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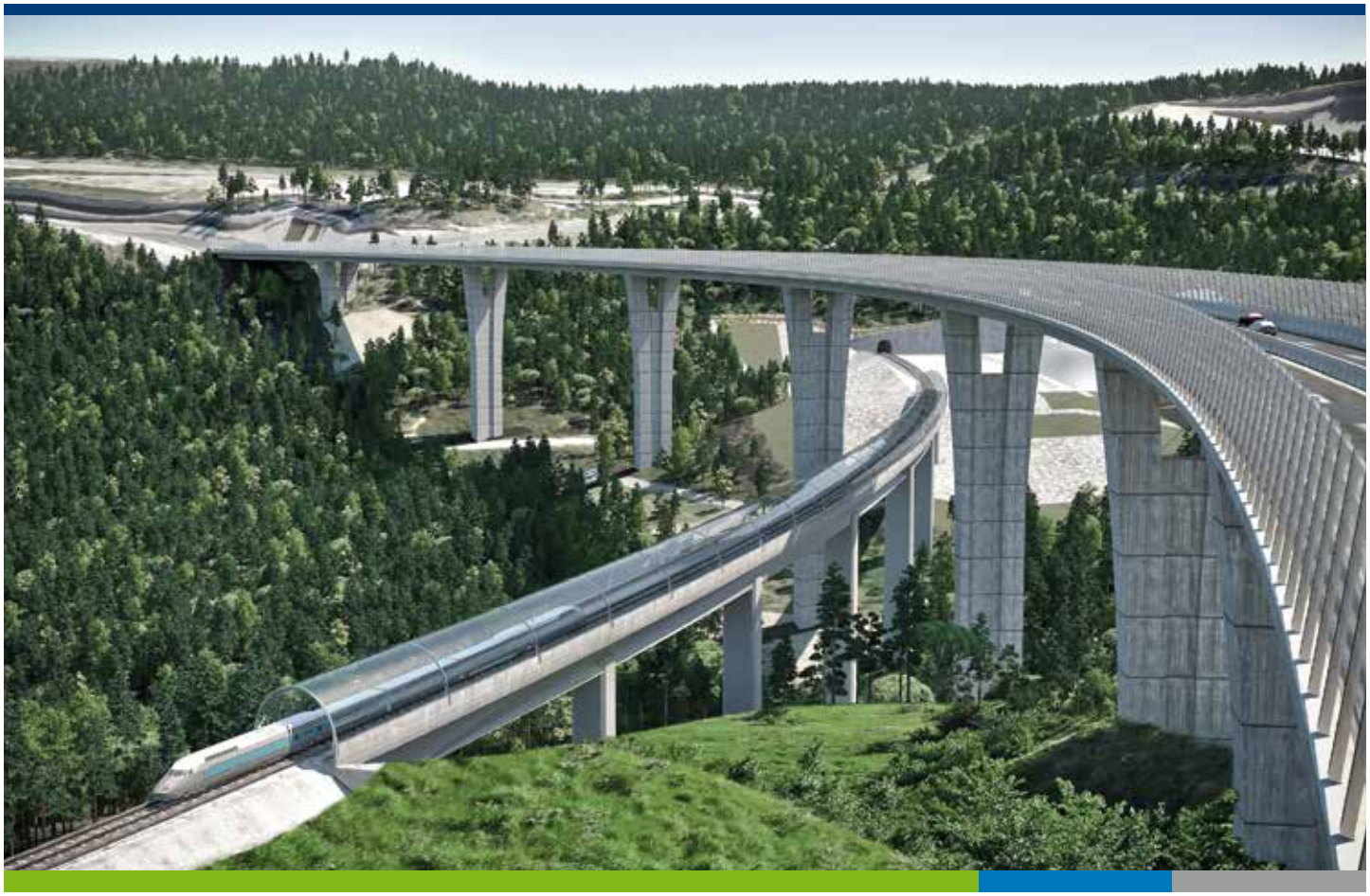

A New Hinterland Rail Link for the Port of Koper?

Review of Risks and Delivery Options

Case-Specific Policy Analysis

OECD

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THE INTERNATIONAL TRANSPORT FORUM

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Foreword

The project organisation for this study was designed to include a core project team and a project peer review committee. The committee functioned as an advisory body during the execution of the project and as a quality control body, by reviewing the draft final report of the project.

The members of the core project team were Dejan Makovšek (ITF), Richard Bullock (external advisor), Jürgen Sorgenfrei (external advisor) and Luis Martinez (ITF). The members of the project peer review committee were Stephen Perkins (ITF), Lou Thompson (external advisor) and Heiner Bente (external advisor).

The project was carried out between April 2015 and July 2015 and involved three missions of the ITF team to Slovenia. These missions included discussions with the representatives of the Special Government Task Force for the Divača-Port of Koper second track rail link (DK2), state engineering company DRI, the Slovenian Railways, the Port of Koper, and the Public Agency for Rail Transport of RS.

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DB	Deutsche Bahn
DK2	Divača-Port of Koper second track rail link
DRI	DRI Investment Management Ltd, Ljubljana
ESA	European System of Accounts
ESPO	European Sea Ports Organisation
GDP	Gross Domestic Product
GoS	Government of Slovenia
HCPI	Harmonised Consumer Prices Index
HHLA	Hamburger Hafen und Logistik AG
ITF	International Transport Forum at the OECD
kTEU	Thousand TEU
MTEU	Million TEU
mtpa	Million tons per annum
MZI/MZIP	Ministry of Infrastructure (and formerly also “Spatial planning”)
NA	Northern Adriatic
NAPA	North Adriatic Port’s Association
PKP	Polske Linie Kolejowe

PPP	Public-Private Partnership
SZ	Slovenske železnice d.o.o. (the infrastructure management division)
t	Tonne
TEU	Twenty foot equivalent unit
UIC	International Union of Railways
UK	United Kingdom
VAT	Value Added Tax

Executive summary

The Port of Koper is the single national port of Slovenia and has been growing fast in recent years. It is expected that the existing rail link to and from the port will reach capacity in a few years. A new additional track, involving a tunnel on a separate alignment, has been proposed as a solution. The ITF was asked to perform a broad risk analysis of the project and investigate options for the delivery of the project through a PPP. Within this broad scope the ITF addressed several questions: would the potential for growing traffic at the port justify added capacity; what are the options for increasing capacity on the existing track to buy time; is the cost of the new rail link adequately estimated; what would be the best way to enable private participation in the project?

ITF's analysis of demand trends finds that there is a credible case for expecting throughput in the port to increase significantly, although the exact amount and timing of such growth is not clear. However, although the expected market potential will increase, inter-port competition in the future will also increase. A major risk is that the port fails to match this increased competition and under these conditions the Port of Koper will struggle to maintain or increase its overall market share. Experience elsewhere has shown that the competitive position of ports is generally strengthened through private involvement and commercialization. If the ownership and organisation of the port is shifted toward a landlord structure, typical of elsewhere in the EU, the ability of the government to generate private involvement in the port (and in the new rail link as well) will be much enhanced. This would also support generating finance for the EUR 800 million of investments needed in the port to increase capacity regardless of the decision on the new rail link.

ITF identified a number of measures that will alleviate capacity issues in the short run including: reduction or even elimination of passenger trains on the Divača/Koper segment in order to maximise its use by freight; and, lengthening freight trains in order to reduce line congestion. These measures could buy some years of time.

ITF considers that there could be room for cost savings assuming that the speeds and engineering standards of the current approach, driven by the assumed need to accommodate high-speed passenger services, would be relaxed. Despite this there is good reason to think that the estimated costs are likely to be underestimated. If the government continues to pursue the new rail link, it should first execute a comprehensive review of technical solutions and project cost with the related detailed recommendations in this report.

A financial assessment of the cost recovery potential makes it clear that a project that could fund itself from market revenues is not viable. This finding is robust regardless of the size of the potential cost savings in the project, inclusion of the port in the model or whether the potential growth of demand would materialise. A model which would minimise the need for (still significant) public finance involvement includes the port and the track together (subject to a change in the port management model). Nevertheless, developing a PPP under these conditions would still require that the majority of the demand risk essentially remains in public hands.

Regardless, whether the project would be procured as a PPP or with traditional procurement, it is likely the new rail link would not become operational by the time the existing rail link reaches capacity.

A detailed engineering and cost review needs to be performed and the new rail link is a complex and major project. With that in mind ITF explored alternative solutions to buy time.

An off-port terminal concept – an extended gate of the port at an inland terminal - has a reasonable potential to recover its own cost. In addition to being much less expensive (up to EUR 50 million versus EUR 1.3 billion) it would significantly reduce investment risk to all parties and could offer essentially the same quality and capacity of service as a new rail link up to a much higher level of demand. In ITF's view the off-port terminal does not inhibit the future growth of the port in any significant way.

The additional alternative solution challenged the initial assumption that the new rail link is the preferred economic solution. The Government of Slovenia asked the ITF to revisit this assumption and execute an economic and financial analysis of the alternatives. The analysis has shown that, for at least the medium-term, the cost of the new rail link by far outweighs the benefits, the majority of which flow to other countries. Conversely the off-port terminal concept has a reasonable potential for generating benefits greater than its costs. In addition it is also a risk mitigation tool. If, in the farther future (15 to 30 years), capacity begins to outstrip the off-port terminal, the new rail link could always be built, at a time when demand would be more convincingly proven.

In addition, PPP arrangements for an off-port terminal might also be more feasible because the investment is much smaller.

Chapter 1. Evaluating the Port of Koper rail link: project outline

The Port of Koper (hereinafter: Koper) is the principal port in Slovenia and the most important container port in the Northern Adriatic[1]. Port-related activities in Koper are an important industry in Slovenia. The maritime sector represented 6.5% of all employment and 12% of the value added created by all non-financial sector firms in the coastal area of Slovenia in 2004 (O 2011).

Approximately 70% of the traffic it handles is in transit from Central European countries (particularly Austria, Slovakia and Hungary). This has increased rapidly over the past ten years. Around 60% of total traffic moves by rail over a steeply-graded single-line connection to the main network. This line is now approaching capacity and there are few opportunities to increase its capacity, either through operating changes or through selective duplication.

The preferred approach at this stage is to construct a second independent line (DK2) between the main line at Divača and Koper and then operate the two lines as a pair of unidirectional lines. This second line has been under discussion for many years and has now reached the design stage and received the necessary environmental and planning approvals. However, at around EUR 1.3 billion it is a costly project and the Government of Slovenia (GoS) is investigating the risks involved in the project and possible financing arrangements, including the involvement of the private sector as a public-private partnership project (PPP).

In this context, GoS, through the Ministry of Infrastructure, asked The International Transport Forum at the OECD (ITF) to execute a case-specific policy analysis of the DK2 project, with particular emphasis on risk assessment and PPP/financing alternatives. The scope of work for the project focused on a broadly defined risk analysis and the evaluation of financing options. The structure of the project broadly follows the agreed scope with the GoS, with each chapter providing answers to a key issue regarding a pending policy decision on the DK2 project:

- **Will there be enough demand to sufficiently utilise DK2?**

  Chapter 2 discusses the demand potential of the Koper and the risks that this potential might not be realised. The sensitivity of demand to price increases to recover the cost of the DK2 project is also assessed.

- **Can we buy time with further measures on the existing rail link?**

  Chapter 3 investigates the potential for technical and operational measures on the existing rail link to provide a view as to how long the existing rail link can sustain different demand scenarios.

- **Can we have confidence in the cost estimate for the DK2 project and is there room to reduce cost?**

1. Others include Rijeka in Croatia and the Italian ports of Trieste, Monfalcone, Venice and Ravenna.

Chapter 4 includes a high level assessment of the robustness of the DK2 cost estimates together with recommendations on how to approach a review of the project base cost, value engineering and a probabilistic risk assessment[2]. In advance of a detailed value engineering exercise, this report also performs a high level assessment of cost optimisation opportunities with the existing DK2 design. Related to the successful project delivery, the section also includes a high level review of the project management approach and provides recommendations for improvement.

- **What type of financing and delivery option promises greatest value for money?**

Chapter 5 investigates the financing and delivery options for DK2, which involve traditional procurement options together with availability-based and demand-based PPP options. All the options are evaluated against a set of common criteria. In the process of analysing the most viable financing options, a need arose to challenge the underlying assumption, that building the DK2 was the most optimal outcome and that other infrastructure alternatives would not offer better economic value to the Slovenian taxpayers. This prompted an economic re-evaluation of the options as the last question.

Box 1.1. **Value for Money and Economic evaluation**

Value for Money is a concept used in relation to the evaluation of different procurement options and involves a qualitative and/or quantitative analysis of each option. The qualitative part analyses the viability of each option and their pro's and con's. The quantitative analysis performs a cost efficiency analysis.

Value for Money is a less standardised and different concept to an economic and financial evaluation or a Cost-Benefit Analysis, which follows a defined process for the appraisal of investment options and is well grounded in microeconomic theory.

In the process of public investment planning an economic and financial evaluation is performed first to assess, whether an investment desirable on a national level. Only after that has been established is a Value for Money analysis performed to suggest the best procurement option for an investment.

- **What would be the economic and financial outcomes of the project alternatives?**

Chapters 6 and 7 present a financial and economic evaluation comparing the selected alternative solutions to a base case in which no additional rail capacity was provided.

2. This and the previous point also included the review of Terms of Reference for the tendering of a detailed engineering review of project cost and design solutions, which were already in preparation at the time the Case Specific Policy Analysis project of the DK2 began.

Chapter 2. Is there potential for demand growth?

The essential prerequisite for the economic and financial viability of the DK2 is adequate demand, which translates into revenues to recover the cost of the project. This requires a review as to whether the demand forecasts are realistic, identifying the risks that projected demand does not materialise and the sensitivity of demand to price increases if accelerated cost recovery were to be attempted.

Koper has increased its throughput steadily over the last fifteen years (1999-2014), growing at 5.6% per annum on average. Its continued growth is primarily a function of three factors:

- the general growth in traffic, particularly containers
- the extent to which the Northern Adriatic (NA) ports can increase their market share for central European traffic at the expense of the Dutch and German ports; and
- the extent to which Koper can maintain or increase its share of transit traffic in competition with other Northern Adriatic[3] ports.

The forecast general growth in traffic is primarily influenced by the growth in GDP of the main trading regions whose traffic uses the NA ports, combined with the 'multiplier effect' relating the growth in container traffic to the GDP growth rate.

The market share the NA ports can gain from the Northern European ports is heavily influenced by the strategies of major container lines and the extent to which they combine calls to hub ports in the Mediterranean with direct calls to NA ports, and Koper in particular. But, in addition to this, supply chain solutions offered by partners linking to Koper can also accelerate changes in the North-South competitive landscape. North European ports like Hamburg with offerings like Polzug (a Hamburg-Poland container block train) and Metrans (the shuttle rail service to the Czech Republic), or the Maersk/ECR block trains from Rotterdam to Czech Republic are examples indicating the potential success of such optimised supply chain approaches.

Finally, Koper's market share within the NA ports is a function of its port capacity, efficiency, charges and hinterland connections compared to neighbouring ports. It is thus a function of developments not only at Koper but also those affecting, in particular, Trieste and Venice.

Before analysing the general growth in traffic and evaluating existing trade and traffic forecasts, the performance and cargo development at Koper are described in greater detail and compared to other ports. The current positioning of Koper and its prospects for the future is discussed and existing trade forecasts evaluated. Finally, the chapter discusses the potential to recover some of the cost of the project, by raising user charges either at the port or on the rail link, or by developing value-added services in the hinterland.

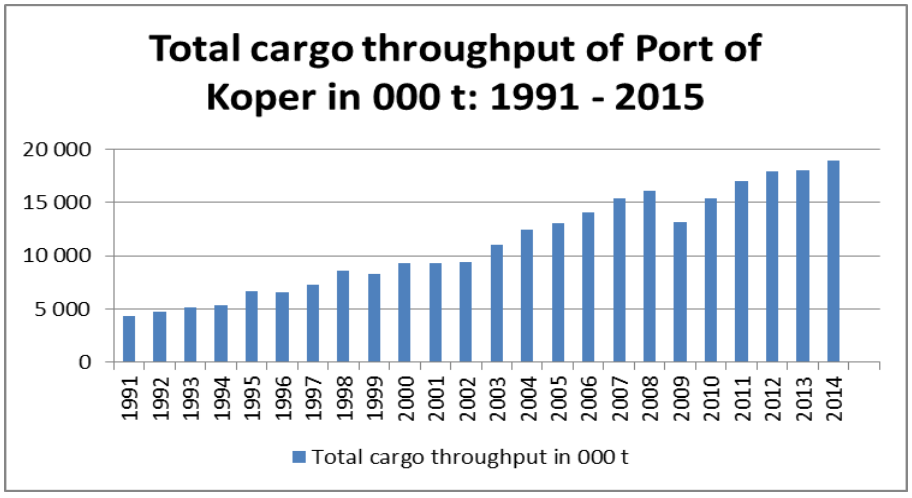
3. Several, but not all, of these ports belong to the North Adriatic Ports Association (NAPA). In March 2010, NAPA was established by the port authorities of Trieste, Ravenna, Venice and Koper with the aim of promoting the position of the ports in respect of the European Union and its transport patterns. Rijeka joined NAPA in November 2010 and Ravenna resigned in November 2012.

Untapped demand exists

Changing trade structure and growth

The growth of the Port of Koper has accelerated since the 1990s with a changing trade structure. Commercial activities in Koper started in the late 1950s with the establishment of the port company in 1957. In the 1970´s cargo throughput fluctuated around 2 million tonnes p.a. (mtpa). In the mid-1980s, shortly after the second oil price shock, cargo volumes climbed to over 5 mtpa but, with the opening of the Iron Curtain between East and West Europe and the consequent political reorganisation, then fell by over one mtpa within a year (Figure 2.1). Trade then increased steadily, reaching 8 mtpa in 1998, followed by three years stagnation at the beginning of the 2000´s before recovering strongly until the financial crisis in 2009. Growth resumed after a year and in 2011 the port handled more than its pre-crisis throughput. By 2014 it was handling nearly 19 mtpa.

Figure 2.1. **Port of Koper maritime throughput 1959-2011**



Source: Zornada-Vrabec, Port of Koper , 2015.

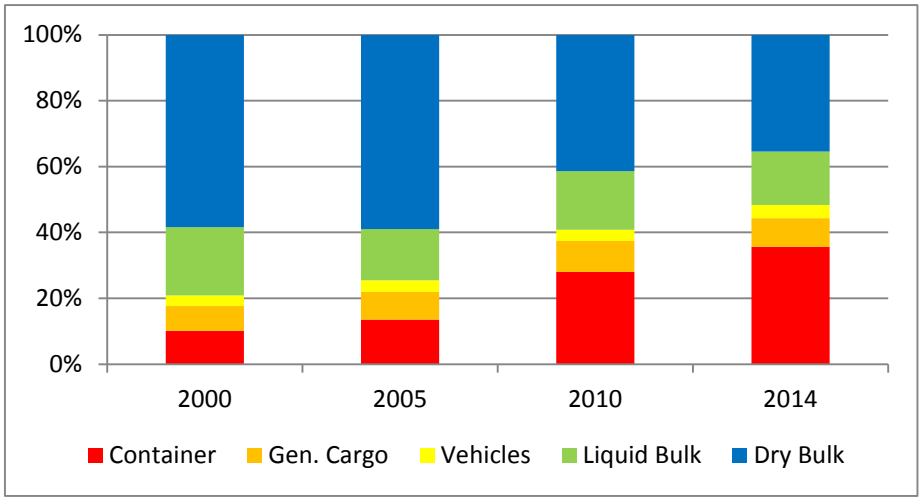
Based on the results for Q1/2015, which include a 19% increase in container trade and a 19% increase in vehicle movements, it is likely that the Koper throughput will reach 20 mtpa in 2015. Cargo handled by the port will thus have doubled from 10 mtpa to 20 mtpa within the 12-year period from 2003 to 2015.

The cargo structure of trade via Koper has changed over time and follows a classical pattern that many small and medium sized ports experience when growing above market trends and gaining market share, with a change of structure from locally-needed bulk and general cargo products to higher-value industrial and consumer products that today are often shipped in containers.

Figure 2.2 shows dry bulk (58%) and liquid bulk (21%) together represented more than 75% of the volume in 2000 while containers and vehicles together just reached 13%. By 2014, this had changed; although the volume of bulk cargoes had increased (dry bulk from 5.4 mtpa in 2000 to 6.6 mtpa in 2014 and liquid bulk from 1.9 mtpa to 3.1 mtpa) they now together represent only about half of the cargo, whilst the container share of the volume had risen from 10% in 2000 to 36%. However, Koper is a relatively diverse port, i.e. a port that handles a wide variety of cargo, with the exception of crude oil and liquid gas. The change in structure has mainly occurred during the last decade but this success in

developing traffic has also created operational challenges that will soon need to be addressed; in particular, the limited operational capacity of the container yard is already a real constraint as noted by mtbs (2012, 28-30). The small adjustments in recent years have not solved these problems.

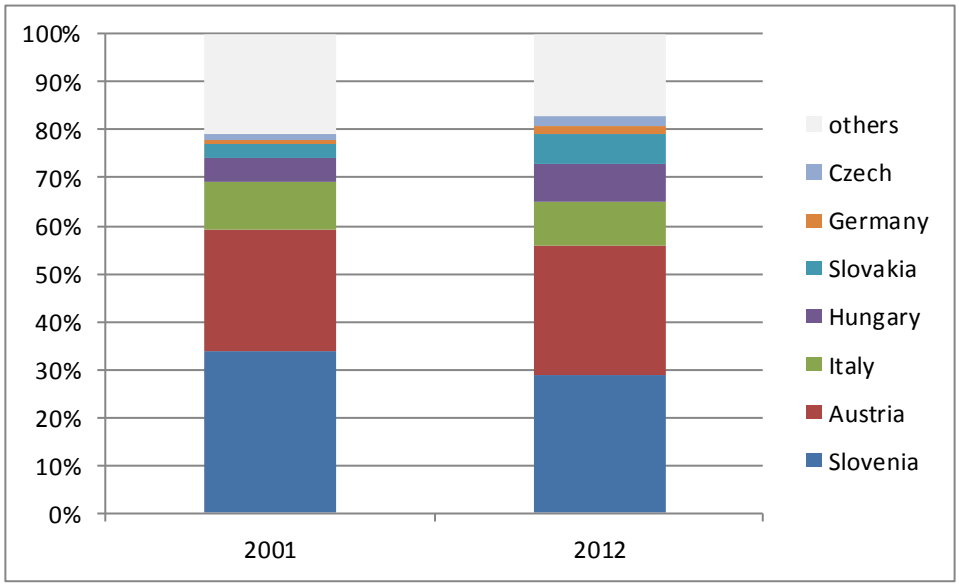
Figure 2.2. **Cargo structure development of Koper**



Source: Based on Port Koper annual reports.

Slovenia is the home market for Koper and the share of this home market has been stable over the last decade (Figure 2.3), with about 30% of the port throughput having its origin or destination here. The second biggest market, with a volume similar to that of the home market, is Austria, for which Koper currently handles more than 5 mtpa.

Figure 2.3. **Port of Koper traffic by hinterland market**

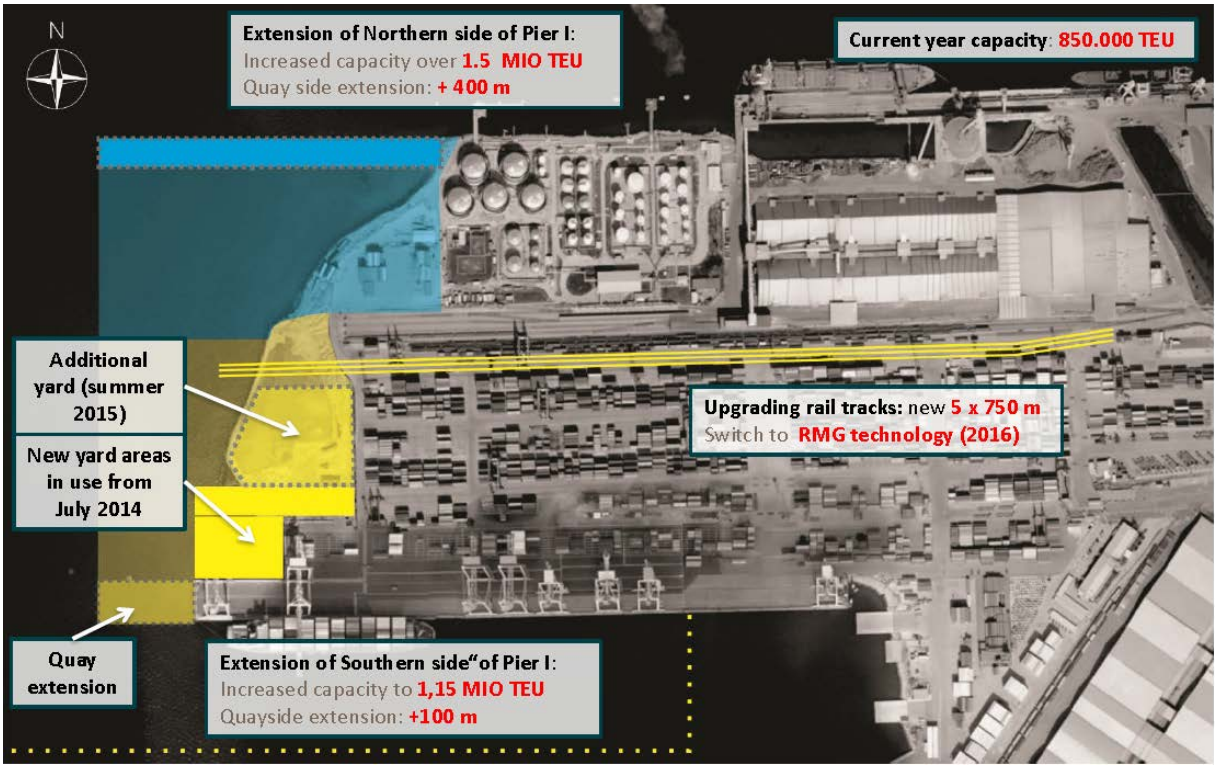


Source: Based on Port of Koper annual reports and 2015 presentation.

The overall hinterland shares of 2001 and 2012 have been relatively stable, with the biggest increases being to and from Hungary and Slovakia. But Koper has not been able to gain a significant volume of traffic in major high-volume markets like Germany or Czech Republic over this period and these are key markets in terms of achieving continuing future growth.

Given the growth above, Koper will also need to consider investments into its own expansion. With the container business rapidly approaching the current capacity of the container terminal of 850 000 TEU/pa, Koper will also need to concentrate very soon on an upgrade of the existing terminal. Until now terminal operations have not been a constraint on future demand, but adopting a growth strategy requires all necessary infra- and superstructure investments to be realised just ahead of increasing demand. Because of the organisational arrangements of the port, all this needs to be financed by public funds. Figure 2.4 highlights the investments needed to upgrade the container terminal.

Figure 2.4. **Port of Koper container terminal development**



Source: Port of Koper 2015.

The investments needed to provide the required operational capacity in Koper have been estimated at some EUR 800 million.

Low penetration of extensive hinterland

Koper's potential hinterland is more extensive than the current market penetration. The hinterland within which Koper can compete includes not only its home market of Slovenia, where the conditions for Koper are good and competition is limited, but also northern Italy and a wide area of central Europe stretching as far as southern Germany, Switzerland and Romania, much of which is also served by

competing ports. Figure 2.5 shows the hinterland market according to the port of Koper. It includes Slovenia, Austria, Hungary, north-east Italy (South Tyrol, Trentino, Veneto, Friuli-Venezia Giulia, Emilia-Romagna), Czech Republic, Slovakia, southern Germany (Baden Württemberg and Bavaria), Croatia and Bosnia-Hercegovina

Figure 2.5. **Potential hinterland of the Port of Koper**

Source: Port of Koper, 2015.

Austria, Hungary, Czech Republic and Slovakia are landlocked countries with no direct access to the open sea. In these countries, Koper can be a key business partner in undertaking imports and exports. The same is true for Bavaria (Munich area) and Baden-Württemberg (Stuttgart area). However, in Croatia and north-east Italy direct port competition exists with alternative ports like Rijeka or Venice.

The home market of Slovenia is a limited market, due to its small size. This does not mean that Koper should neglect this market; but any strategy for continuing strong growth has to concentrate on the wider markets that generate larger absolute volumes.

Overview of demand studies

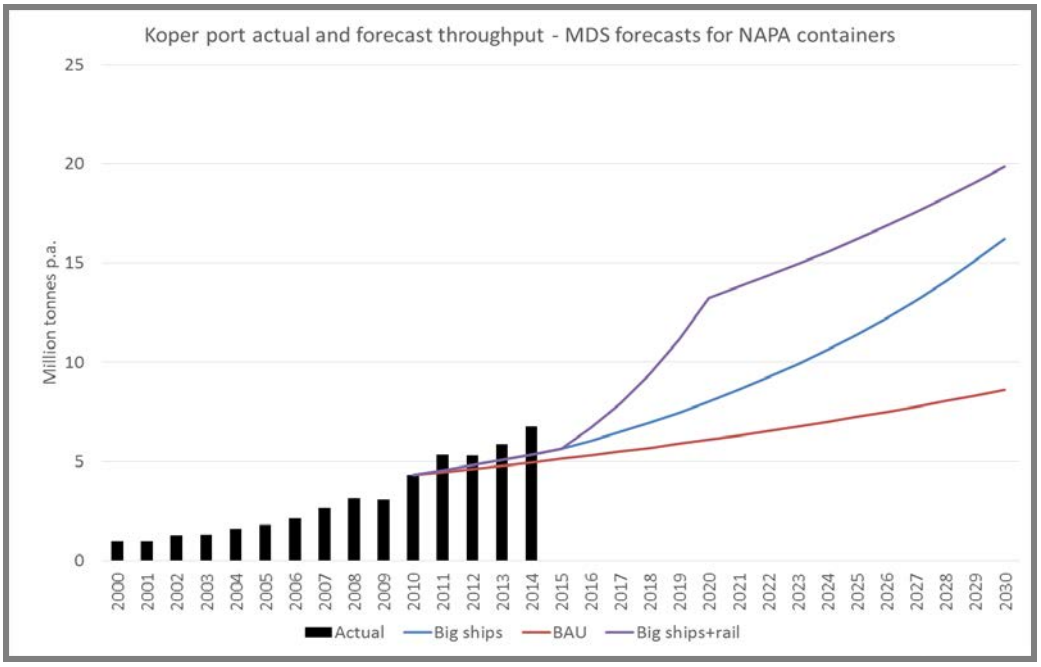
There have been several demand studies in recent years, either for ports in particular or as part of more general studies, which all show reasonably consistent forecasts under a range of assumptions. These confirm the growth potential for the Port of Koper.

MDS Transmodal Ltd. in 2012 prepared forecasts of the existing and potential container port facilities up to 2030 for the NA ports, based on the ports' collective strengths and the likely future business environment. They considered three scenarios characterised as: BAU Business as usual, Big Ships, and Big Ships plus Rail. The BAU scenario assumes that little significant development will be made in terms of either port facilities or hinterland development. The Big Ships scenario assumes that further investments in ports will be made, but with no significant changes in port organisation and hinterland development. Big Ships plus Rail is an optimistic scenario that further assumes that

connections between the NA ports and their hinterlands will be upgraded to meet market requirements. Based on their market analysis, the study forecast the majority of container growth for the NA ports would be in southern Germany, Austria, Czech Republic, Slovakia and Hungary.

Under the Big Ships plus Rail scenario, the consultants forecast that the NA ports as a group should be highly competitive with the Northern Range ports and could secure 6.0 million TEU (MTEU) by 2030, representing 11.3% of the market; this represents a traffic growth of almost 350% over the 20 years from their base year of 2010. No forecasts were prepared for the individual NA ports but if Koper maintains its share of the NA container throughput (about one-third) it could handle 2 million TEU in 2030 under this scenario. Figure 2.6 shows the implied forecasts for Koper on this basis for the three scenarios, together with the actual volume handled since they were prepared.

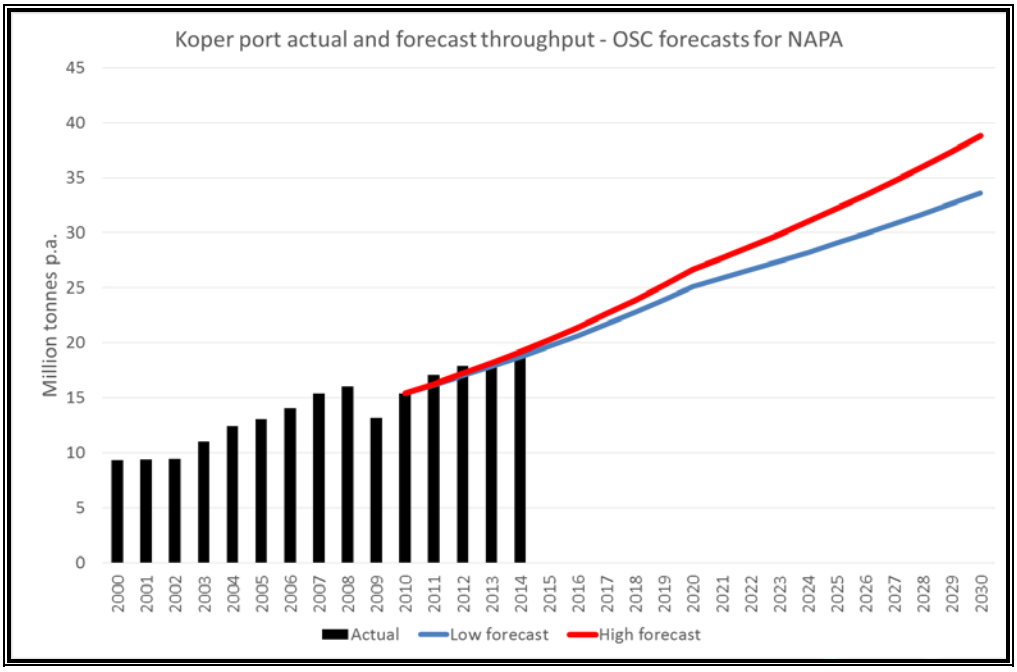
Figure 2.6. **MDS forecast container throughput – estimated Koper volume**



Source: MDS 2012.

In 2011 **OSC Ocean Shipping Consultants** prepared forecasts of the South Europe and Mediterranean Container Port Markets to 2025. These only considered port ranges, 'Central Med' and 'East Adriatic' in the case of Koper, and no specific forecasts were prepared for Koper itself. However, the general results for the Northern Adriatic and the NA region are consistent with those from the MDS study. Three economic scenarios were considered and the key conclusions are consistent with the Big Ships MDS study, forecasting a doubling of container growth in the NA region between 2010 and 2030. Figure 2.7 shows the estimated throughput for Koper, based on these forecasts and its current share of the NA container market.

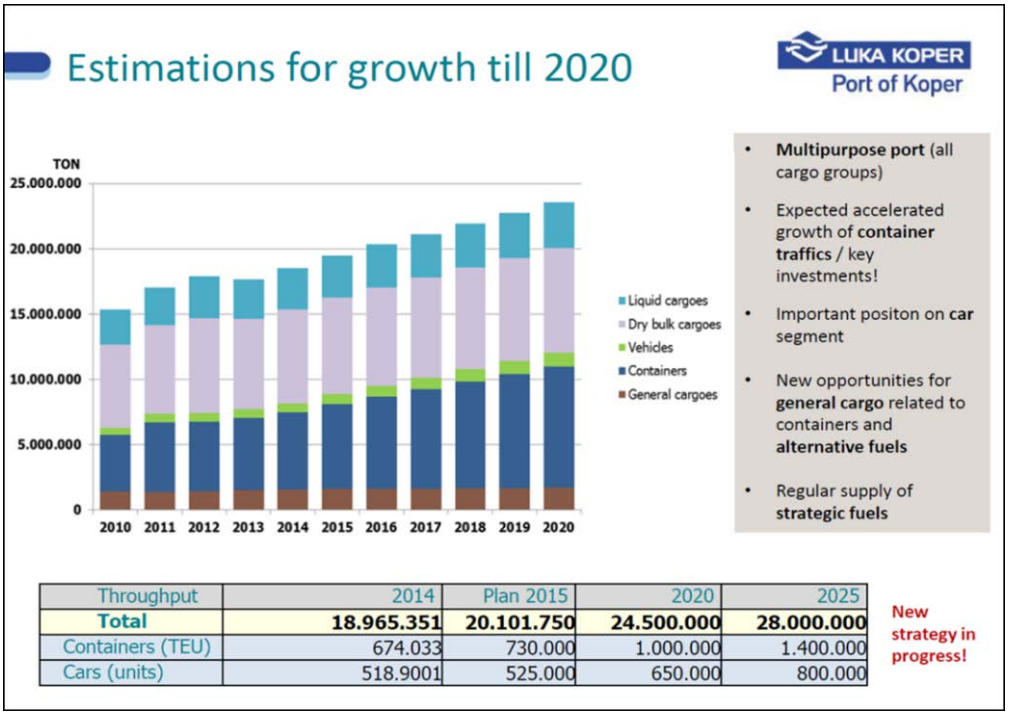
Figure 2.7. **OSC container forecasts – estimated Koper volume**



Source: OSC 2011.

In May 2015 **Koper** forecast a total volume for the port in 2025 of 28 mtpa, including 1.4 million TEU and 800 000 vehicles, and an indicative forecast for 2030 of 2 million TEU. They forecast containers would be the fastest growing segment with only limited growth for dry and liquid bulk cargoes (Figure 2.8).

Figure 2.8. **Port of Koper growth estimates to 2020**



Throughput	2014	Plan 2015	2020	2025
Total	**18.965.351**	**20.101.750**	**24.500.000**	**28.000.000**
Containers (TEU)	674.033	730.000	1.000.000	1.400.000
Cars (units)	518.9001	525.000	650.000	800.000

Source: Port of Koper, 2015.

Koper does not appear to have a master plan including a detailed traffic forecast. However, in 2012 **mtbs Maritime and Transport Business Solutions** was contracted by Koper to produce a Feasibility Study for Container Business Development, based on a future annual volume of 2 MTEU. Although mtbs did not carry out an independent market analysis, the study noted that a volume of 2 million TEU in 2030 could be achieved with growth rates lower than those experienced in previous years.

The **Divača-Koper second track feasibility study** prepared by DRI (2014) forecast a port throughput of 37 million tonnes in 2030, based on the output from the National Transport Model; this model covers not only Slovenia but also adjacent countries which could ship via Koper. The largest share of this throughput is not generated in Slovenia but in the Central and East European hinterland markets of Austria, Italy, Czech Republic, Slovakia, Hungary and Germany. As in all forecasts for Koper, by far the largest single market is the container market, reflecting the growth of industrial and consumer goods in these markets.

Table 2.1. **Assessment of Port of Koper market potential 2030 by DRI, in thousand tonnes**

*	Slovenia	Austria	Hungary	Italy	CZ/SK	Germany	Balkan	others	sum
Container	1 620	3 870	1 980	900	5 400	2 700	630	900	18 000
Vehicle	52	143	104	46	390	325	111	130	1 300
Timber	0	730	90	0	100	0	80	0	1 000
Fruit	60	100	90	30	100	30	30	40	480
other General Cargoes	200	400	150	50	300	100	100	150	1 450
Silos	0	50	200	20	80	0	0	20	370
Alumina	250	0	0	0	250	0	0	200	700
Bulk rest	400	450	500	150	200	100	100	100	2 000
Coal and Iron Ore	600	3 000	150	3 000	200	350	0	100	7 400
Chemicals	50	150	30	20	50	70	10	20	400
Petroleum products	2 500	700	250	200	0	0	0	0	3 650
Total in t	5 732	9 593	3 544	4 416	7 070	3 675	1 061	1 660	36 750
Container in TEU	180	430	220	100	600	300	70	100	2 000
Vehicles in units	40	110	80	35	300	250	85	100	1 000

Source: DRI Investment Management Ltd.

A completely independent forecast was prepared for the ITF analysis using the ITF Global Freight Model. This model, which provides forecasts for the NA ports as a whole, is a long-term model, focusing on the forty-year period from 2010 to 2050. The model is based on national GDP forecasts combined with multipliers; GDP for the central European countries in the Koper hinterland is forecast to grow at around 1.5% over the model forecast period and trade through the NA ports to increase by about 3.2% over the period.

Assuming this is a constant growth rate gives a forecast of 29 million tonnes in 2030 and 40 million in 2040, close to the Feasibility Study forecast above[4]. The model forecasts there will be a shift from North Europe ports to South Europe ports, including Koper, of about 5% of the North Europe volume, equivalent to an increase of about 10% in the South Europe volume. This is partly because of the higher growth in the southern European economies and partly because of the projected stronger growth over the period to Africa and the East, for which the Mediterranean ports have a comparative advantage.

4. Forecasts from the model for intermediate years such as 2030 which are obtained in this way by interpolation are in practice understated as growth is expected to progressively decline over the next 40 years rather than remain constant throughout.

In summary, all available studies have concluded the following for Koper in 2030:

- Total throughput between 32 and 38 million tonnes.
- Container throughput up to 2 million TEU/20 million tonnes; fastest growing segment.
- Vehicles up to 1 million units.
- Slow increase for dry bulk, liquid bulk and General Cargoes.
- No crude oil, no liquid gas.

Precisely where the volume falls in this range would depend on:

- How much traffic Koper could divert from the Northern range ports.
- The extent to which Koper establish itself as a Hub port in the Mediterranean in the long-run.
- How successful it will be in grabbing container traffic in NA region.
- What will happen on the competitive hinterland connections.
- How the competitiveness of Koper will develop.

These are discussed in the following sections leading to the demand forecasts adopted for this study.

Diverting traffic from North Sea ports

Diversion from Northern European ports is possible, but has not yet taken place in many major markets for which the Port of Koper is closer than Northern Europe. Koper has grown fast, but from a low base and the growth is far from the absolute gains of the North Sea Range ports. The so-called North Sea Range or Hamburg-Antwerp-Range consists of four major ports (from south to north):

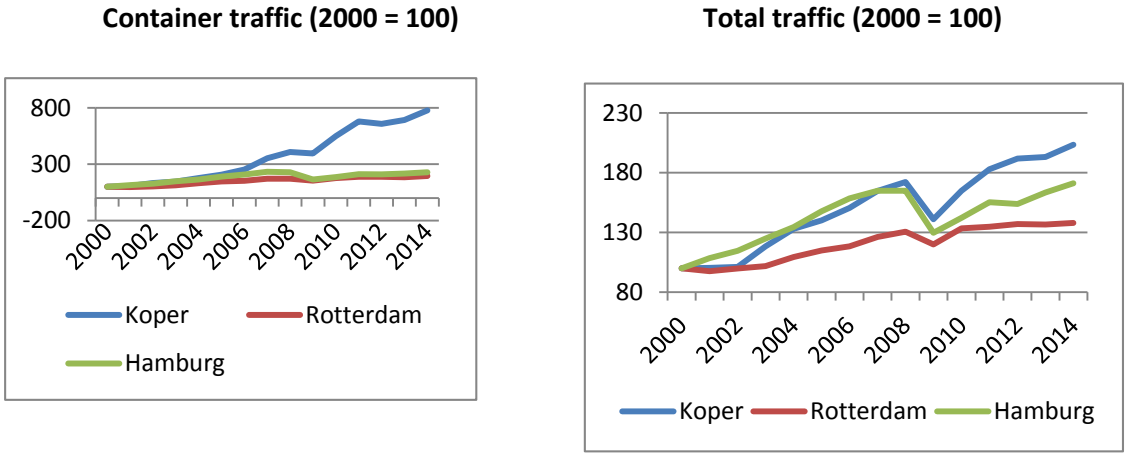
- Antwerp in Belgium
- Rotterdam in The Netherlands
- Bremerhaven in Germany
- Hamburg in Germany.

Rotterdam is the largest port by far with a total throughput in 2014 of 445 million tonnes of cargo, including container traffic of 12.3 MTEU or 128 million metric tonnes. With its large dry and liquid bulk volumes, Rotterdam is the main energy hub in Northern Europe for oil, gas and other liquid products as well as coal, but is also the largest container hub in Europe due to its very good hinterland connections via rail and road as well as via the Rhine. Antwerp ranks number two in Europe with a total throughput of 199 million tonnes in 2014, including 9.0 MTEU. Hamburg is the second largest container port (and third busiest port overall) in Europe, handling 9.7 MTEU in 2014 out of a total volume of 146 million tonnes. Bremerhaven with just 78 million tonnes of cargo in 2014 and 5.8 million TEU in container trade is the smallest of the four. Other large ports in this range include the port of Amsterdam, with a cargo handling volumes of 97 million tonnes in 2014, and Haropa Ports (Le Havre/Rouen/Paris), that reached a cargo throughput of 120 million tonnes and container volumes of 2.6 million TEU in 2013. These ports however handle no relevant container transport to Central Europe as is evident from Figure 2.11.

Figure 2.9 shows the growth in both container and total traffic for Rotterdam, Hamburg and Koper relative to the 2000 volumes, which are set to 100. Koper has grown very fast since 2000, with an even more impressive growth in the container trade, although it started from a very low absolute level in 2 000.

But in terms of absolute volumes, Rotterdam has had the largest increase of over 120 million tonnes and Hamburg, with an additional 60 million tonnes of cargo over the period, has also attracted much more than the 10 million tonnes attracted to Koper.

Figure 2.9. **Relative growth in container and total traffic for Rotterdam, Hamburg and Koper**



Source: Based on Port of Koper Annual Reports, ESPO.

Many of the major North Sea ports handling central European traffic have invested in new container handling capacity: Maasvlakte 2 in Rotterdam, Deurganckdok in Antwerp, optimisation of the container terminals in Hamburg, the new Jade-Weser-port in Wilhemshaven. This new capacity will become gradually operational over the coming years, but will need strong container growth rates to avoid underutilisation.

The success of North Sea ports

North Sea ports have successfully and actively developed hinterland transport infrastructure and operations. Initiatives to develop hinterland activities linked to a specific port have been heavily influenced by the opening in 1989 of routes to the formerly disconnected Central and East European countries. Completely new markets have entered the focus of port and terminal managers, supported by liberalisation and deregulation in the rail freight market. The Hamburg state-owned terminal operator HHLA was one of the first to create links to these new markets. The first private rail initiative in autumn 1991 was a joint venture of HHLA as terminal operator and forwarder Egon Wenk with PKP Polish State Railway as a third partner. A new company "Polzug" started with one weekly container bloc train from Hamburg to Warsaw. Today, more than 20 years later, Polzug owns several rail terminals in Poland and runs daily trains from all North European ports to Poland, as well as many other countries in Central and East Europe, carrying over 100 000 TEU per year. Today about 115 private rail companies are active in the Port of Hamburg, including the former DB Rail daughter company Transfracht with its Albatross-Express[5], linking all North European ports with all major German rail hubs, as well as many terminals in Austria and Czech Republic. Hamburg is now Europe's largest hub for hinterland container transport by railway, with about a 37% modal share of rail for all port traffic. Rotterdam followed Hamburg soon

5. www.transfracht.com

after, but due to its location further to the west and with the Rhine as an alternative to rail, the rail services out of Rotterdam are on a smaller scale to Hamburg. Out of the 9.7 million TEU about one-third is carried by long-distance rail, equalling 3.2 million TEU, despite the development of a dedicated freight rail line from Rotterdam to Germany, the Betuwe rail link.

The central governments of the Netherlands and Germany play a critical role in infrastructure planning. In Germany, the federal government is responsible for large-scale infrastructure financing, particularly in the context of the Bundesverkehrswegeplan (the Federal Transport Infrastructure Plan). This programme includes all major transport modes and the provision of hinterland connections from and into major seaports, such as Hamburg and Bremen. Besides formal responsibilities and action, the federal government is also increasingly engaged in promoting the national maritime services and industries. The same is true for the Netherlands where the central government is well aware of the dominant position of the Port of Rotterdam in Northern Europe. As a result, many promotional activities focus on the port hinterlands e.g. both ports successfully undertake investments in logistics facilities and rail shuttles.

Penetrating hinterland markets

Koper has the potential to attract cargo from more distant markets but has not yet successfully penetrated many which are closer to Koper than to the Northern European ports. The discussion on the balance between Northern and South European ports with respect to container traffic is an old and long one. Recent contributions to this discussion include MDS (2011), Panteia (2011) and Costa and Maresca (2014). At the core of the discussion is the way in which customers' demands could be best accommodated. Following OECD (2014), the three main determinants for port competitiveness are: maritime connectivity, efficiency of port operations and hinterland connectivity.

Maritime connectivity of the Northern Adriatic ports is relatively limited. Most of the intercontinental calls are with Northern Europe, rather than Southern Europe. Within Southern Europe the Northern Adriatic ports, including Koper, have a fairly small market share, resulting in fair low levels of maritime connectivity and service frequency. This can be illustrated by the main intercontinental maritime transport flow, namely to and from Asia. Annual trade capacity between Asia and Northern Europe is double the size of that between Asia and the Mediterranean. The market share of Trieste and Koper in direct Asia-Med calls is 4% for each of them. Koper – as well as Trieste and Venice – are included in a few direct Asia-Europe loops, but the average ship size utilised on these routes is relatively small. This can be illustrated by comparing the average ship size of the direct Asia-Med calls; 7 600 for both Koper and Trieste, but 9 100 for Piraeus, 12 100 for Gioia Tauro and more than 14 000 for Tanger-Med and Algeciras (OECD/ITF, 2015).

Port operations in Koper are relatively efficient. Average ship turnaround times in Koper, as well as in Trieste and Venice, were less than one day in 2014, which is in line with most large Med ports, but faster than turnaround times in some other Mediterranean ports, such as Gioia Tauro, Marsaxlokk and Genoa (OECD/ITF). Koper shows mixed performance in comparative studies of port efficiency. For example, it ranks among the least output-efficient ports in a recent comparative study of 86 container ports across the world (Herrera and Pang, 2008). Although other studies do not find Koper among the least efficient ports, they do not find very high efficiency scores either (Cullinane and Song, 2006; Liu, 2010).

The biggest potential for Koper in hinterland traffic lies in containerised industrial and consumer products. Table 2.2 gives the estimated 2014 volume of non-EU container volumes for regions potentially within Koper's hinterland, totalling 3.6 million TEU p.a.

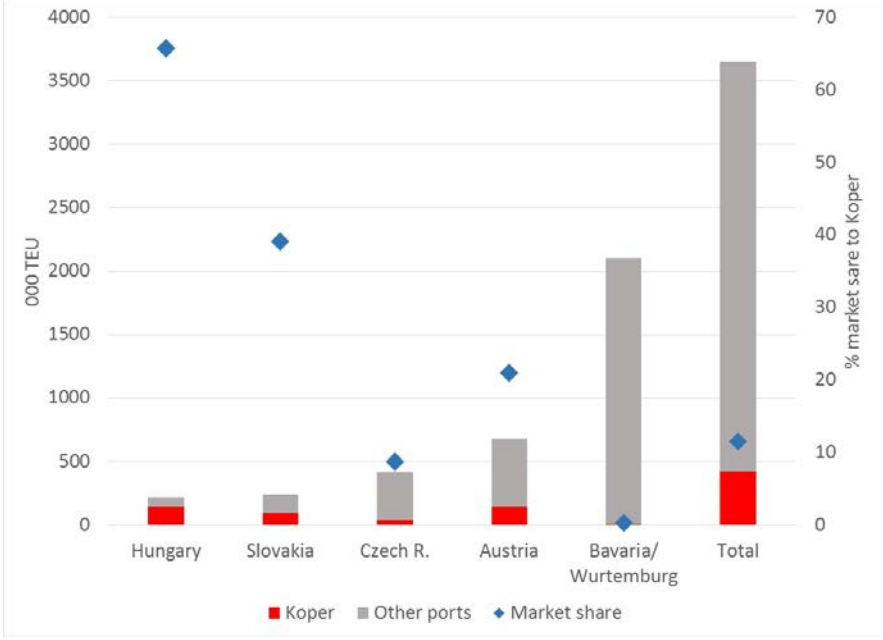
Table 2.2. **Potential sea container market in thousand TEU, 2014**

Country	Import	Export	Total	Koper	Potential
Austria	244	433	677	142	536
Hungary	111	105	216	142	74
Czech R.	241	173	414	36	378
Slovakia	147	91	238	93	145
Germany south	1 003	1 103	2 106	7	2 098
Total relevant market	1 746	1 905	3 650	420	3 230

Notes: (1) only extra-EU trade
(2) Germany south = Baden-Württemberg and Bavaria
Source: Own calculations based on Eurostat, UN Comtrade.

The data in Table 2.2 is also presented graphically in Figure 2.10.

Figure 2.10. **Potential sea container market in thousand TEU, 2014 – a visualisation**



Source: Based on Eurostat, UN Comtrade.

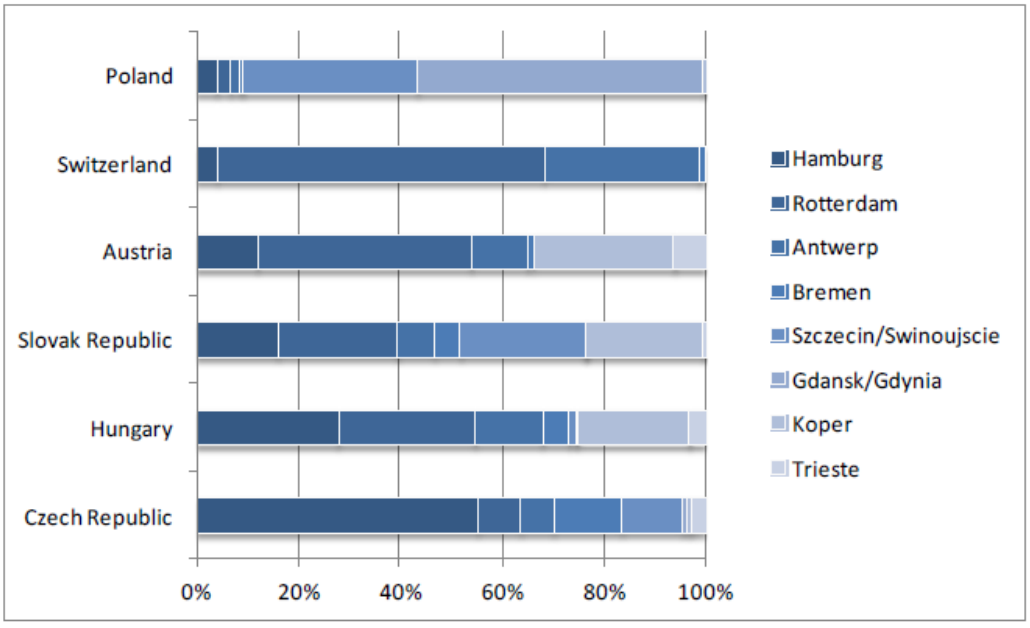
In 2014 Koper had 11.5% of this market; 3.2 million TEU today travels to other, mostly Northern European, ports. Koper´s share of its hinterland market (including Slovenia) has been around 16% to

17% over the last four years; e.g. 598 000 TEU out of 3.6 million TEU in 2011 and 674 000 TEU out of 3.9 million TEU in 2014. There has been solid growth in Koper traffic which has been high in percentage terms (compared with the year before) but Koper has not been able to significantly increase its share of a growing market.

Based on Table 2.2, Koper has a good share of 21% in the Austrian market and a dominant share in Hungary with 58%. The Slovakian share of 39% in 2014 is also good and shows that Koper has the potential to attract cargo in markets that are not that close to Slovenia, with Bratislava at the western boarder of Slovakia being 535 km from Koper.

In Czech Republic the share is relatively low with 9%, although the market is landlocked and is a similar distances to Slovakia. And the situation in South Germany is even worse where the share is very low, has never been high, and is far below 1%, even though the Munich area is closer to Koper than the northern ports by road as well as by rail. This is a major issue for Koper, because this is by far largest market in the hinterland and its marketing and sales activities need to be strengthened in this high-volume market.[6] This situation is in line with an earlier analysis of the main ports for central Europe, in which the market shares of the different ports in 2007 were identified (Figure 2.11), in which the four main North Sea container ports dominate.

Figure 2.11. **Main seaports and their market shares in Central European cargo, 2007**



Source: Merk and Hesse (2012).

6. In the hinterland it is normal that road and rail forwarders actively compete for all boxes, whereas in shipping the contracts often are fixed for larger volumes, so called “packages”. The hinterland strategy should recognise this and separate sales teams should be organised.

The long-term strategy for Koper?

Competing with existing hubs

The ambition for Koper could be to establish itself as a main gateway port in the Mediterranean for container vessels on Far East-Europe trades via the Suez Canal. Such ports are characterised by their high maritime connectivity, and in many cases handle large volumes of transhipment as well as in many cases hinterland cargoes. Koper – as well as the other Northern Adriatic ports – are not located on main shipping routes between Asia and Europe. This means that there is little chance they will be able to compete on maritime transhipment functions, as performed by ports such as Gioia Tauro and Marsaxlokk. Instead, Koper could focus on attracting more direct intercontinental calls, bypassing the hub-and-feeder system in the Mediterranean.

Figure 2.12. **Major Mediterranean container ports**

As the detailed analysis of the Mediterranean ports in Appendix shows, three ports in the Eastern Mediterranean seem to present the highest potential for acting either as partners along supply chains that need to be managed, or as competitors, and the Koper sales force should concentrate on these in order to re-route volumes to the Northern Adriatic: Port Said (Egypt), Marsaxlokk (Malta) and Piraeus (Greece).

Developing a strategy for success

Diverting cargo from other hub ports would require a sharper corporate strategy and will not happen of itself. The three mentioned ports together handled a volume of nearly 10 million TEU[7] in 2014, of which the majority is transhipment cargo. Many of the shipping lines calling at these ports also call at ports in the Northern Range, like Rotterdam or Hamburg. This means that in addition to the volume of 5 million or so TEU that is currently transhipped there is also a potential for cargo that today is routed to central and Eastern Europe via the Northern ports. These volumes are included in the imports and exports of Central and East European countries but represent a helpful increment to boost the limited amount that can be re-routed. Koper should gather more cargo flow information from these three ports and evaluate the potential for capturing part of the potential transhipment volume of 5-plus million TEU. Information about such flows is currently not available and is not the focus of this study, but the future Koper strategy should closely examine these volumes.

The preconditions for re-routing on the waterfront side – i.e. for the shipping market – are different from the ones on the land side. Transhipment volumes normally fluctuate significantly as the so-called 'packages' can easily reach a volume of 100 000 TEU p.a. when a container line moves to another transhipment hub. A liner service might call at a terminal once a week (this would be a minimum to maintain service levels) and discharge 1 000 TEU and load 1 000 TEU, i.e. a total of 2 000 TEU per call which, over 52 weeks per year amounts to about 100 000 TEU p.a.

When volumes per call are below about 2 000 TEU, the costs are generally too high to make a call; this is why the 'extra volumes' described above resulting from a change in supply chain strategy would make it much easier for a liner to move to a port such as Koper. But this does not happen by itself, and liner services normally do not promote it. Active sales and marketing forces at transhipment hubs consider this as their main task and 'packages' of 100 000 TEU p.a. are attractive sales targets.

A possible long term development would be greater involvement by Chinese shipping companies building on the existing operations of COSCO in Pireus, with subsequent distribution to Central Europe by land (a component of the Chinese Maritime Silk Road). An alternative option could be Chinese participation in the proposed Venice off-shore port project. Both potential developments would impact Koper's growth. In their absence Koper might present an attractive alternative for a Chinese maritime entry point into Europe.

Increasing competition in the Northern Adriatic

Koper's biggest potential in the North Adriatic region is in containers, but the competition in the region will increase. There are six ports in the region with which Koper competes directly: Trieste, Ravenna, Venice, Rijeka, Monfalcone and Chioggia.

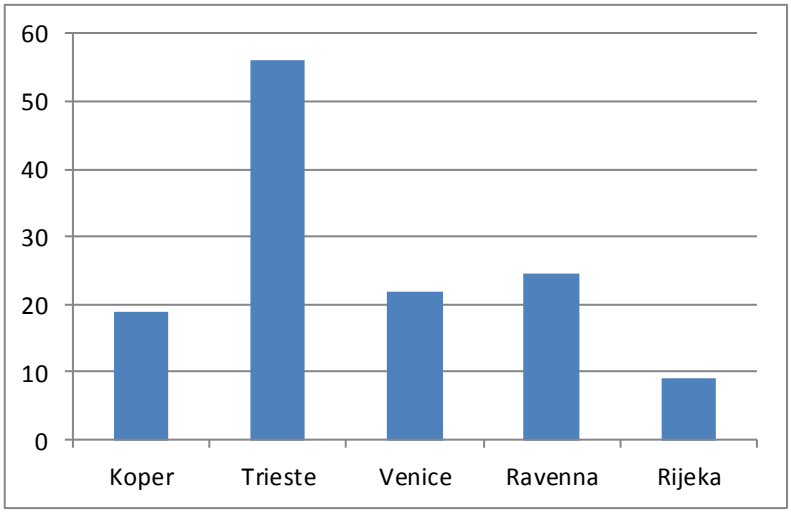
The four large Northern Adriatic ports are to some extent complementary, especially Koper and Trieste, located 10 km from each other. This becomes evident from specialisation patterns, diversification indexes, foreland connections and market orientation. Trieste and Ravenna are very specialised ports, whereas Venice and Koper – despite their smaller traffic volumes – are both very diversified. Both Venice and Koper have commodity diversity scores similar to Hamburg, the third

7. This volume is "cargo handled in the port"; i.e. cargo that moved via the quay wall. As transhipment volumes cross the quay wall twice, this volume does not mean 10 million TEU of imports and exports for other countries. Probably the actual cargo volume is in the range of 5 million TEU.

largest European seaport, despite the fact that Hamburg's traffic volumes are seven times those of Koper (OECD, 2011).

At first sight, there might appear to be some overlap of port specialisations, with both Trieste and Venice specialised in liquid bulk, and both Ravenna and Koper specialised in dry bulk. However, when looking at a more detailed breakdown by commodities, it becomes clear that these specialisations are divided: Trieste mainly deals with crude oil (73% of its traffic) and Venice with refined oil products (42%); Koper is the leader in coal, ores and new cars, whereas Ravenna is more specialised in agricultural products and other dry bulk.

Figure 2.13. **Total throughput in Northern Adriatic region ports in million tonnes**



Source: Based on ESPO and NAPA statistics.

In some commodities, such as ores and forestry products, Koper has hardly any competition from other Northern Adriatic ports. The main competitor in the largest commodity categories for Koper (containers and coal) is Venice. The commodity categories where Trieste and Koper compete are containers, perishable goods, general cargo and timber, but Koper is not dealing with Trieste's main commodity, crude oil. This is also reflected in hinterlands: The port of Trieste is more oriented towards the Italian and Bavarian markets for crude oil; Koper is serving Slovenia, Austria, Hungary, Slovakia, the Czech Republic and the Balkans. A comparison of links between Koper and Trieste with other ports in the world shows the overlaps in their maritime forelands, at least with respect to container traffic. These port links and their intensity can be measured by counting the number of times that container vessels go from one port to another. The port links of Koper and Trieste are highly correlated; this relationship is even stronger if only intercontinental port links are taken into account and links with European and Middle Eastern ports are excluded. This indicates that for almost all ports with which Koper is doing business, Koper and Trieste are considered to be one functional port even if their specialisations suggest they are not really competing.

Trieste, Ravenna and Venice all have greater throughputs than Koper, but much of it is a range of bulk products [8] serving regional industry. Monfalcone and Chioggia are very small ports with concentration of regional bulk cargo supply, and so not of relevance for Koper hinterland activities. Koper has a strong position for Slovenian traffic of this type, as does Trieste has for the north-east of Italy. Due to its proximity to Koper, Trieste may become a competitor for hinterland traffic in the longer-term, but it does not have a clear development strategy and this has been reflected in the relatively sluggish growth in its general cargo and container businesses. Only Venice with its proposed new container terminal currently has a hinterland strategy that may result in increased competition with Koper (Box 2.1).

Box 2.1. **Venice's concept for an offshore terminal could come online in 2017**

During the preparation of this report Venice announced a "new" concept for an offshore terminal, able to handle up to 6 million TEU. This terminal will be directly linked to the new 1400 m CT on land that has limited draught. The offshore terminal will be connected with a floating cassette device called Mama-vessel. This vessel will have special ballast tanks that can lift so it can operate in shallow waters; it is effectively a short-distance feeder connecting the offshore terminal with the land terminal. The project is heavily sponsored by the EC but is still searching for private finance. In a promotional video it is clearly stated that Venice will target the same hinterland as Koper.

The new offshore terminal will also offset the significant advantage that Koper has now, compared to other ports in the region, with its 18 m draught. The draught of the off-shore terminal in Venice will be 20 m.

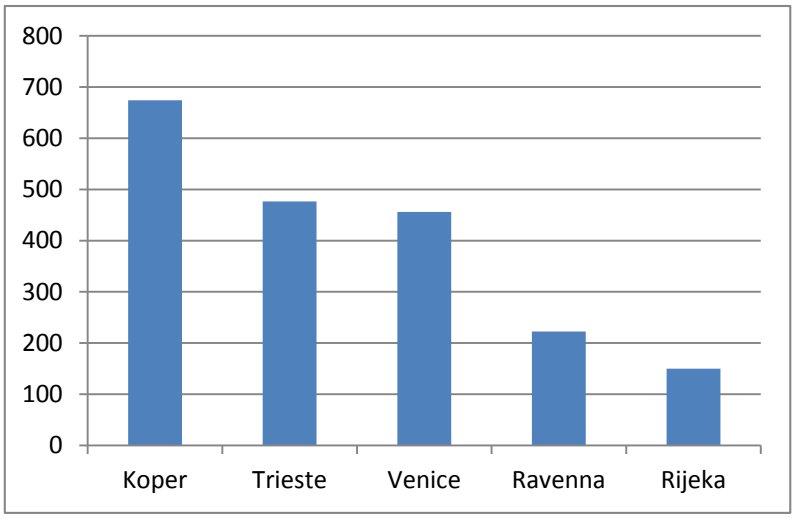
Source: World Maritime News[9]

Rijeka does handle traffic to and from central Europe but this is mostly bulk traffic such as steel from Slovakia and coal. Although it is the closest port to most of Hungary, it is relatively uncompetitive as its inland rail links are poorer than those in Slovenia and there are as yet no third-party operators. However, this is slowly changing and over the time frame of the current project, it seems certain that its competitive position will be greatly improved, especially for any traffic that would naturally move through Budapest.

8. Details of cargo figures per port can be found in Appendix 5

9. http://worldmaritimenews.com/archives/167611/video-venice-gets-eu-funds-to-build-mama-vessel-prototype/?+update+World+Maritime+News%2C+2015-07-28&uid=59905

Figure 2.14. **Northern Adriatic container volumes in thousand TEU, 2014**



Source: Based on ESPO and NAPA statistics.

Nevertheless, the greatest opportunities for Koper to gain market share amongst the NA ports, especially in the short-medium term, are in the container trades of Central and Eastern Europe. Koper estimated the potential volume through Northern Adriatic ports in 2030 from this market as 5.2 MTEU[10] (Table 2.3).

Koper with its existing draft and the scheduled expansion of the container terminal, has the physical characteristics and location to attract a significant share of this traffic, which will subsequently increase due to economic growth, but this will need the port to promote and manage these competitive advantages through its hinterland links and/or intermodal services in the face of what is likely to be increasingly strong competition.

10. Figures published in following presentation: Your five star route to Europe, Transport events, 8th Southern Asia Ports, Logistic and Shipping 2013, North Adriatic serving the Indian market – trends and prospects, presented by Mitja Dujc, Sales and Marketing Manager at Luka Port of Koper – Port of Koper.

Table 2.3. **Estimated container volumes through Northern Adriatic ports in 2030, in thousand TEU**

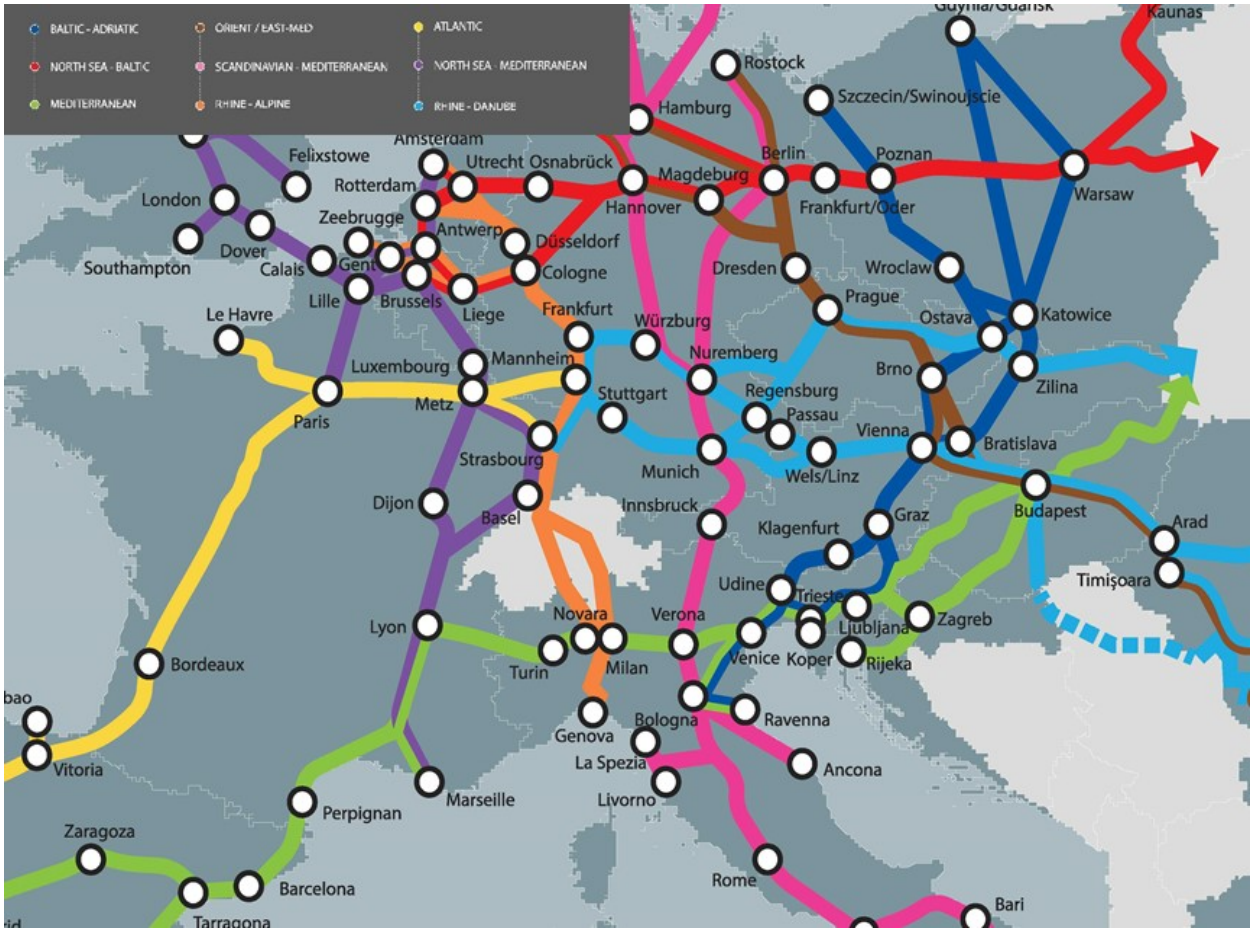
Country	000 TEU
Austria	830
Bosnia and Herzegovina	60
Croatia	322
Czech Republic	649
Germany south	518
Hungary	626
Italy north and mid-west	1 465
Serbia	43
Slovakia	318
Slovenia	314
Swiss	82
Total	5 227

Source: Port of Koper (according to NAPA).

Role of hinterland rail connections

Development plans for hinterland rail connections are also relevant for Koper. The Divača-Koper line is one of three connecting the Northern Adriatic ports with their hinterland in Central Europe – Austria, Hungary, Slovakia and Czech. Under the EU TENS corridor classification, these lines used to be known hinterland as Corridor Vb but since 2014 have formed parts of two TEN-T corridors, the Baltic-Adriatic Corridor and the Mediterranean Corridor. Koper and Trieste are located on both corridors while Rijeka is on the Baltic-Adriatic corridor only. (Figure 2.15)

Figure 2.15. **TEN-T corridors serving Northern Adriatic ports**



Source: European Commission.

Impact of Baltic-Adriatic corridor improvements

On the Baltic-Adriatic corridor, planned improvements will probably only marginally affect the competitive position of Koper. This corridor stretches from the Polish ports on the North Sea through Vienna and Bratislava to Trieste and Koper, then continuing to Ravenna via Venice. It provides the main access from Vienna and Bratislava to Koper via Graz, although much traffic to and from Koper also crosses the Austrian border at Jesenice.

Two major projects currently in progress which will affect Koper are the Alpine crossings in Austria using the Semmering and Koralm tunnels. Work on the 30 km long Koralm-Tunnel started in April 2011 and is due for completion in 2022; this will provide a direct rail link between Klagenfurt and Graz in Austria and reduce the travel time from Vienna to Klagenfurt by 1.5 hours. Preparatory works at the 27 km Semmering Base Tunnel started in April 2012.

Both these projects will divert passenger traffic from the existing line, and thus increase the capacity available for freight trains but are unlikely to significantly affect the competitive position of Koper compared with Trieste. The route parallel to the Semmering tunnel is common to both Trieste and Koper

traffic and the Koralm tunnel will likewise improve access to Klagenfurt (a key route for traffic to and from Koper).

No major works are planned on the Pontebbana line in Italy, the section of this corridor between the Austrian border at Tarvisio and Trieste, which was duplicated and electrified in the 1990s.

The other works planned for this corridor over the next 15 years which will affect Koper are planned improvements to the port connections in Trieste.

Improvements on the northern section of the Baltic-Adriatic corridor might increase the competition between Koper and the Polish ports of Gdynia and Gdansk. The port of Gdansk has managed to achieve impressive growth in the container sector, thanks to its successful attempt to be included in direct calls from the Far East, in particular from Maersk deploying its Triple E ships. Hinterland connectivity has traditionally been a bottleneck for Polish ports, but they have increasingly grasped the potential of market shares in Czech Republic and Slovak Republic, two potential markets for the port of Koper as well.

Impact of Mediterranean corridor improvements

Developments on the Mediterranean corridor will improve connections for both Koper and Rijeka. The Mediterranean corridor is very long, linking Spain to the Ukrainian border with Hungary, following the coastlines of Spain and France before moving inland and crossing the Alps to Italy, finally reaching Ukraine via Slovenia and Hungary. It also has branches linking Rijeka with Budapest and Zagreb with Ljubljana.

Much of this corridor is not relevant to Port of the Koper. However, it provides the main link between Koper and Budapest and also between Budapest and Rijeka, the main potential competitor for the Budapest traffic.

The main projects in this corridor are the proposed cross-border passenger lines between France and Italy (‘Lyon-Turin’) and between Italy and Slovenia (‘Trieste-Divača’). The proposed programme also includes several upgrading projects in northern Italy. None of these will have a significant impact on Koper freight traffic. There are plans, however, for upgrading (and possible relocation) of the Slovenian section between Koper and Pragersko and also for the Croatian section from Rijeka to the Hungarian border. Both of these will improve access to the respective ports (considerably so in the case of Rijeka).

Impact of the Brenner Base Tunnel

The new Brenner Base Tunnel will also affect Koper’s competitiveness. The 55 kilometre-long Brenner Base Tunnel is on the main north-south route between Bavaria, Austria and Italy (the TEN-T Scandinavian-Mediterranean corridor). It is scheduled for completion in 2025, although in practice it may be delayed a few years. It will greatly increase the available capacity on this route and will allow larger train loads with less traction power. The net effect, when completed, will be to increase the competitiveness of Venice in particular for traffic to and from western Austria and southern Germany.

Can projected volumes be reached?

Achieving the projected volumes is by no means guaranteed. The forecasts discussed all indicate that Koper can expect to handle between 30 and 38 mtpa in 2030. Dry and liquid bulk commodities will

grow with the market, largely in line with the existing customers. Vehicle volume is forecast to double and reach 1.0 million units in 2030, an impressive number and important business, but only representing 1.3 million tonnes and still essentially a niche business. General cargoes, especially the timber business with Austria, are forecast to double. However, the container business has the biggest potential, and with up to 18 mtpa could triple in the next 15 years and be the dominant product handled by Koper.

However, this growth will not happen automatically but will require, especially for the higher volumes, a major effort by the port to strengthen its position in the highly competitive markets of central Europe.

Three scenarios

Having reviewed the existing forecasts and taking account of the factors discussed in the previous sections, three scenarios have been developed for the study (Table 2.4).

Table 2.4. **Port of Koper cargo throughput 2014 and scenarios for 2030, in thousands**

		2030		
	2014	low	Base	high
Container	6 760	11 000	14 500	18 000
Vehicle	764	1 000	1 150	1 300
General Cargoes	1 644	2 800	3 200	3 630
Dry Bulk	6 724	8 000	8 800	9 770
Liquid Bulk	3 074	3 500	3 800	4 050
Total in t	18 965	26 300	31 450	36 750
Container in TEU	674	1 200	1 600	2 000
Vehicles in units	519	770	885	1 000

Source: Based on OSC, MDS,and DRI.

Whilst the non-container traffics in the three scenarios essentially reflect differences in the growth rates of the hinterland economies, the major difference in the scenarios is the forecast container traffic which in turn reflects the success or otherwise of the hinterland development plan adopted by Koper. Under the High scenario, Koper will be the major container port in the Northern Adriatic; to achieve this it will need to have established a network of partners throughout the region serving all major countries in Central and East Europe. As a result, around half the throughput in 2030 in this scenario is forecast to be containerised cargo.

Under the low scenario, container volumes are effectively growing with the market, at a rate linked to economic growth alone. In this case, containers only increase from 35% of throughput in 2014 to about 40% in 2030.

The requirements for achieving the High scenario can be assessed by analysing the forecast hinterland import and export volumes. The potential overseas seaborne trade for Koper is summarised in Table 2.5. This table gives the forecast volume through all ports (both Northern and Southern Europe).

Table 2.5. **Port of Koper hinterland container volume in 2030, in thousand TEU**

Year	2014			2030		
Country	Import	Export	Total	Import	Export	Total
Austria	244	433	678	478	735	1 213
Hungary	110	105	216	185	190	375
Czech R.	241	173	414	473	339	812
Slovakia	146	91	238	236	220	456
Germany south	1 002	1 103	2 105	1 767	1 927	3 693
Total market	1 746	1 905	3 650	3 139	3 410	6 549

Notes: (1) Only extra-EU trade

(2) Germany south = Baden-Württemberg and Bavaria

Source: Based on Eurostat, UN Comtrade.

Koper currently has a total market share in its hinterland beyond Slovenia of about 11.5%. If this does not change between now and 2030, about 750 000 TEU from this market will be routed via Koper. Together with the local market, Koper would then have a throughput of about 1.2 million TEU only. This translates into the low scenario forecast of 11 mtpa of containerised cargo or a total throughput for the port around 26.3 million tonnes in 2030.

Achieving a throughput of 1.8 MTEU is only possible if Koper can attract more cargo in its major hinterland markets, especially in the high-volume market of southern Germany. It will need to create attractive market solutions, especially for its German, Czech or Slovak customers but in doing so it will face strong competition from Venice as well as from the Northern European ports. In the medium-long term, it will also need to defend its existing market share in Hungary against Rijeka. Allowing for its Slovenian traffic, achieving its stated 2.0 MTEU target for container traffic will require Koper to attract about 1.6 MTEU out of the total hinterland potential of 6.5 MTEU, increasing its market share from 11.5% to 24%. It would thus need to more than double its current market share in what are highly competitive markets; whilst challenging, it is nevertheless possible, but only with a well-prepared, detailed and flexible approach to business development.

Bridging the gap to achieve the medium and high scenarios is thus strongly related to the port's landside competitiveness in terms of supporting supply chain management. Experience has shown that in the general freight business this is best achieved by private-sector operators and that state owned enterprises are too constrained by regulations, procedures, and other aspects to be able to react with the speed and flexibility that is generally required. This in turn has implications for the future port management structure if the medium and high scenarios are to be realised.

Different management models, different outcomes

Different management models are likely to have different outcomes. Although historically many ports were entirely within the public sector, there has been an increased introduction of private sector business rules (under state ownership) and privatisation. These processes are related to the evolution in the port management models. This is evident in most ports in Europe, particularly those dealing with general cargo and especially containers (Table A.3 in Appendix 1), which also gives an overview of port management models). Koper as currently organised is a tool port; i.e. a port that is organised and managed by public institutions, but with limited participation from private/commercial interests[11].

Physical productivity in ports is important, and economists would normally argue that in competitive markets private ownership is more productive than state owned enterprises[12]. But this is not the main issue in the context of the general freight business. Public-sector organisations, be they ports or railways, face major problems competing against the private sector in terms of marketing, business development and speed of doing business as a result of the regulations and constraints that limit their freedom of action. This is not such a problem in those parts of the freight business such as some of the bulk traffics where there are relatively few large customers, but where there is a wide range of potential customers with differing requirements, there are few public sector organisations that can effectively compete against the private sector in an open market.

Addressing this problem needs the organisation responsible for the container business to be free from public-sector regulations and constraints so that it can conduct its routine business in a commercial manner. This has resulted in a trend towards more private sector integration via commercialisation and privatisation. Experience around the world (Farrell 2012) suggests the best approach is to concession the container business to a major international operator who can bring capital and expertise with them. There are indications that intra-port competition improves port performance. This refers to a situation where two or more different terminal operators within the same port are vying for the same market. This competition prevents monopolistic rent seeking of port service providers and is also means to achieve economies of scope and flexible multi-service organisation structures (De Langen and Pallis, 2005). At the same time, there are barriers to entry in the port sector: surveys of European ports show that in many cases there is only one service provider of container handling. Internationally based stevedore companies have been found to have a positive impact on the efficiency of container terminals, but not terminals run by global carriers (Cheon, 2009) who generally tend not to manage a facility directly but to outsource day-today operations frequently to local stevedores (Parola and Musso, 2007). This may perpetuate institutional lock-in. Luka Koper is both port authority and port operator; there is no intra-port competition for cargo handling in Koper. How Koper will organise itself in future is a decision for the owners, i.e. the GoS.

Development strategy

Koper does not currently plan any significant changes to its development strategy. Although the current vision and mission statements contained in the Annual Report of Koper emphasise its objective to become the leading port servicing central and Eastern Europe, there is little reference to clients or customers, suggesting that the port business is still seen as primarily a technical operation rather than a

11. Koper is state owned company (directly 51% and more indirectly through other state owned entities), with minority private interest.

12. Literature reviews such as that of Megginson and Netter (2001).

service provider. This may not be too much of a problem when dealing with bulk traffic but for a business such as containers, with a wide range of potential customers, it is an important distinction. Moreover, the port expects no significant changes before at least 2020[13].

Overall assessment of future demand

Given the analysis in the previous sections, as competition intensifies in future, and Koper expands into central Europe, a clear market development strategy[14] and a high level of service will be required to endure that the hinterland supply chains are competitive. In its absence, it is unlikely that the Low scenario forecast will be significantly exceeded.

If the container business is commercialised, a hinterland development strategy is put in place and the central European economies achieve even modest economic growth, the Medium scenario should be achievable.

Achieving the High scenario forecast is subject to the fulfilment of multiple conditions. It will require steady economic growth, combined with a comprehensive hinterland development strategy implemented by a strong operator. There are thus substantial uncertainties that need to be overcome and it is likely to be well into the 2020s before its achievement can be predicted with any confidence (i.e. will the GDP growth materialise and will the port of Koper be commercialised.

Apart from the demand factors treated above demand is also related to the charging policy. As stressed in the introduction to this chapter, the issue of demand is related to the economic and financial viability of the DK2. The demand scenarios above assume current charging policies at the port, rail and road. Changes in these policies in an attempt to improve the financial or economic viability of the project will also affect demand. This is the subject of the next section.

Cost recovery through rail and road charges?

Various options are available to attempt to obtain a contribution from traffic to recover the cost of the tunnel but these are all unlikely to generate significant funds, whilst at the same time diverting traffic to other ports. The two main options are:

- A specific access charge for the Divača-Koper rail section; this would presumably be applied equally on both the new and old lines.
- A general surcharge on all traffic to and from Koper, by both road and rail.

Trains using the rail line to the port are charged according to national rates for the use of rail infrastructure. Rail infrastructure currently recovers about 15% of its infrastructure-related operating costs through access charges and capital works are effectively funded by the government. Rail companies are free to set end user tariffs according to the market. Rail services to and from the port are currently provided by two state-owned operators (SZ Cargo from Slovenia and Rail Cargo Austria) and by one

13. The Annual Report 2014, page 23: "[…], *significant conceptual changes are not expected on the method of operation, management and positioning of the company."*

14. Appendix 2 discusses the main elements of a hinterland development strategy and gives the example of Barcelona.

independent operator (Adria, part-owned by Koper). SZ is by far the dominant operator (currently carrying about 83% of the traffic), followed by RCA with about 12%. Both state operators just break-even but this is heavily influenced by the level of access charges and internal cross-charges within the group structures.

If a specific access charge was levied on rail traffic between Koper and Divača to finance the new link, some users would either transfer to road or divert to another port. The impact of this was assessed using the National Transport Model. This indicated that increases of 20% and 30% in Slovenian rail tariffs (equivalent in the model to increases of EUR 2/tonne and EUR 3/tonne for transit traffic moving 330 km across Slovenia) generated reductions of 25% and 48% respectively in rail tonnages to and from the port[15]. Of these reductions about 85-90% diverted to other ports and 10-15% remained at Koper. A typical rail access charge for transit traffic moving 330 km is around EUR 1.50/tonne (EUR 0.50/ntkm) and the increase in revenue to the infrastructure authority in 2030 if additional surcharges of EUR 2/tonne or EUR 3/tonne were levied on the Divača-Koper sections would thus be (after allowing for the projected traffic loss) about EUR 15-20 million on top of the existing user charges.

A general surcharge on all port traffic, whether by road or rail, could presumably be levied through the port charges. Modelling suggested that a toll of EUR 1/tonne and EUR 2/tonne would reduce total traffic by about 8% and 16% respectively, generating revenue of EUR 30-50 million annually in 2030.

Such revenues would increase as traffic increased and the levies could also be increased, although charges such as EUR 5/tonne are likely to encourage large-scale movements of bulk and semi-bulk traffic away from Koper. Such charges also need to be seen against the general background of the current under-recovery of infrastructure costs. The level of cost recovery is such that charges probably only cover about half the variable costs and it seems inevitable that the general level of charges will have to increase in the medium term. Current user tolls for trucks probably cover variable costs but the cost of providing additional capacity will also need to be covered in future.

15. This is consistent with experience elsewhere, which has generally found a cross-elasticity of at least -1 between road and rail where there is a competitive market, as there is at Port of Koper.

Chapter 3. Buying time for the second rail link and optimising costs

Remaining capacity on the existing track

The existing line can accommodate some additional traffic before reaching capacity. It was constructed in 1968 with several subsequent modernisations as a branch from the existing Divača-Pula line at Prešnica. It is 46 km long between Divača and the port and consists of the following sections:

- Divača-Prešnica junction – 16.5 km
- Prešnica junction-Bivje junction (junction for the port) – 28.1 km
- Bivje junction-Koper (passenger) – 3.5 km
- Bivje junction- Koper – 0.9 km.

It is a single-track electrified railway line which, in common with the lines to neighbouring ports on the Adriatic, includes steep grades and sharp curves as it descends from the karst plateau immediately inland from the port to the port itself. The highest point of the line (38 km inland from the port) is 525 metres above sea level, while the lowest point is Koper freight terminal, at 3 metres above sea level. As a result, over 50% of this distance has gradients greater than 15‰ and some 17 km has a grade of 26‰; this is compounded by some tight curves, the sharpest of which is 250 metres. The maximum line speed is 80 km/h and the axleload is 22.5 tonnes.

The length of the crossing loops is relatively short, with that at the Hrpelje-Kozina station being just recently extended from only 550 metres to 750 m in late 2014. In many cases, there are also steep grades immediately following a crossing loop, thus limiting acceleration from a stop. As most of the line is located in regional parks and water reserves, few of these loops can be lengthened and this also limits train size. The critical section on the line is the 9 km section between Črnotiče and Hrastovlje, with an average grade of 21‰.

It has recently undergone modernisation, improving track layout at stations Koper freight, Hrpelje-Kozina and Divača. Modernisation of the line's signalling and telecommunications system was executed with the installation of intermediate block signals (which facilitate consecutive train movements in the same direction) and a new train control centre established at Postojna with local control at Divača and Koper. Two planned projects are a new substation to strengthen the electrical supply and improvement of the yard layouts at Koper itself to remove internal bottlenecks.

Existing traffic is still manageable

The line currently carries about 11 million net tonnes, with an average of about 60 freight trains in total each day. Eight passenger trains are also scheduled each day[16]. Table 3.1 summarises train

16. Until recently, these were temporarily replaced by busses due to a last year's sleet disaster, which destroyed the catenary, disabling electrical traction.

movements over recent years. However, many trains from Koper are double-headed to cope with the grade and this leads to a large number of light locomotive movements returning towards Koper, up to 15 or 20 per day, which are excluded from Table 3.1.

Table 3.1. **Traffic volume on Prešnica-Koper line, 2008-2014 (excluding light loco movements)**

	Number of trains		
Year	Freight	Passenger	Total
2008	16 553	3 286	19 839
2009	13 690	3 517	17 207
2010	17 012	3 316	20 328
2011	19 121	3 334	22 455
2012	19 391	3 434	22 825
2013	20 118	3 386	23 504
2014	20 708	3 252	23 960
Growth	3.8%	-	3.2%

Source: SZ.

The number of trains in 2015 is about 2% greater than in 2014. Seasonal fluctuations in traffic are small, typically ± 10% around the mean. However, the variation by day is more significant, with fluctuations of ± 20% (excluding partial closures for maintenance).

Capacity will be reached by 2028

The link's capacity will by exhausted by 2028 at the latest even with additional operational measures. The grade and short loop lengths impose considerable constraints on train operations. Up to three locomotives are currently used on each train from Koper in push-pull formations, with a maximum load of 1 750 tonnes and a maximum length of about 550 metres (although longer trains are occasionally operated). In addition, power supply constraints require minimum intervals between consecutive ascending loaded trains.

A detailed analysis of traffic covering the entire year was undertaken in 2012, and a further analysis was undertaken for March 2015. The key results are summarised in Table 3.2.

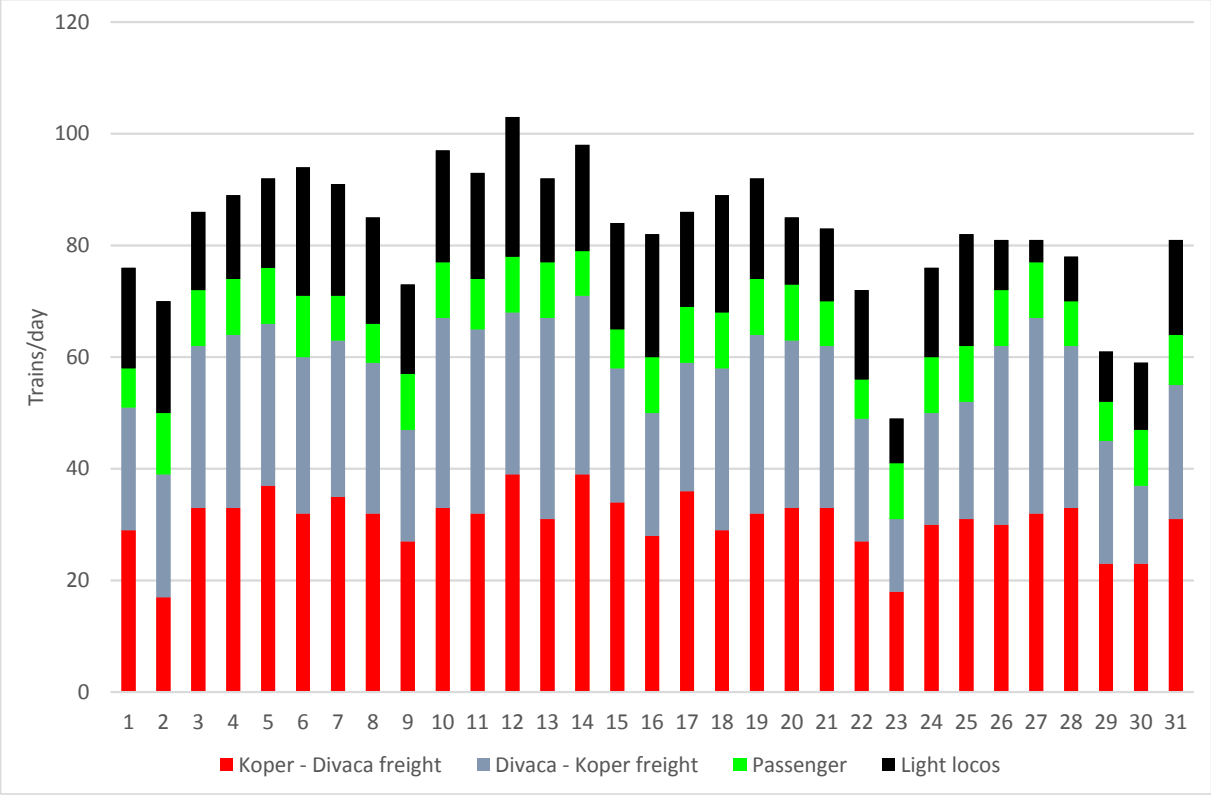
Table 3.2**. Summary operating statistics 2012 and March 2015**

	Divača-Koper	Koper-**Divača**	Total
2012 (full year)			
Net tonnes (million p.a.)	3.2	7.2	10.4
Gross tonnes (million p.a.)	8.4	12.2	20.6
Net tonnes/freight train	343	677	
Gross tonnes/freight train	900	1151	
Trains/day			
Passenger	5	5	10
Light loco	18	1	19
Freight	25	29	54
Total	48	35	83
March 2015			
Net tonnes/train	397	623	
Trailing tonnes/freight train	941	1098	
Trains/day			
Passenger	5	5	10
Light loco	16	0	16
Freight	26	31	57
Total	47	36	83

Source: SZ and Public Agency for Rail Transport.

Analysis of the March 2015 movements by day showed the number of movements, excluding maintenance days, ranged from 59 to 103, within which freight trains varied from 45 to 71. In both cases the average for the month was about 80% of the maximum daily throughput (Figure 3.1)

Figure 3.1. **Daily movements between Prešnica and Koper, March 2015**



Source: Based on SZ and Public Agency for Rail Transport data.

Current train operations typically involve 'flights' of 4-5 trains in a single direction, taking advantage of the recently-installed intermediate block signals. The capacity of the line is thus a function, amongst other factors, of the capacity of both Koper and Divača to store trains before and after using the line. This has been studied several times and results are typically 80-90 movements per day, although the precise figure critically depends on factors such as the time required for maintenance.

Currently routine maintenance is normally undertaken on alternate Mondays, with a window of about six hours, and about 100 hours has been required annually for emergency repairs, or about 250 hours in total p.a. Discussions with SZ Infrastructure suggest this time will need to increase to about 700 hours each year to allow for the planned programme of track renewal.

SZ Infrastructure consider that, taking into account the recent modernisation works and the increased maintenance downtime of the line, the capacity of the line is an average of 84 freight train movements per day, or about 30 600 annually. How this translates into net tonnes depends on how many passenger trains operate, whether there is any scope for more closely matching freight train sizes to the line constraints, how much allowance is made for light engine movements returning from Divača and the balance of freight by direction.

Four to five pairs of passenger trains currently operate over the line. Current policy is that these services have priority over freight trains and they thus use rather more than one train path per trip – a reasonable estimate is probably the equivalent of 1.5 freight train paths. These services thus represent the equivalent of 15 freight train paths, or about are 6-7 years of growth. Given the low volume of

passengers (about 100 000 to 150 000 p.a.) and the readily available option of a connecting bus service using the expressway between Divača to Koper, there seems little reason why these rail services should continue on a regular basis as capacity becomes limited.

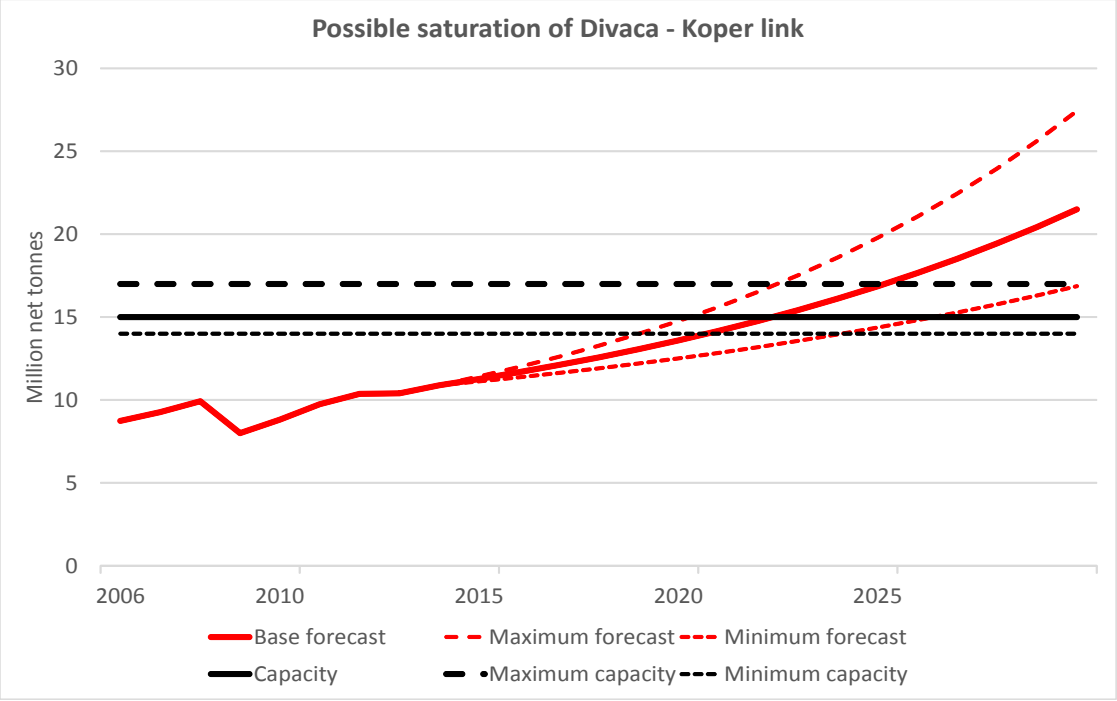
Some additional capacity could possibly be squeezed out of the system by more closely matching freight train size to the tonnage and length constraints. In March 2015, freight trains from Koper (the critical direction) averaged 1 100 tonnes and 390 metres, compared to the maximum possible of 1 750 tonnes and 550 metres. There is thus some scope for increasing average train sizes; however, taking into account the impact of both of these restrictions on an individual train basis, the potential reduction in train movements is at most about 15%. In practice, given the multiple operators on the line and the prevalence of unit workings which operate as fixed blocks of wagons, the figure is probably closer to 5-10% at most and has not been considered further.

The movement of light locomotives returning from Divača to Koper can probably be reduced but not eliminated entirely. These movements typically use less than the equivalent of a freight train path, as the light locos are more flexible operationally. For the purposes of the current analysis, it has been assumed they use the equivalent of seven freight train paths per day.

The balance of freight by direction is also an important factor. In March 2015 about 35% of the freight on the line was toward Koper; in 2014 the corresponding figure was 32%, in 2012 it was 30% and in 2010 it was 28%. As there is considerable spare capacity on the trains from Divača, the greater the growth in export as opposed to import traffic, the greater the total capacity of the line will be in net tonnes. The rate of growth of import traffic, as opposed to total traffic, is thus the key consideration and in recent years this has been about 4% p.a., compared to about 6% for the port as a whole.

On this basis, the capacity of the line is about 17 million net tonnes (7 million export and 10 million import) and it would reach capacity in 2023. If, however, import and export growth were equal, the line would reach capacity in 2020, when it would be carrying 5 million tonnes of exports and 10 million tonnes of imports. It is possible to develop scenarios in which the 2023 date could be extended but it seems certain that by about 2027 the line would be at capacity. This is illustrated in Figure 3.2, which combines low and high forecasts of capacity with high and low demand forecasts. In this diagram, container growth ranges from 6% p.a.to 10% p.a., with other freight growth ranging from 0% to 2% p.a., with the line capacity ranging between 14 and 17 million tonnes p.a. Depending on the precise assumptions, the line will reach capacity sometime between 2018 and 2028, with the most likely date being around 2023.

Figure 3.2. **Timing for Divača-Koper to reach capacity**



Upgrade of other hinterland connections

Releasing additional rail capacity through for Koper also involves the upgrade of other hinterland connections. The line to Divača is not the only section of the Slovenian network that will come close to capacity over the next 15 years. Table 3.3 gives the current loading and capacity of the key links onwards to Austria and Hungary.

Table 3.3. **Number of passenger and freight trains by line section, 2014**

From	To	Capacity	% used	Trains per day		
				Total	Passenger	Freight
Sežana	Ljubljana	135	87	104	31	73
Ljubljana	Jesenice	76	98	69	38	31
Ljubljana	Zidani Most	300	43	127	74	53
Zidani Most	Maribor	185	64	101	57	44
Maribor	Sentilj	62	64	44	18	26
Pragersko	Ormoz	112	41	45	25	20
Ormoz	Hodos	46	65	33	16	17

Source: SZ.

The two critical sections are between Sežana and Ljubljana and between Ljubljana and Jesenice. The former is likely to reach capacity, assuming no change in passenger services, around 2025. However, this line is double-tracked and the signalling could presumably be readily upgraded to substantially increase the capacity.

The Jesenice line is currently being used as an alternative route to Austria as it allows a higher axle load (22.5 tonnes) compared to alternative routes which have sections limited to 20 tonnes. As these sections are upgraded, traffic will be re-routed. Nevertheless, it appears likely that major investments will be required in the medium/long-term on the single-line sections to Austria and Hungary if the projected increase in Koper traffic is to be accommodated. According to the Ministry, these are underway and should be completed at the latest within the EU 2014-2020 financing perspective.

In addition, the Ljubljana station area is congested, with freight trains between Jesenice and Divača having to reverse in the yard due to the lack of a direct connection between the two lines. A feasibility study to upgrade this part of the network was completed in 2009 but there is as yet no firm alignment or date for construction. Although it is unclear if this connection will still be needed if the more easterly sections of the network are upgraded to 22.5 tonnes or when it will become a critical constraint for traffic to and from Koper, it seems likely it will be required if Koper rail traffic continues to grow.

Spare capacity on inland road links

The inland road links from Koper have a lot of spare capacity. Koper has direct expressway links to all its principal markets. Table 3.4 gives the key characteristics of the routes, based on 2012 data.

Table 3.4. **Expressway links to Koper, 2012**

Segment	AADT (total)	AADT (freight)	Capacity(1)	% freight	V/C ratio
Divača-Koper	20 567	3 291	70 150	0.16	0.29
Divača-Sežana	13 446	4 706	67 861	0.35	0.20
Divača-Ljubljana	41 857	10 030	68 106	0.24	0.61
Ljubljana-Maribor	38 540	9 754	67 929	0.25	0.57
Maribor-Austria	18 712	4 935	67 861	0.26	0.28
Maribor-Hungary	11 986	4 958	67 861	0.41	0.18

Notes: (1) In vehicles; allowing for traffic mix.

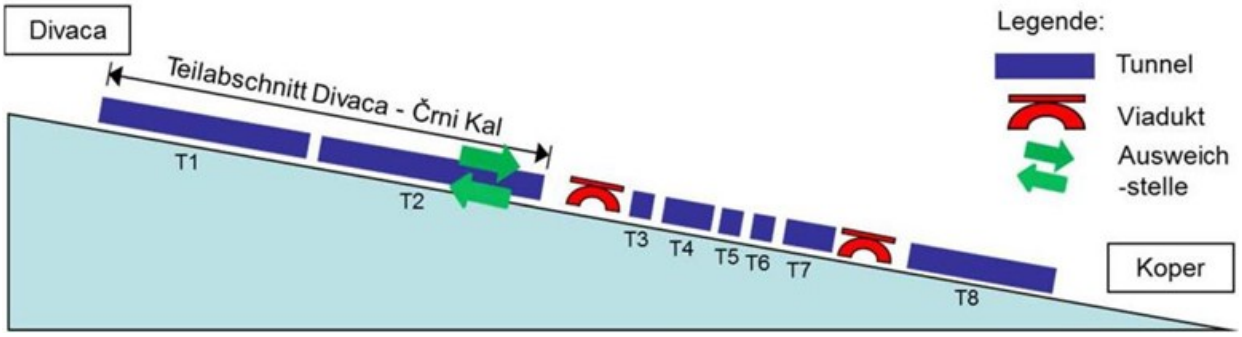
Source: Traffic counts, Ministry of Infrastructure.

Although road freight flows to and from the Koper are substantial in absolute terms, they represent less than 15% of the freight vehicles on the network east of Divača. The main determinant of the need to expand expressway capacity on these routes will thus be the growth in non-port traffic and, especially around Ljubljana, the development in surrounding areas such as Vrhnika and consequent increase in commuting traffic. Whilst travel in peak periods will doubtless become slower, lack of road capacity is unlikely to be a significant factor in future mode choice for freight to and from the port.

Mixed traffic design is costly

The proposed new line is costly; it is also designed for both passenger and freight traffic. The proposed single-track line would run 27 km in almost a straight line between Divača and Koper. It has eight tunnels of varying length (Figure 3.3), with the two longest (T1 and T2) being linked by two short bridges and a covered cutting, forming a continuous enclosed tube 13 km in length. There are two crossing points (one within the long tunnel). The line is designed for a maximum line speed of 160 km/h, with a continuous gradient of 17‰. It will be electrified at 3 kV and have an axle load of 25.5 tonnes.

Figure 3.3. **Structures on proposed new line**



Source: DRI 2014.

Once it is constructed, the proposed operating plan is for the existing line to be used for freight trains to Koper and local passenger trains (if they continue to operate), whilst the new line carries freight trains from Koper as well as a small number of regional passenger trains in both directions.

Under this plan, the new line will have a capacity of 120 trains/day while the capacity of the existing line will increase to around 100 trains/day because of the largely unidirectional movement. Because of the length of the tunnels some (including T1 and T2) have a parallel service tunnel connected by cross walkways every 500 metres. Table 3.5 summarises the estimated construction cost of EUR 1.46 billion (September 2014 prices), including contingencies and VAT.

Table 3.5. **Estimated construction cost, September 2014 prices**

Cost items	EUR (million)
Tunnels	656.2
Structures	37.8
Roads	30.0
Earthworks	14.1
Trackwork	68.2
Equipment	58.8
Other	125.6
Subtotal	990.7
Physical contingency (10%)	99.1
Price contingency (10%)	109.0
Total excluding VAT	1 198.8
VAT(22%)	263.7
Total including VAT	1 462.5

Source: Feasibility Study for the new Divača-Koper line, DRI Investment Management Dec 2014. Contingencies as assessed by ITF.

Some doubt must surround the base estimate, as it is based on historic prices in Slovenia, indexed by the Slovenian CPI[17], and this is being reviewed independently. The single largest item is the tunnel cost. This includes the cost of the service tunnels, which add about 50% to the cost of the bore carrying the trains (Tables 3.5 and 3.6).

Table 3.6. **Tunnel lengths and costs**

		Cost(1) (EUR million Sept 2014)	
	Service tube	Total	Per km of main tube
6 714	6 683	250.3	37.4
6 017	6 029	183.3	30.5
330		6.7	20.3
1 953	206	34.1	17.5
128		3.3	25.8
359		9.1	25.3
1 163	165	19.9	17.1
3 808	3 818	106.6	28.0
20 472	16 901	613.3	30.0

Notes: Cost excluding contingencies and VAT. Also excludes cost of removal of material which is included in Table 3.5.

Source: Feasibility Study for the new Divača-Koper line, DRI (2014).

Possible cost savings

Significant cost savings are possible if passenger services do not use the new tunnel. The operation of passenger trains will probably require more onerous, and expensive, safety requirements associated with the service tube and one option is thus for passenger trains to use the existing line. This will only add about twenty minutes to the travel time but will also allow the track design to be optimised for freight operation, thus reducing wear and tear on what will be an expensive and difficult line to maintain.

The main part of the cost savings if the new track were freight dedicated comes from the service tunnels. The service tunnels are mandatory under EU specifications but their dimensions (and hence their cost) are not specified. The primary purpose of such tunnels is to facilitate the evacuation and rescue of passengers and train crew, especially in cases of fire. As such, the dimensions could be expected to vary depending on whether passenger trains use the tunnel or not. This is currently being discussed with the safety consultants but the potential saving if the tunnel was used for freight only and all passenger services used the existing line would probably be EUR 100 million.

Removing passenger services from the tunnel would also allow the design standards to be relaxed; while this would not affect the alignment it would allow detailed design of the track to be made more compatible with an all-freight service. Similar considerations in terms of safety also apply with dangerous goods (mostly petroleum products). If these require expensive safety precautions in order to travel through the tunnel, one option is for this traffic to continue to use the existing line, as is often the case with road tunnels.

17. This is a Slovenian legal requirement but an appropriate Slovenian construction cost index would clearly be a better option in this case.

The ITF also inquired with the EU commission[18], whether a change to a freight-dedicated design would preclude the use of TEN-T funding. This does not appear to be the case. It would, however, probably require negotiation and explanation of this specific case to the EU commission.

18. Emailed explanation from the EU commission, dated 22 May 2015.

Chapter 4. Evaluation of project cost estimates

Substantial resources should be devoted to the revision of the project cost estimates. As with the demand forecast discussed earlier in this paper, the project cost estimate plays an important role in the project's financial analysis and economic evaluation and can influence the outcomes of the bidding process.

If the cost estimate is biased, the outcomes of financial analysis and the economic evaluation will be affected, even if all other inputs are correct. There may be insufficient financial resources provided for the project or the economic analysis may show a project to be preferred, when alternatives were actually better. The literature on ex-post investment analysis (e.g. Cantarelli and Flyvbjerg 2013), has shown cost underestimation in the project preparation process is a serious problem, with a common reason for the bias being strategic misrepresentation to achieve the approval for projects.

Procurement outcomes may also be influenced by the cost estimate. Strategic misrepresentation aside, if the letting price of the procurement authority creates high bidder confidence, it may guide the outcomes when the project is being procured. Auction theory predicts that if uncertainty regarding the valuation of an object is reduced, more aggressive bidder behaviour may be expected. Box 4.1 provides an example where this appears to have been the case.

Box 4.1. **Bidders don't necessarily know more about risk than the procurement authority**

In a study of more than 13 000 submitted bids by construction firms in Oklahoma and Texas over the period 1998–2003, researchers examined the impact of a policy change by the Department of Transport in Oklahoma, that that led to the release of the state's internal estimate of the costs to complete highway construction projects.

The researchers compared the bidding outcomes through time in the case of Oklahoma, where a change in policy took place with the case of Texas, where the same change did not occur. After the change of policy in Oklahoma the winning bids on average were reduced by 11% for more risky/complex (bridge construction) projects but were unaffected for low risk projects (asphalt paving). In general the bidders appeared to have had more faith in the estimates of the state than their own. Where the new information reduced uncertainty, bidding outcomes have systematically improved through time.

Source : De Silva et al 2008

DK2 is a major construction project that consists for the most part of tunnelling, which in itself generates substantial risk or uncertainty. When incentivised through a contract that transfers construction risk, private designers and contractors may be better in managing risks. But there is no evidence that the private side will have a better view on the risk exposure or uncertainty in the project.

As a general principle, the procuring authority should always make a considerable effort to produce a robust estimate. This will work against strategic misrepresentation and also provide a signal for the market, leading to more favourable bidding outcomes. This will be relevant regardless of whether a project is procured traditionally or as a PPP. It is useful to stress that "robustness" is more a function of the process and approach adopted to establish the estimate rather than with the estimate itself. It is still useful to compare the cost of different infrastructure projects of the same type, giving a broad indication of whether the estimated cost of a specific project is realistic or not.

Adequate resources should be made available to execute a cost review. Price should not be the only criterion for selection of a consultant and it should be made clear to bidders that the goal is the provision of the best overall approach to the project. The bidding consortia should have sufficient time to organise and prepare their bids (several weeks after the announcement) and then to execute the project (possibly up to 6 months or more).

The sections below summarise the efforts already made for a review of the inputs to the full business case and the views and recommendations of the ITF. The last subsection deals with the general approach to project management within the DRI, which would be the project manager in case the project would be delivered traditionally or the state counterpart if the PPP would be chosen for the procurement. Having a modern approach to project management is an important factor of successful project delivery.

Business case review

A comprehensive full business case review is underway. The preparation of the Terms of Reference (ToR)[19] for the review of the DK2 project (DRI 2013)[20] was already underway at the DRI when the ITF began advising MZI. The ITF was asked to comment on the proposed approach and help define the scope for the probabilistic risk estimate, which at the time was not yet included.

The ToR at the time of the review included four main tasks:

- General alignment of the full business case with the legislation, defining the structure of the document.
- Demand forecast, operational capacity of existing track, cost-benefit analysis.
- Base cost review (due diligence of calculations, prices, quantities, tasks).
- Value engineering (verification of technical solutions and/or proposed optimisation).

The view of the ITF regarding the ToR is presented below. This only covers those points where issues have been raised and/or where recommendations were made. These involve the general structure of the ToR, ensuring an outside view in the review process, the base cost review, and the probability-based risk assessment.

Streamline the Terms of Reference

The general structure of the Terms of Reference should be streamlined and tasks that do not require related fields of expertise should be separated. The current ToR should be reduced in size to focus on the

19. The ToR was based on an earlier study (MZIP 2013).

20. In Slovenia the relevant document is called "Investicijski program" (eng – "Investment programme"). Its adoption represents the formal decision to build.

immediate tasks at hand. The document presented to the ITF included long descriptions of the existing situation with references to numerous studies executed in connection with the DK2 project. It is recommended that the ToR starts with a short introduction, immediately followed by the tasks to be executed in succinct wording. The references to project background documentation should be transferred to the annex of the ToR if they are regarded as necessary for inclusion.

In terms of scope, the defined tasks of the ToR should target specialised bidders and not pursue an all-in-one bidding consortium. Demand forecasting and cost-benefit analysis are distinct fields of expertise from the review of cost and value engineering. The ITF therefore suggests that specialist advice on these two areas be sought and that they should be tendered separately. In the case of the CBA a review should be done through an international economic consultancy which specialises in these types of exercises. Similarly, there are consultancies which specialise in forecasting maritime demand. This is preferable to developing complex evaluation criteria for a single ToR, which would require the formation of diverse consortia of bidders to match the required tasks.

The order of the task execution in the ToR should follow the logical sequence of the tasks. For example, after checking the general structure of the document, the value engineering needs to be executed first (to define the preferred design), followed by a base cost review and then a probabilistic risk assessment. The demand forecast review can be done in a separate project in parallel, followed by the last project – the review of the financial and economic evaluation using the revised demand and cost inputs.

Include an outside view

Where possible an outside view should be sought. Both the project tendering/evaluation of bids and the bidding itself should avoid or minimise conflicts of interest. In terms of the tender preparation and evaluation, the DRI itself, whilst not directly involved in the preparation of the designs, acted as a supervisor. The DRI is, however, also an in-house advisor/engineering consultant on the matter to the MZI and thus should not be excluded from the tender preparation and evaluation process.

It is recommended that for this specific project a special steering committee be formed to execute the tender and evaluate the bids, consisting of the relevant DRI experts and an external expert appointed to the committee by MZI. If possible, MZI should source a senior or retired expert, who has been active in a foreign government or an intergovernmental organisation, with appropriate experience on major infrastructure projects[21].

On the bidding side, given the required local insight (such as the local laws, rules and regulations on which the design of this project is based as cited in the ToR) it is impossible to expect stand-alone foreign competition from an international design/engineering company. Instead, joint-venture consortia with a local design company are likely to bid.

What should be avoided or at least minimised are situations in which firms review their own work. For example, the purpose of Value Engineering is to take an outside view on the existing solutions, given the technical constraints of the project. The purpose of the exercise is defeated if the design bureaus which prepared the original design also prepare the value engineering study.

21. The ITF proposes that an external expert be sought for a cost review and separately for the economic evaluation. Such a step is necessarily required for the review of the maritime demand forecasting, in which DRI was not involved.

Reconsider the approach to base cost

The base cost should not be estimated on the basis of local historical data but current regional unit prices. The ITF held discussions with DRI and representatives of the lead designer on the DK2 project in forming a view on the existing base cost estimates and developing the proposed approach to the cost review. The ITF also took into account available data on past investment performance. Two important issues were identified. The unit prices[22] on which the DK2 cost estimates were made were mainly derived from tunnelling experiences in previous motorway construction. The ToR did not provide any suggestions for the approach to the cost review, while the single criterion for the choice of the preferred bidder was the minimum price. The implications of both aspects are treated below.

In preparing the cost estimates for a given project, engineers normally rely on recent past experiences or use specialised publications summarising unit price movements on the market[23]. In the case of the DK2 estimates, designers used unit prices from the tunnelling undertaken in the National Motorway Construction Programme, which began in 1995. The last relevant project was the Markovci tunnel, which was tendered in 2010. The unit prices were then inflated to current prices, using the Harmonised Index of Consumer Prices (HICP).

The unit price data being used is dated and not representative for the purpose of DK2. The analysis of Makovšek (2009, 2014) showed the motorway programme experienced large price fluctuations in addition to the presence of collusion and other factors. The average cost overrun at the investment programme stage for the period to 2007 was 19%. While there are good reasons to assume that the price levels during those years were elevated, and reflected a seller's market, the latter years were marked by an economic downturn in which it is not uncommon for firms to bid at or below their costs in order to secure cash flow; indeed the Markovci tunnel was notable for the bankruptcy of the main contractor and his Austrian joint-venture partner. Since then, there have been no major tunnelling works in Slovenia. Other more recent railway investments have all been brown-field projects, with considerably smaller capital outlays and risk (an overview is provided in Appendix 7).

The use of the HICP index to inflate past prices in the construction sector is also inadequate, as the price shifts in this sector involve a different set of products and services to the typical "consumer basket". This practice results from legislative requirements and has been previously identified by Makovsek (2009), who suggested the use of a specialised sectorial price index, similar to practice in other countries.

Given the absence of recent local tunnelling experience it is recommended that the ToR requires an estimation of tunnelling costs on the regional-European construction market. The ITF proposes that the base cost review be executed using a bottom-up approach, combined with a top-down approach by international engineering consultancies.

The bottom-up approach should determine the unit prices in other recent tunnelling projects in the region as required for the bill of quantities of the DK2 project. The bidders should present a methodology for how they will collect and use such unit price information. The proposed methodology should then form a major part of the bid evaluation process.

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22. Unit prices refer to units of inputs used in the construction for example an m3 of concrete, a ton of steel etc. In the bill of quantities, tasks are split into unit costs x quantities and all together represent the total construction phase cost of a project.

23. RS Means in North America is an example of a corporation, offering cost data services and publications (http://www.rsmeans.com/Cost-Data/)

Separately, DRI should commission a simpler top-down study, involving the comparison of tunnelling costs on other recent tunnel-intensive projects in Europe. This should be used as a broad check against which the bottom-up estimates can be compared. Additional considerations that should be taken into account and included in the ToR are presented in Appendix 8.

Outsource risk assessment

Probabilistic risk assessment can be done either by outsourcing to dedicated experts or in-house, provided such expertise has been developed. The Norwegian Public Roads Administration, for example, has developed in-house expertise[24], which is complemented by the participation of external experts, while the California High-Speed Rail Authority has outsourced the risk assessment to a private contractor.

As Slovenia currently has no in-house risk assessment capacity, ITF recommends that the probabilistic-based risk assessment for this project be outsourced. The aim should however not be to just produce risk-adjusted estimates but should be treated as input into a risk management process which is a part of the project management process[25]. This aspect does not appear to be well developed in the DRI as yet, although it is under consideration.

The existing project is already well advanced. The ITF project has given substantial attention to demand risk, the engineering is at the detailed design stage and the alignment has mainly been set, subject only to minor adjustments if a freight-dedicated solution is selected. The major remaining risks are institutional in terms of the procurement authority and endogenous to the project. The probability risk assessment should thus focus on:

- the risk, that the project is not delivered to specification (including exceeding specifications and scope creep)
- the risk that the project is not delivered on budget
- the risk that the project is not delivered on time.

The consultant should be asked to identify risks (including those related to the procurement authority) and uncertainty in terms of the 3 groups above and:

- Create a risk register following an established project management standard (e.g. PRINCE2, PMI). Box 4.2 below presents an example of the composition of a risk register.
- Make a risk response plan for the risks identified.
- Using Monte Carlo analysis, derive a risk distribution and a risk-adjusted estimate of project cost and schedule with confidence levels stated.
- A set of realistic scenarios should be devised to illustrate the occurrence of the most probable events in the risk register and develop risk mitigation/management plans.

24 . Email exchange with Norwegian University of Science and Technology, dated 13 March 2015.

25. The issue of project management is briefly treated in Table 4.1.

Box 4.2. Risk register structure in line with the PRINCE2 standard

The PRINCE2 risk register includes the following data points (those that cannot be determined now are pro forma and intended for future risk management):

- **Risk identifier** - a unique reference for every risk entered into the Risk Register. It will typically be a numeric or alpha-numeric value.
- **Risk author** - the person who raised the risk (in this case generically "external consultant")
- **Date registered** - the date the risk was identified.
- **Risk category** - the type of risk in terms of the project's chosen categories (e.g. schedule, quality, legal etc.).
- **Risk description** - in terms of the cause, event (threat or opportunity) and impact.
- **Probability**, **impact** and expected **value**.[26]
- **Proximity** - this would typically state how close to the present time the risk event is anticipated to happen (e.g. imminent, within project stage x, beyond project; standard scales should be defined).
- **Risk response categories** - How the project will treat the risk in terms of the project's chosen categories. For example: for threats - avoid, reduce, fall-back, transfer, accept, share. For opportunities: enhance, exploit, reject, share.
- **Risk response** - actions to resolve the risk, and these actions should be aligned to the chosen response categories. Note that more than one risk response may apply to a risk
- **Risk status** - typically described in terms of whether the risk is active or closed.
- **Risk owner** - the person responsible for managing the risk (there can be only one risk owner per risk).
- **Risk actionee** - the person(s) who will implement the action(s) described in the risk response. This may or may not be the same person as the risk owner.

Source : OGC 2009

The tender documentation should provide a link to documentation which provides an overview on what has already been done in terms of risk assessment.

DRI should require that the risk assessment will be done through risk workshops, following a period of preparation. The workshops should be run by a moderator with previous experience of risk assessment for major transport infrastructure projects. DRI should define the profiles of the experts that need to be present at the workshops. DRI should offer its own staff to participate at the workshops but these should supplement, but not replace, the profiles, that need to be provided by the consultant.

The Monte Carlo calculations can be executed using standard proprietary software which recognises that some (risk) events are interrelated and not independent.

26. For DRI or the contractor using the risk register, it is helpful to estimate the inherent values (pre-response action, i.e. prior mitigation and after) and residual values (post-response action).

Implement project management standards

DRI should take account of established standards for project management. Having a well-defined project organisation and a project management process is also an integral part to successful delivery of projects. This section provides a high-level perspective on these issues at the DRI, which was developed with the organisation's help.

DRI has had an established ISO9001 standard since 1999 and has introduced many of its project management principles. For example, for managing projects a project manager and team are designated, management processes are systematically organised (Plan – Do – Check – Act), audit trails established and responsibilities assigned; a predefined structure of project documentation and risk management is then in place.

However, some project management aspects are not developed to a sufficient extent or fully aligned, with what could be considered global best practice standards in project management. One of these is PRINCE2 (Managing Projects IN Controlled Environments). The standard establishes general principles, which are briefly reviewed in the table below.

In support of these principles PRINCE2 defines a range of required outputs or documents (and their content), included in different project management phases. The ITF did not review how these correspond with the existing documents required in the DRI project management process beyond the context of risk management. How the latter should be positioned in the DRI is briefly outlined in the subsection below.

Risk assessment is only a part of the risk management process, which should continue throughout the project's duration. The section on risk assessment above outlined how the tendering of a probabilistic risk assessment process could be approached and provided an example of a risk register that is much more comprehensive than the example in the DK2 investment programme (DRI 2013).

From a broader perspective the risk register and risk response plan[27] are both a part of the continuous risk management process. Guidance is available at both the institutional level (e.g., the Orange Book (HMT 2013)) and the project level (e.g. Washington Department of Transport[28]). DRI should install a risk management process which can be generically applied to all its projects. Such a process should be defined in internal DRI documents, roles assigned to personnel and the process run continuously (i.e., the risk register for D-K must not be forgotten once elaborated and must be checked and refreshed throughout the project). Figure 4.1 below provides one possible view on the risk management.

27. The DRI with the help of speleology experts for example already defined possible solutions to carst events during tunneling.

28. http://www.wsdot.wa.gov/Projects/ProjectMgmt/RiskAssessment/

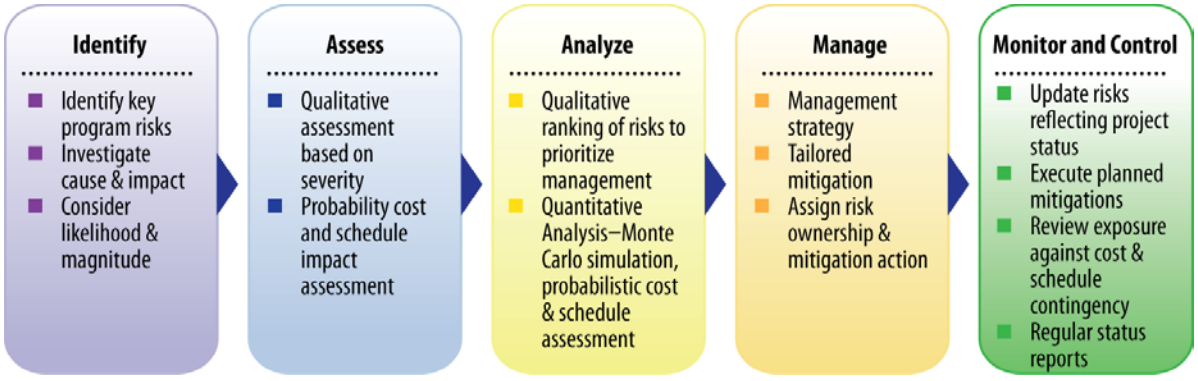
Table 4.1. **PRINCE2 principles and project management in the DRI**

No.	PRINCE2 principles[29]	Explanation
1	Continued business justification	DRI (under the current Slovene legislative requirements) only reviews the business justification before the investments are started. There is no systematic process in place to periodically review (relevant for longer lasting projects), whether the business case still holds.
2	Learn from experience	Although systematic ex-post analysis of project performance is performed, experiences appear to be retained and shared on a more informal level. A systematic process and the need to review these experiences before embarking on new projects does not appear to be in place.
3	Defined roles and responsibilities	The roles and responsibilities of the stakeholders in the project management process appear to be defined,
4	Manage by stages	Stages appear to be aligned with legislative requirements (for the preparation of different project documents). This process could be streamlined in line with the next principle and could more closely follow critical development points in the project, rather than legislative requirements, where possible.
5	Manage by exception	Tolerances in cost, time quality etc. are defined, but in terms of reporting and controlling the principle of management by exception (escalating the problem, which is expected to occur to a higher level of management) does not appear to be systematically organised as a process. Only periodical reporting is in place. This may lead to excessive (micro) management requirements at different levels.
6	Focus on products	The characteristics of the "products" (e.g. infrastructure) is defined in various legislative requirements and standards adopted by the DRI. Greater attention should however be given to the "purpose" of the product aspect (for example in the case of DK2 – should there be passenger services on the track or not and how that affects the design and cost)

Source: ITF and DRI.

29. One additional principle notes that the standard needs to be tailored to meet the needs of the project environment.

Figure 4.1. **California High-Speed Authority risk management process**



Source: CA HSPA revised business plan 2012 (2012)[30].

DRI should pursue a review of its project management approach to better align it with the international best practice. This would involve external advice from specialised consultancies. In addition dedicated DRI personnel should be trained in PRINCE2 or PMI project management techniques.

30. http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2012Ch8_RiskIDMitigation.pdf

Chapter 5. Financial participation of the state in a Public-Private Partnership solution

At present, any Public-Private Partnership (PPP) solution would require significant financial participation of the state. In principle, the DK2 project could be delivered and financed in many ways. From an economic perspective, the desired solution should maximise the economic value of the project to Slovenia. But in pursuing this goal the GoS faces two constraints: a public borrowing constraint and a current spending constraint. This has prompted it to seek a solution with private capital participation (or a Public-Private Partnership, PPP).

The GoS rationale is that under the current Eurostat rules, PPPs can be structured in a way which achieves off-balance sheet treatment (i.e. does not increase the public debt as reported to Eurostat), and they are thus also often attractive as a means of circumventing government debt constraints. However, there is an increasing consensus that PPPs should be recorded on government balance sheets to promote fiscal responsibility (e.g. Funke et al. 2013). Although this has not yet been reflected in the Eurostat accounting standards, a number of countries now publish 'whole of government' accounts which allow a full reporting of liabilities. This position is also reflected in the OECD PPP principles (2012), which clearly note, that the primary consideration in adopting PPPs is to achieve better economic efficiency.

In order to provide some perspective for the later discussion of options, this section first compares the indicative financing costs DK2 would potentially generate and compares it to the potential cost recovery from port users.

The remainder of the chapter then considers six different procurement options (including PPP). Each procurement option provides different opportunities for the allocation of risk between the public and the private party. These in turn have different impacts on the economic value of the project for the country and the accounting treatment under Eurostat guidelines and the chapter undertakes a qualitative evaluation of two of the more promising.

The financing burden

The analysis shows that the financing burden of the DK2 project will be too great to recover in the near future. This section estimates the indicative debt servicing requirements for DK2 as background for the review of PPP options. It considers the following questions:

- How much debt financing could be required to finance DK2, assuming its current estimated cost?
- How might that loan be drawn down, given the construction profile of DK2?
- What would be the borrowing cost and conditions?
- How do the annual borrowing costs compare to the existing financing capacity of Koper?
- How would the financing capacity of Koper develop under the forecast medium growth scenario?

DK2 should attract a substantial EU grant component and, if it is a PPP, possibly 10% of the cost as project equity. For the purposes of illustration, debt has been assumed as EUR 600 million out of a total project cost (excluding VAT, which would normally be a government contribution) of EUR 1.05 billion, as last estimated by the government (DRI 2014). Debt would then be drawn down progressively through the period of project construction. (An illustration of the debt draw down is provided in Appendix 9)

Table 5.1 shows the annual debt servicing requirements for a range of interest rates under typical lending conditions[31]. Any increase in the cost of DK2 would be directly reflected in the size of the debt increases and the servicing costs would increase proportionately. The interest rate of 2% is closer to the borrowing cost by the government, though this will depend on the market and sovereign risk rating at the time of borrowing. As financing risk get transferred to the private parties in a PPP the costs of borrowing will increase. For an availability-based PPP model it might be 1.5% or 2% points higher than the government borrowing rate, while the transfer of demand risk would push the cost still higher. As this would be the first really big PPP project in Slovenia and there is no track record for the lenders and investors, there might also be an additional risk premium.

Table 5.1. **Typical debt servicing requirement in the first year of operation at different interest rates, with an illustration of debt increase impact**

	Annual debt servicing requirement (million EURO)		
CAPEX assumptions (required loan increase)	Lending cost (2%)	Lending cost (4%)	Lending cost (+6%)
600 m (as-is)	49	56	72
700 m (as-is +100 m)	57	65	83
800 m (as-is +200 m)	64	74	95

Debt service by itself, whilst critically important, is not the only consideration. Loans may involve additional fees to those assumed and they also come with covenants, such as debt service coverage ratios, cash flow available for debt service and others. For example, in an availability-based model a debt servicing coverage ratio of 1.2 may be applied, while for a demand-based PPP it could go up to 2.0. Thus, if the profits of Koper were used for nothing but servicing this debt, a 1.2 debt service coverage ratio would require it to have a free cash flow of EURO 67 million each year for an interest rate of 4% p.a. (and breaching covenants risks the loan being in default).

Comparing the analysis above with the financing capacity of the port will provide an illustration of what might be sufficient. The table below summarises selected financial results of Koper from recent years. EBIT-Earnings before interest and taxes represents the disposable income to service the cost of financing and the potential return expectations of the owners.

31. 1.2% insurance on each tranche, 7 year grace period, 25 year term, interest compounded and repayments made half yearly and fixed interest rates. These tenors would normally only be available from IFIs or for sovereign (or IFI) -guaranteed loans. Appendix 8 gives the detailed repayment schedules.

Table 5.2. **Operating revenue and EBIT of the Port of Koper Group in the last 3 years**

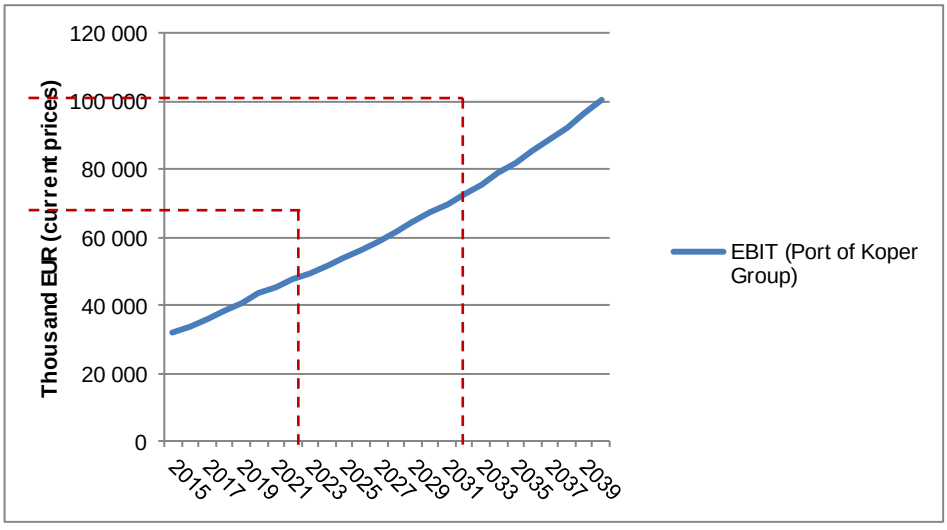
Selected performance indicators	2012	2013	2014
	EURO 000	EURO 000	EURO 000
Operating Revenue	144 360	144 235	163 602
EBIT	19 184	12 202	33 381
EBIT/Operating revenue	13%	8%	20%

Source: Port of Koper Group Annual Report, Consolidated financial statements.

The figure below illustrates how EBIT would develop through time given the following assumptions:

- a 2% price growth from the revenue base of EUR 8.5/tonne of maritime throughput in 2015 (the revenue per tonne of the port's throughput in the period 2012-2014 was EUR 8.4/tonne)
- a maritime throughput growth in line with the median forecasts in Chapter 2 (detailed in Chapter 7), and
- an optimistic EBIT margin of 20% (this margin was only achieved once in the past 10 year history of Port of Koper and was generally lower)

Figure 5.1. **Illustration of future EBIT development of Port of Koper**



The simulation suggests that the (nominal) EBIT would be about double in 2030 and would reach about EUR 100 million in 2040. By 2030, however, at a 2% p.a. price growth, the nominal estimated cost of the project would grow by about 35% as well. If a loan of EUR 900 million would be required, at 4% p.a. fixed the indicative annual debt servicing requirement in the first year of operations would reach about EUR 83 million. Given the assumptions above, the Port of Koper would be theoretically able to finance the track in 2040, if it could spend the entire EBIT to service the debt. Clearly this ignores the

fact that it would need to further finance its own capacity expansion[32] and pay a dividend to its owners. It also assumes a 20% EBIT margin would be sustainable for a very long period, which given the performance of Port of Koper in the last decade and expected increase of competition, covered in Chapter 2 appears remote. Taking this into account, the time when the Port of Koper would be able to service the assumed debt would be still further in the future.

The analysis above is indicative. While its assumptions could be tightened or relaxed within reasonable ranges, its fundamental result would not change. The likely borrowing terms can be refined once there is a clear allocation of project risks, combined with market testing by financial advisors. However, the above analysis strongly suggests it is unlikely that the project would be bankable in the near future unless the State is involved in a significant way (e.g. through either a capital grant or state guarantees or both) or the EU grants were substantially higher than assumed in the analysis.

Against this background potential options for procurement are analysed in the next two sections.

The delivery options

In conjunction with the Special Government Task Force for the Koper-Divača second rail link project (DK2), the ITF developed six options for project delivery and financing (Table 5.3)

Table 5.3. **Long list of delivery options for Koper-Divača second rail link project**

No.	Option	Explanation
1	Traditional procurement	Procured traditionally and financed through the state budget
2	Procurement/financing through an existing infra manager	Procured and financed through an existing large infra manager against its own balance sheet (e.g. DARS)
3	Availability-based PPP (for the second track)	Concessioned with the state paying annual charges for availability
4	Demand-based PPP on the second track	Concessioned with the demand risk borne by the private party
5	Demand-based PPP (for the second track and Port)	DK2 and the port are jointly concessioned with the demand risk borne by the private party
6	Demand-based PPP (port, excluding second track, which will be built traditionally)	The port is concessioned without DK2, with DK2 built traditionally, but with demand risk borne by the private party

Source: ITF and the Special Government Task Force for the DK2.

Four of these options present significant difficulties. Option 1 is not regarded as a possibility at present due to government borrowing constraints as recognised under Eurostat. These constraints are one of the main reasons for pursuing a PPP solution.

Option 2 is not viable. The existing large infrastructure managers - Slovenian Railways and the highway management company – DARS - cannot absorb an investment of this magnitude and are in any event subject to other future investment and maintenance commitments.

32. Koper will need to finance significant investments required for its own future growth (the third pier and other planned expansions), which are estimated to cost some EUR 800 million by 2030. The detailed analysis of these future investments is outside the scope of this report but they will represent a significant financial burden which will also need to be financed, or the debt serviced, from the port's EBIT.

Option 4 is also not viable. The rail user charges to be collected would be insufficient to cover any significant part of the debt servicing obligations. This is not only the case for the proposed DK2 but the entire Slovene railway network, which in 2013 earned just EUR 7 million from freight traffic on the network. It could be possible to have a special levy at the port, but this would not be under the control of the DK2 operator.

Option 6 was not pursued further, as it offers less powerful incentives to control construction risk. Options 3 and 5 were selected as the most promising, while Option 1 was retained for comparison.

The different project delivery options for the second Koper-Divača rail link differ in regard to four key characteristics:

- **Timing of project implementation:** The different delivery options have different timing consequences. A simpler procurement method will take less time, while more advanced contractual models, like PPPs will take more time. Additional capacity for rail transport to and from the port will be required at some time between 2018 and 2028, depending on the rate of growth of demand (see Chapter 2). It is clear that no procurement approach enables DK2 to be operational by 2018 but options that take more time for delivery increase the risk that the growth of the port will be inhibited by the lack of rail capacity. Implementation timing also directly affects the demand risk exposure and environmental impacts, as described below.
- **Transfer of demand risk:** The GoS may wish to transfer some of the risks associated with the use of DK2 to the private sector to provide an incentive to the private owner to maximise its competitiveness and hence maximise the port's growth potential. However, a private owner will not be able to influence demand to the same extent under all options and these differences in risk will also affect the cost of finance.
- **Recovery of financial costs:** The GoS would benefit from an improved recovery of infrastructure costs from users. Different procurement options offer the owner different charging and pricing powers (e.g. by enabling charging across road, rail or port infrastructure as opposed to just DK2 itself).
- **Transfer of construction risk**[33]**:** The GoS may wish to minimise its direct exposure to construction risks by transferring these to the private party. However, recent research has argued that transferring all construction risk to the private party may not be the best approach for government (Box 5.1). A further complication is that contracts that transfer construction risk can also be used without a PPP structure. However, contracts that do not involve money at risk, or do not involve lenders in a manner that ensures strict supervision and control, may have reduced incentives to manage construction risk or consider how construction choices affect maintenance and operations cost later.

33. The operational or availability risk, which would be transferred in any PPP, is a less challenging aspect in this case. A high-level review of the maintenance of the proposed project did not reveal any significant issues in terms of availability or maintenance efficiency. The estimated cost of maintaining DK2 (at about EUR 1.4 million p.a.) is small compared to the cost of construction, so the potential benefits from transferring this risk to the private sector are relatively small.

Box 5.1. **Exogenous project risks, risk sharing, and economic outcomes**

A common principle associated with PPPs is that the risks should be allocated to those most able to bear them. This is however not always straightforward and may also depend from project to project. The base cost of any risk transferred to the private sector will be higher than if financed through the public budget (Spackman 2004) because of incomplete capital markets, uncertainty (insufficient information on risk), and the behavioural aspects of capital market (Makovšek 2015). The ultimate cost of a transferring a risk can thus only be reduced if the private party can manage the risk or reduce its impact. Transferring risks where this is not the case will only increase the cost of financing, without yielding any efficiency improvements. In the case of construction risk, for example, the lenders in a PPP typically insist on transferring all of the construction risk to the contractor, which reduces the risk of cost overruns but increases the project cost at the outset. Risks that cannot be managed are typically exogenous (or external) risks and, to some extent, these can be mitigated through risk sharing with the state. But governments can also have an incentive avoid incurring an immediate cost, by sharing selected project risks or retaining exogenous project risks. Eurostat, for example, requires that the majority of the construction risk is transferred for it to classify a project as off-balance sheet but also acknowledges that some exogenous risks (such as archaeological conditions) need not be transferred to satisfy this condition. In the case of DK2, however, more than 60% of the project cost is associated with tunnels. Ground conditions will represent a major risk and there is a good case to classify them as an exogenous risk but it is unclear how this would be treated by Eurostat given such a large part of the project cost is involved.

These four characteristics affect four outcomes which have implications for GoS. These outcomes, which are discussed below, form the basis of the option assessment.

- Port of Koper's growth

  Increased port trade has the potential to provide net financial and economic benefits to Slovenia. The implicit assumption is that the added cost of the port trade on the Slovene hinterland infrastructure needs to be recovered as well. The shortlisted options differ in the incentives for the port operator to expand port trade.

- Bankability and the cost of financing

  Under traditional procurement (Option 1) the funds are normally provided through government borrowing; the cost of financing then primarily depends on the country's credit rating. However, if the project is delivered through a PPP, bankability and the cost of financing are key considerations; the decisions above will all influence the financial feasibility of the project or its ability to attract debt:

  Timing affects bankability when demand risk and/or the port are transferred to the private party in a PPP. The faster the port grows its volumes and revenues, the more easily it can manage its debt servicing obligations. From a bank's perspective, the risk level would be reduced and the cost of finance could be lowered.

  Transferring demand risk and/or construction risk will generally increase the cost of finance, even though such transfers also provide incentives to be more competitive. If too much risk is transferred, the project becomes un-bankable: lenders are no longer willing to finance the project. In major infrastructure projects, investors are generally wary of accepting demand risk.

EPEC (2015) for example reports, that 90% of transport PPPs in Europe did not involve demand risk transfer in 2014.[34]

- Where the project is structured to maximise cost recovery possibilities, its bankability will be improved, all other things being equal. As previously discussed, charging at the port provides a greater potential for cost recovery than charging on the railway alone.
- Eurostat classification of the project as on or off the government's balance sheet

  Eurostat applies the European System of Accounts 10 standard (ESA 10), which distinguishes between PPPs and concessions, to determine the accounting treatment of a project. Details of this distinction are beyond the scope of this report, though Appendix 10 provides an example. For simplicity, this report assumes any DK2 option with private capital participation would be treated as a PPP under ESA 10.
- Environmental impacts

  These impacts depend on the timing of project implementation. The later the project is delivered, the greater the more port throughput moving by road, producing greater negative environmental impacts.

The first three outcomes – Port of Koper growth, bankability, and Eurostat treatment – directly or indirectly affect public spending. Faster port growth means that more of the cost of DK2 can be recovered. Bankability affects the cost of finance and the potential need for state participation. Lastly, off-balance sheet treatment of the project in the short term creates an impression, that the government borrowing constraint has been relaxed (suggesting, that the "unspent" borrowing capacity to be spent on other projects. Over the long-term, however, off-balance sheet projects still incur significant costs to the government, either in terms of direct payments to the private party (such as minimum revenue guarantees or unitary charges) or in terms of revenue foregone from user charges (such as expressway tolls) which have been transferred to the private party.

If an option reduced or precluded the possibility of obtaining EU grants for DK2, this would also influence the economic value of this project for Slovenia (although not for Europe as a whole). However, as EU grants are being successfully used in both PPPs and traditionally procured projects, this possibility has not been considered further.

The evaluation of the procurement options based on these outcomes is discussed in the next section.

Option shortlist

Assessment of the shortlisted procurement options suggests the concession of the port should be bundled with the DK 2 project. Tables 5.4, 5.5, 5.6, and the summary in Table 5.7, compare the two shortlisted options (Options 3 and 5) against the traditional procurement option (Option 1).

In terms of practical execution an availability-based model would likely involve the creation of a Special Purpose Vehicle – a project company, which would enter into contractual arrangement for the delivery and operation of the second track. The demand-based model on the other hand could in principle be executed through the concession contract of the private partner (as explained earlier, preferably after the port would be reorganised in a land-lord form). The concession contract would then define the risk

34. Where demand risk is transferred, lenders often require credit enhancing measures such as a minimum revenue guarantee by the state, which protects them if demand falls short of expectations.

allocation, triggers for various investments, including the DK2 and the level of state participation in the financing of the projects and other elements. A more detailed assessment at this stage of the process is not possible as the PPP contract stipulations would depend on the detailed decisions of the state, the private partner, market conditions and numerous other factors.

Table 5.4. **Option 1 – Traditional procurement (no private participation)**

Criteria	Assessment	Score	Comment
Decisions	(relative to other options)		
Implementation timing	Very fast (start +1 year)		The fastest way to deliver DK2 if there were no financial constraints
Demand risk transfer	None (state)		
Financial cost recovery potential	Low		Although it is possible to charge users at the port (by introducing a special levy[35]) and on the track, this assessment assumes the port continues under the current management model and that the elasticity of user demand to changes in user costs is -1 due to competition from adjacent ports.
Construction risk transfer	Medium (behavioural risk)		In principle, the same construction contract could be applied in either traditional procurement or a PPP (preferably a turnkey contract with a fixed price). However, recent experience in Slovenia suggests there are significant risks of delays or cost overruns for green-field projects. In any event, the size of DK2 would present a challence in any location, due to the political and financial interest it would attract.
Outcomes			
Public spending	Very high (public borrowing)		The entire project would need to be funded by the state
Port growth (relative)	Low (organic, limited growth incentives)		The current management model in the Port is considered to be less likely to achieve long-term growth compared to the alternatives.
Bankability	n/a	-	Not relevant, bankability of this option depends on the credit rating of the state.
Eurostat treatment	On balance sheet		All risks remain with the state.
Environmental impact	Very low		Implementation is delivered faster than under other options.
	Performs poorly		Performs excellently 

35 From a business perspective a rigid levy over which the port operator has no control is sub-optimal. This is much better resolved in the demand-based PPP model, where the owner manages the cost recovery flexibly through his charging policy and can adapt the policy to market conditions and his competitive position.

Table 5.5. **Option 3 – Availability-based PPP**

Criteria	Assessment		Comment
Decisions	(relative to other options)		
Implementation timing	Medium (start +3 years)		The project would need to be structured first. In UK, a country with much PPP experience, structuring can take 18-24 months for relatively simple projects. This assessment assumes it would take about 2 years, from completion of the cost and design review project for DK2.
Demand risk transfer	None (remains with the state)		Only the construction and availability risks are transferred.
Financial cost recovery	Low (demand can't be managed)		As in the traditional procurement model.
Construction risk transfer	High (shared)		Construction risk is transferred to the private partner where this would not adversely influence the price of the project, without corresponding benefits on the cost side. Compared to the traditional delivery model the incentives to control costs should be more powerful.
Outcomes			
Public spending	High (current spending)		Under this model the state needs to pay annual charges for the availability of the track. The construction risk would also be shared, but more tightly controlled than under traditional procurement
Port growth	Low (organic only, limited growth incentives)		As in the traditional procurement model.
Bankability	Very high		The lenders are generally well protected from construction risk[36] and exposure to operational or availability risk is considered to be a less significant factor by the capital markets.
Eurostat treatment	Off-balance sheet (with high probability)		Of all the options, this model should be the easiest to classify as off-balance sheet. Risk sharing should be accommodated where necessary, to the extent possible under Eurostat provisions.
Environmental impact	Medium		The track is delivered later than under traditional procurement.
	Performs poorly		Performs excellently 

36. Based on an analysis of construction risk outcomes on 75 major infrastructure projects around the globe which have been delivered through the project finance model (PPP) (Blanc-Brude and Makovsek 2013).

Table 5.6. **Option 5 – Demand-based PPP**

Criteria	Assessment	Score	Comment
Decisions	(relative to other options)		
Implementation timing	Slow (start +4 years)		More complicated than the availability-based PPP and it is assumed that its structuring would thus take more time.
Demand risk transfer	High (shared)		Investors and lenders are generally not keen on taking demand risk. It would need to be shared with the state to ensure interest from the private sector.
Financial cost recovery	Medium (complicated)		This option has the highest cost recovery potential as it provides the strongest incentive for the port to grow and it gives full control to the private party to manage the charging at the port or on the new track (the existing track charging would also have to be taken into account). It is still unlikely that the project could fully finance itself if implemented in the near future.
Construction risk transfer	High (shared)		The caveats and the incentives are the same as in the availability-based model.
Outcomes			
Public spending	Low (minimum revenue guarantee, grant)		The cost recovery may be improved, compared to other options, but significant government involvement would still be necessary to cap demand risk exposure, share construction risk and possibly provide a grant towards the capital cost of the project.
Port growth	High		This option has the highest incentive to grow due to private investment at risk and partial exposure to demand risk.
Bankability	Medium		In terms of the construction and availability risks the situation is the same as in the availability-based model. Part of the demand risk will also need to be transferred to provide the incentive to the private partner to grow the port but this will depend on market willingness to accept risk.
Eurostat treatment	Complicated		In addition to the construction risk sharing issues in the availability-based model in this case demand risk would also need to be shared. An off-balance sheet treatment is normally not possible with a minimum revenue guarantee. There are other possible structures such as splitting the contract into a Port PPP and an availability-based DK2 PPP but accommodating these rules could significantly complicate the project.
Environmental impact	High		The track is delivered later than with either a traditional procurement or an availability-based model.
	Performs poorly		Performs excellently 

In terms of practical execution an availability-based model would likely involve the creation of a Special Purpose Vehicle – a project company, which would enter into contractual arrangement for the delivery and operation of the second track. The demand-based model on the other hand could in principle be executed through the concession contract of the private partner (as explained earlier, preferably after

the port would be reorganised in a land-lord form). The concession contract would then define the risk allocation, triggers for various investments, including the DK2 and the level of state participation in the financing of the projects and other elements. A more detailed assessment at this stage of the process is not possible as the PPP contract stipulations would depend on the detailed decisions of the state, the private partner, market conditions and numerous other factors.

Table 5.7. **Assessment of shortlisted options**

Options		Decisions				Outcomes				
		Timing	Demand risk transfer	Cost recovery	Constr. risk transfer	Public spending	Port growth	**Eurostat**	Bank-ability	Env. impact
1	Traditional procurement								-	
3	Availability-based PPP option (on the 2nd track)									
5	Demand-based PPP (port, including 2nd track)									
		Performs poorly				Performs excellently				

In terms of the overall economic value of the project Option 5 is the most promising. However, it takes the most time to organise and satisfying the Eurostat criteria for off-balance sheet treatment might further complicate the structuring of the project. The most critical condition is time. If Option 5 is pursued, the time to structure the project and six to seven years for its construction would deliver the project after 2025 at the earliest exposing Koper to a significant risk it could no longer accommodate additional rail cargo under the current arrangements.

Implementation timing is therefore a critical consideration if there is no alternative[37]. The next chapter discusses whether this is actually the case

37. If this were the case, having no established track record in major infrastructure PPP's, GoS should appoint a professional PPP project manager to recruit financial and legal advisors to GoS and manage the procurement of the project itself. The procurement process itself is described in publicly available guidelines such as the EPEC Guide to Guidance: How to Prepare, Procure and Deliver PPP Projects: http://www.eib.org/epec/g2g/index.htm

Chapter 6. Advantages of an off-port container terminal

An option which would reduce the pressure on the existing rail line from Port of Koper and delay the need for the tunnel is the development of an off-port container terminal, connected to rail, and connected to the port by a road shuttle service. Such terminals are common in many ports (e.g. Bremen) and can be expanded from a simple road-rail transfer terminal to a more comprehensive logistics centre.

The best location would be in the Divača/Sežana area, with ready access to the railway. Road transport to and from the port would be via the expressway, which has more than adequate capacity, with almost no travel on local roads.

Such terminals are generally developed in a staged manner. In terms of trans-shipment alone, a terminal with an annual capacity of 270 000 TEU (about 150 000 containers) would be adequate until 2030 and one with an annual capacity of 650 000 TEU (about 360 000 containers) would be sufficient until 2040. Such transfer terminals would typically require about 10-20 ha of area.

In addition to reducing the pressure on the existing rail line at the off-port terminal additional value added services could be offered in the longer term. Examples include warehouses for cargo consolidation, contract packaging, product re-assembly, wrapping services, over sea packaging, quality control inspections, product labelling, local delivery and shuttle services, appliance installation, etc. The variety of potential services is huge. For the port it is very helpful to support such initiatives, because they create a lot of local work places, primarily for low-skilled labour and tie the cargo more closely to the port, due to the greater service offering of the port.

The potential bottleneck in hinterland operation for Koper is competitive access to long distance rail markets. Although the optimal solution is for all rail activities to start and end in the port, in this case it is clearly a very cost intensive one. So one option is that a part of future long-distance rail cargo operations do not start in the port itself, but – for the purpose of this report – in the Divača/Sežana area, with access between the port and the terminal realised, via truck.

This concept requires a suitable area with rail access in Divača region which can be upgraded as a CFS Container Freight Station, i.e. a centre where rail-road transfer operations will be performed. This will be a fenced area with a small office building, a paved ground and container storage facilities. For ground operations a reach stacker would perform the heavy lifts, with standard fork lifts undertaking the supporting tasks.

This remote terminal in Divača will receive containers from the port by road which would then be stored temporarily and then loaded on rail to e.g. Austria, Hungary or Slovakia. The concept would work in the opposite way for export containers: a train from e.g. Budapest would terminate in Divača, the boxes unloaded and carried from Divača to the port proper by road.

Such a concept has the advantage that the unavailability of DK2 would no longer be an immediate bottleneck for port growth while the capital investment would be much more closely matched to the current level of demand. A remote terminal concept as an interim solution should be able to handle some 700 000 TEU; under the Base demand scenario, this would provide capacity for container demand in excess of the current line capacity until well past the end of the next decade.

The remote terminal would be complementary to the existing rail operations and is intended to handle the anticipated growth in container traffic. Non-container traffic, such as bulk commodities, vehicles and wagon-load traffic such as timber would continue to operate to and from the port as it is does at present.

There is ample capacity on the Koper-Divača expressway for the required road vehicles under normal circumstances. 700 000 TEU is equivalent to about 450 000 container (20ft and 40ft), assuming the current TEU-factor of 1.6. Although some 20ft containers can be carried as two containers on a single truck (which will reduce the number of truck loads), a conservative analysis in which they are all carried separately would imply an additional 1 200 vehicles trips per day on average between the terminal and the port[38]. Table shows that the expressway will have ample spare capacity for many years for this additional traffic.

A two-track terminal should be able to handle up to 12 trains each way daily at 60 TEU/train; this would be 80% of the slots for a 540 metre train. As the terminal is not foreseen as a storage depot, the longest time a container will stay is possibly two days, with an average stay of one day. The initial storage capacity of the terminal would thus need to be 1 500 to 2 000 TEU with a throughput of 500 000 TEU p.a. For such a terminal a dimension of 600 by 200 metres or 12 hectares is realistic.

Most of the cost of such a terminal is the land and the pavement; the latter typically costs EUR 120 per square metre. In addition, there is the cost of fencing, an office, a lightweight shed for the equipment together with the cost of the handling equipment and road vehicles. The rail infrastructure would comprise about 2 000 metres of track plus switches in the terminal plus track and signals for access to the main line). The total costs should not exceed EUR 50 million, depending on land availability.

A remote terminal in the Divača region will create space for the port to expand and demonstrate that long-term growth forecasts are feasible and realistic. It should be operated as an integral part of the port i.e. users should be indifferent as to whether their traffic moves through the port itself or the terminal. This means the port should absorb the additional cost of the road transfer and terminal handling, although some can be recovered by charging rail operators for their use of the remote terminal as they will avoid the costs of operating on the existing line.

ITF estimates that through additional handling costs the cost of loading in the off-port terminal is EUR 25 per container over and above the costs incurred in the port[39], which includes a margin of 10% for the terminal operator. The port is also assumed to pay the road operators who transfer the traffic, for which an additional cost of EUR 65 per container is assumed.

Rail operators would have lower costs if they used the off-port terminal, estimated at EUR 8 per container. This could be captured by the port through the use of a terminal access charge, thus making rail operators indifferent as to whether they operated via the terminal or the port proper. Netting off this

38. As the terminal should handle both import and export containers, most vehicles could be expected to be loaded in both directions. In addition, many countries now allow higher-capacity vehicles (such as the so-called Canadian B-doubles) for movements such as this which are fixed routes on high-capacity roads; this would reduce the number of trips (and the associated cost) still further. In addition, in terms of immediate environmental impact for such short trips electric trucks may be coming to the market in the coming decades (http://www.cnet.com/news/bmw-puts-a-40-ton-electric-truck-on-the-road/).

39. ITF assumes the current port charge per container is about EUR 120 per container.

potential revenue, the off-port option would represent a net increase of about EUR 82 per container, which the port would need to absorb. These extra costs, which would be spread over the total throughput of the port, would only affect the increment of container traffic which is over and above the capacity of the current track rather than the total container throughput of the port. In 2030, for example, under the Medium demand scenario about one-eighth of the container throughput (200 000 TEU or 125 000 containers) would use the off-port terminal, at an additional cost to the port of about EUR 10 million.

Compared to the cost of servicing the debt incurred in constructing DK2 it is a small amount. This is examined further in the next chapter.

Chapter 7. Economic and financial evaluation

This section considers the economic and financial analysis of two proposed options. Option 1 involves the construction of the DK2. Option 2 involves the construction of an off-port terminal on the top of the karst scarp and transporting containers there by road for onward transhipment by rail. These are compared with a base case which assumes no investment in providing additional rail capacity and instead allowing traffic to divert to other ports. Both options have been assessed in economic and financial terms and, in the financial case, distinguishing the costs and benefits to Slovenia from the costs and benefits to hinterland countries.

The assessment has a conventional structure. It separately identifies the costs and benefits to users (i.e. freight consignors and consignees), operators or producers (railways, road and port) and third parties (externalities such as noise, accidents, greenhouse gases (GHG) etc.). These impacts are assessed using standard methods with the externality impacts largely based on the most recent estimates developed by CE Delft for the UIC (CE Delft et al. 2011).

Assessing options and demand outcomes

The analysis adopts the growth rates for container and non-container traffic given in Table 7.1.These are consistent with the forecasts developed in Chapter 2 with demand forecast to reach 31 mtpa by 2030 and 37 mtpa in 2040.

Table 7.1. **Demand growth rates (% p.a.)**

	Low		Medium		High	
	Containers	Other	Containers	Other	Containers	Other
2014-20	4.8%	2.3%	8.0%	2.3%	9.9%	2.9%
2021-30	2.0%	1.9%	3.0%	1.9%	4.1%	2.2%
2031-40	1.3%	1.0%	2.2%	1.0%	3.3%	1.0%
2041-	1.3%	1.0%	2.2%	1.0%	3.3%	1.0%

Three options for handling this traffic were analysed. In the base case rail traffic to and from Koper is constrained to a physical limit, initially set at 16 million net tonnes p.a. (as discussed in Chapter 2) As this limit is reached, non-container traffic is assumed to continue to use rail while container traffic is progressively diverted to other modes and ports. Based on the results of tests using the National Transport Model (NTM), 15% of this diverted traffic is assumed to remain at Koper but to be transported by road. The remainder is assumed to divert to adjacent ports (mostly to Rijeka and Trieste but a small

proportion to the Northern European ports) and transported to and from final origins and destinations by rail[40].

Under Option 1, modal choice is assumed to be unchanged from the present because the second track is built and ample rail capacity to and from Koper is available.

Under Option 2, an off-port terminal is assumed to be developed at Divača/Sežana. As in the base case, container traffic is progressively diverted from rail at Koper but is transported by road between the port and the off-port terminal and carried by rail for the remainder of its trip. This option assumes this is done at no additional cost to the user, the cost being absorbed by the operators.

Demand in 2020, 2030 and 2040 for land transport to and from Koper for each of the three cases under the Medium demand scenario is summarised in Table 7.2.

Table 7.2**. Forecast demand for rail and road transport to and from Koper, in thousand tonnes**

	Base (do nothing)	Option A (DK2)	Option B (off-port terminal)
		2030	
Rail			
Existing rail	16 000	8 807	16 000
Tunnel	0	8 807	0
Off-port	0	0	1 613
Other port	1 371	0	0
Road	12 282	12 040	12 040
Total	29 653	29 653	29 653
		2040	
Rail			
Existing rail	16 000	10 745	16 000
Tunnel	0	10 745	0
Off-port	0	0	5 489
Other port	4 666	0	0
Road	15 658	14 834	14 834
Total	36 324	36 324	36 324

40. This is similar to the assumptions made in the Feasibility Study of December 2014.

Under the base case, 4.3 million tonnes of potential rail traffic has diverted to other ports by 2040, while 0.8 million tonnes has remained at Koper but diverted to road. Under Option A, all potential rail traffic is transported using the existing route and the tunnel. Under Option B, in 2040 5.5 million tonnes is transhipped to the off-port terminal.

Identification and quantification of impacts

The impact of the different options was estimated by comparing the financial and economic benefits and costs of each option with those incurred in the base case. These benefits and costs were estimated as the product of the various physical activities associated with each option (e.g. net tonne-kilometres (ntkm) carried by road) and the unit revenues and costs per ntkm of rail freight transport. In general, the unit costs adopted are based on typical European figures, to allow for expected convergence of Slovenian rates to average European rates over the medium-term. Detailed discussion of the underlying assumptions is given in Appendix 12.

User impacts

Under the base case, users would find that they were unable to use rail for traffic to and from the port and would either transfer to road or divert to another port, creating dis-benefits for users. These were estimated using the analysis described in Chapter 2. This showed an increase of around 1-1.5% in the Slovenian rail tariff, equivalent to about EUR 0.11 per tonne, would result in a 1% reduction in rail traffic. The forced reduction in rail traffic, and associated disbenefits, when the existing line reaches capacity can thus be related to an equivalent increase in rail tariffs.

In Option A, the tunnel provides ample capacity and there are thus no dis-benefits from diversion. The transfer in Option B is assumed to be an intra-port movement which would not be visible to or affect the customer and would thus also create no user disbenefits.

Operator impacts

Under the base case, traffic will divert to other ports and to road from Koper instead of rail. Traffic diverting to other ports will affect:

- Shipping lines; in practice most ships will divert to either Trieste or Rijeka, with 5% assumed to continue to Northern European ports.
- Koper; the port will lose traffic and its revenue and costs will thus reduce.
- Other ports; these will gain traffic and their revenue and costs thus increase.
- Rail operators; rail operators from Koper have reduced revenues and costs, as will the infrastructure authorities. Rail operators to and from the other ports will gain correspondingly.
- Road operators; road operators to and from Koper will gain some additional traffic under this option.

Compared to the base case, in Option A there will be a no costs associated with shipping and other ports for the diverted traffic. Koper will handle more traffic and thus have greater revenues and costs. Traffic will return to rail from road and this will lead to reduced revenues and costs for road operators and road/expressway authorities. There will be a corresponding increase in rail revenue and costs from Koper and this will also be significantly shifted from non-Slovenian operators to Slovenian operators.

Under Option B, use of an off-port terminal will affect:

- Koper through additional handling costs and the cost of the road transfer.
- Rail operators; the line haul task will be slightly reduced compared to Option A.
- Road operators who transfer traffic between the port and the terminal on behalf of the port.

Impacts on third parties

Impacts on third parties include:

- Road congestion; this has been estimated directly using Slovenian traffic volume data and the volume-delay relationships for expressways in the 2010 Highway Capacity Manual (road congestion is relevant for the 10% of the increment traffic that would end up on roads in case insufficient rail capacity was available – Chapter 2 provides further detail).
- GHG emissions; derived-based on standard emissions for road and sea transport. Electric rail transport emissions are based on Slovenian data for electricity-created GHG emissions. Construction-related emissions have only been included for the tunnel option.

All other impacts have been estimated using the CE Delft figures derived in 2011 for UIC[41]. These cover:

- accidents
- noise
- upstream and downstream impacts
- nature and landscape
- biodiversity losses
- soil and water pollution
- urban effects.

Capital costs and economic costs

The capital cost of the base case is taken as zero. In practice, the diversion of traffic from Koper will allow some capital expenditure to be deferred but this has been allowed for in the operator costs as an equivalent annual saving per tonne of freight diverted.

The capital cost of the Option A is taken as EUR 1.2 billion, including contingencies but excluding VAT. This is assumed be disbursed over a six-year period prior to opening.

The capital cost of Option B has been taken as EUR 50 million, excluding VAT and land cost. This is conservatively assumed to be disbursed over a three-year period prior to opening. The economic costs

41. These follow the same principles as those derived in the HEATCO and IMPACTS studies but have been updated to 2008 values.

used in the economic comparisons are based on the financial costs by excluding taxes[42] and including subsidies. Detailed analyses of costs were not undertaken but VAT was excluded and economic costs taken as 90% of financial costs.

The analysis separately identifies the costs and benefits accruing to Slovenia and those accruing to other countries. This is done on a cost by cost basis, as summarised in Figure 7.2.

Limited economic benefits of the logistics chain

General net economic benefits of the logistics chain in Slovenia are small for a variety of reasons. The evaluation considered the different costs and benefits over the period 2015-2052 for each of the base case and the two options. It derived a Net Present Value (NPV) by discounting the stream of annual costs and benefits to 2015 at 7% p.a. for the economic evaluation and 4% p.a. for the financial evaluation. The net benefit of each option was then derived by comparing it with the base case.

The evaluation does not include any benefits associated with economic multipliers. In general, these are only relevant when comparing undertaking a project with an alternative of no investment at all; however, whenever there is a choice of projects the impact of, say, an investment multiplier will only vary to the extent that one investment involves a greater or lesser proportion of locally-sourced inputs. This is beyond the scope of the current analysis.

Benefits of an off-port terminal

The "do nothing" option is not far worse than the off-port terminal due to significant disbenefits Slovenia incurs through handling transit traffic. Table 7.3 summarises the economic evaluation results for a range of opening dates for Option A and Option B. These are expressed as Net Present Values in 2015 EUR, discounted at 7% to 2015.

Table 7.3. **Economic Net Present Value of options, in EUR million 2015**

	Opening date of tunnel/terminal			
	2025	2030	2035	2040
	Net benefit of option compared to base case			
Option A (tunnel)	-536	-332	-199	-115
Option B (off-port)	-7	3	10	13

42. However, there are also certain taxes that attempt to internalise externalities and therefore may more accurately reflect real resource costs (such as the taxation of cigarettes).

If no facility is built (base case) there are disbenefits due to the diversion; two-thirds of these are related to increased hinterland road traffic, broadly corresponding to its share of the traffic through Koper.

The NPV of Option A progressively improves (although still remaining negative) the longer the construction of the tunnel is postponed, as the cost is deferred and the operating disbenefits from diverting to other ports are relatively minor. The off-port facility (Option B) has slightly larger disbenefits than the base case if constructed by 2025 but by 2030 has become the better option in economic terms, and this advantage increases as the construction date is deferred.

From an overall economic viewpoint, Option A is an expensive proposition. Figure 7.1 shows the composition of the economic costs and benefits of the two options. The green columns are benefits, the red columns are costs and the black column is the net result. The tunnel option shows a net discounted disbenefit of EUR 536 million, as in Table 7.3. Users gain a benefit of EUR 56 million as they can now use the port and mode of their choice; railways operating to and from Koper incur additional costs from carrying the tunnel rail traffic while railways to and from other ports save costs as traffic returns to Koper.

Shipping saves a small amount as traffic is no longer diverted to other ports and road operations also reduce cost as traffic moves back to rail. Koper incurs additional costs but this balanced by the savings at other ports. Finally, the reduction in road traffic generates savings in externalities such as accidents, congestion and greenhouse gases. Detailed figures are given in Table 7.4.

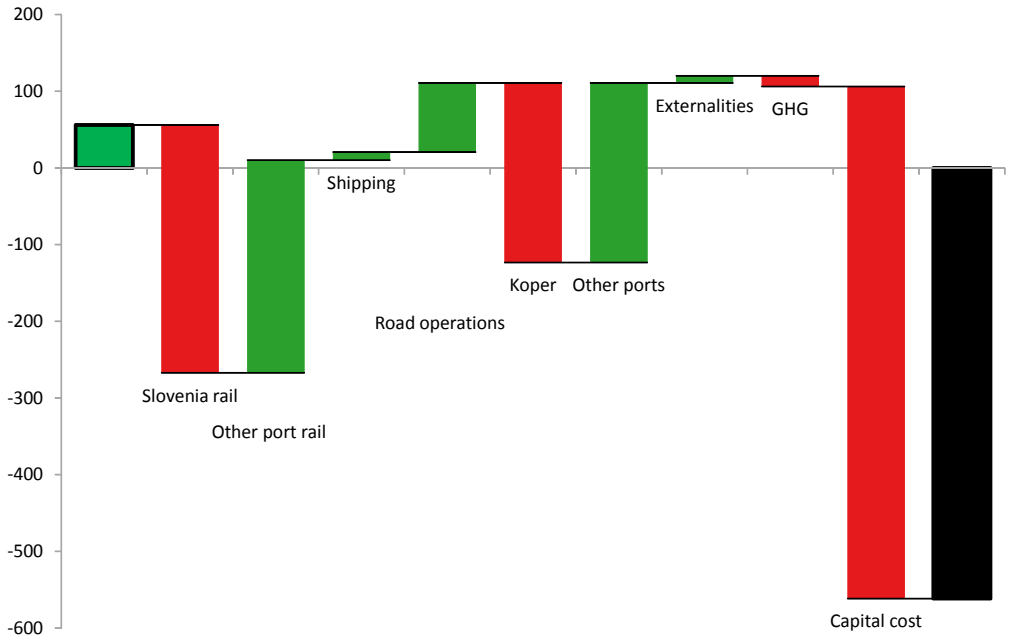
The recurrent costs and benefits (user benefits, operator costs and GHG/externalities) are EUR 132 million for Option A and EUR 19 million for Option B, reflecting the additional cost of the road transfer operations compared to rail operations through the tunnel. However, this difference is dwarfed by the difference in discounted capital cost of EUR 643 million.

User benefits are the same in both options. Rail operations are similar, with Option B slightly more expensive[43]. Shipping and port operations are the same as no potential traffic is diverted in either case. However, the port incurs additional costs for the transport and operating associated with the off-port terminal in Option B. The difference in GHG and externality savings is relatively minor between the two options. Option A GHG costs are greater because of the emissions incurred during construction, which heavily outweigh the emissions from the road transport in Option B to and from the terminal.

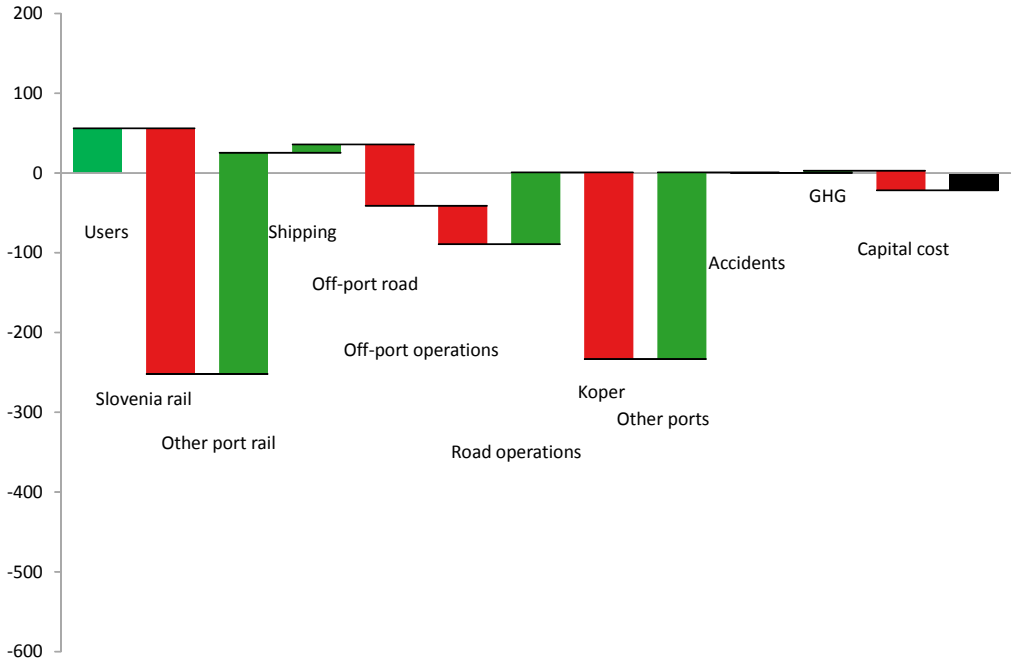
43. This is because of the extra distance associated with the assumed location of the terminal. However, this difference would probably disappear with a more detailed analysis, as no allowance has been made for the additional traction power required to climb to Divača.

Figure 7.1. **Economic costs and benefits of tunnel (upper graph) and off-port (lower graph) options**

OPTION A



OPTION B



Note: Tunnel opening 2025, EUR 2015 discounted at 7% to 2015

Financial evaluation of alternatives

A financial evaluation gives similar aggregate results and does not suggest a different ranking of alternatives. Figure 7.2 shows the incidence of the difference for each option of the financial costs and benefits, discounted at 4% again for opening dates of 2025. As in Figure 7.1 the green columns are net benefits and the red columns are net costs. In all cases, the figures are the aggregate financial margin (i.e. the difference between revenue and marginal cost) for each mode.

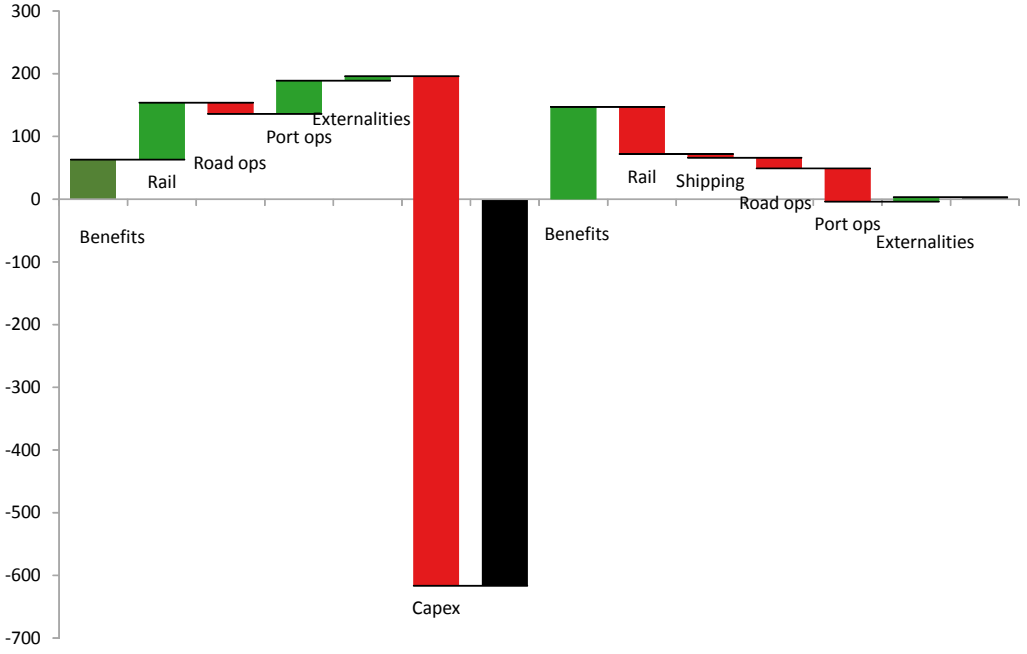
Users gain benefits in both options as they are able to use their preferred mode at their preferred port, with rail having lower tariffs than road. However, as about 70% of traffic is transit traffic, these benefits are greater for non-Slovenian users than for Slovenians. Rail operators based in Slovenia have a small net gain as a result of traffic not diverting whilst operators based outside Slovenia have a small net loss. Shipping operators, all assumed to be non-Slovenian, incur a small net loss under both options. Road operators incur larger losses as traffic moves back to rail in the options but, in Option B, this is largely offset by the loss of road traffic to and from the off-port terminal, all of which is assumed to be carried by Slovenian operators. In Option A, Slovenian ports make a surplus as traffic returns to them, with non-Slovenian ports making a loss. Under Option B, Slovenian ports also make a financial loss as they have to absorb the cost of the additional road transfer. Under both options there is a net reduction in road operations and thus a reduction in the financial cost of accidents.

The capital costs fall on Slovenia; although the tunnel might be partially financed with EU grant funds, these have been treated as if it was Slovenian money as this money could presumably be redirected to TEN-T corridors in Slovenia and used there.

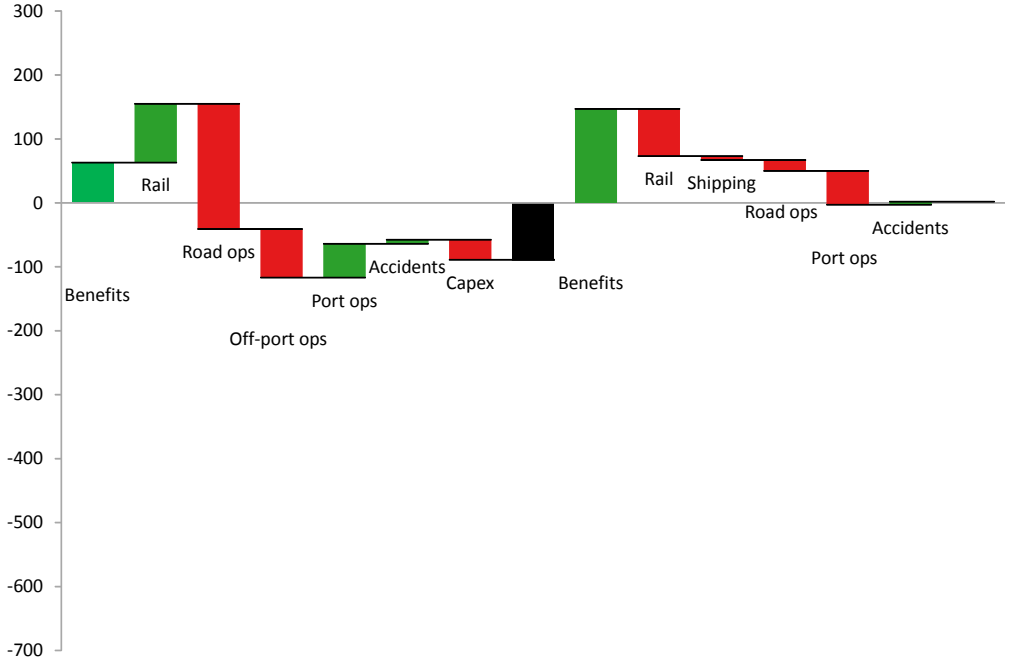
Figure 7.2. **Incidence of financial costs and benefits**

EUR 2015 discounted at 4% to 2015, medium demand scenario

OPTION A



OPTION B



The net result is that, under Option A, Slovenia incurs a financial loss in terms of the discounted NPV of over EUR 600 million[44], while hinterland countries break even. Under Option B, Slovenia incurs a loss of about EUR 90 million, while hinterland countries break even[45].

Testing the robustness of the evaluation

Testing confirms the robustness of the financial and economic evaluation. The results are robust against a wide range of sensitivity tests. Option B remains the preferred option on the basis of the economic NPV in all cases. The disbenefit of Option A under the High demand case (with a forecast of 35 mtpa in 2030 and 45 mtpa in 2040) is sharply reduced and it becomes economically justified (at 7% pa) by 2040 but by the same measure Option B is justified in 2025. Under the Low demand forecast (26 mtpa in 2030 and 31 mtpa in 2040) Option A is not justified for many years; Option B is justified around 2040.

Table 7.4. **Sensitivity tests of Options A and B**

(EUR 2015 million discounted to 2015, 2025 openings; medium demand)

Test	Economic NPV (discounted at 7% p.a.)		Financial NPV (discounted at 4% p.a.)	
	Option A	Option B	Option A	Option B
Base Case	-536	-7	-611	-86
High Demand Forecast	-341	52	-362	-103
Low Demand Forecast	-637	-23	-747	-56
25% at Koper/75% divert	-489	40	-541	-16
EUR 100/container transfer cost	-536	-53	-611	-192

Sensitivity tests on the proportion of traffic not diverting to other ports under the Base Case (and thus travelling by road through Slovenia) show Option B is justified by 2025. However, increasing the assumed container transfer cost to EUR 100 per container has little effect on the relative standing of the two options; a transfer cost of EUR 500 per container would be required to make Option A economically superior to Option B (although neither would be close to being justified).

44. To offset the NPV of 600 million for Slovenia with EU grants, at a discount rate of 4% and assuming equal annual disbursement, Slovenia would have to secure about 758 million in EU grants. At the assumed capital cost of EUR 1.2 billion for the tunnel, this implies over 60% of EU co financing. Even if achievable, it should be demonstrated, that there are no other investment alternatives where the EU funds would be better used (i.e. the NPV or other metrics would be higher/better).

45. These figures cannot be directly reconciled to those in the economic analysis because of the different discount rate used in the financial analysis.

Chapter 8. Concluding remarks

In this report, the ITF executed a broad risk analysis of the DK2 project and investigated its procurement options. The initial analysis worked under the assumption that the DK2 is an economically preferred solution to the hinterland rail capacity constraints of Koper.

The economic outcomes of the DK2 are inextricably linked to Koper, which is the sole reason, why the investment is being considered. Thus, the demand analysis of the DK2 is in principle a demand analysis of Koper. The demand forecasts for the region have been verified. However, the analysis has shown that there is little room to expect that the past competitive situation in the region, which has enabled Koper to grow, will persist indefinitely. If nothing changes, a state-owned port will be facing private, commercialised terminal operators in an increasingly competitive market. The study developed three demand scenarios, the high one was consistent with Koper (2 MTEU). The ITF does not consider that is achievable, without commercialising container operations. Most of the ports in Europe have already commercialised their activities and allowed private participation in terminal operations.

The demand related risks are by far more relevant than other DK2 considerations on the cost side. There, although moderate cost savings are possible on the design, the current cost estimates are more likely to be underestimated rather than overestimated.

At the margin, the demand or cost considerations change little, if a PPP option is to be pursued for the delivery of the DK2. A self-financing PPP option does not exist and some form of public finance involvement will inevitably be necessary. The obvious reason is a huge difference between the "financial" size of the port and the required capex of the DK2. But there may be other reasons to pursue a PPP. The GoS may want to achieve an off-balance sheet treatment due to budgetary commitments and Eurostat requirements. This would probably be relatively easy to achieve with an availability-based PPP. It would however not change anything with regard to demand risk. A more recommendable path would be to pursue a PPP, where the port is part of the scheme and some of the demand risk is transferred (in line with the commercialisation suggestion above). Regardless of the path chosen, the impact on the public finance would be substantial, whether on- or off- the balance sheet.

If the project as such does not have a business case, does the country as a whole have one? The economic and financial evaluation has clearly shown this is not the case. Slovenia recovers too little money at the port and at the road and rail infrastructure. At best Slovenia breaks even in terms of road and rail infrastructure and rail operations. Hence, larger throughput at the port does not translate into bigger economic and financial benefits for the Slovene taxpayer. As about 70% of the port's throughput is transit, the majority of net benefits actually go to other countries.

The economic evaluation does not consider potential multiplier effects. This is because the objective of economic evaluation or standard investment appraisal is to compare alternatives. In these alternatives multipliers over different alternatives cancel out[46]. In any country there will always be more alternatives or other investments proposed than there is money available. Thus, if the money would not be spent on

46. In practice these multipliers will depend on the distribution of project cost between local and foreign firms.

DK2 it would be spent on another alternative, which may well have a better financial outlook and have multiplier effects as well. Because Slovenia already has a mature transportation system there is also no case to consider transformative effects on the Slovene economy or wider economic benefits due to the DK2.

In principle the DK2 creates a large but costly increment of capacity to be filled, exposing the country to a sizeable demand risk, i.e. the risk that the investment will never be recovered in the decades to come. A more prudent approach would be to pursue an alternative solution one provides additional capacity in smaller increments or is scalable. Such an alternative is the off-port terminal, which has a far better chance of achieving positive net benefits in the less distant future. It can also be expanded as needed, until the DK2 is economically and financially justified. The off-port terminal capex or the operational cost are not prohibitive and would not impact the financial results of the port in a major way.

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Appendices

Appendix 1. Overview of Port Management Models

In practice, a variety of factors influence the way ports are organised, structured and managed; these include the political system and socio-economic framework, historical structures, the cargoes handled (bulk or general cargo/container), the competitive situation as well as size and access to hinterland markets. In its Port Reform Toolkit, the World Bank notes (WB 2007):

"Four main categories of ports have emerged over time, and they can be classified into four main models: the public service port, the tool port, the landlord port, and the fully privatised port or private service port. These models are distinguished by how they differ with respect for such characteristics as:

- Public, private, or mixed provision of service.
- Local, regional, or global orientation.
- Ownership of infrastructure (including port land).
- Ownership of superstructure and equipment (particularly ship-to-shore handling equipment, sheds, and warehouses).
- Status of dock labour and management.

So called "Public Service Ports" and "Tool Ports" mainly focus on the realisation of public interests. Landlord ports have a mixed character and aim to strike a balance between public (port authority) and private (port industry) interests. Fully privatised ports focus on private (shareholder) interests".

Service and tool ports with their dominating public character in the definition of the World Bank **(**Table A.1) represent large government influence and control. Landlord ports have a mixed character between public and private interests. And directly opposite to tool ports are private ports with their dominating private industry influence. Table A.2 provides an overview about the four basic port systems or port management models.

Table A.1. **Basic port management models**

Type	Infrastructure	Superstructure	Port Labour	Other functions
Public Service Port	Public	public	public	majority public
Tool Port	Public	public	private	public/private
Landlord Port	Public	private	private	public/private
Private Service Port	Private	private	private	majority private

Source: WB 2007; adjusted by ITF.

100% governmental controlled public service ports are as rare as 100% fully privatised ports. However, historically there have been many more public controlled ports then today. During the 1970's and 1980's there were worldwide trends to commercialise the public port business and to transfer

the public-dominated port system into a mixed public/private system. UK and in New Zealand (both island countries with many competing ports) fully privatised several ports during this period, but such decisions have been considered in most countries of the world as an extreme version of privatisation.

Each of the four mentioned models has strengths and weaknesses. In particular, the historically dominant public and tool ports like Koper do not meet many objectives of growing market economies. They tend not to:

- provide services which are efficient and cost-effective from the port users' perspective
- respond to changes in cargo-handling technologies
- respond to the changing requirements of the port users
- provide choices of services and foster competition
- make timely capital investment to improve efficiency and expand capacity
- generate the funds needed to finance investments
- enforce labour discipline in the face of strong trade unions.

Koper as it is organised is a tool port; i.e. a port that is organised and managed by public institutions, and with limited participation of private/commercial interests. The four different port management models are further described in the table below and the rest of this section.

Model 1 - Public service port: Public service ports have a predominantly public character. The port authority of a public service port performs the entire range of port related services required for the functioning of the seaport system, as well as that of owning the entire infrastructure. This means that the port authority owns, maintains and operates every available asset (fixed and mobile) and cargo handling activities are executed by labour employed directly by the port authority. Some ancillary services can be left to private companies. Public service ports are usually controlled by (or partly controlled by) the Ministry of Transport (and/or Communications), and the Chairman (or Director General) is a civil servant appointed by, and/or directly reporting to, the relevant Minister. The port authority is commonly a branch of a Ministry and most of the employees are civil servants.

In some public service ports, the cargo handling activities are carried out by a separate public entity often referred to as the 'cargo handling company'. Such public companies usually report to the same Ministry as the port authority.

To have public entities with different and sometimes conflicting interests reporting to the same Ministry, and which are forced to cooperate in the same operational environment, represents a challenge. For this reason, the port authorities and cargo handling companies of some ports were merged into one single entity.

Public service ports are generally seen as less efficient. Therefore, the number of public service ports in Europe and in the US is limited. Many ports in developing countries (approximately 70%) are public service ports. Most of the public service ports are smaller ports.

Model 2 - Tool port: Similar in every other aspect to a public service port, the tool port differs only in the private handling of its cargo operations, although the terminal equipment itself is still owned by the port authority. In the tool port model, the port authority owns, develops and maintains the port

infrastructure as well as the superstructure, including cargo handling equipment, such as quay cranes and forklift trucks. Port authority staff usually operates all port authority-owned equipment.

Table A.2. **Port management models characteristics**

Public Service Ports	
Ports like:	Nampho/N. Korea, Puerto Cabello/Venezuela, Nouakchott/Mauretania
Characteristic:	• Infrastructure and Superstructure planning and operation is in the hand of the state • managed like a public department • no private port operation • normally smaller ports

Tool Ports	
Ports like:	Chittagong/Bangladesh, Dakar/Senegal, Koper/Slovenia
Characteristic:	• an independent public body is responsible for the port • independent from other ministries • small private operators • often a mix between state and municipal management • many ports “in transition”

Landlord Ports	
Ports like:	Rotterdam/Netherlands, New York/USA, Singapore
Characteristic:	• Infrastructure in the hand of the municipal government • superstructure private (planning and financing) • public port authority and private terminal operators • public and private power is balanced • main organisational structure in Northern Europe

Private Ports	
Ports like:	Felixstowe/UK, Nordenham/Germany, Tauranga/New Zealand
Characteristic:	• both infra- and superstructure is in the hand of private companies • no (or limited) public influence (e.g. for planning, financing) • normally not universal ports • often work ports with concentration on one product (e.g. coal import for a power plant)

Source: Sorgenfrei 2013.

However, other cargo handling on board vessels as well as on the apron and the quay is usually carried out by private cargo handling firms contracted by the shipping agents or other principals licensed by the port authority. In the past, these companies tended to be small, with few capital assets and activity fragmented over many participants. Their costs were almost entirely variable. The cost of under-utilisation of port facilities was usually absorbed by the port authority, which minimised the risk for the cargo handling companies. The lack of capitalization of the cargo handling companies constituted a significant obstacle to the development of strong companies that could function efficiently in the port and be able to compete on an international level.

The above-mentioned division of tasks within the tool port system clearly identifies the essential problem with this type of port management model, namely the split of operational responsibilities that leads to operational inefficiency. Whereas the port authority owns and operates the cargo handling equipment, the private cargo handling firm usually signs the cargo handling contract with the ship-owner or cargo-owner. However, the cargo handling firm is not able to fully control the cargo handling operations itself. To prevent conflicts between cargo handling firms, some port authorities allow operators to use their own equipment (at which point it is no longer a true tool port). In several cases, a tool port is a transitional stage between a public service port and a landlord port. With a volume of approximately 20 million tonnes of cargo in 2015 and the ambition to grow in future, Koper as tool port can be identified as port in transition as well. This has also been the case for the Autonomous Ports or "Port Autonome" in France (a typical public driven tool port system) that have recently been converted in 'Grand Ports Maritimes', i.e. landlord ports.

Model 3 - Landlord port: The landlord port is characterised by its mixed public-private orientation. Under this model the port authority is the owner of the basic seaport infrastructure and acts as both the regulatory body and landlord. Meanwhile, private companies supply port operations (especially cargo handling) as services for clients. A key role for many port authorities is that of the landlord with the responsibility of managing the real estate within the port area. This management includes the ownership, the economic exploitation and long-term development of the land and the upkeep of basic port infrastructure such as fairways, berths, access roads, bridges and tunnels. However, other infrastructure, particularly terminals, is leased to private operating companies and/or to industries such as refineries, tank terminals and chemical plants. The most common form of lease is a concession agreement where a private company is granted a long term lease in exchange for a rent that is commonly a function of the size of the facility as well as the investment required to build, renovate or expand (e.g. land reclamation and quay wall construction).

The private port operators provide and maintain their own superstructure, including buildings (e.g. offices, sheds, warehouses and workshops). They also purchase and install their own equipment on the terminal grounds (e.g. quay cranes, pumping stations and conveyor belts) as required by their business, with a view to maintaining the operating standards. Dock labour is employed by private terminal operators, although in some ports part of the labour may be provided through a port-wide labour pool system.

Biggest advantage of the landlord model is that the power in decision making in and for the port is balanced. Public and private stakeholders share responsibilities and commitments for the success of the port. At present, the landlord port is the dominant port model in larger and medium sized ports in Europe and North America. Clear examples of landlord ports are Antwerp and Rotterdam in Europe, Los Angeles and New York in the US, and the port of Singapore in Asia.

Model 4 - Private port: Full privatisation means that the State no longer has any meaningful involvement or public policy interest in the port sector. In fully privatised ports (which often take the

form of a private service port), the port authority is entirely privatised with almost all of the port functions being under private control with the public sector retaining a standard regulatory oversight. Despite this, public entities can be shareholders and gear the port towards strategies that are deemed to be of public interest. In these ports, the real estate of the port is privately owned (contrary to the situation in other port management models). This requires the transfer of ownership of such land from the public to the private sector.

The risk in this type of arrangement is that land can be sold for carrying out activities that are neither related to the port nor to maritime transport. Therefore, port land is usually sold to private parties with a mandate that the facilities retain their maritime role. In addition, along with the sale of port land to private interests, some governments may simultaneously transfer the regulatory functions to private companies. For example, in the United Kingdom, in the absence of a port regulator, privatised ports are essentially self-regulating.

Fully privatised ports are few in number and can be found mainly in the United Kingdom (e.g. Southampton) and in New Zealand.

Table A.3 shows the management models adopted in a range of European ports which are comparable with Koper.

Table A.3. **European Sea Ports, comparable in size with Koper**

No.	Port**	2012[2]	2013	2014	Organisational Model[3]
1	Tarragona	33 218	28 006	8 782	LL+PA
2	Cartagena[1]	30 099	29 374		LL+PA
3	Nantes Saint-Nazaire	29 867	27 612	26 443	LL+PA
4	Bilbao	28 953	29 601	30 820	LL+PA
5	Sines	28 563	36 514	37 583	LL+PA
6	Huelva[1]	28 506	26 370		PSP
7	Dublin	27 999	28 839	30 849	TP/Con
8	Livorno[1]	27 418	27 953		LL+PA
9	Gdansk	26 901	30 257	32 277	LL+PA
10	Ghent	26 302	25 955	25 887	TP/Con
11	Venezia[1]	25 349	24 411		LL+PA
12	Rostock	22 803	23 045	26 109	LL+PA
13	Las Palmas	22 391	19 418	20 067	PSP
14	Ravenna	21 460	22 486	24 460	PSP
15	Rouen	21 160	22 382	21 671	PSP

No.	Port**	2012[2]	2013	2014	Organisational Model[3]
16	Napoli[1]	20 038	20 391		LL+PA
17	Gijon	17 128	17 768	18 897	LL+PA
18	Leixoes	16 615	17 186	18 090	LL+PA
19	La Spezia	15 438	15 546	15 747	LL+PA
20	Piraeus1	15 283	15 799		PSP
21	Thessaloniki	14 515	12 984	14 407	TP/Con
22	Ferrol	13 695	12 506	13 051	LL+PA
23	Santa Cruz de Tenerife	13 682	12 278	11 683	PSP
24	Savona Vado[1]	13 311	13 442		LL+PA
25	La Coruna	12 824	11 405	11 610	LL+PA
26	Civitavecchia[1]	11 480			LL+PA
27	Lisboa	11 075	12 031	11 852	LL+PA
28	Fredericia	10 907	10 651	9 380	TP/Con
29	Helsinki	10 831	10 530	10 816	PSP
30	Brindisi[1]	10 108			PSP

Notes: (1) no full dataset for three years available in ESPO

(2) Ranking by volume 2012; ports with 10 to 30 million t; in 1000 t

(3) LL+PA = Landlord model with public Port Authority and Private operator

PSP = Public Service Port

TP/Con = Tool Port with Concession

Source: ESPO, ITF.

Appendix 2. Case study: Hinterland strategy of the Barcelona Port Authority (APB)

A hinterland strategy has two main elements: an analysis of the cargoes available in the relevant markets and an approach to competing for the volumes. In the case of Koper, the first element includes the potential volumes that could be diverted from Northern European ports and the cargo volumes out of the NA region. The second element is directly linked to the performance of Koper. Similar ports have been successful in approaching new hinterland markets as demonstrated in a case study of the Port of Barcelona discussed below.

The global logistics market is changing frequently, new hot spots are on the rise and supply chains are continually redesigned. Koper thus faces a number of strategic, tactical and operational issues:

- Where are the new hot spots in the European hinterland?
- Which markets or market segments are being developed?
- What can be offered as logistics solutions for the changing business cases?
- What is the competition doing? What is our position?
- How to facilitate the interests of key stakeholders?
- How to attract new potential port users in this changing landscape?
- What drives existing clients and how can their needs be anticipated to retain and expand their business?

Strengthening its competitive position and focussing on individual market segments should be one of the Koper´s top priorities in the new 2016-2020 port development strategy. The goal of this strategy should be to capture the benefits provided by intermodal road and rail transport to feed the inland terminals that serve agglomerations.

The case of Barcelona

The Port of Barcelona is Catalonia's largest port and ranked under the top 20 container port in Europe. Although the Port of Barcelona was recognised as one of the most important ports in the Mediterranean, seeing the potential risks of dissolving boundaries of its port hinterlands and competitive ports' activities engaged over its hinterland.

Instead of adopting a wait and see approach, APB started to implement a proactive development strategy to manage and expand the port's hinterland. Researchers observed that the active involvement of APB in managing its location splitting of port-hinterland strategy has successfully attracted a substantial growth in container volumes from distant hinterlands and improving the accessibility of the port.

APB's old strategy

Despite the beneficial location of Barcelona to serve distant regions in Spain and parts of France, APB was traditionally focused on serving the immediate hinterland (Catalonia) by using road transport. Consequently, APB's old strategy tended to focus on the development of the local port area and play a minor role in the development of port hinterlands. The old strategy persisted until Spain commenced the port devolution process, which led the APB to rethink its future development strategy. Finally, it

favoured a more logistics-driven development approach, and APB started to extend its development objectives to the interest of the port into that of the hinterland.

APB's new strategy

It took courage for APB to take an active approach in developing its hinterland connections. In fact, there were many experts who relied on the old strategy, for example, opining that captive hinterlands are diminishing and port competitiveness has become largely dependent on changes in the logistics environment, which are out of the control of port authorities. Researchers from the old camp argue that port authorities should stick with their orientation from the seaside, and be limited to the traditional role as a landlord, and they lacked the experience and it would be costly to acquire the experience and know-how to take up the new role of becoming a port-hinterland network managers.

Port authorities can create a platform in which various stakeholders are brought together to identify and address issues affecting logistics performance. A role, which goes beyond the role of landlord, would be the development of strategic relationships with other transport nodes. Just like the private sector, port authorities can strengthen their position in the market through the tightening of the relationships with inland centres, for example, through investments in inland terminals or distribution facilities in inland port areas. A port networking strategy focused on inland terminals might enable port authorities to tackle the problem of diseconomies of scale in the port in the form of congestion, lack of space etc.

The corridors towards the inland terminal network, in fact, create the necessary margin for further growth in seaborne container traffic. These inland terminals acquire an important satellite function with respect to the seaports, as they help to relieve the seaport areas of potential congestion.

Mission statements

APB made gradual shift rather than one bold step in taking up its new role. It started with its mission statements. In 2003, the mission of APB was "to contribute to the competitiveness of the port's customers by providing efficient services that respond to their needs for maritime transport, land distribution and logistics services."

Six years later, APB changed its mission to "to lead the development of the Port of Barcelona, generate and manage infrastructures and guarantee reliable services to contribute to the competitiveness of its customers and create value for society."

The 2009 mission statement is much broader and includes the changing role of APB from a reactive position (contribute to the competitiveness) into a proactive position (to lead the development).

Activities

APB implemented its activities in a well-organised manner. Before APB started the heavy investment in developing the intermodal connections, it started with the promotional activities and customer services.

The heavy investments were planned only if the beginning steps were being successfully implemented. The flow of activities is in the following orders:

- promotional activities
- investments in logistics facilities (i.e. container depot, rail terminal and logistics zone)

- investments in developing rail shuttles.

The aim of all these activities and investments in the hinterland has only one single focus: attracting additional traffic to Barcelona.

Although the promotional activities constitute the least amount of investment in financial terms, APB saw it as a high priority. If the promotional activities did not carry out well, the entire plan lacked a firm foundation. APB invested in people that could promote Barcelona in the hinterland and acquire knowledge about the difficulties, help resolving difficulties and providing information regarding customs procedures, logistics service providers, use of port information systems and other logistics related aspects. The representatives conducted studies to review potential new geographic markets.

In summary

Koper as well as Barcelona or any other seaports can be viewed as a two-sided platform, with shipping lines on one side and hinterland transport companies on the other side. Therefore, any investment on one of these two sides can make the platform stronger. Then, one relevant strategic question to be asked is: Which side of the platform should be a receiver of the investment? For APB, the answer was to invest in the land side. By making the port better accessible from the hinterland, the return on investment could be realised by the existing port area through attracting additional shipping lines and volumes. What the priorities for Koper are cannot be answered in this demand risk study, but should definitely be addressed in Koper´s new 2016-2020 strategy.

Appendix 3. Container volumes in key Northern European ports 2000-2014

Table A.4. **Container volumes at Rotterdam, Hamburg and Koper**

	Koper		Rotterdam		Hamburg	
	Container in 000 TEU	2000 = 100	Container in 000 TEU	2000 = 100	Container in 000 TEU	2000 = 100
2000	87	100	6 290	100	4 248	100
2001	93	107	6 120	97	4 869	115
2002	115	132	6 506	103	5 374	127
2003	126	146	7 144	114	6 318	149
2004	153	177	8 292	132	7 003	165
2005	180	207	9 287	148	8 088	190
2006	219	253	9 653	153	8 862	209
2007	306	353	10 791	172	9 890	233
2008	354	408	10 784	171	9 737	229
2009	343	396	9 743	155	7 008	165
2010	477	550	11 146	177	7 900	186
2011	589	680	11 880	189	9 000	212
2012	571	658	11 866	189	8 900	210
2013	600	693	11 621	185	9 229	217
2014	674	777	12 298	196	9 700	228

Appendix 4. Ports in the Mediterranean

The figures below show which big ports in container trade already exist, i.e. which could be potential competitors.

Table A.5. **Major Mediterranean container ports, 2013**

Global Rank	Port	Country	TEU 2013 in million
30	Algeciras	Spain	4.50
31	Valencia	Spain	4.33
34	Port Said	Egypt	4.10
39	Ambarli	Turkey	3.38
43	Piraeus	Greece	3.16
44	Gioia Tauro	Italy	3.09
50	Marsaxlokk	Malta	2.75
55	Tanger Med	Morocco	2.56
72	Genoa	Italy	1.99
77	Barcelona	Spain	1.72
89	Alexandria	Egypt	1.51
95	Mersin	Turkey	1.38
96	Haifa	Israel	1.36
99	La Spezia	Italy	1.28

Notes: Shaded areas are ports of Eastern Mediterranean.

14 out of the Global Top 100 container ports are located in the Mediterranean; this is a relatively high agglomeration in such a small region of the World. This underlines how important the Mediterranean container market is, and how large the volume is. The ports underlined with light blue colour are all located in the Eastern part of the Med.

Port Said East Port Container Terminal, managed by APMT (Maersk Group) is the largest container hub in Eastern Med, and for sure a relevant port that needs to be considered by Koper

Management. This either as competitor, because most of the 4.1 million TEU are transhipment container, but also as potential partner in a supply chain concept, being Port Said the hub port for the Mega vessels, and Koper the destination port for Central and Eastern Europe.

Ambarli is the major port for the Istanbul region and has only limited potential as competitor for Koper. Transhipment volumes in Ambarli are mainly heading into the Black Sea Region. With this, Ambarli should not be considered as relevant competitor or SCM partner.

Piraeus port is actually under heavy political influence. The former Greek government announced a privatization project for the port, and Chinese COSCO-Group as well as Maersk APMT are potential bidder, but actually all plans are under hold with the new government. But however, Piraeus like Port Said has the potential to act as partner; i.e. for major Chinese trade volumes, transhipped with Mega-vessel to Piraeus and further on with the new size of 3 000 to 5 000 TEU Feeder Vessel up to Koper. But Piraeus could also be seen as relevant competitor with relevant transhipment volumes. What the position finally will be depends on Koper´s partnership strategy.

Gioia Tauro is a pure transhipment hub and has – similar to Algeciras in West Med – nearly no loco-potential. With this, Gioia Tauro also has the potential as partner or competitor, depending on the strategy. But Gioia Tauro in the past faces a lot of operational problems and has seen up´s and down´s frequently. The management of the port is closely linked to Contship Italia (majority owned by Family Batistello – and Cecilia Batistello, the CEO, is married with Thomas Eckelmann, 50% owner of Eurogate Container Terminals). This set up will probably not really support a joint strategy with Koper. They would more likely prefer to go with La Spezia or Ravenna in order to build supply chains to Central and East Europe, because both ports also belong to the Contship Italia Group.

Marsaxlokk Freeport Container Terminal has like Port Said a fantastic location at the Far East-Europe trade line with nearly no deviation. This makes it a preferred transhipment hub. The French line CMA-CGM´s subsidiary is managing the port, and this with a focus as hub for Northwest Mediterranean. Similar strategy could work for Central and East Europe via Koper. This is why the management should consider Marsaxlokk as a preferred partner for Koper.

Alexandria has a relatively high loco quote and only limited volumes in transhipment. Same is true for **Mersin** is the upper north-east of the Med; here is also only local transhipment relevant. Same for **Haifa** in Israel, where there are also no huge container volumes for long distance transhipment are visible.

Appendix 5. Ports in Greater Northern Adriatic region

Trieste is the port with highest cargo throughput in this region; 56.1 million tonnes of cargo in 2014. As nearest port to Koper and with facilities capable of serving the largest vessels with natural draughts up to 18 metres, a comparable accessibility, good road and rail connections, proximity to the rapidly growing economies of Central and Eastern Europe, Trieste is an efficient and competitive free port of call and for sure an important competitor to Koper. The analysis of cargo by sectors reveals (2014 compared with 2013):

- crude oil and other liquid bulk: 42 400 849 tons (+0.97%)
- dry bulk: 790 057 tons (-19.92%)
- general cargo (intermodal and conventional traffic): +2.62%
- container: 506 011 TEU (+10.34%)
- trucks and other intermodal traffic units on Ro-Ro ships: 297 194 ITU (+9.46)%.

With this structure as major port concentrating on liquid bulks, Trieste is for sure a very strong competitor in this sector. Due to the existing relations of Trieste to its customers and the variety of services Trieste could offer for its mainly Italian clients, it would make not much sense that Koper focusses on competition with Trieste in the liquid bulk sector.

Exactly opposite is the situation in container trade. It´s a well-known fact that Trieste had made only very little progress in opening new hinterland markets and still today is on a relatively low level. In Container trade the position of Koper is stronger already today; this is why it is recommendable for Koper to focus on containers. Similar is true for vehicles, but on a lower level.

Rijeka port is also relatively close to Koper, but only represents a volume of 9.0 million tonnes and with a cargo structure dominated by liquid bulk, too (2014 compared with 2013):

- liquid bulks: 4 882 695 t (- 4%)
- dry bulk: 1 610 630 t (+69.9%)
- general crago:1 162 782 t (-18,0%)
- container: 192 004 TEU (+13%).

Especially for the interesting container segment, Rijeka is not a real competitor. Since many years the port tumbles between 100 and 200 000 TEU, and a clear strategy is not visible, yet. This may change with new rail hinterland activities that have been announced, but is not an immediate concern. Over the lifetime of DK2 its competitive position will almost certainly change.

This is different in **Venice**; although today the cargo structure looks similar to Trieste and Rijeka:

- liquid bulks: 6 889 980 t (- 30.6%)
- dry bulk: 7 001 983 t (+7.7%)
- general crago:7 887 095 t (-0.4%)
- container: 456 068 TEU (+2.2%).

Venice has a clear focus of attracting more container from Central and East Europe via its terminals. This includes a strategy to develop hinterland container trade and a new container terminal in the port with following character:

- 1 400 000 TEUs/year at the beginning
- 1 400 m of quayside
- about 90 ha surface.

This facility shall be the starting point for a more aggressive sales and marketing initiative with focus on transhipment cargo via Venice. Access channels to the Port of Venice (now at 11 m) will be dredged to a depth of 12 m to enable access to larger ships. This fact and the location of the port at the end of the access channel via the narrow "Bocca di Malmocco" bottleneck is the disadvantage of Venice, and on the other side places Koper in a better position for long distance calls with big vessel. As noted, if/when the new off-shore terminal will become operational, this will change as well.

Ravenna in Italy is a port with relatively long distance to Koper, and so not that much of direct interest for loco cargoes. In addition, the port of Ravenna is like most of the other NA ports concentrated on local supply of liquid and dry bulk cargoes, and has a limited number of container trades. In addition, like Venice, Ravenna has limited draft and so limited capacity for general cargo/vehicles/container trade. This is why Ravenna should not be considered as real competitor for Koper. The cargo structure in 2014 compared with 2013 looks like follows:

- liquid bulks: 4 425 573 t (+0.2%)
- dry bulk: 10 120 015 t (+3.1%)
- general cargo: 9 914 566 t (+20.1%)
- container: 222 548 TEU (-1.8%).

The relatively strong position in dry bulk comes from the local agribusiness. The container volumes are since nearly 10 years swinging around the number of 200 kTEU and a new strategy is not visible yet, but may be included in the Contship Italia/Eurogate strategy in future. This needs to be observed.

The port of **Chioggia** south-west of Venice has experienced, in the past few years, an interesting phase of development, thanks to the recent structural and logistical renewal by ASPO[47], the special Company of the Venice Chamber of Commerce. In addition to being the main fishing port of the Veneto region, with a large and busy market, it has reached a level of productivity and competitiveness compared with other small Adriatic ports. 2013 wasn't a remarkable year for the port as the total movement of goods recorded 1.6 million tons, a decrease of -16.1% compared with the previous year. Chioggia is definitely not a competitor for Koper.

Monfalcone at the very north of the Adriatic, and approx. 20 km north of Trieste, handled in 2014 approx. 4.5 million tons of various goods: China clay, coal, cellulose, cement, grains, timber, plant systems, various bulk minerals, stone products, steel products, iron scrap. The port is specialised in general cargo and dry bulk cargo, with experience in specific commodities, but has no big relevance for destinations in the far hinterland. With approx. 400 TEU pa the port is also not of interest as competitor for Koper.

47. ASPO = Azienda Speziale per il Porto di Chioggia is a regional development initiative of the Venice Chamber of Commerce. Details can be found here: http://www.portodichioggia.it/operatori/aspo/statuto.htm

Appendix 6. Koper throughput forecast in the DK2 feasibility study

The forecasts, prepared for the December 2014 feasibility Study appear to have been strongly influenced by the MDS study. The forecasts have been prepared as part of the National Transport Model, and are summarised in the table below.

Table A.6. **Feasibility study forecasts for Koper**

	Without second track	With second track
2020	25.0	27.0
2030	29.5	33.5
2040	33.5	42.5

Source: Pavšek et al. 2014.

Appendix 7. Review of recent experiences in rail construction in Slovenia

The ITF has attempted to collect some data on the recent performance of recent rail infrastructure projects in terms of on time and on budget delivery (construction risk). All the recent projects are brownfield and relatively smaller projects and as such not comparable to the DK2 in type, risk or size. The actual cost are as reported by the MZI and have not been transformed to the same price level as the estimates.

Table A.7. **Recent rail infrastructure projects in Slovenia – selected facts**

Project	Estimate price level	Estimated cost in the Full Business Case (TEUR; fixed prices, excl. VAT)	Actual cost (TEUR; excl. VAT)	Scheduled		Actual	
				Start	Finish	Start	Finish (expected)
A	B	C	D	E	F	G	H
Electrification and reconstruction of the Pragersko-Hodoš track section	Jul-11	201 335	216 379	May-11	Sep-15	Jan-13	Mar-16
Level crossing construction at the Pragersko-Hodoš track section	Apr-12	110 722	119 973	Apr-13	Jun-15	Jun-13	-
Modernization of the existing **Divača**-Koper track section	Jun-12	166 887	171 766	Nov-09	Dec-14	Sep-09	Mar-16[a]
Upgrade of the Dolga Gora-**Poljčane track section**	Nov-11	36 432	28 879	Jul-12	Dec-13	May-14[b]	Dec-15
Upgrading of the Slovenska Bistrica-Pragersko track section	Nov-12	30 123	21 180	Mar-14	Jul-15	May-14[b]	Aug-15
Upgrade of the Slovene rail network with GSM-R	Jun-11	120 889	120 810	Dec-12	Jun-15	Sep-13	Feb-16

Notes: a) Reported data expects a finish in the first 6 months of 2016 – a middle value was chosen.

b) Contract signature date

Source: MZI.

Appendix 8. Some considerations that should be included in the ToR and used by the bidders

Both the top-down and the bottom-up approaches should attempt to take into account the circumstances of the data that would be collected.

In this context, it would be useful to record and take into account the following necessary components:

- number of bidders (at the project, from which the prices are sourced, giving a view on the competitiveness of the winning bid)
- amount of cost increase given the initial contract (the larger the increase, the lower the representativity of the prices)
- the project owners should be interviewed in terms of the behaviour of the contractor (in terms of the potential scope adjustments to the project during construction/pressure from variations demands by the contractor)
- letting contract type (DBB, DB, DB/turnkey) should be reported (DB/turnkey will be most expensive – the price will be more representative, as there is less options to claim variations; DBB will be cheaper with more options for variations).

If relevant from the perspective of the mix of local labour and materials used, the cost/unit prices of comparable peer projects should be corrected for Purchasing Power Parity or another more appropriate index, to achieve a closer match with Slovene price level.

If several project examples from different contract types are sourced, the simulation results for the DK2 should be presented separately, using each contract type.

Lastly with regard to the process of data collection, if necessary, the MZIP should offer help to the contractor in making contacts with other (government) owners of similar projects.

Appendix 9. DK2 loan drawdown illustration

The table below illustrates how a loan drawdown might proceed in the project. The actual structure would depend on the availability of EU grants, possible grants by the state and other aspects. That being said, changing the drawdown distribution will not change the outcomes of the related debt servicing analysis.

Table A.8. **Construction pace of the project and a loan drawdown illustration**

(in EUR 000)	Year							Total
	1	2	3	4	5	6	7	
Construction pace	48 952	105 654	210 632	249 296	170 337	228 634	36 796	1 050 000
Loan drawdown	50 000	100 000	200 000	250 000	-	-	-	600 000

Source: DRI 2014, ITF.

Appendix 10. Eurostat, risk allocation and accounting treatment

Eurostat distinguishes also between PPPs and concessions. Both can be on- or off- the balance sheet. Eurostat's distinction between PPPs and concessions is to enable national accountants to differentiate between different contractual arrangements in order to apply the correct statistical rules. The table below provides an illustration how the classification is derived.

Table A.9. **EPEC summary of Eurostat distinction between PPPs and concession contracts**

No.	Question	Yes	No
1.	Is the contract a long-term contract (by convention, at least Five years) between a government entity and a non-government partner (private or public company. Special Purpose Entity-see section III B)?		
2.	Does the long-term contract define: i) specifically designed fixed assets, requiring an initial capital expenditure; ii) the delivery of agreed services, which require the use of those assets; and iii) qualitative and/or quantitative standards for the assets and services?		
3.	Is government the main purchaser of the services supplied by the partner? In other words, is government paying (on a Periodic or irregular basis) all or most (over 50%) of the Revenues received by the partner under the contractual arrangement?		
4.	Are the majority of the partner's revenues under the Contract sourced from the final users of the service?		
5.	Does the contract refer to a new asset or the significant refurbishment, modernisation or upgrading of an existing asset owned by government?		
6.	Does the major part of the partner's revenues come from the direct sale of services to third parties on fully commercial conditions?		
7.	Does the contract foresee any payment from the partner to government?		
8.	Is the project a PPP?	The project is a PPP project in statistical terms if the answer to each of the questions 1, 2, 3 and 5 is "yes".	
9.	Is the project a concession	The project is a concession project in statistical terms if the answer to each of the questions 1, 2 and 4 is "yes". Questions 6 and 7 are not decisive, but indicative of a concession.	

Source: EPEC 2014.

In principle the Eurostat accounting treatment is binary. A PPP or a concession is either on the government balance sheet and a part of public debt or not, though in practice, the rules whether the project is on the government balance sheet or not, require the classification of risks and their allocation in the procurement of the project. At a basic level a project is considered to be off the balance sheet if the majority of risks have been transferred to the private party. If the major risks are summarised in demand risk, availability risk and construction risk, that means two out of three need to be with the private partner. In practice, determining the accounting treatment may be very complicated, especially if some public finance participation is necessary, possibly combining risk sharing arrangements, government guarantees or grants and market revenues to improve project bankability.

Appendix 11. International examples for remote logistics centres

Remote facilities that support the cargo handling activities in ports can be found in many parts of the world. In the United States for example, many ports concentrated rail operations outside the ports, and here it is – like e.g. in Savannah, Georgia – often the case, that each of the big class-1-railroads have their own terminals. It doesn´t really matter whether the rail terminal is 5, 15 or 50 kilometres away from the port. The handling costs occur anyway, and the operational concept is similar. This concept is widely in use, if not to say: that what one often faces in Europe, that the rail operations are included in port terminal operations, is the exception in the US. This concept they call "on-dock-railway", and it is something not widely used.

A concept similar to the one proposed above in order to "buy time" for Koper can be found in Valparaiso, Chile. Although the main driver here was not a second rail track but the congestion on the container terminal, but the concept realised, called ZEAL Zona de Extensión y Apoyo Logístico, is similar.

Figure A.1. **Valparaiso ZEAL Zona de Extensión y Apoyo Logístico**

Source: Puerto Valparaiso.

The port was limited in growth, and because of the fact that the city limits didn´t allow that the port area could be extended, some of the function of Port Valparaiso have be relocated to a remote terminal, the ZEAL. This allowed the port to continue to grow, and due to the fact that some functions have been concentrated in ZEAL terminal, the port was no longer hindered in growth. Trucks shuttle between the

terminals and a new southern access road, so that also possible congestions in the city could be avoided. As the figure shows, the ZEAL created a fast and powerful link to the port, but on the other side ZEAL is also the main access point for containers coming to Valparaiso region. Due to the intermodal situation in Chile, the longer distances will not be realised via rail, but the concept is similar[48].

In Germany one can find one of the largest Logistics Center in Europe with a size of 500 ha, the so called GVZ Güterverkehrszentrum Bremen. This Center is located approx. 30 km away from the main Bremerhaven Container Terminal and functions as consolidation centre for the port. The GVZ connects road and rail business as it could be identified on the left side in the picture below; for this it has six parallel rail tracks for complete trains on its yard and sufficient truck holding areas. Again, the concept her is also slightly different from Koper-Divača, because the Container Terminal Bremerhaven (not to see on the picture below) has so called "on dock rail" access, but for the huge numbers of container cargoes, the GVZ Bremen is a concept similar to the one proposed for Koper.

Figure A.2. **GVZ Bremen**

Source: GVZ Bremen.

48. For more info about Valparaiso ZEAL: https://www.youtube.com/watch?v=z1PcHPdMsko

Appendix 12. Unit costs and revenues adopted in value for money analysis

User Impacts

Under the Base Case, users would find that they were unable to use rail for traffic to and from the port and would either transfer to road or divert to another port. The impact of this was assessed by comparing it to the impact on demand of an increase in rail tariffs. Tests using the National Transport Model suggested that increases of 20% and 30% in the Slovenian rail tariffs generated reductions of 25% and 48% respectively in rail tonnages to and from the port. Of this about 90% diverted to other ports and 10% remained at Koper. A 1% reduction in rail traffic would thus result from an increase of around 1-1.5% in the Slovenian rail tariff, equivalent to about EUR 0.11 per tonne. This was used as the basis for estimating the user benefit of Option A compared to the Base Case, in any given year, of the elimination of any diversion through lack of rail capacity. This benefit is net of any difference in user costs through using alternative modes and routes.

Compared to the Option A, Option B is assumed to have no user impacts, as the transfer would be an intra-port movement which would not be visible to or affect the customer.

Operator impacts

Under the Base Case, traffic will divert to other ports and to road from Koper instead of rail. Traffic diverting to other ports will affect:

- Shipping lines; in practice most ships will divert to either Trieste or Rijeka, with a difference in distance of either an additional 4 nautical miles or a saving of about 35 nautical miles. Some traffic might be diverted to Northern European ports, an additional 2000 nautical miles. The analysis has adopted a net increase of 85 nautical miles (160 km) on the basis that 5% of the traffic continues to Northern European ports and the remainder splits equally between Trieste and Rijeka. Shipping operator revenue is based on a rate of EUR 0.50/ntkm, with operating cost assumed at EUR 0.40/ntkm.
- Koper; the port will lose traffic and its revenue and costs will thus reduce. Koper's revenue includes port dues (taken as EUR 0.70/tonne) and container handling (EUR 12/tonne). The port dues include a substantial capital element and the avoidable cost is assumed at EUR 0.30/tonne. The cost of container handling is taken as EUR 10/tonne, comprising EUR 5/tonne of operating cost and EUR 5/tonne of capital cost.
- Other ports; these are assumed to have the same revenue and cost structure as Koper.
- Rail operators; rail operators from Koper have reduced revenues and costs, as will the infrastructure authorities. Rail operators to and from the other ports will gain correspondingly. All operators are assumed to have the same revenue and cost structure, earning EUR 0.03/ntkm with avoidable costs of EUR 0.025/ntkm including access charges of EUR 0.003/ntkm. In Slovenia, the infrastructure operator only receives 20% of its total costs from passenger and freight access charges. The analysis assumes usage-related costs are around one-third of the total costs, or the equivalent of about 0.05c/ntkm. Similar contributions from government exist in neighbouring countries and these values have been adopted for all operators. In Option A, the average rail distance to and from Koper decreases by 10 km; the average rail distance for traffic diverted from Koper is the same as for Koper, assuming the 5% of traffic through the

Northern European ports travels an extra 1 000 km, while the 95% diverted to Rijeka and Trieste travels 50 km fewer on average[49].

- Road operators; road operators to and from Koper will gain some additional traffic under this option. Operating revenues are taken as EUR 0.06/ntkm and operating costs as EUR 0.055/ntkm. The operating cost excludes the cost of the vignettes and tolls charged for expressway use, estimated as EUR 0.01/ntkm for traffic to and from the port. The marginal damage to the road is taken as EUR 0.005/ntkm, the remainder of the toll being to contribute to capital costs.

Compared to the Base Case, in Option A there will be a no costs associated with shipping and other ports for the diverted traffic. Koper will handle more traffic and thus have greater revenues and costs. Traffic will return to rail from road and this will lead to reduced revenues and costs for road operators and road/expressway authorities. There will a corresponding increase in rail revenue and costs from Koper and this will also be significantly shifted from non-Slovenian operators to Slovenian operators.

Under Option B, use of an off-port terminal will affect:

- Koper through additional handling costs; the cost of loading in the off-port terminal is assumed as EUR 25 per container[50] over and above the costs incurred in the port, which includes a margin of 10% for the terminal operator. The port is also assumed to pay the road operators who transfer the traffic.
- Rail operators; their unit costs and revenues are assumed to be the same as in Option A.
- Road operators who transfer traffic an assumed 40 km between the port and the terminal; revenue is assumed to be EUR 65/container transferred, including lift-on and lift-off, with a margin of EUR 5/container.

Third parties

Impacts on third parties include:

- Road congestion; this has been estimated directly using Slovenian traffic volume data and the volume-delay relationships for expressways in the 2010 Highway Capacity Manual. The estimated incremental delay from an additional road vehicle has been converted into costs using values of time-based on the Slovenian average wage (EUR 8.97/hour for business/work travel and EUR 3.14/hour for non-business travel in 2015), increasing over time in line with assumed income growth of 2% p.a.
- GHG emissions; derived based on standard emissions for road and sea transport. Electric rail transport emissions are based on Slovenian data for electricity-created GHG emissions. The unit cost of GHG emissions was assumed as EUR 25/tonne in 2015, increasing to EUR 65/tonne in 2050.

49. For example, Trieste is 20 -50 km closer to many destinations than Port of Koper and Rijeka is 70 km closer to Budapest and Kosice.

50. The mix of containers is taken as 60% 40’ and 40% 20’ containers; one container is therefore equivalent to 1.6 TEU and has an average net of 16 tonnes.

All other impacts have been estimated using the CE Delft figures derived in 2011 for UIC[51]. These cover:

- accidents
- noise
- upstream and downstream impacts
- nature and landscape
- biodiversity losses
- soil and water pollution
- urban effects.

Third party impacts are summarised in Table A.10. The CE Delft costs were expressed in 2008 EUR. As many are related to perceptions, they can be expected to increase over time in line with average incomes. They have thus been projected forwards in line with average incomes of 2% p.a. The exception is air pollution from heavy goods vehicles. Since the early 2000s, increasingly stringent regulations (Euro V and Euro VI) have been introduced to control the emissions of particulates, the principal cause of the costs of air pollution from trucks. Future average emissions are likely to be no more than 30% of those in 2011 and the air pollution cost of trucks has been adjusted accordingly. Given the dominance of electric traction in the region, the pollution cost given by CE Delft for rail has also been halved.

Table A.10. **Third-party impacts, EUR/000 ntkm, 2015**

Impact	2015		2050	
	Road	Rail	Road	Rail
Pollution	2.2	0.6	4.0	1.0
Accidents(1)	0.3	0.2	0.5	0.4
Noise	2.1	1.1	3.7	2.1
Upstream and downstream	2.0	2.8	3.5	5.0
Nature and landscape	0.8	0.0	1.5	0.0
Biodiversity losses	0.6	0.0	1.0	0.0
Soil and water pollution	0.9	0.5	1.7	0.8
Urban effects	0.6	0.1	1.0	0.2
Total	9.5	5.3	16.9	9.5

Notes: (1) Motorway estimate (Table 33 of CE Delft), adjusted for value of life through time.

Source: CE Delft, with some adjustments by ITF.

51. These follow the same principles as those derived in the HEATCO and IMPACTS studies but have been updated to 2008 values.

Table A.11 summarises the unit financial and economic costs used in the analysis. As they are applied over a thirty-year period to 2052, they do not attempt to reproduce current costs in detail e.g. different port charges and costs. The costs represent marginal costs i.e. the cost that would be incurred or saved as the result of a change in throughput; this is taken as the average cost for transport operators but as considerably less for infrastructure authorities.

The relationship between economic and financial costs has not been analysed in detail but instead a general 10% reduction has been applied to financial costs to derive economic costs. The percentage of costs incurred by Slovenian organisations as opposed to other countries is based on the estimated market share for transport operators (e.g. rail operations are taken as 90% by SZ) and on the share of journey distance for infrastructure (e.g. 51% of the road transport journey is estimated as being on Slovenian roads).

Table A.11. **Economic and financial unit costs (2015 EUR)**

	Revenue from users	Cost/ntkm		Cost/tonne or km		Economic:Financial			
		Financial	Economic	Financial	Economic		% Slovenia	Per	Comment
Port existing rail TOC	2.5	2.5	2.3			0.90	90%	EUR cents/ntkm	
Port existing rail infra	0.5	0.5	0.5			0.90	51%	EUR cents/ntkm	
Port tunnel rail TOC	2.5	2.5	2.3			0.90	90%	EUR cents/ntkm	
Port tunnel rail infra	0.5	0.5	0.5	1 400	1 260	0.90	100%	EUR 000 fixed	Allows for rail cost saving
Off-port rail TOC	2.5	2.5	2.3			0.90	90%	EUR cents/ntkm	Fixed cost of tunnel section
Off-port rail infra	0.5	0.5	0.5			0.90	48%	EUR cents/ntkm	Allows for rail cost saving
Other port rail TOC	2.5	2.5	2.3			0.90	0%	EUR cents/ntkm	
Other port rail infra	0.5	0.5	0.5			0.90	0%	EUR cents/ntkm	
Road	6.0	5.5	5.0			0.90	50%	EUR cents/ntkm	
Road infra	1.0	0.5	0.5			0.90	51%	EUR cents/ntkm	
				Fixed					

	Revenue from users	Cost/ntkm		Cost/tonne or km		Economic:Financial	% Slovenia	Per	Comment
		Financial	Economic	Financial	Economic				
				cost/tonne					
Off-port road transport	0.0	10.0	9.0			0.90	100%	EUR cents/ntkm	Free to users
Off-port cont. Handling	2.5			2.2	2.0	0.90	100%	EUR/tonne	Revenue from rail terminal access fee
Shipping	0.5	0.4	0.4			0.90	0%	EUR cents/ntkm	
Koper dues	0.7			0.3	0.3	0.90	100%	EUR/tonne	
Koper containers	15.0			14.0	12.6	0.90	100%	EUR/tonne	
Other ports	15.7			14.3	12.9	0.90	0%	EUR/tonne	

Table A.12 gives a detailed analysis of the constituent costs and benefits for the two options.

Table A.12. **Economic costs and benefits compared to Base Case**

2025 opening, EUR million 2015 discounted at 7% to 2015

	Option A (tunnel)	Option B (terminal)
User benefits	56	56
Producer benefits		
Koper rail	-323	0
Off-port rail	0	-308
Other port rail	277	277
Subtotal rail	-46	-31
Shipping	10	10
Koper operations	-234	-234
Off-port road operators	0	-77
Off-port operators	0	-48
Subtotal Koper	-234	-359
Road operators	90	90
Other port operations	234	234
Subtotal producer benefits	55	-55
GHG	-14	3
Other externalities	35	15
Capital expenditure	-668	-25
Total	-536	-7

Table A.13 gives a breakdown of the financial gains and losses for the two options, subdivided into Slovenian and non-Slovenian organisations, using the factors listed in Table A.13.

Table A.13. **Financial evaluation of options**

2025 opening, EUR million 2015 discounted at 4% to 2015

	Tunnel		Terminal	
	Slovenian	Other	Slovenian	Other
Users	63	147	63	147
Producers				
Port rail	-140	18	0	0
Tunnel rail	231	-29	0	0
Off-port rail	0	0	92	-10
Other port rail	0	-64	0	-64
Shipping	0	-6	0	-6
Koper	53	0	53	0
Off-port road	0	0	-178	0
Off-port ops	0	0	-76	0
Road ops	-18	-17	-18	-17
Other port ops	0	-53	0	-53
Subtotal	127	-150	-126	-150
Congestion/accidents	7	7	6	5
Capex				
Tunnel	-812	0	0	0
Off-port	0	0	-31	0
Total	-615	4	-86	3

International Transport Forum

A New Hinterland Rail Link for the Port of Koper?

Review of Risks and Delivery Options

The Port of Koper, Slovenia's single port, is growing and its throughput will likely exceed the capacity of its existing single track railway link in the future. A second railway line has been in the planning for more than a decade. But at an estimated cost of EUR 1.4 billion it is a costly project. The Ministry of Infrastructure asked the ITF to present a view on the project's risks in relation to demand, its costs, the overall economics of the scheme and the possibilities for partial private financing.

The study reviews the adequacy of existing cost estimates and demand forecasts and evaluates different PPP options against traditional procurement. It also investigates potential options to buy time and presents a financial and economic evaluation of the main alternatives available to the Ministry.

This report is part of the International Transport Forum's Case-Specific Policy Analysis series. These are topical studies on specific issues carried out by the ITF in agreement with local institutions.

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