facilities Grants are difficult to justify in the case of small barge operations. It is unlikely that consignors will be willing to provide a guarantee of traffic for the purchase of new, or replacement craft, especially as the project life is ten years where craft are involved.

As the number of barges declines, so does the nucleus of labour with training and experience in handling heavily laden craft on the waterway system. There are potential long term limitations on the system being able to move freight traffic effectively. Some consignors commented that when they had cargo which they desire to move by water, notably short duration movements from ships in

the Humber ports, they could not obtain craft or crews in the numbers required.

Silting is a common complaint which has a number of repercussions. Apart from wear and tear on the barges, it causes delays. However, the most important effect is that if draught is restrictive, each barge can carry only a limited cargo which inflates the cost of carriage. In some cases this makes water transport uneconomic.

It appears the problem of silting has been increasing in recent years, the Trent and the Ouse being worst affected. The cause is a combination of less traffic stirring up the bed of the waterway, the lower traffic level reducing gross revenue making it difficult to justify dredging operations, the costs of which become relatively low as traffic increases. A vicious circle. The low summer rainfall has exacerbated the silting problem, and reduced depth of water for a period on parts of the network.

4. INNOVATION

New methods of working have been slow in coming to Britain, partly because fleet renewal has been very limited. The push-tow system is used on several flows, and is likely to be chosen for future operations except for the movement of hazardous commodities where a powered barge may be more appropriate in the case of some commodities.

However, because renewal of the fleet is negligible the introduction of new more cost effective operating techniques is very slow. Given that the current level of rates do not seem to allow barge operators to fully cover their capital costs the introduction of new craft may never occur.

The mothership concept was developed for U.K. Continental traffic in the seventies under the BACAT name. Unfortunately the service was probably ten years ahead of its time, and did not survive labour restrictions in British ports. It is unlikely to be successful in the current climate because the volume of waterway traffic is now too low to justify the introduction of a service.

Currently the 'split ship' system is under development. This consists of two powered barges which lock together for sea transit. Each barge can be up to 700 tonnes capacity, but the capital cost would be some 30% more than a coastal ship of the same capacity as two barges. They could only be justified where the system would avoid transhipment en-route. A Section 36 Grant is seen as one possible method of building a prototype vessel, though some Continental countries give much more support to their shipbuilding industries than the U.K.

5. SECTION 36 GRANTS TO 1992

There have only been seven grants to assist the transfer of traffic from road to waterway; they are listed in Table 4. A difference in emphasis is apparent when compared to the take-up of Section 8 Grants regarding commodities transferred from road.

Table 4: Section 36 Grants Awarded

Company	Grant (£)	Year	Nature of Project

Millgate Inv. Gainsborough		1983	Refurbishment of wharf for general merchandise
Varma Services Deptford		1984	Facilities for newsprint at Convoys Wharf
SHS Rotherham		1984	Refurbishment of wharf for steel and general merchandise
West County Fuels, Gloucester		1985	Refurbish oil storage tanks and associated works
Colwick Petrol Nr, Nottingham		1986	Refurbishment of jetty and oil storage tanks
Sand and Gravel, Leeds		1990	Refurbishment of wharf and handling equipment for aggregates
Wimpey Hobbs		1991	Refurbishment of wharf and handling equipment for aggregates

We have been unable to establish similar opportunities for the transfer of traffic to waterway, with or without grant. The combination of short length of haul and a restricted network mean the raw materials have to be alongside the existing canal network; a movement involving transhipment would, in virtually all cases be uneconomic.

Many of the Section 36 Grants have been based on traffic related to inland movement of port traffic, even though in the case of oil this may be refined at the break bulk point, using an esturial port. Our interviews with users, or potential users, of the waterways indicates that it is in the movement inland of basic commodities which are imported where any future expansion of inland waterway transport is most likely to arise.

6. VALUATION OF ENVIRONMENTAL BENEFITS

Many researchers have investigated the area of valuation of environmental benefits, and disbenefits. The techniques used have varied. The most successful have used as a basis either the Hedonic Property Prices technique, the contingent valuation approach or the cost of off setting the damage caused.

Of the major impacts:

- Traffic noise, both daytime and at night.

- Visual intrusion, both by vehicles and infrastructure.

- Vibration.

- Accidents

- Exhaust emissions, including particulates.

- Land take

many attempts have been made to value noise, accidents and emissions. Even in the case of noise, probably the easiest impact to value, results are very variable (Table 5).

Table 5: The Impact of Traffic Noise on House Prices
(per cent of house price)

Location	Impact of one unit change in Leq
United States	
North Virginia	0.15
Tidewater	0.14
North Springfield	0.18-0.50
Towson	0.54
Washington	0.88
Kingsgate	0.48
North King Country	0.30
Spokane	0.08
Chicago	0.65
Canada, Toronto	1.05
Switzerland, Basle	1.26

Source: Pearce, D.W. and Markandya, A. *Environmental Policy Benefits: Monetary Valuation*. OECD, Paris 1989.

One aspect of reducing the environmental effects listed above is that their impact is much greater in urban areas, whereas in the more sparsely populated rural areas fewer people are affected. For example, on a rural motorway visual intrusion of the vehicle is low, the impact of the road being of more importance. Valuation of impacts by road type should be a long term goal.

The section of the community suffering most disbenefits from commercial vehicles on rural roads are, other road users. Not only are they affected by the general environmental disbenefits, but also by road congestion. Relief of congestion demands investment in the road network, encouraging freight to use inland waterways delays such expenditure, with financial benefits to the Treasury

There is one disbenefit of the use of road vehicles which can be costed fairly accurately, and which is not recovered as part of the vehicle taxation system. It is the community costs of road accidents. In order to estimate this cost statistics are available on accident involvement rates. These are published annually for HGV's as a whole by road type, and until 1988 were available by axle class, though we have factored the current figures in order to show the relatively poor performance of the largest vehicles on the lowest quality roads (Table 6). Other sources of data give the costs of injury accidents by severity (DTp 1989).

Table 6: HGV Accident Involvement Rates (1991)
(per 100 million vehicle kilometres).

	All HGV's	Adjusted Four axle	Adjusted Five axle
Motorways			
fatal		1.6	
serious	1.5	4.9	1.4
slight		16.4	
	4.9		4.5
A roads			
fatal	17.6	7.1	17.1
serious		18.7	
slight		53.5	
Other roads	3.9		4.9
fatal		8.1	
serious	13.1	38.1	13.7
slight		107.9	
	44.0		36.9
All roads			
fatal		4.2	
serious		12.0	
slight	2.4	36.9	10.2
	16.6		87.8
	54.0		196.6
	2.9		2.1
	11.1		9.2
	39.0		27.1

Source: *Road Accidents Great Britain 1991:The Casualty Report*. HMSO, London.
Note:The involvement rates for the largest HGV's have been adjusted on the basis of their accident rates in 1987; see Appendix A.

Table 7: Average Cost per Casualty and per Accident:GB

Type	Cost/casualty (£)		Cost/accident (£)	
	1991	1992	1991	1992
Fatal	683,155	718,306	762,840	802,091
Serious	20,710	21,776	26,490	27,853
Slight	420	442	2,510	2,639
Damage only	-	-	960	1,009

Source: Derived from *Road Accidents GB 1991:The Casualty Report*. DTp, London.

In Table 7, the amounts at which the DoT values life are adjusted for inflation to 1992 levels. Of this amount the percentage borne by the community rather than the vehicle operator has been estimated as 72% in the case of fatal accidents, 32% serious and 19% slight (Fowkes, Nash and Tweddle 1990). A value of 1.13 pence per vehicle mile, or 0.13 pence per tonne mile is produced by using average involvement rates for all HGV's and an average payload of 8.72 tonnes. In the case of five axle HGV's using 'other roads', those classified as 'B' roads or unclassified, these accident costs rise to 4.21 pence per vehicle mile.

This value of accident benefits gained from switching freight from road may appear to be small. The total value of environmental benefits is made up of many such small increments, though it is not known precisely which benefits the Department of Transport include in their current valuation of £1 per sensitive lorry mile (£1.50 in urban areas).

Even when a value of benefits has been determined, it has been based on the removal of HGV's from the roads, or sections of road. Little account is taken of possible disbenefits of the alternative mode, or the net environmental benefit when switching among a selection of modes is considered. If a flow of traffic can be transferred from road to either rail or waterway at the same level of cost, then the benefits will be greater if the transfer is to water. The emissions from craft are less than that from rail, and noise levels are also lower particularly when considering the passage of heavy freight trains through residential areas at night.

Attempts have been made in a number of European countries to value the impact of air pollution from road and rail transport (including France, Sweden and Czechoslovakia). These indicate that the reduction in terms of tonne kilometres by using rail in the range of 78% to 98%/

One study undertaken in Germany valued a wide range of external costs, and included an inland waterway comparison (Table 8). Though conditions in the U.K. are different from those in Germany, we have attempted to apply the results of this study to the use of 38 tonne GVW vehicles (assuming an average payload of 17.1 tonnes and an exchange rate of DEM 2.426). The reduction in external costs is 85% in the case of rail and 93% for inland waterways. Applied to an individual

lorry this is approximately 18.6 pence per mile for rail and 20.4 pence per mile for inland waterway.

Table 8: External Costs of Freight Transports
(Germany; DEM per 100 tkm)

Cost Item	Railways	Trucks	Inland Waterways
Air pollution	0.33	2.36	0.34
Damage to soil and water table	0.00	0.40	0.00
Noise	(0.68)	0.35	0.00
Accidents	0.12	1.78	0.01
Environmental desections	0.00	0.06	0.00
Land-take	0.02	0.06	0.35
	1.15	5.01	0.35
With rail bonus			
Noise	0.26	0.35	0.09
Total	0.73	5.01	0.35

Source: PLANCO Consulting; Externe Kosten des Verkehrs, Essen 1990

This assessment indicates that in order to reflect the true environmental benefits of using inland waterways, any grant system should differentiate between the values which apply to various modes, and that the valuation of SLM's on high quality rural roads, such as motorways, should be at least 20 pence per mile. Apart from rail and water, these alternatives could include pipeline and long distance conveyor systems which remove lorries from the road network. While these alternatives may not use inland waterways in a conventional manner, they may use the infrastructure as a routeway.

7. CASE STUDIES

Case studies have been generated in order to test various approaches to providing grant aid in order to cause goods to be moved by inland waterway as opposed to road "where this would be in the interest of any locality or of some or all of its inhabitants". These examine the possibility of water movement of dry bulk materials from a quarry situated alongside the River Trent to a break bulk depot, or factory, near Leeds on the Aire and Calder Navigation. A secondary application of the movement of aggregates from this quarry is to compare the costs where road vehicles are delivering full loads direct to customers in West Yorkshire.

A possible source of future waterway traffic is the inland movement of imported goods. In order to examine the effect of grant aid on such a flow, the third case study takes a movement of dry bulk cargo being imported at Immingham bound for a factory situated on the River Ouse near Selby.

The estimated costs for the case studies have been obtained from a variety of sources, and may not

be wholly accurate but are nevertheless confidential. The flow of costs and benefits over the life of the project have been discounted. For the financial case an NPV rate of 10% was adopted, whereas for the environmental benefits the public expenditure rate of 8% was used. This approach is based on our understanding of the Department of Transport's method.

The value of a sensitive lorry mile (slm) has been adjusted on a number of occasions. Currently it is set at £1 per mile (except motorways and rural dual carriageways), while urban roads are given a 50% higher value. From 1994, high quality roads will be included in the assessment of slm's, but a lower rate is proposed. We have undertaken a sensitivity test on the case studies using a rate of 10p per mile on motorways and rural dual carriageways. In addition we have valued all lorry miles at £1 to demonstrate the level of potential grant which could be generated, if the political will existed to do so.

7.1 MOVEMENT FROM PRODUCTION QUARRY TO A DEPOT

A flow of traffic from Dunham on Trent, to a depot near Leeds provides a relatively long distance movement by inland waterway within Britain. However, using the River Trent northwards, then reaching the Aire and Calder canal via Goole means the distance of 80 miles by barge is considerably longer than 60 miles by road.

For the purposes of the case study, it has been assumed that the quarry already possesses loading facilities and the capital works required by the project are limited to the refurbishment of a wharf near Leeds, and the supply of suitable discharging equipment. The purchase of a new barge is planned, which means that the planned project period in order to qualify for Freight Facilities Grant would be ten years. An alternative to a new barge would be to obtain one second hand with an anticipated life of ten to fifteen years, which considerably reduces the capital required by the scheme.

The costs were calculated, based on a plan to move 50,000 tonnes per year. The operating costs proved to be less if waterway is used, and if some or all of the capital can be funded by grant, then the traffic can switch from road .

The discounted cash flow calculation (DCF) over ten years gives a negative net present value (NPV) without grant. In order to encourage this movement to use inland waterway transport, the minimum level of grant required, equates to 68% of the capital expenditure. This establishes the financial case required in order to qualify for a grant; that is, without grant road transport is cheaper than inland waterway.

The next step is to examine the environmental case which quantifies the benefits to be gained, thereby establishing the maximum grant payable. The benefits are based on the number of lorries removed from sections of road which are classified as sensitive. Currently these include all roads except dual carriageways in rural areas with a few exceptions, and grade separated dual carriageways in urban areas, ie. Urban Motorways. Though most of the inter-urban trunk and motorway network is currently excluded, they may be brought into the scheme from 1994, but at a lower valuation of environmental benefit per lorry mile.

The route from Fledborough to Leeds uses 2.3 miles of unclassified roads to reach the A57. This is single carriageway to the A1 (5.65 miles). The route then follows the A1 and A1(M) north to Ferrybridge, then the M62 and M1, 49.75 miles of high quality road not currently classified as sensitive. The depot is reached along 2 miles of the A642, half of which is urban and counts for 50% additional level of grant.

Under the current assessment of sensitive mileage the route contains 10.45 miles which qualify. Prior to 1991 this would have only been 3.3 miles, and if high quality roads qualify at one tenth of the standard rate from 1994 this will increase to 15.43 slm's per lorry in each direction. The flow requires 2,083 lorry loads (assuming a payload of 24 tonnes) giving a total of 43,535 sensitive lorry miles (slm's) per year at £1 per mile, the urban mileage having been factored by 1.5. If a policy was adopted valuing all lorry miles as being sensitive, and valued at £1, then this could produce a total of 248,710 slm's per year in this case.

As with the financial case the environmental benefits have to be discounted. The outcome of this procedure shows that there is insufficient environmental benefits to allow the DTp to offer a capital grant which is large enough to encourage the project to go ahead, under the current definition of which categories of road are considered to be environmentally sensitive.

If the high quality road network is assumed to be sensitive (as it may be from 1994), but at a rate of 10 pence per lorry mile, the total environmental benefits increase. However this is still insufficient to result in transport by waterway being cheaper than road. The alternative would be, in addition to this level of Section 36 grant, to pay part of the tolls as a separate operating grant, or broaden the grant assessment. Valuing a lorry mile on all roads at up to £1 would allow the DoT to provide sufficient grant to encourage switch of mode.

The operator may decide to change modes where grant means water transport is slightly more costly, on the basis of being a good neighbour. In this particular case, the substitution of a new barge by a second hand craft may allow the scheme to go ahead even under the current valuation of sensitive lorry miles, because the capital investment required is substantially reduced.

7.2 MOVEMENT FROM QUARRY TO CUSTOMER

The supply of low value bulk materials via a break bulk depot close to the customer is acceptable where such a method is necessary. However, the distance from the quarry to customers in the West Yorkshire area is relatively short, and a lorry could achieve two round trips within a drivers shift direct from quarry to customer, eliminating the costs incurred at the depot.

The costs of a depot capable of transferring aggregates from barge to road delivery vehicle, via storage, have been estimated to include ground rent, storage and reloading to road vehicle of the material, plus delivery costs in the West Yorkshire area. In this case the operating cost per tonne using inland waterway exceed those of direct road delivery, without considering capital costs. The system will not be economic, with or without grant. In order to encourage this flow of traffic to use water a form of operating grant would have be introduced, in this case to reduce operating costs

significantly. The scheme would still require a 100% capital grant in order to reduce the costs of transport by inland waterway to the same level as obtained from road transport.

The case study serves to demonstrate that, given the short distances which are available for the movement of domestic traffic by inland waterway, they are only competitive for traffic flows which have their origin and destinations located alongside the canal network. Freight Facilities grants will only assist operations in which a break of journey is desirable for other reasons. Taking the supply of aggregates as a example, this may be for the supply of small consignments of less than a lorry load, or supply of material to a ready mixed concrete plant situated alongside the canal. The cases where the current Grant Scheme can assist an operation where an additional transhipment is required will be a rarity.

7.3 MOVEMENT OF IMPORTED GOODS INLAND

The third case study examines a situation where a factory imports 120,000 tonnes per year of dry bulk raw material into the port of Immingham. This material is then moved to the factory situated on the River Ouse near Selby, where there is already wharf facilities used for other cargo. Would application of the Grant encourage the firm to use river barge for the movement from Immingham instead of road?

Estimates indicated that one 1,000 tonne capacity esturial vessel was capable of transporting about 80,000 tonnes per year, given tidal restrictions in reaching Selby. The scheme would be unlikely to support the purchase of two barges, so that part of the flow would have to remain on road, only two thirds being the subject of a grant application. The handling costs at Immingham could be reduced by equipment capable of transferring cargo direct from ship to barge, but this was not modelled.

The financial case shows that a negative NPV is produced, without grant. However, the maximum grant which could be offered currently would be insufficient to make river transport more attractive. If motorways are included as being environmentally sensitive roads, valued at 10 pence per slm, then the total grant possible rises, but is insufficient to encourage the firm to change modes. This needs to be increased to at least 20p per slm before this scheme becomes viable.

It is likely that the environmental benefits of removing lorries from motorways will be valued at a very low cost per mile. A high valuation would attract a large number of applications to switch long distance traffic from road to rail. An alternative grant which is now being proposed is for an operating grant to the track authority, based on the avoidable infrastructure costs of each flow of traffic. In this case study, such a grant could be used to reduce, or eliminate the tolls. The current Freight Facilities Grant Scheme, in combination with eliminations of tolls would, in this case at least, encourage a switch of mode. Broadening the scheme would allow the combination of aid measures to encourage use of river transport.

8. ALTERNATIVE GRANT SCHEMES AND OTHER MEASURES

If we assume that the current Grant Scheme is unlikely to have a significant effect on switching

traffic to waterway, then it is worth considering alternative measures. It is apparent that the disparate nature of the parties involved in waterway transport mean any long term commitments as a basis of a grant proposal are unhelpful, and this requirement should be avoided. However, following this logic capital grants may be risky method for the taxpayer as the benefits are uncertain. Generally the Treasury insists on some measure of value for money in return for public expenditure.

The philosophy of the Grant Scheme is to reduce the capital expenditure involved in a proposal to a level at which the cost of a movement over a period of five or ten years is lower than that forecast by road. Evidence that the traffic does move by the environmentally friendlier mode must be produced following receipt of grant.

An alternative in the case of inland waterway would be to provide grant towards the construction of new craft. As the fleet as a whole is very old, and replacement on a normal commercial basis is unlikely, current flows by canal are likely to switch to road eventually. New equipment would help retain some of this traffic, but the standard Freight Facilities Grant assessment method is inappropriate. A subsidy on barge construction would also be seen as giving water an unfair advantage against rail.

Allowing toll free use of the waterways (as will be available for some rail traffic after privatisation) is unlikely to have a major impact as these are fairly low, though in combination with a Section 36 Grant elimination of tolls may be more effective. The avoidable cost of maintaining some canals to a standard of "commercial waterways" is greater than the revenue from tolls.

Rents for canalside development are of greater importance. An alternative would be to provide British Waterways with an operating grant based on freight moved, in terms of tonne miles, and allow it to generate the maximum tonnage by charging what the traffic will bear, based on a combination of charges (tolls, wharfage and rents) though on many movements the wharfage and rents are payable to parties other than British Waterways. This would involve British Waterways offering a package of facilities, not just transport. The application of such a scheme will depend on the outcome of the rail privatisation debate, and what is seen as a fair basis for competition between the two modes.

In order to improve the infrastructure, particularly easing the capacity constraints, the DTp should look sympathetically on major infrastructure improvement schemes should any substantial new flow of traffic arise which could use water transport. This is particularly pertinent with regard to the possible future import of coal (foreign or coastwise) via the Humber ports. Improvements to stretches of the Ouse, Trent and Aire and Calder Navigations may be necessary if the substantial flows of coal were to be moved by water.

Assessment of such schemes could be undertaken on a similar basis to the Section 56 Grants used in some passenger transport schemes. These encompass a wider range of benefits than Freight Facilities Grants, including accidents and regional development. Because of the relatively complex assessment procedure such a grant is unlikely to be provided specifically to examine possible flows on inland waterway, though a more generalised scheme could incorporate development along canals. Nevertheless, they would only be suitable for large investment projects.

An alternative to a grant scheme is to encourage industry, especially those firms who use commodities suitable for canal transport, to consider locating depots and factories adjacent to canals. Such an approach would probably have more impact on mode choice than a grant, and may be less costly for the taxpayer. Unfortunately, the conversion of canal side land for amenity use tend to preclude access to canal facilities, though sites are available for industrial development along most commercial waterways.

Local authorities are required to provide a portfolio of land for industrial development, some of which is suitable for firms which wish to use freight transport other than road. Unfortunately, local authority planning departments are discouraged from questioning the economic location decisions of firms and are not in a position to ask them to consider alternative locations so that they are able to use water transport. Most industrial development requires good road links as a first priority.

Wakefield District Council has several waterside sites available and these are included in the Unitary Development Plan (UDP). This Council is experiencing an increase in the waterside sites available following the closure of collieries and a power station. They are also promoting Port Wakefield, which has good communications by rail, road and waterway. In the Leeds area, Stourton fulfils the role for such facilities.

9. EUROPEAN COMPARISONS

Like most of Continental Europe, costs exceed toll revenues on most stretches of inland waterway, especially where locks are required. One aspect of cost recovery is that the infrastructure is a fixed asset, though locks may require extra staff if traffic expands, so it is the volume of traffic which determines whether a canal pays or not.

The outlook towards the provision of infrastructure differs between countries within Europe, though in general they are provided and maintained as part of the country's transport infrastructure. They are seen as a necessity, along with roads and railways. No one asks which roads are most profitable! The Rhine does not have tolls as it is considered to be an 'international waterway'.

In relation to other inland waterways the European Commission (EC) has introduced a system of waterway classification, to which it is hoped all canals will eventually be converted (EC 1992). The main waterways of Yorkshire conform to the Class II category, though with respect to beam the maximum recommended is 6.1 metres. Although through movement of goods from the Continent on barges of 650 tonnes capacity is unlikely, adoption of the standard dimensions would allow inter-changeability of craft which allows simple adaption to changes in traffic patterns and sale of used craft without conversion. Being able to purchase new craft of standard design, which are produced in reasonable numbers, would reduce operators costs.

The main problems to be addressed regarding waterway traffic in Europe are seen as the lack of international movement, except in the North West. This is partly the result of the French network, but the fact that a number countries are not connect to the core network such as Italy and the U.K.

The under utilisation of the inland waterway fleet is also of concern.

In order to form a coherent approach towards planning the waterway links in the EC, a group of national experts reported in February 1992 on the development of a European Inland Waterway Network (Commission Communications COM (92) (231)). The British government representative submitted no proposals regarding Great Britain, which is therefore not included in the network, and may mean that it is more difficult to obtain funds from Brussels should any infrastructure investment be required in the future for the development of waterways in the U.K.

This led to a draft decision on the creation of a European inland waterway network. This has been received by the Council of Ministers but not yet adopted. For the most part, this is simply a matter of coordinating national plans.

Some development of transport infrastructure has been undertaken using EC funds. However, the most recent regulation establishing Community Infrastructure Fund expired in December 1992 and has not yet been renewed. Nevertheless, Parliament has granted 185m ECU for a new fund (a very small amount when spread over the entire community).

The previous regulation excluded Inland Waterways. Under the draft new regulation, funding of between 25% and 50% would be available for studies of all modes of land transport (this included inland waterways). But inland waterways are still not included in the list of actual projects to be funded. This regulation has not yet been adopted by the Council of Ministers.

European Regional Development Fund (ERDF) grants are available in the eligible regions, but use of these should be consistent with the outline plan. Once again the exclusion of the U.K. network from the European Waterway Network may mean ERDF funds are more difficult to obtain for improvements to British Waterways infrastructure.

With regard to commercial competition on the waterways, there is no European Community policy on charging for the use of waterways. This policy applies to intra European traffic by all modes. Given the extensive network of waterways in northern Europe, barge operators are in a fairly strong position to compete for longer distance movements of some bulk commodities.

The EC see the development of the major routes to carry containers, and became part of the inter-modal transport network as a desirable aim. In order to carry boxes stacked four wide and two or three high would require an air draught of up to 7 metres. Though British canals do not conform to these dimensions, it may be possible for shallow draught coastal cellular ships to reach inland ports. However, on the Rhine, where such services are already available, they are used mainly to overcome weekend and night time lorry bans, nevertheless producing an environmental benefit.

Within the individual countries forming the European Community various policies are adopted towards the provision of waterways. The French government has recently proposed to revise its law relating to charging for use of inland waterways, though in general the funds available for infrastructure development are not provided to same extent as in countries to the north. Some parts of the French network are no longer effective commercial links as a result.

In contrast to the U.K., inland waterway investment in Germany forms part of the coordinated transport infrastructure investment programme of the Federal Government, which provides funding in the form of grant. It is generally believed that charges do not even cover maintenance costs let alone capital charges.

There are a number of new, or modernised, canal projects being undertaken in Europe, most of which are funded by individual governments. The most important new inland waterway is the Rhein-Main-Donau canal, which opened in 1992, run by a Federal/Bavarian State owned company.

Information received from the EC indicates that they have no knowledge of any system of grants for environmental purposes in any member state other than Britain. It seems the Freight Facilities Grant is unique in its requirement to assess the value of removal of individual flows of traffic from the road, and impose conditions for grant aid. The more general European approach being to provide infrastructure capable of carrying the available traffic by all suitable modes, without detailed assessment of whether infrastructure investment produces an economic return.

10. CONCLUSIONS

Our conclusions from the study are as follows.

1. The Section 36 grant scheme has had limited success in diverting traffic from road to water. The principle reasons for this are:

- the relatively small amount of traffic with origins and destinations alongside the limited commercial waterway network of Great Britain

- the fact that waterways frequently parallel motorways and trunk roads, on which the grant has to date not been available.

- the fact that little water traffic moves on the sort of long term traffic needed to provide a convincing justification for a grant.

2. The government has announced radical changes to the methods of support for railfreight in the context of the privatisation debate. In particular:

- the scope of the Section 8 grant is to be extended to include (at a reduced rate) mileage saved on motorways and dual carriageway roads.

- a new grant is to be introduced to cover up to 100% of the track costs of rail freight where the traffic would otherwise go by road and where the environmental benefits of rail are adequate to justify the grant.

- it is proposed that lorries of up to 44 tonnes GVW should be permitted as part of intermodal movements on trips to or from rail terminals.

3. We can see no reason why these measures should be limited to diversion to rail. Indeed there is good reason to believe that water transport is even more environmentally friendly than rail. Moreover, an equivalent track charges grant for water would be less helpful to water transport than to rail because of the differing cost structure involved. We therefore recommend:

- Section 36 grants should be extended to cover motorway and rural dual carriageway roads and should be paid at a higher rate than Section 8.

- a new waterways operating grant should be available to operators of waterways craft at a somewhat higher rate per tonne km than the rail track costs grant.

4. There appears to be no close relationship between the rate of grant and the marginal social cost of road freight transport on different types of roads. We accept that a quantification in

this field is difficult, but believe that advances in techniques and new studies in many countries (e.g. Germany, Sweden) mean that DoT should redouble its efforts to quantify this, including congestion, accidents, road wear and tear and air pollution as well as noise and visual intrusion.

5. Currently no British waterways are included in the European master plan for inland waterways. We understand that the British government chose not to put any forward, and this may jeopardise the future availability of EC grants for waterway transport. We recommend that the government re-examine this issue in consultation with all interested parties.

6. We accept that the scope for shifting freight to waterways is currently very limited because of the need to tranship in the case of most traffics. The long term potential for waterways would be much improved if more potential customers were located adjacent to waterways. We recommend that:

- the DoE should give local authorities more positive guidance on the need to exploit this possibility in drawing up development plans and in dealing with planning applications.

- the potential for grants towards land assembly and building developments in cases where this is justified on environmental grounds should be examined.

Given the increased reliance of the U.K. on imported goods, including low value bulk materials, new flows of waterway traffic are most likely to come from the inland movement of such materials. Policies should encourage the use of waterway transport from the point of importation wherever this is practicable.

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APPENDIX A

Source: Private correspondence with the Department of Transport