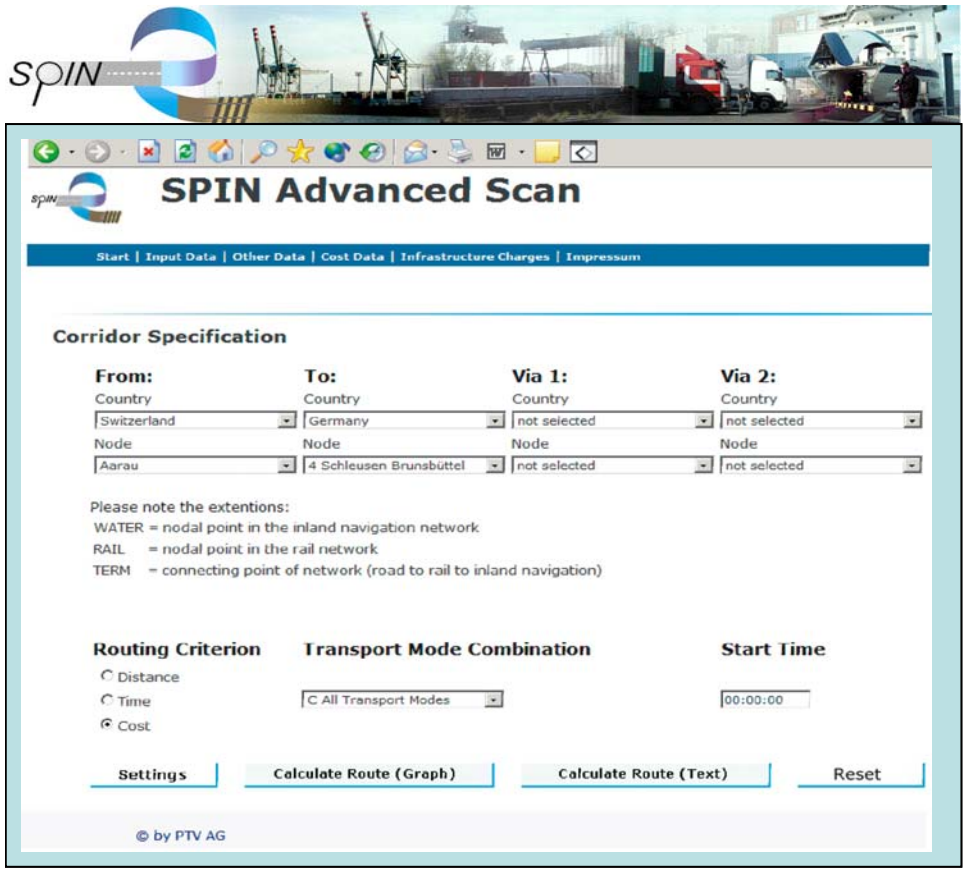

SPIN
Scanning the Potential for Intermodal Transport

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SPIN – Scanning the Potential for Intermodal Transport

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Abstract

SPIN is a research and development project within the 5th framework programme supported by DG TREN of the European Commission. SPIN aims at providing initial information to support a modal shift from pure road transport to more sustainable means of transport.

In the past years the national and international policy efforts to achieve a modal shift have been focused on improving the competitive position and the market share of intermodal transport. This was mainly forced by a direct improvement of the infrastructure and terminal landscape, the reaction on transport means and load units and changes in legislation. Nevertheless road transport has today the biggest mode share and forecasts show that road transport also in the mid- and long-term view will grow more than other transport modes.

Contrary to the supply policy SPIN approaches modal shift from the demand side. To achieve this objective the SPIN project consortium has developed and applied a toolbox for scanning the potential for a modal shift towards intermodal transport. This internet-based tool supports shippers as well as logistics services in assessing the potential benefits.

The developed demand driven SPIN-approach to identify the potential for modal shift on micro level has proven its suitability for supporting the mode decision process. It can support the use of intermodal transport because a part of the shippers is not aware of the opportunities provided by intermodal transport.

The SPIN-Toolbox played an important role in the consulting process and provided an important part of the results such as door-to-door leading times, costs, distances for various mode combinations and information about existing intermodal services and terminal locations.

Keywords

Intermodal Transport – Modal shift – Transport Demand Analysis – Sustainable Transport

1. The project

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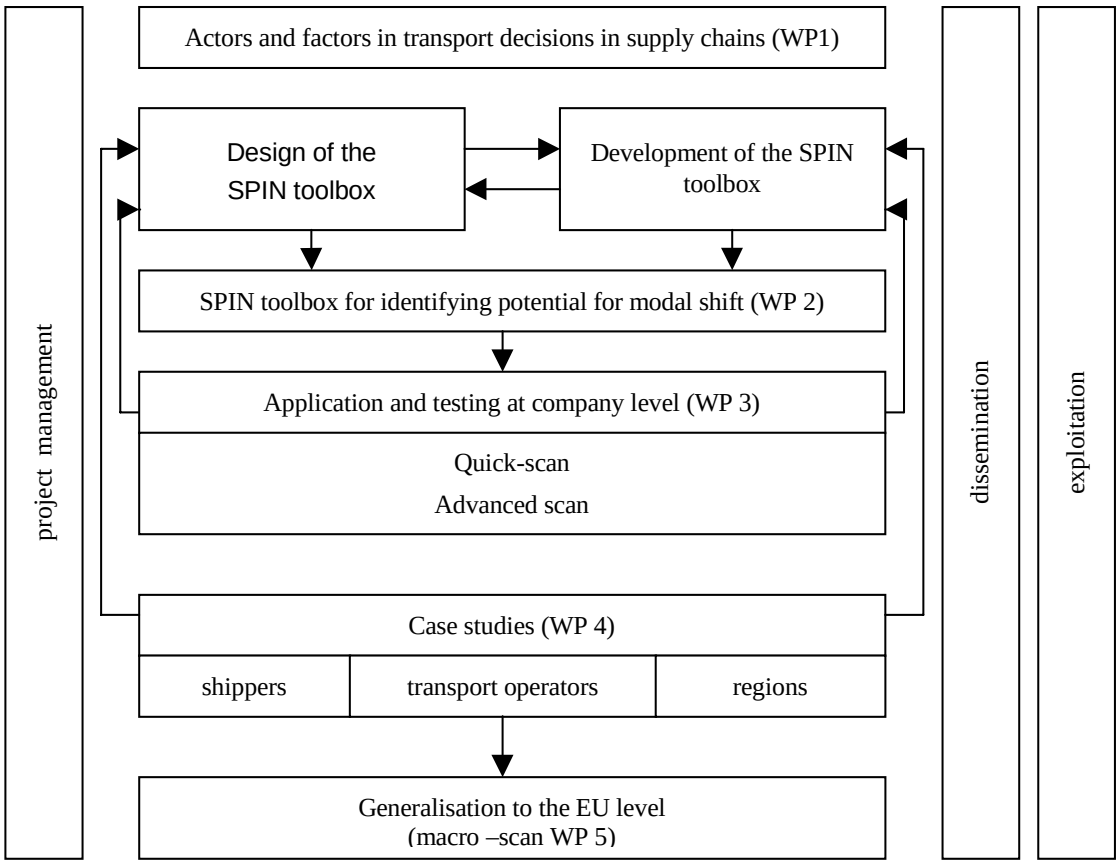
The following figure 1 gives an overview about the project approach:

Figure 1 Approach of the SPIN-project



The main objectives of the SPIN-project can be summarised as follows:

- To develop a toolbox for the assessment of the potential for a modal shift towards intermodal transport
- To apply the toolbox on a business level, which creates insight into the impact of a modal shift on supply chains
- To apply the toolbox on a macro level in order to assess the potential for a modal shift on EU-level
- To provide wide access to the toolbox, in particular to the Quick Scan

The SPIN tools are:

- the Quick Scan,
- the Advanced Scan and
- the Macro Scan.

One important objective of the SPIN-project has been the test of those tools in an existing real business environment. Therefore 14 case studies have been carried out within the SPIN project with the objective to identify modal shift opportunities in real existing cases under real business conditions. The case studies have been conducted in co-operation with companies (industrial partners).

The developed demand driven SPIN-approach for the identification of the modal shift potential on a business level has proven its suitability for supporting the mode decision process. The SPIN-Toolbox played an important role in the consulting process and provided an important part of the results such as door-to-door leading times, costs, distances for various mode combinations and information about existing intermodal services and terminal locations.

2. The Scanning Tools

2.1 The SPIN-Tools (Toolbox)

The SPIN-instruments (toolbox) are capable to scan the potential on business (operational) level (micro-level) as well as on spatial level (macro-level).

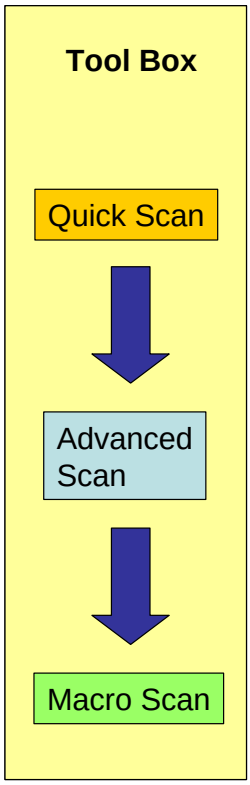
The **macro approach** is a more strategic approach, which identifies the potential for modal shift for regional, national and international freight flows. As input data the freight flows (origin, destination) for the various commodities, information about the transport networks and transport offers and also affinity factors are needed. The results provide estimation on the potential for modal shift for a region or an origin-destination connection. Statements on company (operational) level and recommendations for individual mode choice are not possible.

Typical applications of the macro-approach are the assessment of infrastructure needs, feasibility studies for terminals or intermodal services and ex ante evaluations of modal shift policy. Therefore, the typical users of a macro-scanning tool are policy makers and suppliers of intermodal transport services.

The **micro approach** is a more supply chain specific or individual tailor-made approach which identifies the potential for modal shift on company level taking into account the decision making process of the shippers. As input data the transport logistics chains and freight flows for the transported commodities on company level are needed as well as the key factors for the decision making process of the company (cost, reliability, leading times, etc.). What can be considered as the potential for a modal shift also depends on the quality and cost characteristics of the supply side.

The SPIN-Toolbox consists of three tools: The SPIN tools that have been developed are the Quick Scan, the Advanced Scan and the Macro Scan. While the Quick Scan gives a first indication of the modal shift potential, the Advanced Scan is a tool that proposes alternative intermodal transport chains from origin to destination. The Macro Scan is a versatile tool, which assesses whether certain policy measures could affect a modal change in favour of intermodal transport. This can be done on a region to region or on a corridor level by converting the policy measures to be introduced into values related to transport costs, travel time, transhipments, border crossings etc. Also it assesses the present competitive position of intermodal transport and the potential for modal shift.

Figure 2 The SPIN-Toolbox

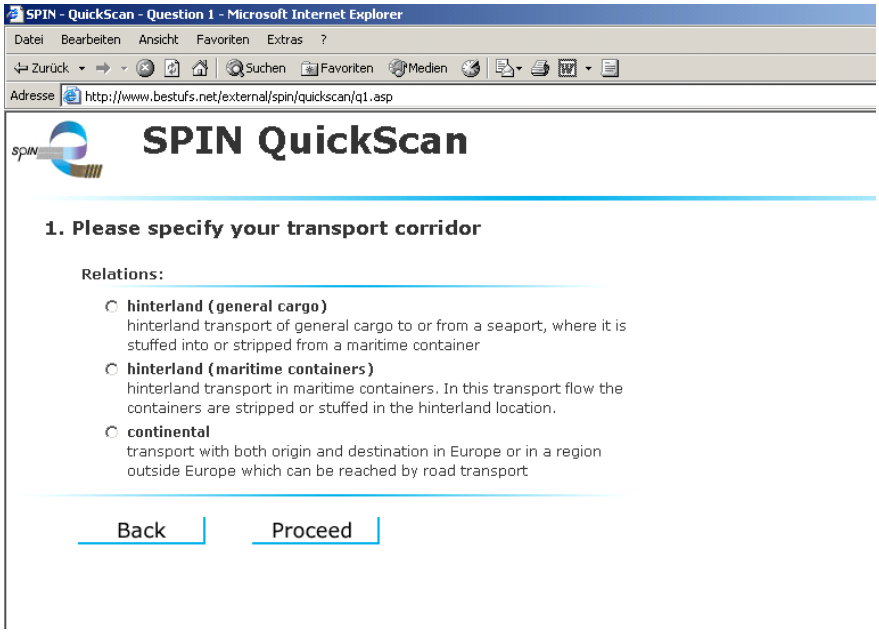


Purpose	Approach	Level	Tool-Basis	Implementation
Identification if intermodal transport is a real alternative to road transports (rough analysis)	Standardised questions with an automatically evaluation	Company (individual situation of the concern)	Internet	Company
Detailed analysis of the possibilities of intermodal transport with simultaneous consideration of cost and quality	Modelling and comparison of the transport alternatives (costs, quality), different basic conditions	Company (individual behaviour of the concern)	Combination of transport and cost model (with specific functions and options)	Company and consultant (case studies)
Analysis of the potential of a shift on regional an European level.	Conventional potential analysis	Region (aggregated data)	Freight transport model and GIS	Consultant

2.2 The Quick Scan

The Quick Scan aims at identifying the transport demand on a general level for which intermodal transport can be a realistic alternative through a characterisation of simple quantitative and qualitative company and freight flow parameters assessed by a light Origin-Destination matrix qualifying the intermodal service quality.

Figure 3 Interface of the Quick Scan



The functionality of the tool is based on an internet supported interface that allows the user to characterise the basic conditions of his transport activities.

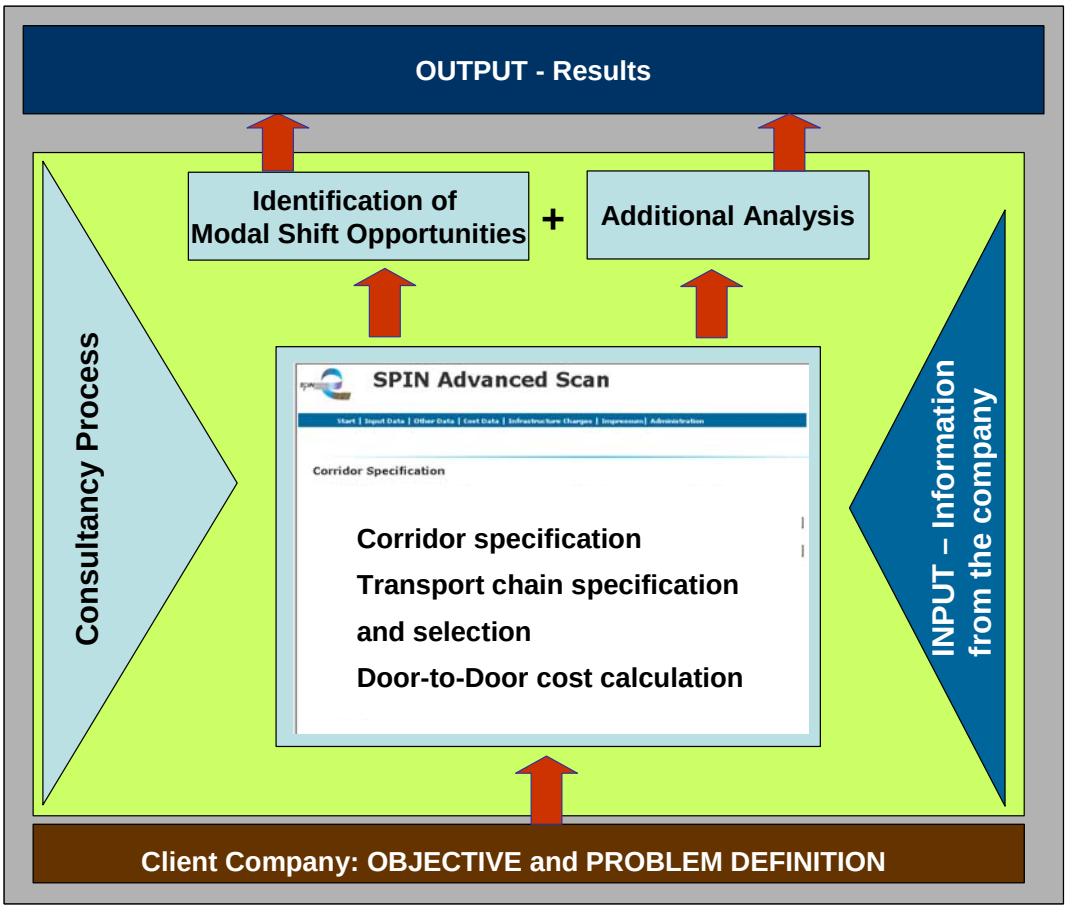
Input Data: The first input data is the general modification of the transport corridor: “hinterland (general cargo)”, “hinterland (maritime containers)” or “continental transport”. In a second step the transport corridor has to be more specified. This specification does include the determination of the hinterland region and optional the seaport region. Additionally the distance of the transport corridor has to be determined. Further input data that are of relevance are the kind of commodities in the selected corridor, the frequency and volume of the transport and the required acceptance (quality criteria) for the usage of intermodal transport opportunities for the specified transport task. Finally some advantages of intermodal transport can be given, that serves as information for the importance of intermodal transport for the shippers’ transport flows.

Output: The result of the application is a general recommendation if modal shift opportunities exist or not. If modal shift opportunities have been identified, the Quick Scan advises to continue with the Advanced Scan for a more in-depth analysis.

2.3 The Advanced Scan

The application of the Advanced Scan within the consultancy process comes thus after the Quick Scans' first identification of possible modal shift opportunities. The main objectives of the Advanced Scan application are to precisely quantify and qualify the opportunities and barriers from the intermodal supply and demand side and to draw recommendations to the shippers in order to realise this modal shift. The consultant uses the Advanced Scan as a support tool for the identification of modal shift opportunities.

Figure 4 Advanced Scan application in the consultancy process



This Advanced Scan helps to provide a realistic assessment of the potential of intermodal transport for a (target) users' door-to-door transport chain in terms of costs and time requirements. The tool is destined to appraise the full effects of a modal shift on the supply chain: changes in costs and service levels, in the supply chain configuration and operational adjustments which are necessary. The tool is developed to support the consultancy process.

Together with the know-how and experience of the consultant the Advanced Scan can bring a clear benefit for companies' needs.

Basis of the Advanced Scan is a comprehensive database of:

- a detailed European road network of 61'932 nodes
- the UIC rail network with 1'782 nodes
- the European inland waterway network of 3'350 nodes
- a short sea shipping distance matrix of 11'642 connections
- about 500 European terminals
- and more than 3'000 European intermodal rail services of different providers

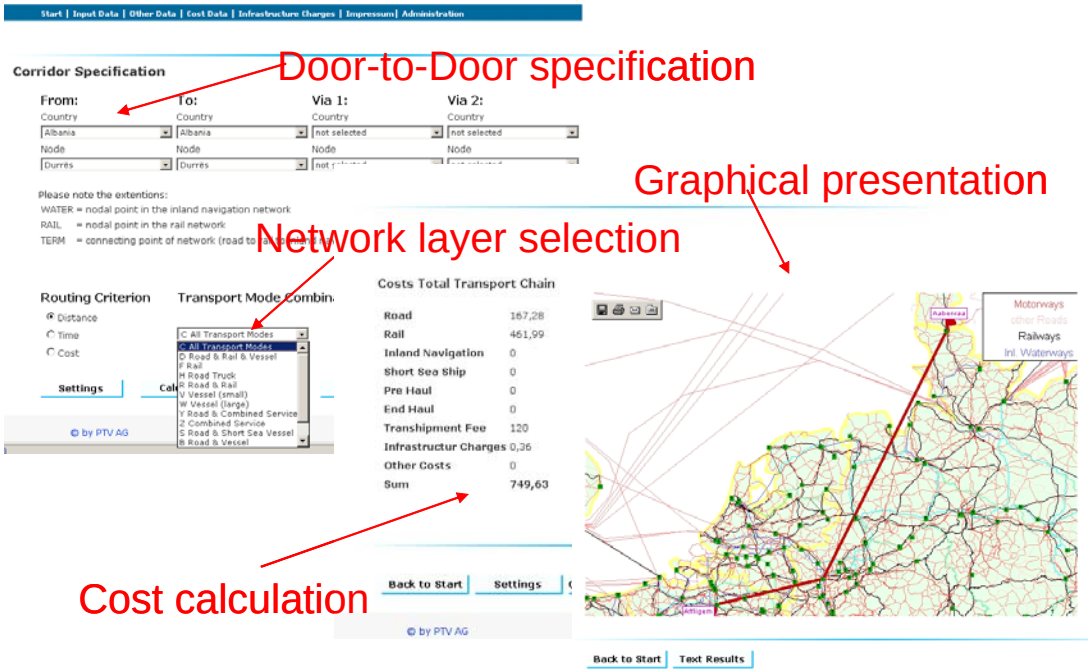
The tool proposes alternative intermodal transport chains from origin to destination and provides European transport customers and logistics service providers with a basis for modal and route choices. The features of the tool include:

- Proposal of alternative modal choices
- Cost estimates for each individual part of the transport chain (operator's cost)
- Proposal for alternative routings
- Time indications for a transport chain
- Customisation to preferred mode choice and via-connections

The Advanced Scan is clearly addressed to companies, especially shippers and logistics services/forwarders. The tool has been developed for the strategic level and aims at supporting the decision makers by organising their logistics chain. The Advanced Scan can be used in the consultancy for strategic short-term and medium-/long-term decisions.

The tool can also be used by political decision makers, transport planners and intermodal operators to get an insight in the supply of intermodal opportunities and framework conditions for example, but it has to be remarked that the Macro Scan is more suitable for this target group.

Figure 5 Contents of the Advanced Scan



The Advanced Scan can be applied for different companies' problems and questions. The technical field of application lies mainly in the assessment of short-term modal shift opportunities regarding service supply, costs and leading times. The tool provides actual information about existing services and costs parameter. Furthermore it supports logistics service providers and shippers in their long-term strategy and assists them by rethinking their current logistics and transport strategy and by looking for new opportunities that bring them probably profitable benefit.

Of further interest for the logistics services provider is the analysis in case of setting up a new intermodal service. With support of the Advanced Scan existing services can be scanned regarding their services and costs. This helps intermodal transport operators to estimate the chances and risks in case of the implementation of a new intermodal service.

Also strategic improvements in efficiency within transport chains can be assessed by support of the Advanced Scan. A differentiated costs and service comparison between the current status and the envisaged service can be carried out.

For producers of transport vehicles or equipment the tool can be used to identify opportunities and barriers in intermodal transport chains. They receive an overview of costs and times for

intermodal transport options. This can be used in international market research to estimate impacts on their mid- and long-term strategy.

In policy questions but also for the calculation of company internal transport costs in case of changing framework conditions (policy measures) the Advanced Scan helps to estimate the impacts of new framework conditions like for example road pricing measures or working time regulations. The client can be supported by the tool to look for new strategic transport options that are able to avoid negative impacts and save costs.

2.4 The Macro Scan

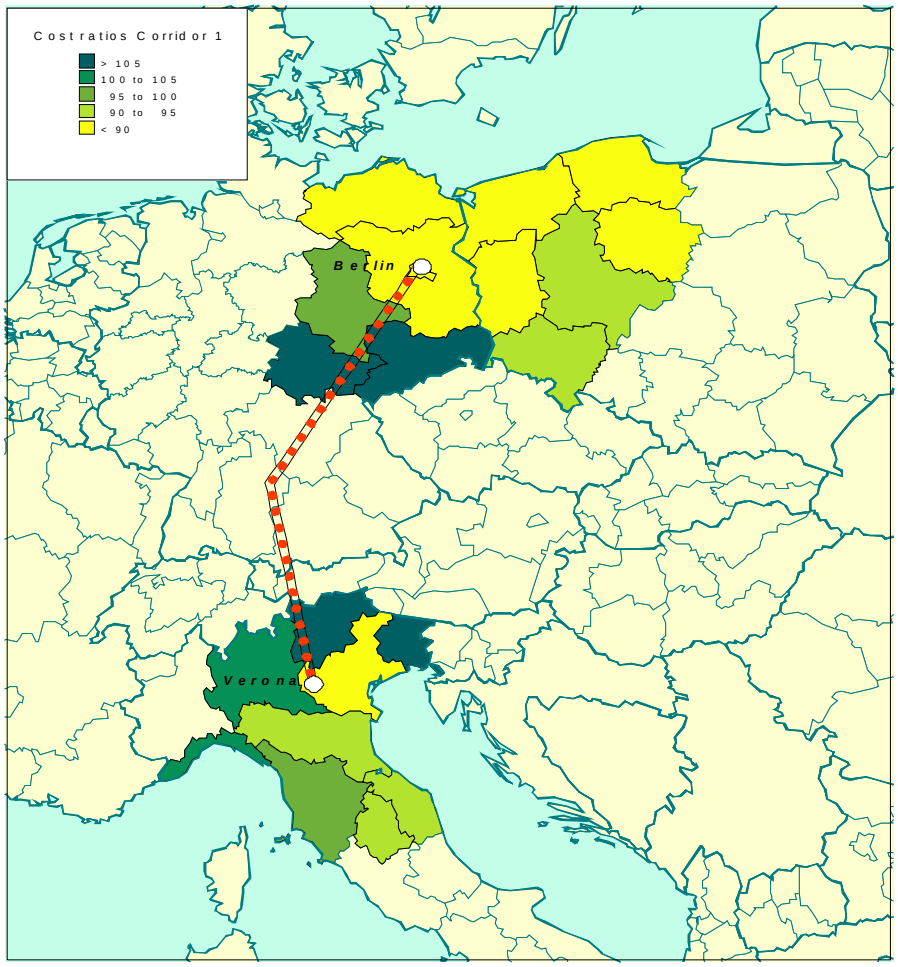
The Macro Scan is a versatile tool, which assesses whether certain policy measures could affect a modal change in favour of intermodal transport. The tool aims at providing a regional (spatial) assessment in terms of service quantities and qualities. The main function of the Macro Scan is to calculate costs and door-to-door travel times by comparison of road transport and intermodal alternatives between regions. This assesses the competitive position of intermodal transport compared to road transport on origin-destination pairs in Europe, which enables to draw conclusions about the potential for a modal shift between these regions. The Macro Scan is a flexible tool that uses default values but also can use individual input data, to take specific circumstances in transport supply into account.

The Macro Scan reads the so-called default SPIN-matrix which contains a data file with about 90.000 records. Each record represents an origin-destination pair. It encompasses distances and travel times for each of the four modes (road, rail, short-sea and inland waterway transport), default values for pre- and end-haulage distance and time within a region, indicators for the transport types which are used on this connection and the road transport volume which is indicator for the maximum potential for modal shift. For rail and for road transport it also contains distances covered per country passed in order to assess impacts of infrastructure charges.

Each transport type is defined by parameters about capacity (number of standard load units or tons), travel speed (i.e. deviation from average), time needed for loading and unloading, other waiting time which is relevant for costs, waiting time which is not paid for but relevant for lead times, fixed cost amount per hour utilization, variable cost amount per kilometer distance covered and an “other cost” component, which is meant for adding cost which are fixed per trip. The database contains values for infrastructure charges per kilometer traveled in all European countries for road transport and for rail transport.

The tool includes default values which are built on general average data. But there exist also modification opportunities for the user.

Figure 6 Example of the Macro Scan application



The Macro Scan is mainly addressed to political decision makers on EU-, national but also regional level. Despite the fact that the Advanced Scan clearly is more accurate (based on more refined network data compared to regional "gravity point" data) for many strategic long-term decisions, it can also be used as an alternative tool on business level.

There are many possible types of applications of the Macro Scan:

- Assessment of competitiveness of intermodal transport to and from a specific region. This can help regional authorities in identifying transport relations strengths and weaknesses in intermodal transport supply and support in prioritisation of policy measures.

- Assessment of the catchment area of intermodal transport services. The Macro Scan can identify the regions for which the service is competitive to road transport.

- Impact assessment of changes in intermodal transport supply characteristics, by comparing values related to the amended transport supply with reference values. Examples are impact assessments of:

    - innovations, like introduction of a new vessel type, which changes e.g. costs per hour, energy consumption or speed,

    - new or an improved services, which changes cost and time parameters of the service level between regions,

    - a new terminal, which reduces pre- and main-haulage distances,

    - infrastructure charges, which changes door to door costs,

    - Ex ante evaluation of impact on modal shares of policy measures.

- Assessment of regional competition with respect to (intermodal) access. Intermodal access is a location factor for logistic companies. It affects the choice for locating in a logistic park or a seaport and therefore is relevant to regional or port authorities as well as for shippers, forwarders and shipping lines.

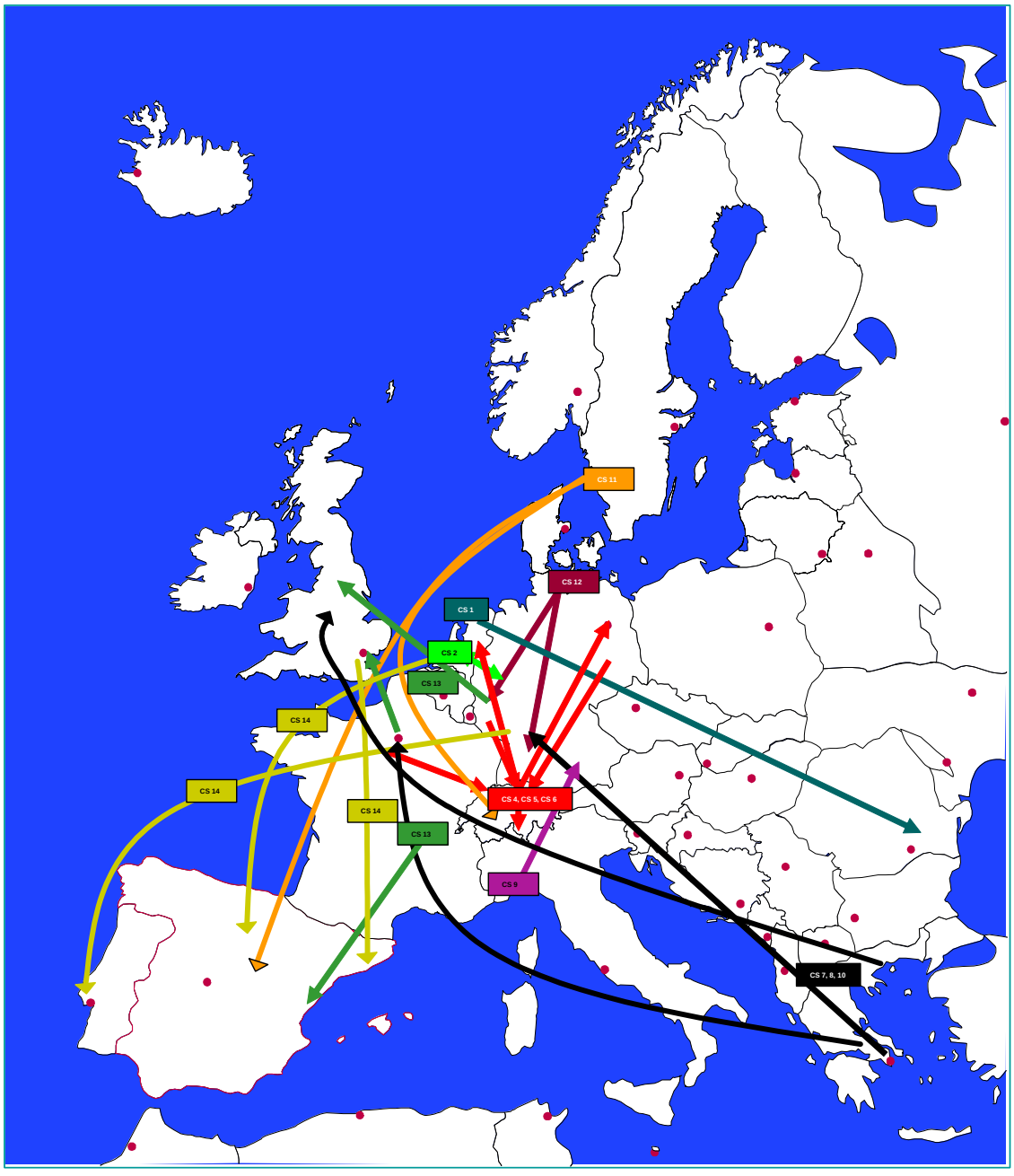
- Assessment of competitiveness of logistic concepts, like e.g. Motorways of the Sea.

As seen in the practical application within one case study the Macro Scan has delivered a clear assessment of modal shift opportunities for different corridors between regions. The results contribute to the decision making process for the customer and deliver a clear benefit. In this case the benefit has been the identification of corridors for the set up of a new intermodal short-sea-service between Rotterdam and the Iberian Peninsula. The Macro Scan has supported the intermodal operator by taking costs and lead times of different corridors in consideration. The result of this case study has been the first step for an implementation of such a service.

3. The Case-Studies

The main aim of the case studies has been to investigate possible intermodal solutions against current road transport practice and the potential for modal shift on company level. The case studies have been carried out in co-operation with industrial partners mainly shippers and logistics services.

Figure 7 Investigated Corridors



The case studies cover most parts of Europe, Western Europe as well as Eastern European countries, inland transport corridors as well as maritime corridors and long-distance corridors as well as short-distance ones. The case studies can be characterised by the involved partners, the investigated corridors and the investigated transport modes.

The involved partners have been transport operators as well as shippers. In both cases the responsible logistic and transport managers have been contacted to carry out the case study. In total 8 (57 %) logistics providers and 6 (43 %) shippers have been involved in the case studies. From the side of the logistics operators one combined transport operator, one terminal operator and mainly 3PL-providers have taken part. The involved shippers are composed as follows: two producers of paper and paper products, one producer of river vessels for inland navigation, one wholesaler, one producer of beverages and one producer of flooring elements. The logistics providers and shippers have been selected from different countries: four partners from The Netherlands, three partners from Greece, three from Switzerland, two from Sweden, one from Germany and one from Italy. The companies that have been involved are mainly big- and medium-sized companies.

The corridors that have been investigated cover nearly whole Europe, Western and Eastern Europe. But the origins and destinations are with main focus on Western Europe, only one destination was in Eastern Europe (Romania).

The length of the investigated corridors differs. Most corridors that have been investigated are more than 1000 km and between 500 km and 1000 km, less of them are between 200 km and <500 km. Because of the high relevance of advantages in combined transport mainly long-distance-cases have been chosen. Nevertheless there are also existing combined transport technologies that can be applied on shorter distances like shown in the case of Switzerland (Cargo Domino).

It has been of high importance to analyse different modes and different modal shift opportunities. The current transport mode mainly used by the surveyed companies has been road transport and in case of Greece road-SSS, in one case road-ferry (Ruhrgebiet DE – Manchester UK) and in another one inland shipping. The modal shift opportunities that have been mainly looked at are combined transport road–rail and in case of Greece road-SSS-rail.

The main objective of the case studies was to investigate modal shift opportunities for selected corridors. But in one case the modal shift improvement by increasing efficiency in inland waterway transport by terminal co-operation has been investigated. The Italian case study tried to find out how to attract freight flows from Southern Germany going to northern European ports to the port of Genoa and linked with this the possibility to build up an intermodal service for these flows from Southern Germany (Munich) to Genoa. Another case study aimed at assessing the performance and costs of door-to-door transport alternatives on

corridors on which sea-river vessels could be deployed and to derive conditions under which exploitation of sea-river-vessels can be successful.

As result of the 14 case studies it can be concluded that there is a potential for modal shift towards more environmentally forms of transport like intermodal transport.

- In nearly 50 % of all investigated corridors a modal shift opportunity is given. In this case a clear shift potential has been identified, because leading times meets the requirements of the industrial partners and costs and/or prices are equal or even lower than the current transport mode.

- From 11 case studies with the objective to investigate modal shift opportunities in four case studies a clear recommendation for modal shift can be given for 100% of the investigated transport corridors. In one case a recommendation for nearly 70 % of the investigated corridors is possible and for four case studies a recommendation to shift the transport mode for 50% of the investigated flows can be given.

Also the main barriers and opportunities have been investigated in those case studies with the following results:

- The identified **main barriers for modal shift** in the case studies are too long leading times, logistical constraints, intransparent services, missing flexibility for short term orders, insufficient quality level, too many involved partners, restrictions from loading units, investment costs for intermodal equipment, insufficient rail infrastructure, unbalanced flows and fixed tariffs in road transport.

- The identified **main opportunities for modal shift** in the case studies are short leading times provided by shuttle services, transparent and reliable services, high flexibility for short term orders, sufficient quality level relating to time tables, limited number of involved partners, standardized and harmonized loading units, low investment costs in intermodal equipment, adequate rail infrastructure and niche concepts.

4. Results and Conclusions

The developed demand driven SPIN-approach to identify the potential for modal shift has proven its suitability to support the mode decision process and can be seen as a valuable support for companies and political decision makers to estimate modal shift opportunities for their transport tasks and policy efforts.

The SPIN-Toolbox played an important role in the consulting process and provided an important part of the results as door-to-door leading times, costs, distances for various mode combinations and information about existing intermodal services and terminal locations. Nevertheless also other analysis relating to organisational, infrastructural and technical feasibility and the influence of market prices and other constraints from regulations is important.

The companies have shown a high interest for the SPIN-tools enabling them to get a more global vision of their transport scheme. The testing of the tools has shown that the results of the scans provide realistic and reasonable information regarding modal shift opportunities.

The Advanced Scan application within the case studies has shown that the SPIN-toolbox delivers realistic results and can be considered as a useful tool for the identification of modal shift opportunities. On business level it has in most case studies aimed at identifying potential modal shift opportunities and for a lot of companies it has been very surprisingly to see what options do exist against their current mode choice. For 50 % of all investigated corridors (transport tasks) in all case studies a modal shift opportunity has been identified. In two case studies the SPIN-tools delivered support to assess the implementation of a new transport service.

The Macro Scan supports the political authorities in a neutral assessment of their transport (modal shift) policy. The demand estimation and the potential evaluation are only two examples of an application. The tools can be used to provide an actual overview about the modal shift potential based on reliable information. Additionally opportunities and barriers in modal shift policies for regions and concepts could be analysed neutrally by the consultant using the Advanced and Macro Scan. For political authorities the Macro Scan therefore delivers a high value in supporting them in the assessment of future political measures. Typical applications of the macro-approach are the assessment of infrastructure needs, feasibility studies for terminals or ex ante evaluations of modal shift policy.

For intermodal operators and logistics service providers the tool could be used to assist them in future long-term strategy: the build up of new services or infrastructure like terminal are practical fields of application.