4.2   Case Study: investment in a railway line

4.2.1   Introduction

A government of a country eligible for Cohesion Fund assistance has planned to improve the rail connection along a corridor that runs across one of its most densely populated regions. Currently the transport supply in that area includes a relatively old single-track railway line, 215 km in length and a well developed, but congested road network. The railway line has been losing its freight traffic in favour of faster truck transportation and passenger traffic to private cars.

Road congestion particularly affects the network near the main cities and the railway line cannot offer a competitive service: train speed is low and the services provided are unreliable. The main objective of the project is to develop a high-quality rail connection for passengers and freight by improving the existing line. The improved rail link is expected to benefit the environment and to reduce the need to further increase road capacity. The shift of passengers and goods traffic from road towards the railway is one of the objectives of the National Transport Plan in order to reduce congestion and limit CO_2 emissions and air pollution the latter, particularly in densely populated areas where exposure is higher. There is also an expectation that the improved rail line will accelerate regional development. The improvement of the line is further encouraged by the introduction of the Eurovignette, which implies a taxation system for road heavy goods vehicles, foreseen for the near future.

In order to achieve these goals, the government has decided to investigate the feasibility of different investment options. The technical feasibility of the project has been confirmed since no specific barriers or other particular physical constraints have been found on the ground. A pre-screening of a number of technical development options on the basis of the preliminary assessment of investment costs and traffic potential has allowed the selection of two main options to be assessed against the BAU scenario:

- business as usual: the railway line will continue as it is and will lose further shares of its passengers and freight traffic. This implies that in the future some congestion is foreseen, particularly around the main cities due to freight traffic growth in the region. The main problem will be air pollution, that is expected to increase significantly as a consequence of the dominance of road mode in freight transport;
- 'option 1': a solution with limited investments which secures an improvement in the line reliability, although this will have only marginal benefits in terms of modal shift and reduction in environmental and social costs;
- 'option 2': a solution which reflects a more ambitious plan for the full modernisation of the existing railway line.

The existing railway services are operated by two private companies; one for passengers and the other for freight transport whilst the infrastructure is owned by the government and is managed by a state owned company.

4.2.2   Traffic analysis

The two selected options have been analysed with respect to what effect they will have on passengers and freight flows in comparison to the business as usual scenario along the whole corridor. Some sections of the existing line are presently in a very bad shape, and this is having a negative affect on the capacity of the railway infrastructure and the reliability of the services. The line is currently operating at its maximum capacity. No additional trains can be provided although there is a potential demand, particularly for freight going towards the regional port, which will shift from road to rail if further capacity is made available.

Investment in Option 1 is likely to result in a moderate increase in passenger and freight demand. It would bring to a halt the decreasing competitiveness trend of the rail and the modal share of the rail will be slightly lower than currently but will take advantage of the expected growth in the overall transport demand.

Option 2 however, will result in a further increase in demand from both passengers and freight, as the capacity will be significantly higher than in Option 1, with the rail modal share showing a limited positive trend.

The following Table shows traffic forecast and service provided in the two options.

Table 4.14   Traffic and service forecasts

	BAU		Option 1		Option 2	
	Per day	Per year	Per day	Per year	Per day	Per year
Expected traffic volumes						
Tons						
Opening year	1,400	308,000	7,200	1,584,000	14,400	3,168,000
Year 15	1,400	308,000	8,113	1,784,860	16,226	3,569,720
Passengers						
Opening year	17,500	6,300,000	30,000	10,800,000	48,000	17,280,000
Year 15	17,500	6,300,000	33,805	12,169,800	54,088	19,471,680
Number of trains						
Freight						
Opening year	2	440	12	2,640	24	5,280
Year 15	2	440	14	3,080	28	6,160
Passengers						
Opening year	70	25,200	100	36,000	160	57,600
Year 15	70	25,200	112	40,320	180	64,800

4.2.3   Investment costs

The second step in the appraisal is the calculation of the financial costs of the rail upgrading. Preliminary estimates of financial investment costs have been provided by the project engineers and are shown to be compatible with the expected volume of traffic. Having checked the opportunity to further develop the technical feasibility, detailed estimates of the costs of two options have been made available.

Table 4.15   Investment Costs (€)

	Option 1		Option 2	
	Millions	%	Millions	%
Works	506.0	65.2	1058.1	63.7
Equipments	126.5	16.3	293.9	17.7
Contingencies	77.6	10.0	166.9	10.1
Other expenses	66.0	8.5	141.3	8.5
Total	**776.1**	**100.0**	**1660.2**	**100.0**

Maintenance costs of the rail line include all costs for maintaining tracks, signalling, telecommunication, catenary systems and surrounding areas. The costs have been estimated on an annual basis, split into the main components (personnel, materials, freight and carriage costs) for the BAU and the two options, taking into account the expected volume of traffic in each case. The estimates reflect the costs of carrying out the necessary maintenance work that is required to ensure the specific level of service.

4.2.4 Economic analysis

The benefits of the two options are measured in terms of:

- time savings for the existing passengers rail traffic, fares being equal in all the alternatives;
- costs saving for the existing freight traffic, due to fares reduction on account of the reduced marginal costs made possible by the railway upgrading[61];
- time and operating costs savings for the passenger traffic diverted from road to rail;
- air pollution reduction as a result of the shift of freight and passenger traffic from road to rail;
- CO_2 emission reduction as a result of the shift of freight and passenger traffic from road to rail
- accident reduction owing to the shift of freight and passenger traffic from road to rail

The economic benefits of the two options can be summarized in the following categories:

- changes in consumer's surplus , represented by the changes in users generalised costs;
- changes in producer's surplus (railway operator) and in user's surplus;
- reduction of the negative externalities as a result of the diverted traffic from road to rail (air pollution, CO_2 emissions, accidents).

Table 4.16 summarises the unit generalised costs per trip for passengers and freight

Table 4.16   Costs per trip (€)

	BAU Scenario	Option 1	Option 2
Passangers			
Rail			
Time costs	28.6	25.0	22.3
Tariffs	16.7	16.7	16.7
Generalised costs	45.2	41.7	39.0
Road			
Time costs	25.1	24.9	24.3
Operating costs (including taxes)	17.6	17.6	17.6
Generalised costs	42.7	42.4	41.8
Freight (per ton)			
Rail Tariffs	11.6	6.5	6.5
Road Tariffs	12.9	12.9	12.9

4.2.4.1 Consumer's surplus

Passenger's consumer's surplus has been calculated according to the so-called 'rule of half' for all the rail users and for users remaining on the road network that benefit from a reduction in congestion. The following Table shows the volumes of traffic in the three options (Business as usual, 1 and 2) and the unit benefits for the different flows. The unit benefits for the existing traffic are calculated as the difference between the generalised costs (tariffs for freight) with and without the project[62]. The unit benefit for freight is the difference in rail tariffs[63], no value of time for goods has been considered given the low value of the goods and the limited time saved. For the modal shifters and the users remaining on the road, the unit benefit is half of the difference of the generalised costs of the rail and the road, respectively[64].

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[61] In this illustrative example we assume that pricing rules for the operator are given by a fixed mark-up on marginal costs. See case study motorway and Chapter 4 for an explanation of unperceived users operating costs.
[62] For instance, the unit benefit for initial users of Option 1 is (€45.2 - €41.7) = €3.6. The total benefit is € 3.6 * 6.3 Million passengers = 22.6 Millions of Euros.
[63] For instance, the unit benefit for rail freight service users of Option 2 is (€11.6 - €6.5) = €5.1
[64] For instance, the unit benefit for the modal shifters under Option 2 is (€45.2 - €39) = €6.2/2 = €3.1

Table 4.17   Consumer's surplus

Passengers	Passengers (Millions)			Unit benefits (€)		Benefits (Millions of Euros)	
	BAU	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
Rail							
Initial users	6.3	6.3	6.3	3.58	6.27	22.6	39.5
Modal shifters	0.0	4.5	11.0	1.79	3.14	8.1	34.4
Total	6.3	10.8	17.3			30.6	73.9
Road							
Users	40.7	36.2	29.7	0,22	0.96	8.0	28.5
Total consumers' surplus						38.6	102.4
Freight	Tons (Millions)			Unit benefits (€)		Benefits (Millions of Euros)	
	BAU	Option 1	Option 2	Option 1	Option 2	Option 1	Option 2
Rail							
Initial users	0.3	0.3	0.3	5.16	5.16	1.6	1.6
Modal shifters	0.0	1.3	2.9	2.58	2.58	3.3	7.4
Total	0.3	1.6	3.2			4.9	9.0
Road							
Users	64.7	63.4	61.8	0.04	0.17	2.7	10.4
Total						7.6	19.4

4.2.4.2   Producer's surplus and Government net revenues

The producer's surplus is calculated as the sum of the changes in the rail service operator's surplus plus the changes in the road user's surplus due to the shift of demand from road to rail (changes in freight road transport operators surplus plus the changes in unperceived costs for car users). The rail operator's surplus is calculated as the difference between the tariff revenues and the marginal costs of producing the services.

The changes in net Government revenues depend upon the changes in fuel taxes, due to the reduction in distance travelled by road and other taxes on railways.

Table 4.18   Producer's surplus

Passengers	Revenues and costs (Millions of Euros)			Benefits (Millions of Euros)	
	BAU (a)	Option 1 (b)	Option 2 (c)	Option 1 (b) − (a)	Option 2 (c) − (a)
Rail					
Operating costs	-184.7	-283.5	-470.0	-98.8	-285.3
Tariff Revenues	209.9	359.8	575.7	149.9	365.8
Total	25.3	76.4	105.7	51.2	80.5
Road					
Car users unperceived operating costs	-177.3	-157.7	-129.5	19.6	47.8
Total producers' surplus				**70.8**	**128.3**
Government					
Fuel taxes	366.1	325.6	267.3	-40.5	-98.7
Other taxes	40.6	58.1	92.9	17.4	52.2
Total Government revenues	**406.7**	**383.7**	**360.2**	**-23.0**	**-46.5**
Freight	Revenues and costs (Millions of Euros)			Benefits (Millions of Euros)	
	BAU (a)	Option 1 (b)	Option 2 (c)	Option 1 (b) − (a)	Option 2 (c) − (a)
Rail					
Operating costs	-0.8	-4.7	-9,4	-3,9	-8,6
Tariff revenues	7.2	20.4	40,9	13,3	33,7
Total	6.4	15.7	31,4	9,4	25,1
Road					
Production financial costs	-804.1	-785.5	-758.3	18.5	45.8
Tariff revenues	834.4	817.9	797.5	-16.5	-36.9
Total	30.3	32.4	39.2	2.1	8.9
Total producers' surplus				11.4	33.9
Government					
Fuel taxes	327.4	320.0	309.7	-7.3	-17.6
Other taxes	0.2	1.0	1.9	0.8	1.8
Total Government revenues	**327.5**	**321.0**	**311.7**	**6.5**	**15.8**

Financial investment costs have been adjusted for fiscal components. Personnel costs have been adjusted by deducting national insurance contributions and income taxation. The conversion factor is equal to 0.74 because the reservation wage has been taken into consideration for this area given its high unemployment.

Specific conversion factors, calculated as a weighted average of the single component conversion factors, have been applied to investments and maintenance costs as well as to tolling and residual value (see the following Table).

Table 4.19 Conversion factors for each type of cost

Type of cost	CF	Notes
Labour	0.747	Shadow wage for not-competitive labour market
Raw Materials	1.000	Traded good: Standard Conversion Factor
Carriage	0.777	44% Labour, 19.4% Diesel Oil, 36.6% Other
Works	0.867	35% Labour, 45% Raw materials, 20% Carriage
Equipments	0.918	20% Labour, 66% Raw materials, 14% Carriage
Maintenance	0.835	58% Labour, 33.9% Raw materials, 7.7% Carriage

The economic performance indicators of the two options are summarised in the following Table and detailed flows of costs and benefits are reported on (see Tables 4.21 and 4.22). The reference social discount rate is 5.5%. The results show that both investment packages are economically viable. As shown below, Option 2 gives the best results in terms of NPV while Option 1 shows a marginally higher ERR. Option 1, the upgrading of the existing line, shows a lower Net Present Value than Option 2. The difference in net present benefits between the two options is much higher then the difference in investment costs. The volume of traffic attracted by the fully upgraded railway more than justifies the higher investment costs. This result will be further enhanced in the medium term by the charging policies for road freight transport that are likely to be implemented in the forthcoming years and that will support the modal shift from road to rail with respect to freight traffic.

	Option 1	Option 2
- ENPV (Millions of Euros)	938.1	1,953.3
- ERR (%)	15.1	14.9
- B/C Ratio	2.5	2.4

4.2.5 Scenario analysis

The results of the economic analysis are subject to uncertainty given the preliminary definition of some investments; the variability of expected traffic and the limited knowledge of unit costs. In this case, traffic projections are particularly important as the main objective of the project is to increase the share of rail transport along the corridor and optimise the use of the existing capacity so as to reduce the negative externalities of the road transport. Therefore, to assess the robustness of the analysis, a pessimistic scenario analysis has been carried out on both alternatives with investment costs increased by 30% and transport demand decreased by 30%.

The impact of the new scenarios on the Net Present Value and Economic Rate of Return for each Option is shown in the following Table. The ranking of the two projects remains the same, but in this pessimistic scenario the performance indicators of both options become negative, highly negative for Option 1 and marginally negative for Option 2.

Table 4.20 Project performances in the scenario analysis

	ERR (%)	ENPV (Millions of Euros)
Option 1		
Base case	15.1	938.1
Pessimistic scenario	1.9	- 347
Option 2		
Base case	14.9	1,953.3
Pessimistic scenario	4.5	- 127

4.2.6   Risk assessment

The risk assessment is shown here on the investment costs, which emerged as one of the critical variables in the sensitivity test. The risk assessment has been carried out for the Option 2. Given the lack of reliable past data on similar investment, a three point distribution has been assumed, with the following range of values: a high estimate in which the investment costs are three times higher than the estimated 'best guess value', and a lower value in which the investment costs are 10% lower than the 'best guess value'. This highly pessimistic assumption is based on historical data, which show a tendency towards a systematic optimism bias in railway investment. Given the range of values adopted, the result is an asymmetric triangular probability distribution.

Figure 4.4   Probability distribution of investments costs, Triangular (0.9; 1; 3)
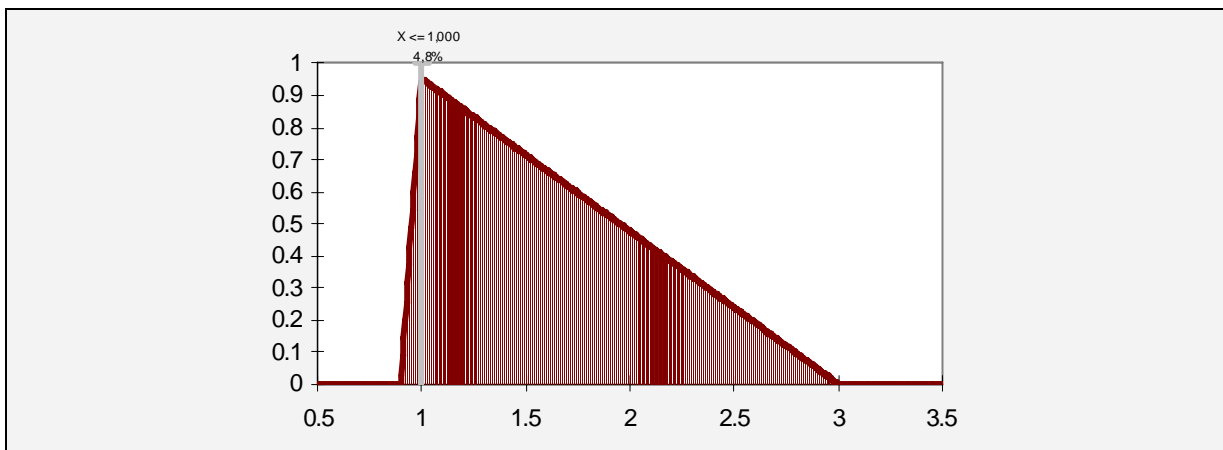
The results of the risk assessment, shown in the Figures 4.5 and 4.6, are extremely positive: the option selected is quite robust as there is just 7% probability that the ERR falls below 5.5%.

Figure 4.5   Results of the risk analysis for ERR
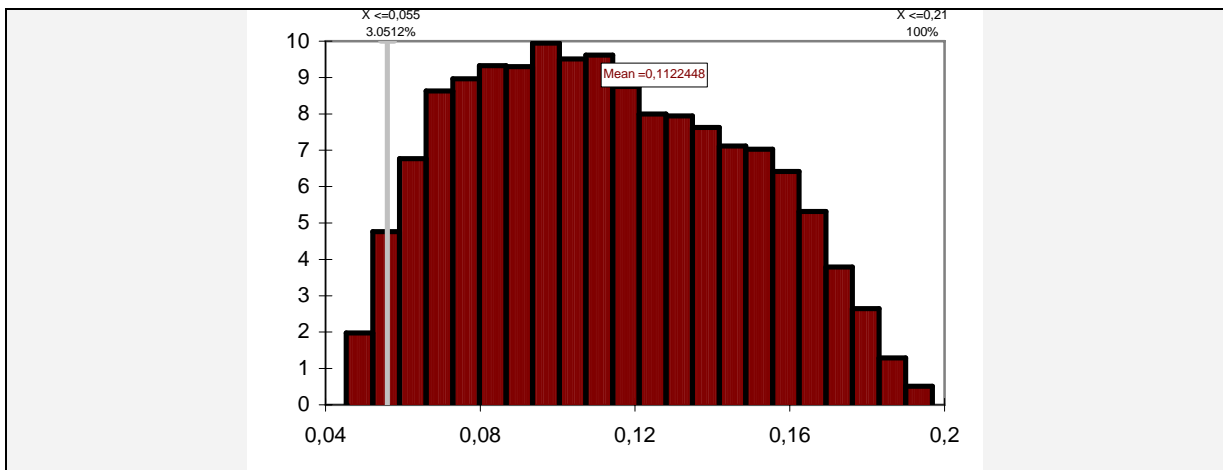
Figure 4.6   Results of the risk analysis for ERR
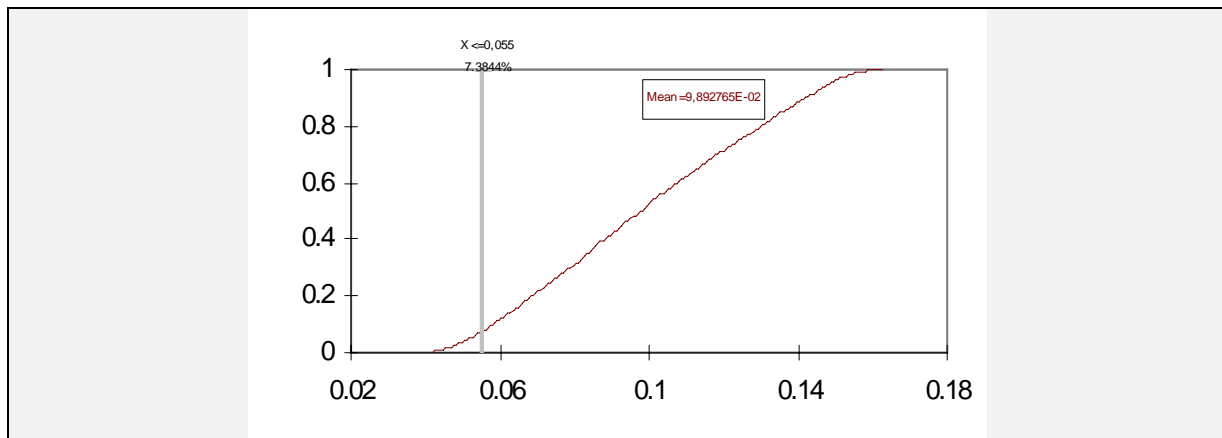
4.2.7   Financial analysis

The upgrading of the railway line will be completed in 3 years and the new railway is expected to be in operation after the fourth year. The upgrading of the line will be completed in both options without causing any interruption to the services already provided. The time horizon should not exceed the economically useful life of the project and in particular the lifetime of its most durable elements. In this case, the time horizon of the investment is 30 years, and given the components of the investment, the residual value beyond the evaluation period has been estimated to be 50%.

The total estimated financial costs of the upgrading is €1,660,000,000 and no major costs are further envisaged in the two existing railway stations. Yearly maintenance costs are €26,800,000 in the opening year and will remain constant throughout.

The financial inflows are related exclusively to the access charges paid by the service operator. Access charges are calculated by taking into account the marginal maintenance costs and scarcity. Average access charges for train km will be 1.4 Euros for passenger trains and 2.1 for goods trains, with the difference attributable to the different times of the day when the tracks are used by passenger and freight trains.

The financial resources are planned as follows:

- EU grant => €182,000,000;
- National Public Contribution => €1,478,000,000;

The EU Grant is calculated applying a maximum rate approved by the Operational Programme (70%) to the total eligible cost (€260,000,000). It should be noted that although the annual revenue exceeds the operating costs in some of the years, the project does not classify as 'revenue-generating' because the present (i.e. discounted) value of operating costs over the reference period is higher than the present value of project revenue.

The financial performance indicators are:

- Financial Net Present Value (investment)   FNPV(C)   €−1,320,810,000
- Financial Rate of Return (investment)   FRR(C)   −2.5%
- Financial Net Present Value (capital)   FNPV(K)   €−1,156,029,000
- Financial Rate of Return (capital)   FRR(K)   −1.9%

Table 4.21   Economic analysis (Millions of Euros) - Railway Option 1

	CF	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BENEFITS																
Consumer's surplus																
Passengers		0.0	0.0	0.0	38.6	39.6	40.7	41.7	42.7	43.7	44.8	45.8	46.8	47.9	48.9	49.9
Freight		0.0	0.0	0.0	7.6	7.9	8.3	8.6	9.0	9.3	9.7	10.0	10.3	10.7	11.0	11.4
Producer's surplus																
Passengers		0.0	0.0	0.0	70.8	71.7	72.7	73.6	74.6	75.6	76.5	77.5	78.4	79.4	80.4	81.3
Freight		0.0	0.0	0.0	11.4	11.9	12.4	12.9	13.4	13.9	14.4	14.9	15.4	15.9	16.4	16.9
Government surplus																
Passengers		0.0	0.0	0.0	-23.0	-23.4	-23.8	-24.2	-24.6	-25.0	-25.4	-25.8	-26.2	-26.6	-26.9	-27.3
Freight		0.0	0.0	0.0	-6.5	-6.7	-6.9	-7.0	-7.2	-7.4	-7.6	-7.8	-8.0	-8.2	-8.3	-8.5
Externalities																
Passengers		0.0	0.0	0.0	12.7	13.0	13.3	13.6	13.9	14.2	14.5	14.8	15.1	15.4	15.7	16.0
Freight		0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1
TOTAL BENEFITS		0.0	0.0	0.0	112.6	115.0	117.7	120.2	122.8	125.3	128.0	130.5	132.9	135.6	138.3	140.8
COSTS																
Investment Costs																
Works	0.87	143.5	149.1	141.2												
Equipments	0.87	36.2	37.6	35.6												
General Expenses	0.87	22.0	22.9	21.7												
Other expenses	0.87	18.7	19.5	18.4												
Total investments costs		*220.4*	*229.1*	*216.9*												
Maintenance	0.835				7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
TOTAL COSTS		220.4	229.1	216.9	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
NET BENEFITS		-220.4	-229.1	-216.9	104.9	107.3	110.0	112.5	115.1	117.6	120.3	122.8	125.2	127.9	130.6	133.1

	CF	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
BENEFITS																
Consumer's surplus																
Passengers		50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9
Freight		11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Producer's surplus																
Passengers		82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3	82.3
Freight		17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4
Government surplus																
Passengers		-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7	-27.7
Freight		-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7	-8.7
Externalities																
Passengers		16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
Freight		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
TOTAL BENEFITS		143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4	143.4
COSTS																
Investment Costs																
Works	0.87															
Equipments	0.87															
General Expenses	0.87															
Other expenses	0.87															
Total investments costs																*-330.6*
Maintenance	0.835	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
TOTAL COSTS		7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	-322.9
NET BENEFITS		135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	135.7	466.3

Discount Rate	5.5%
ENPV	938.1
ERR	15.1%
B/C ratio	2.5

Table 4.22 Economic analysis (Millions of Euros) - Railway Option 2

	CF	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
BENEFITS																
Consumer's surplus																
Passengers		0.0	0.0	0.0	102.4	104.0	105.5	107.0	108.6	110.1	111.6	113.1	114.7	116.2	117.7	119.3
Freight		0.0	0.0	0.0	19.4	19.9	20.4	20.9	21.3	21.8	22.3	22.8	23.2	23.7	24.2	24.7
Producer's surplus																
Passengers		0.0	0.0	0.0	128.3	129.9	131.5	133.1	134.7	136.3	137.9	139.5	141.1	142.7	144.3	145.9
Freight		0.0	0.0	0.0	33.9	34.7	35.5	36.3	37.1	37.9	38.6	39.4	40.2	41.0	41.8	42.6
Government surplus																
Passengers		0.0	0.0	0.0	-46.5	-47.1	-47.8	-48.4	-49.1	-49.7	-50.4	-51.0	-51.7	-52.3	-53.0	-53.6
Freight		0.0	0.0	0.0	-15.8	-16.2	-16.5	-16.8	-17.1	-17.4	-17.7	-18.0	-18.3	-18.6	-18.9	-19.2
Externalities																
Passengers		0.0	0.0	0.0	30.9	31.4	31.9	32.4	32.9	33.5	34.0	34.5	35.0	35.5	36.0	36.5
Freight		0.0	0.0	0.0	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5
TOTAL BENEFITS		0.0	0.0	0.0	254.7	258.8	262.7	266.7	270.7	274.8	278.6	282.7	286.6	290.6	294.6	298.7
COSTS																
Investment Costs																
Works	0.87	306.8	306.8	306.8												
Equipments	0.87	85.2	85.2	85.2												
General Expenses	0.87	48.4	48.4	48.4												
Other expenses	0.87	41.0	41.0	41.0												
Total investments costs		*481.4*	*481.4*	*481.4*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
Maintenance	0.835				22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
TOTAL COSTS		481.4	481.4	481.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
NET BENEFITS		-481.4	-481.4	-481.4	232.3	236.4	240.3	244.3	248.3	252.4	256.2	260.3	264.2	268.2	272.2	276.3

	CF	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
BENEFITS																
Consumer's surplus																
Passengers		120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8	120.8
Freight		25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2	25.2
Producer's surplus																
Passengers		147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5	147.5
Freight		43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3	43.3
Government surplus																
Passengers		-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3	-54.3
Freight		-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5	-19.5
Externalities																
Passengers		37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0
Freight		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
TOTAL BENEFITS		302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5	302.5
COSTS																
Investment Costs																
Works	0.87															
Equipments	0.87															
General Expenses	0.87															
Other expenses	0.87															
Total investments costs		*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*-722.2*
Maintenance	0.835	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
TOTAL COSTS		22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	-699.8
NET BENEFITS		280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	280.1	1,002.3

Discount Rate	5.5%
ENPV	1,953.3
ERR	14.9%
B/C ratio	2.4

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Table 4.23   Financial return on investment (Millions of Euros)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Passenger trains	0.0	0.0	0.0	19.5	19.7	19.9	20.1	20.3	20.5	20.7	20.9	21.1	21.3	21.5	21.8
Goods trains	0.0	0.0	0.0	5.0	5.0	5.1	5.1	5.2	5.2	5.3	5.3	5.4	5.4	5.5	5.5
TOTAL REVENUES	0.0	0.0	0.0	24.5	24.7	25.0	25.2	25.5	25.7	26.0	26.2	26.5	26.7	27.0	27.3
Works	352.7	352.7	352.7												
Equipments	98.0	98.0	98.0												
General expensses	55.6	55.6	55.6												
Other expenses	47.1	47.1	47.1												
TOTAL INVESTMENTS COSTS	553.4	553.4	553.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	0.0	0.0	0.0	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL OPERATING COSTS	0.0	0.0	0.0	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL OUTFLOWS	553.4	553.4	553.4	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
CASH FLOW	-553.4	-553.4	-553.4	-2.3	-2.1	-1.8	-1.6	-1.3	-1.1	-0.8	-0.6	-0.3	-0.1	0.2	0.5

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Passenger trains	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
Goods trains	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
TOTAL REVENUES	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
Works															
Equipments															
General expensses															
Other expenses															
TOTAL INVESTMENTS COSTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-830.1
Maintenance	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL OPERATING COSTS	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL COSTS	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	-803.3
CASH FLOW	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	830.6

Discount Rate	5.0
FNPV (C)	-1,320.8
FRR (C)	-2.5%

Table 4.24 Financial return on capital (Millions of Euros)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Passenger vehicles	0.0	0.0	0.0	19.5	19.7	19.9	19.5	20.3	20.5	20.7	20.9	21.1	21.3	21.5	21.8
Goods vehicles	0.0	0.0	0.0	5.0	5.0	5.1	5.0	5.2	5.2	5.3	5.3	5.4	5.4	5.5	5.5
TOTAL REVENUES	0.0	0.0	0.0	24.5	24.7	25.0	24.5	25.5	25.7	26.0	26.2	26.5	26.7	27.0	27.3
RESIDUAL VALUE															
TOTAL FINANCIAL INFLOWS	0.0	0.0	0.0	24.5	24.7	25.0	24.5	25.5	25.7	26.0	26.2	26.5	26.7	27.0	27.3
Local contribution															
Regional Contribution															
National Contribution	492.7	492.7	492.7												
Total national public contribution	492.7	492.7	492.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	0.0	0.0	0.0	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
Total Operating Costs	0.0	0.0	0.0	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL FINANCIAL OUTFLOWS	492.7	492.7	492.7	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
CASH FLOW	-492.7	-492.7	-492.7	-2.3	-2.1	-1.8	-2.3	-1.3	-1.1	-0.8	-0.6	-0.3	-0.1	0.2	0.5

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Passenger vehicles	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
Goods vehicles	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
TOTAL REVENUES	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
RESIDUAL VALUE															830.0
TOTAL FINANCIAL INFLOWS	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	857.3
Local contribution															
Regional Contribution															
National Contribution															
Total national public contribution	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
Total Operating Costs	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL FINANCIAL OUTFLOWS	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
CASH FLOW	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	830.5

Discount Rate	5.0%
FNPV (K)	-1,156.0
FRR (K)	-1.9%

Table 4.25 Financial sustainability (Millions of Euros)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EU Grant	60.7	60.7	60.7												
Local contribution															
Regional Contribution															
National Contribution	492.7	492.7	492.7												
Total national public contribution	492.7	492.7	492.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating subsidies				2.3	2.1	1.8	2.3	1.3	1.1	0.8	0.6	0.3	0.1		
FINANCIAL RESOURCES	553.4	553.4	553.4	2.3	2.1	1.8	2.3	1.3	1.1	0.8	0.6	0.3	0.1	0.0	0.0
Passenger vehicles	0.0	0.0	0.0	19.5	19.7	19.9	19.5	20.3	20.5	20.7	20.9	21.1	21.3	21.5	21.8
Goods vehicles	0.0	0.0	0.0	5.0	5.0	5.1	5.0	5.2	5.2	5.3	5.3	5.4	5.4	5.5	5.5
TOTAL REVENUES	0.0	0.0	0.0	24.5	24.7	25.0	24.5	25.5	25.7	26.0	26.2	26.5	26.7	27.0	27.3
TOTAL INFLOWS	553.4	553.4	553.4	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	27.0	27.3
Works	352.7	352.7	352.7												
Equipments	98.0	98.0	98.0												
General expensses	55.6	55.6	55.6												
Other expenses	47.1	47.1	47.1												
TOTAL INVESTMENTS COSTS	553.4	553.4	553.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	0.0	0.0	0.0	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL OPERATING COSTS	0.0	0.0	0.0	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TAXATION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
TOTAL OUTFLOWS	553.4	553.4	553.4	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.9
NET CASH FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4
CUMULATED CASH FLOW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
EU Grant															
Local contribution															
Regional Contribution															
National Contribution															
Total national public contribution	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating subsidies															
FINANCIAL RESOURCES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Passenger vehicles	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8	21.8
Goods vehicles	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
TOTAL REVENUES	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
TOTAL INFLOWS	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3
Works															
Equipments															
General expensses															
Other expenses															
TOTAL INVESTMENTS COSTS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maintenance	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TOTAL OPERATING COSTS	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
TAXATION	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TOTAL OUTFLOWS	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9	26.9
NET CASH FLOW	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
CUMULATED CASH FLOW	1.1	1.4	1.8	2.2	2.6	2.9	3.3	3.7	4.1	4.4	4.8	5.2	5.6	5.9	6.3