

# FINAL IMPLEMENTATION REPORT (D.T2.3.5)

*Saxony-Anhalt*

*30<sup>th</sup> November 2018*

## A. Overall Pilot Approach

### a. Pilot Phase Summary

The chemical and plastic industry in Saxony-Anhalt is counted among the leading industrial sectors. In the state, this field of industry accounts for 17.7% of the total industrial production. With the majority of products, it is at the beginning of many value chains and offers a wide range of products. These include basic chemicals, specialty chemicals as well as pharmaceuticals.

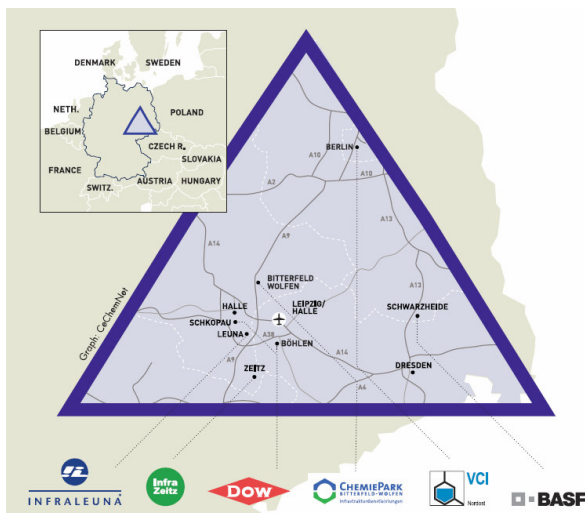


Figure 1: Overview chemical park locations Central Germany and pilot project locations<sup>1</sup>

In the Middle East of Germany the chemical industry is concentrated in the Central German Chemistry Triangle. The model of chemical parks is a model of success within the Central German Chemistry Triangle. Within chemical parks large companies and even SME's are supplied with composite materials and an effective infrastructure. Supply and disposal systems, the energy supply, safety, logistics and

<sup>1</sup> Isw GmbH.

further services are managed by competent specialised companies, so that chemical manufacturers can concentrate on the production and marketing of their products.

The key locations of the chemical industry are - as you can see in figure 1 - at Bernburg, Leuna, Schkopau, Bitterfeld-Wolfen, Zeitz and Piesteritz (Saxony-Anhalt) as well as at Schwarzheide (Brandenburg). This leads to the pilot project workshops being held within this triangle in Schkopau, Schwarzheide and Leuna. With these workshops a communication and cooperation platform was created on which the requirements for multimodal chemical transport and potential transport routes are discussed intensively. The terminal operator and logistics service providers presented their current and planned multimodal efforts. Companies articulated their interests for specific routes and volumes currently being transported by road, but with potential for Multimodal transport. The workshops were accompanied by further presentations on the development of transport infrastructure or on existing fundings.

The share of Multimodal Transports in the chemical industry in Saxony-Anhalt is relatively high, compared with the total share in Germany, but there is still a high potential to shift more volume from road to multimodal transport. Nevertheless there is no special motivation for the companies to prefer multimodal transport instead of road transport. The real and almost only factor for the decision making is the transport cost.

For that reason the project partners held bilateral discussions with seven interested companies to discuss their specific situation and specific supply chain requirements. In this smaller framework, it is easier for companies to talk openly about individual connections, quantities and products. With the help of the ChemMultimodal toolbox the Saxony-Anhalt project Team with support from logistics expert Wolfgang Schnabel gave advice to the chemical companies to find possible multimodal connections. As a result of the discussions the project partners issued recommendations for the change of transport mode and, if necessary, also provide personal contact with the logistics service providers. Companies thus have the opportunity to get a concrete offer. However, the negotiation and implementation phase is then again entirely their responsibility. Seven routes were proposed to the companies and are still in the process of decision making.

## **b. Pilot Phase Impact**

Objective of the ChemMultimodal Pilot Project is to create the awareness for multimodal transports within the chemical companies and to bring them together with the logistics service providers to develop new routes with the existing volumes. The project aims to achieve this by coordinating and facilitating the cooperation between chemical companies, specialised logistics service providers, terminal operators and public authorities in chemical regions in Central Europe. The ChemMultimodal toolbox was developed to support chemical companies and logistics service providers in their strategic and operational planning. The toolbox consists of 4 main elements:

1. IT Visualisation of transport flows
2. Planning Guidelines for increasing the share of multimodal transport
3. Consulting Services for chemical companies to improve multimodal transport
4. Measuring CO2 footprint of chemical logistics

The common objective of the pilot projects is to increase multimodal transport by 10% and reduce CO2 footprint by 5% until the end of the project duration. To meet these requirements a number of bilateral discussions have taken place and seven routes were proposed to the companies. It is now up to the companies to continue the efforts and to develop the new routes together with the service providers.

The project partners will continue and consolidate their cooperation with the companies until the end of the project in May 2019. Subsequently, the then established support structures should be continued by the involved chemical associations and clusters like VCI and SPC.



## B. Participating companies

Name of company	Profile (products/services)	SME or large enterprise	Location (subject to pilot)
LCP Leuna Carboxylation Plant GmbH	<p>The leading manufacturer/supplier of para-hydroxybenzoic acid (p-HBA) and of technical pure grade of Potassium Sulphate &gt; 99.8% (K<sub>2</sub>SO<sub>4</sub>).</p> <p>Products</p> <ul style="list-style-type: none"> <li>P-HYDROXYBENZOIC ACID (CAS: 99-96-7)</li> <li>POTASSIUM SULPHATE &gt;99,8% technical pure</li> <li>SALICYLIC ACID</li> <li>CRESOTINIC ACIDS</li> </ul>	SME	<p>Leuna</p> <p>The chemical site of Leuna has been in existence since 1916 and has been developed to an industrial park in the 1990's. All companies are able to take advantage of the services offered on-site, such as local plant security, the officially certified plant fire department, telecommunication systems, power and steam supplies, as well as the centralized biological wastewater treatment plant. Companies have the opportunity to obtain their base products and raw materials from companies that are located at the same chemical site.</p> <p>Here on the premises, all the prerequisites are available to allow for short transit times. And it doesn't matter whether the inbound and outbound transportation takes place via ship, rails, motorway, or by aircraft. A modern road network of 25 km in length, 75 km of internal railway tracks, as well as 600 km of laid pipes between the companies located on-site all allow for short transit times and supply chain solutions across the entire chemical site.</p>
Manuli Stretch Deutschland GmbH	<p>Manuli Stretch has been engaged in the manufacture of LDPE stretch films for industrial and agricultural use since 1970. As a pioneer and first manufacturer of stretch film in Europe, Manuli Stretch is still one of the</p>	Large company	<p>Schkopau</p> <p>The ValuePark as an industrial park concept of Dow Olefinverbund GmbH was founded in 1998. The settlement of preferred Dow clients and vendors creates synergies between</p>



**ChemMultimodal**

	<p>world's leading suppliers through constant quality control and continuous development of its products. With 15 offices worldwide, Manuli Stretch s.p.a has a tightly knit distribution network. With 4 production sites in Europe and South America, Manuli Stretch has an annual production capacity of well over 200,000 tonnes. Over 12,000 active customers can rely on more than 610 employees, 365 days a year!</p> <p>With the takeover in 2000, DRG Plastic Films Vertriebs GmbH took over and expanded the full support of the German market for Manuli Stretch.</p>		<p>investors and Dow, while promoting the region's economic development. Since opening in 1998, 21 national and international companies have invested on 150 hectares more than 800 million euros and created over 1200 jobs.</p> <p>Since the on-site terminal in the value park Schkopau has no access to waterways, it is specialized on the handling between rail and road. The economic structure in the region is characterized by the chemical and plastic industries and companies with a focus on machine and plant construction. Therefore mainly chemical bulk goods, containers, conventional unit loads and bulk materials are handled on the terminal.</p> <p>In the year 2016 the length of the terminal was extended by 220 meters and equipped with a second portal crane, which allows now to load and unload two full train length at the same time. Furthermore new storage areas and capacities were created.</p>
<p>ICL-IP Bitterfeld GmbH</p>	<p>ICL is an international chemical company and manufacturer of inorganic phosphorus chemicals, flame retardants, plasticizers, hydraulic fluids and technical hydrochloric acid.</p> <p>Further products of Supresta are inorganic phosphorus compounds and additives. The specialty chemicals manufacturer is based in Chemiepark Bitterfeld-Wolfen and employs about 90 people. The former Akzo Nobel division Supresta was bought in 2004 by Ripplewood Holdings.</p> <p>The company was founded in 1994 and belonged for some years to the US group Supresta. In 2007, Supresta</p>	<p>Large company</p>	<p>Chemiepark Bitterfeld Wolfen</p> <p>In the Bitterfeld-Wolfen Chemical Park, investors can benefit from a modern infrastructure, specific for the chemical industry, as well as from services rendered individually. Closed feedstock cycles and a network of innovative companies are further advantages of the location. The position in the dynamic business region Leipzig-Halle offers competent business and science partners in close proximity.</p> <p>The Chemical-park concept offers the advantage that the companies can fully concentrate on their core competences. More than 360 companies form a wide range of producers, suppliers, service providers and potential partners. The in-</p>



	was acquired by Israeli specialty chemicals manufacturer Israel Chemicals Ltd.		ternal feedstock interconnection system of the companies at the location increases supply reliability and the creation of value.
INEOS Styrolution Europe GmbH	<p>INEOS Styrolution is a global styrenics supplier and is headquartered in Germany. It is a subcompany of INEOS and provides styrenics applications for many everyday products across a broad range of industries, including automotive, electronics, household, construction, healthcare, toys/sports/leisure and packaging. In 2016, sales were at 4.5 billion euros.</p> <p>Styrolution offers various styrenics commodity and specialty product types, i.e. styrene monomer (SM), polystyrene (PS), acrylonitrile butadiene styrene (ABS), styrene-butadiene block copolymers (SBC), other styrene-based copolymers (SAN, AMSAN, ASA, MABS), and copolymer blends. Styrenics are thermoplastics.</p> <p>Styrene monomer (SM) is an intermediate product. It is a colorless liquid that polymerizes easily.</p> <p>Polystyrene (PS) is a thermoplastic resin that is used in many applications, such as disposable packaging, electronic devices, large appliances (for example in refrigeration liners) and household goods.</p> <p>Acrylonitrile butadiene styrene (ABS) is a thermoplastic resin, used primarily in colored products that need to be heat and impact-resistant, such as vacuum cleaners or power tools. It is also commonly found in vehicles, mobile phone housings and recreational goods.</p> <p>Styrene-butadiene block copolymer (SBC) is a</p>	Large Enterprise	<p>Frankfurt am Main, Germany (global and European headquarters)</p> <p>Not in the Central German Chemistry Triangle but with transports through this region</p>



	<p>thermoplastic resin that is transparent and impact-resistant. It is used to provide a high optical appearance and is mostly found in food and display packaging.</p> <p>Styrene-based copolymers (SAN, AMSAN, ASA, MABS) and blends (ABS/PA, ASA/PA, ASA/PC) are thermoplastic resins that are mainly used in various technical applications, such as vehicles, garden equipment, tools, appliances, consumer electronics, communications devices and computers.</p>		
Braskem Europe GmbH	<p>Created in August 2002 by the merger of six companies from the Odebrecht Group and the Mariani Group, today Braskem is the largest petrochemical company in the Americas and the world's leading biopolymer producer. Braskem produces polyethylene (PE), polypropylene (PP) and polyvinyl chloride (PVC) resins, as well as basic petrochemicals such as ethylene, propylene, butadiene, chlorine, benzene, toluene, etc.</p> <p>Braskem operates in the chemical and petrochemical industry and plays a significant role in other production chains that are essential to economic development. In this context, chemicals and plastics help create sustainable solutions that improve people's lives in areas such as housing, food and transportation.</p>	Large Enterprise	Schkopau See Manuli Stretch
BASF	<p>BASF Schwarzheide GmbH is a wholly owned subsidiary of BASF SE. It is located in the lignite mining area of the Lausitz in Schwarzheide. The plant was founded in 1972 as a hydrogenation plant Schwarzheide (Ruhland) for the production of synthetic gasoline from the oil and gas industry in 1972.</p>	Large Enterprise	Schwarzheide The special position of multimodal transport for chemistry in Brandenburg is exemplified by the example of Schwarzheide. Close to this terminal BASF and many other smaller companies are located, inter alia the logistics service provider Bertschi



**ChemMultimodal**

	<p>Today, in Schwarzheide - but also a waterway to lie - also the polyurethane basic products are not yet manufactured plastics, water-based paints, pesticides and fine chemicals. BASF Schwarzheide GmbH employs around 1,800 people, including around 3,100 employees in third-party companies.</p>		<p>AG. In 2014 Bertschi AG was expanding its multimodal terminal in Schwarzheide. The extension included a second crane with six transshipping tracks and a gantry loader with a span of 90 meters. The terminal also offers now a new location for the growing demand for storage of hazardous goods containers. As a result of the expansion, the Schwarzheide region has been connected directly to seaport hinterland traffic. A new direct connection to South-Eastern Europe and Turkey was also opened. As a result, Schwarzheide is developing from the previous West-East gateway terminal to the hub for intermodal traffic.</p>
<p>Dow Olefinverbund GmbH</p>	<p>Dow Olefinverbund GmbH, headquartered in Schkopau, Saxony-Anhalt, is a subsidiary of the US chemical company Dow Chemical. In Central Germany, Dow continues the long tradition of producing plastics and chemicals. Dow's involvement began in 1995 with the assumption of economic responsibility for the Schkopau, Böhlen, Teutschenthal and Leuna facilities. After extensive restructuring of the plants and facilities in the year 2000, the site was wholly owned by Dow.</p> <p>The Schkopau, Böhlen, Leuna and Teutschenthal plants are connected by a pipeline network for the exchange of basic chemicals. Overall, Dow operates pipelines over a total length of 1,300 km, which also connect the Central German area with the Dow plant Stade and the Dow Terminal in the port of Rostock. The Böhlen factory is home to the "core" of the olefin composite - the cracker. On the basis of raw petrol, chemical raw materials such as ethylene and propylene are produced here, which can be found in Böhlen u. a. on raw materials for hygiene</p>	<p>Large Enterprise</p>	<p>Schkopau See Manuli Stretch</p>



	articles or products in construction as well as on the locations Schkopau and Leuna u. a. be processed to high quality plastics.		
Ecogreen Oleochemicals GmbH / DHW Deutsche Hydrierwerke GmbH Rodleben	<p>Ecogreen Oleochemicals is a Singaporean chemical company that is a subsidiary of the Indonesian Salim Group. In Germany, Ecogreen Oleochemicals owns DHW Deutsche Hydrierwerke GmbH in Rodleben. There, unsaturated fatty alcohols, fatty amines and sorbitol are produced.</p> <p>Based on the experience of the German hydrogenation plants in the field of catalytic hydrogenation reactions in the production of fatty and sugar alcohols, the development of esters and ethers, sugar derivatives and other chemical specialties has been accelerated enormously. In 1991, DHW GmbH Rodleben was integrated into the global oleochemical group of the Indonesian company Salim. With the formation of Ecogreen Oleochemicals in 2001, DHW's position as a major global producer and supplier of unsaturated fatty alcohols, fatty amines, sorbitols, other sugar alcohols and specialties such as fatty acid esters and ethers has been further strengthened. Extensive experience in the areas of research and development combined with the experience of global oleochemistry make the DHW GmbH Rodleben a strong and competent partner in the field of industrial cooperation with a focus on the food and beverage industry, cosmetics, pharmacy and industrial applications.</p>	Large Enterprise	Rodleben located near Dessau Rosslau
Schirm GmbH	Schirm GmbH, a wholly owned subsidiary of Imperial	Large	Schönebeck located near Magdeburg





	<p>Logistics International B.V. &amp; Co. KG, as a neutral service provider to the chemical industry at its Schönebeck location, performs the synthesis of organic compounds, the formulation and packaging of solid and liquid chemical products and a comprehensive raw materials service for the procurement of active ingredients and excipients. Specifically, these are agricultural and agrochemicals (such as fertilizers and pesticides), the rubber and rubber industries, the biocidal, polyol and adhesives industries, and many other applications that are synthesized or processed in liquid form. Powder formulations are refined, packaged, stored and shipped.</p>	Enterprise	
Radici Chimica	<p>Radici Chimica Deutschland GmbH is a wholly owned subsidiary of the Italian Radici Group and manufactures adipic acid, a precursor, in particular, of nylon-6,6 within the Chemical and Industrial Park Zeitz, located in Southern Saxony-Anhalt. Radici-Group is one of the most active international chemical companies. The Radici Group's diversified business units operate worldwide, focusing on the chemical, plastics and synthetic fibers industries. A core strength of the Radici Group is the integration into the production chain for polyamide, which frees up further synergies.</p>	large enterprise	<p>Elsteraue</p> <p>The Zeitz Chemical and Industrial Park belongs to the municipality of Elsteraue and is located 5 kilometers from the city of Zeitz and 40 kilometers south of the city of Leipzig. In the neighbourhood are the Chemiepark Leuna, the Total Refinery Mitteldeutschland and the ChemiePark Bitterfeld-Wolfen. The companies based in the Zeitz Chemical and Industrial Park also have supply relationships with the Agrochemiepark Piesteritz, Value Park Schkopau and BASF Schwarzheide.</p> <p>Inside, the Zeitz Chemical and Industrial Park is connected by a 9-kilometer road system and a 4-kilometer ring track, which is connected to the Zeitz-Altenburg railway line. By means of a pipeline coming from the chemical park Leuna the resident enterprises are supplied with hydrogen.</p>



	<p>raw materials</p> <p>ammonia      phenol</p>		
	<p>intermediates</p> <p>cyclohexanol      cyclohexanone</p>		
	<p>end products</p> <p>adipic acid</p>		

## C. Transport routes addressed

#	GENERAL DATA			BEFORE PILOT LAUNCH			
	Chemical company addressed	Shipped materials or goods	Quantity (estimate; per month)	Logistic service provider(s)	Transport distance and mode(s)	Modal split (in %)	CO2 emitted (per month; calculated)
1	Manuli Stretch	Industrial foil	1,000 t	?	1,176 km	100% road	80.6 t
2a	Eco Green	oleochemicals	175 t	?	700 km	100% road	7.6 t
2b			417 t		600 km	100% road	15.5 t
3a	INEOS	Various styrene commodity	250 t	?	2,000 km	100% road	31 t
3b			333 t		1,000 km	100% road	21 t
3c			70 t		850 km	100% road	3.6 t
4	Radici Chimica	Adipic acid	1,650 t	?	900 km	100% road	92 t

## D. Planned and Realized Multimodal Shifts












#	Number of small face-to-face meetings	ANTICIPATED OR REAL SITUATION AFTER PILOT PHASE				CHANGE
		Logistic service provider(s)	Transport distance and mode(s)	Modal split (in %)	CO2 emitted (per month; calculated)	CO2 reduction (anticipated or real)
1	1	Lineas, Grimaldi	3 km road 700 km rail 300 km short sea 173 km road	60% rail 26% short sea 15% road	30 t	50,6 t
2a	1	Lineas	75 km road 700 km rail	10% road 90% rail	2,6 t	5 t
2b		Lineas	166 road 700 rail	19% road 81% rail	6 t	10 t
3a	1	HUPAC, Kombiverkehr	2 km road 1,770 km rail 228 km road	88.5% rail 11.5% road	13.3 t	17.7 t
3b		HUPAC	2 km road 960 km rail 38 km road	96% rail 4% road	7.06 t	13.94 t
3c		HUPAC	2 km road 409 km rail 439 km road	48% rail 52% road	2.54 t	1.06 t
4	1	HUPAC	57 km road 1,000 km rail 7 km road	94% rail 6% road	42.58 t	49.15 t

## Route 1

In order to look for a suitable transport route via multimodal transport modes, Intermodal links was used. Intermodal links showed up various possible connections. A transport time up to 4 days is feasible for the shipper so the first two connections were explored.

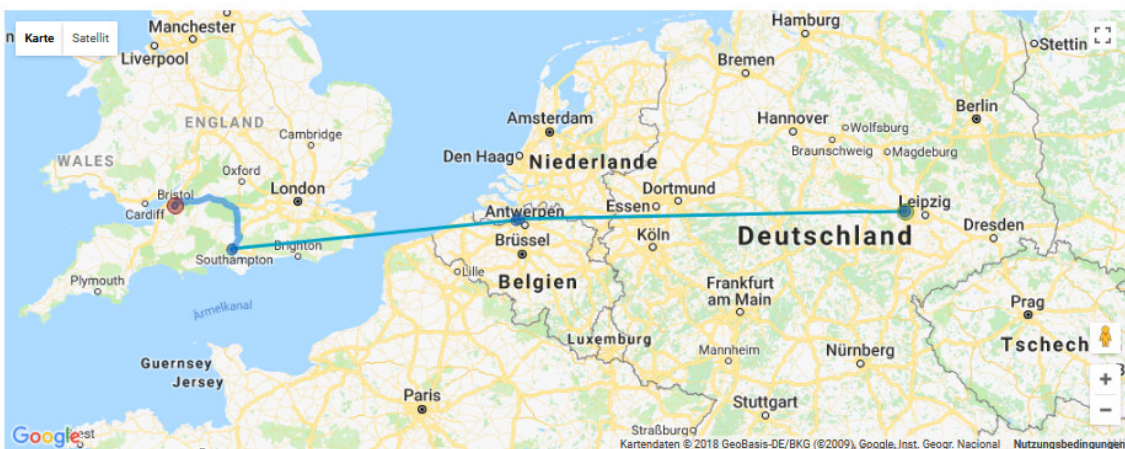
### SCHKOPAU - BRISTOL

#### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality
Schwarzheide - Antwerp - Southampton	3	1	1	 
Schkopau (Halle) - Antwerp - Southampton	4	1	1	 
Schkopau (Halle) - Ludwigshafen - Le Havre - Portsmouth	5	2	2	 
Schkopau (Halle) - Ludwigshafen - Antwerp - Southampton	5	1	2	 
Schkopau (Halle) - Ludwigshafen - Le Havre - Southampton	6	2	2	 
Schkopau (Halle) - Duisburg - Antwerp - Bristol	6	1	2	  
Leipzig - Duisburg - Antwerp - Bristol	6	1	2	  

The first one is from Schwarzheide to Southampton via Antwerp. The operators are HUPAC for the rail transport and Grimaldi for the Sea transport. The second one is from Schkopau to Southampton via Antwerp. The operators are LINEAS for the rail transport and Grimaldi for the Sea transport. Due to the fact that Manuli Stretch is located at the chemical parc Schkopau, The ChemMultimodal Team decided to take the second connection.

The ChemMultimodal Team mediated the contact to LINEAS that presented their Route at the first exchange of experiences for multimodal transport in the chemical industry organised by the ChemMultimodal project team. Contracts are currently being negotiated.



The potential route has a pre haulage of 3.1 km and an end haulage of 173 km in Great Britain that has to be organised by truck. Main transport is organised by rail and short sea and is of about 1,000 km length. Lineas organises the first part of the main haulage from Schkopau (KTSK TERMINAL) to Antwerp (Euroterminal) about 700 km. After the transshipment in the Antwerp, Euroterminal Grimaldi took over the transport by short sea for about 300 km. The result is an optimized modal split with 60% rail, 26% short sea and 15% road. CO2 emission are only 30t per month - that means a CO2 saving of about 50,6 tons per

month using the ChemMultimodal CO2 calculator for Truck + electrified rail with 15% by truck due to the fact, that there is no option to put in data for combined transport of more than 2 different transport modes.

### Result of the Pilot

- proposed transport reorganisation under evaluation by company decision-makers

### Success Factors

Manuli Stretch does not have any experience with multimodal transport. During the conversation turned out that the head of logistics fears the complexity of organising multimodal transport. From his point of view there are no suitable offers. As the consulting process showed an opinion for multimodal routes it can be said, that the market for multimodal transport is too intransparent for the responsible logistics people. Even multimodal routes within their own chemical parc were not known. The conclusion is that logisticians need to be better networked.

### Use of Tool-Box

Tool-Box Element	Who used this tool-box element? (project representatives/logistics service provider/chemical company representatives)	How was the element evaluated? (scale: not useful, somewhat useful, very useful, not used)
IT-Visualization	project representatives, chemical company representatives, logistic expert	Very useful
Consulting services	project representatives, chemical company representatives, logistic expert	Very useful
Planning Guideline	project representatives, logistic expert	Not useful
CO2-Calculator	project representatives, chemical company representatives, logistic expert	Somewhat useful

### COMMUNICATION

-


## Route 2a

In order to look for a suitable transport route via multimodal transport modes, Intermodal links was used. Intermodal links showed up various possible connections. A transport time up to 1 day is feasible for the shipper so the first two connections were explored.

### INTERMODAL LINKS SMART WAYS TO INTERMODAL ROUTES

## DESSAU - ROTTERDAM

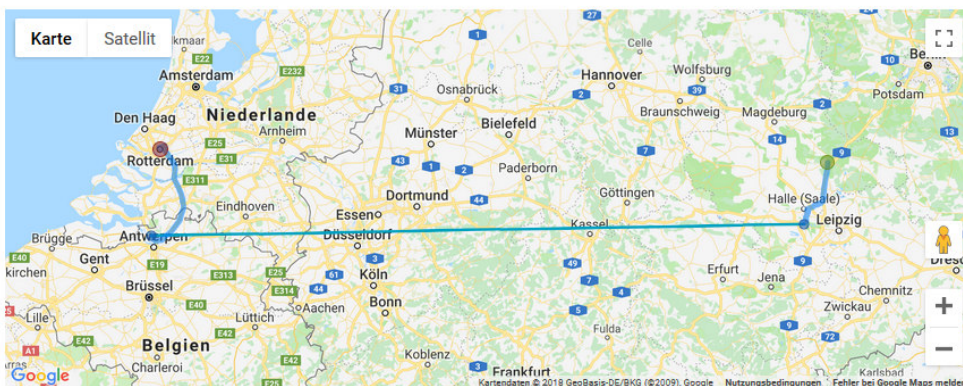
### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality	
Frankfurt/Oder - Rotterdam	1	7	0		Login
Schkopau (Halle) - Antwerp	1	2	0		Login

The first one is from Frankfurt Oder to Rotterdam was excluded because of too long prehaul to Frankfurt Oder. The second one is from Schkopau to Antwerp. The operator is LINEAS. Due to the fact that Ecogreen is located Dessau, the ChemMultimodal Team decided to take the second connection due to better accessibility.

The ChemMultimodal Team mediated the contact to LINEAS that presented their Route at the first exchange of experiences for multimodal transport in the chemical industry organised by the ChemMultimodal project team. Contracts are currently being negotiated.

### SCHKOPAU (HALLE) ANTWERP



The potential route has a pre haulage of 60 km and an end haulage of 106 km in Belgium and the Netherlands that has to be organised by truck. Main transport is organised by rail of about 700 km length. Lineas organises the main haulage from Schkopau (KTSK TERMINAL) to Antwerp (Euroterminal) about 700 km. The result is an optimized modal split with 81% rail and 19% road. CO2 emission are only 6t per month - that means a CO2 saving of about 10 tons per month using the ChemMultimodal CO2 calculator for Truck + electrified rail with 10% by truck.











## Route 2b

A second route has been identified for the modal shift for Ecogreen, which is going from Dessau to Kallo, which is close to the Antwerp chemical triangle. The same connection from Lineas has been identified as most interesting multimodal connection

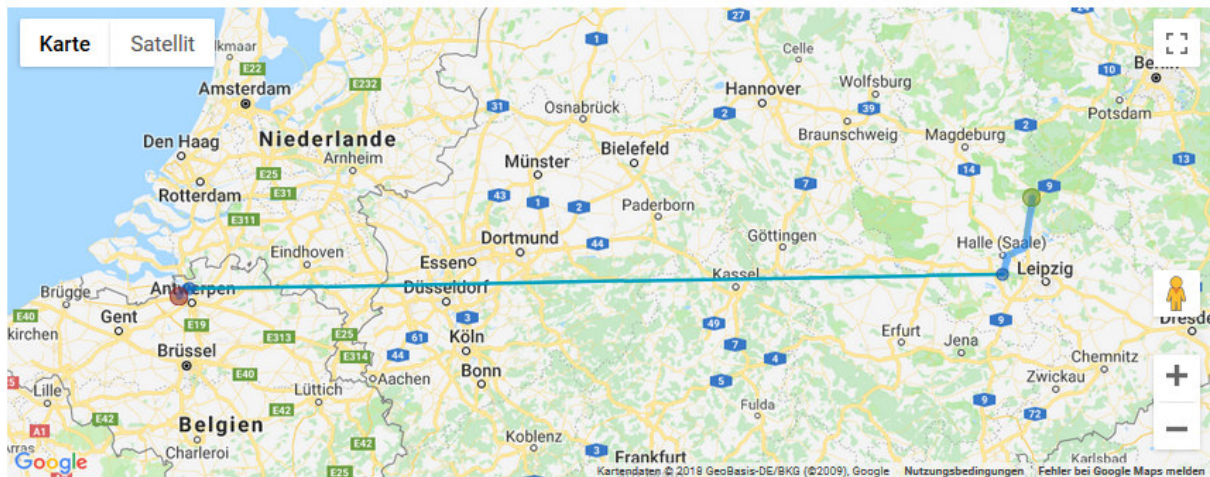
 **INTERMODAL LINKS**  
SMART WAYS TO INTERMODAL ROUTES

## DESSAU - KALLO

### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality
Schkopau (Halle) - Antwerp	1	2	0	
Schwarzheide - Antwerp	1	1	0	
Leipzig - Duisburg - Antwerp	3	2	1	 
Schkopau (Halle) - Antwerp - Willebroek	3	2	1	 
Halle - Bremerhaven - Rotterdam	3	2	1	 

## SCHKOPAU (HALLE) ANTWERP



The potential route has a pre haulage of 60 km and an end haulage of 13 km in Belgium that has to be organised by truck. Main transport is organised by rail of about 700 km length. Lineas organises the main



haulage from Schkopau (KTSK TERMINAL) to Antwerp (Euroterminal) about 700 km. The result is an optimized modal split with 90% rail and 10% road. CO2 emission are only 2,6t per month - that means a CO2 saving of about 5 tons per month using the ChemMultimodal CO2 calculator for Truck + electrified rail with 10% by truck.

### Result of the Pilot

- proposed transport reorganisation under evaluation by company decision-makers

### Success Factors

Main success factor is to establish reliable transport with respective capacity, where road transport reaches its limit. The biggest argument against multimodal transport was higher complexity and coordination and planning effort. Responsible staff sometimes has no time and resources to coordinate this new mode of transport.

### Use of Tool-Box

Tool-Box Element	Who used this tool-box element? (project representatives/logistics service provider/chemical company representatives)	How was the element evaluated? (scale: not useful, somewhat useful, very useful, not used)
IT-Visualization	project representatives, chemical company representatives, logistic expert	Very useful
Consulting services	project representatives, chemical company representatives, logistic expert	Very useful
Planning Guideline	project representatives, logistic expert	Not useful
CO2-Calculator	project representatives, chemical company representatives, logistic expert	Somewhat useful

### COMMUNICATION

So far no

## Route 3a

In order to look for a suitable transport route from Schwarzheide to Saragossa via multimodal transport modes, Intermodal links was used. Intermodal links showed up various possible connections. A transport time up to 4 days is feasible for the shipper so the first two connections were explored.

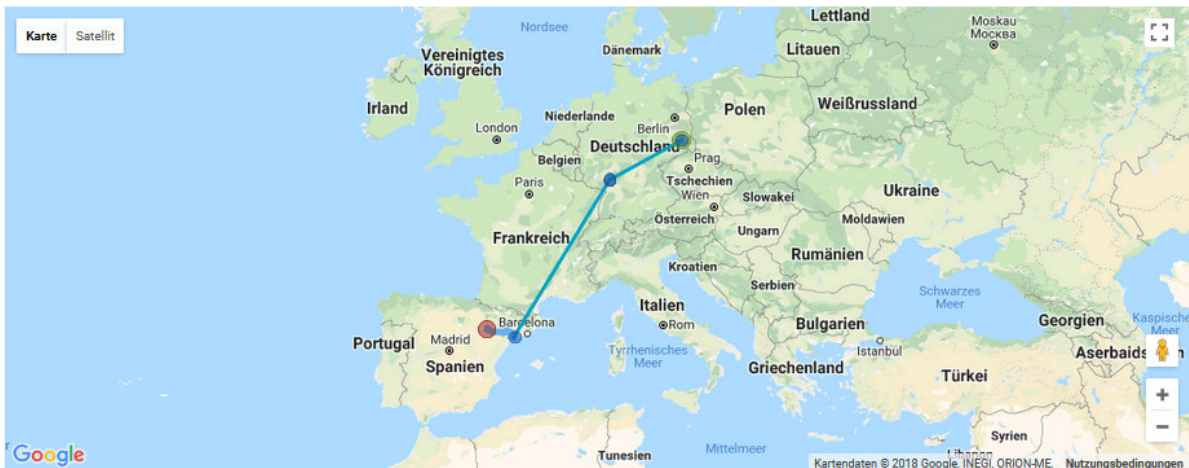
### SCHWARZHEIDE - SARAGOSSA

#### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality
Schwarzheide - Ludwigshafen - Tarragona	4	4	1	
Schwarzheide - Ludwigshafen - Mouguerre	4	2	1	
Schwarzheide - Antwerp - Tarragona	5	1	1	
Schwarzheide - Antwerp - Hendaye	5	1	1	

The first one is from Schwarzheide to Tarragona via Ludwigshafen. The operators are HUPAC and Kombiverkehr. The second one is from Schwarzheide to Mouguerre via Ludwigshafen. The operators are HUPAC and Kombiverkehr as well. Due to the fact that the first connection has a higher frequency, the ChemMultimodal Team decided to recommend this one.

### SCHWARZHEIDE LUDWIGSHAFEN TARRAGONA



Pre haulage is 2.3 km and End haulage 228 km. The main haulage of 1,770 km rail is organised by HUPAC from the terminal in Schwarzheide to the terminal in Ludwigshafen and then by Kombiverkehr continue to the terminal in Tarragona. In sum this is a modal split with 88.5% rail and 11.5% road. The CO2 emission of this transport option is 13.3 tons - that means a CO2 reduction of 17.7 tons.

### Result of the Pilot

- proposed transport reorganisation under evaluation by company decision-makers

## Route 3b

In order to look for a suitable transport route from Schwarzheide to Milano via multimodal transport modes, Intermodal links was used. Intermodal links showed up various possible connections. A transport time up to 3 days is feasible for the shipper so the first seven connections were explored. Due to the fact that Schwarzheide and Milano have their own terminals only routes with start in Schwarzheide and end in Milano were considered. 3 routes were analysed more in detail.

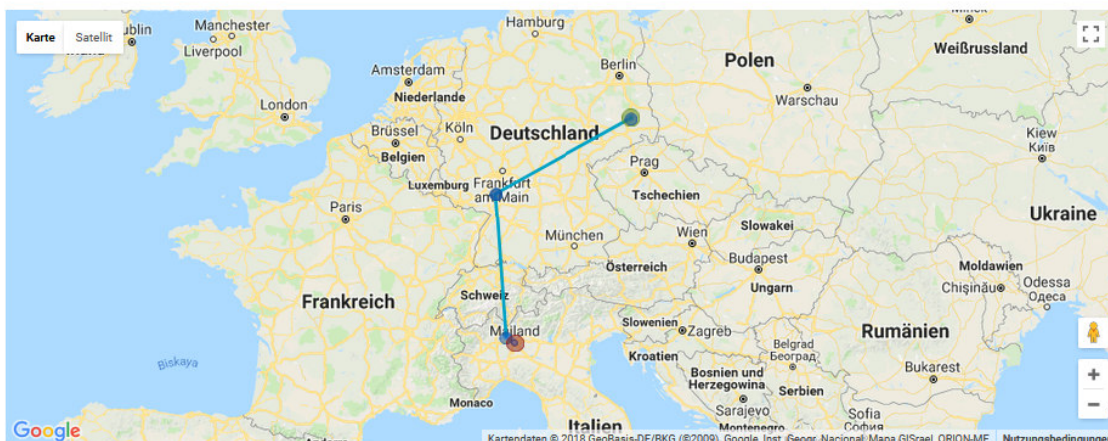
### SCHWARZHEIDE - MILANO

#### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality
Frankfurt/Oder - Rotterdam - Milano	3	7	1	
Schwarzheide - Ludwigshafen - Verona	3	6	1	
Schwarzheide - Ludwigshafen - Milano	3	6	1	
Lovosice - Duisburg - Milano	3	4	1	
Schwarzheide - Duisburg - Milano	3	4	1	
Schwarzheide - Ludwigshafen - Novara	3	4	1	
Schwarzheide - Antwerp - Milano	3	1	1	

The first one is from Schwarzheide to Milano via Ludwigshafen. The second one is from Schwarzheide to Milano via Duisburg. The third one is from Schwarzheide to Milano via Antwerp. The preferred operator is HUPAC because they can handle the transport in one hand. Due to the fact that the first connection has the highest frequency, the ChemMultimodal Team decided to recommend the first connection.

### SCHWARZHEIDE LUDWIGSHAFEN MILANO



Pre haulage is 2.3 km and End haulage 37.9 km. The main haulage with 960 km rail is operated by HUPAC. In sum this is a modal split with 96% rail and 4% road. The CO2 emission of this transport option is 7.06 tons - that means a CO2 reduction of 13.94 tons.

### Result of the Pilot



- proposed transport reorganisation under evaluation by company decision-makers

### Route 3c

In order to look for a suitable transport route via multimodal transport modes, Intermodal links was used. Intermodal links showed up various possible connections. A transport time up to 3 days is feasible for the shipper so the first six connections were explored. Due to the fact that Schwarzheide has its own terminal only routes with start in Schwarzheide were considered. Just one route was analysed in more detail.

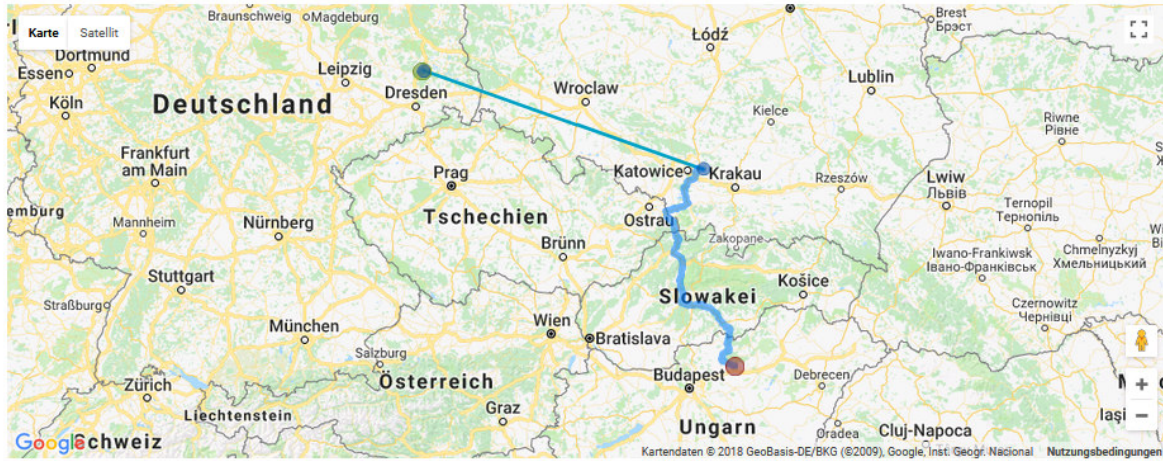
#### SCHWARZHEIDE - GYÖNGYÖS

##### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality
Schwarzheide - Katowice	1	1	0	
Glauchau - Hamburg - Budapest	3	5	1	
Dresden - Hamburg - Budapest	3	5	1	
Riesa - Hamburg - Budapest	3	4	1	
Lovosice - Hamburg - Budapest	3	3	1	
Dresden - Bremerhaven - Budapest	3	2	1	
Lovosice - Duisburg - Budapest	4	4	1	

The route is from Schwarzheide to Katowice with a long End haulage. The operator is HUPAC.

**SCHWARZHEIDE**  **KATOWICE**



Pre haulage is 2.3 km and End haulage 439 km. The main haulage of about 409 km is organised by HUPAC by rail. Because of the large end haulage this ends up in a relatively balanced modal split of 48% rail and 52% road. This option causes 2.54 tons CO2 emission and that means a total CO2 reduction of 1.06 tons.

The transport volume is too small and the end haulage too long to offset the higher complexity of organisation of multimodal transport. This transport reorganisation has not been realized because it is not competitive.



## Result of the Pilot

- proposed transport reorganisation discarded because found solutions are not competitive

## Success Factors

INEOS has some good experiences with multimodal transport. 7% of their transports are organized multimodal. In fact they do have the same concerns about multimodal transports like Manuli Stretch: The complexity of organising multimodal transports chains. The feeling is, that there are no suitable offers for the evaluated routes but the consulting process showed a lot options for multimodal routes. It appears that the market for multimodal transport is too intransparent for the logistics managers. Beside a visualization of existing connections in a simple and illustrated way, the logistics people need to improve their networking with logistic service providers.

## Use of Tool-Box

Tool-Box Element	Who used this tool-box element? (project representatives/logistics service provider/chemical company representatives)	How was the element evaluated? (scale: not useful, somewhat useful, very useful, not used)
IT-Visualization	project representatives, chemical company representatives, logistic expert	Very useful
Consulting services	project representatives, chemical company representatives, logistic expert	Very useful
Planning Guideline	project representatives, logistic expert	Not useful
CO2-Calculator	project representatives, chemical company representatives, logistic expert	Somewhat useful

## COMMUNICATION

-

## Route 4

In order to look for a suitable transport route via multimodal transport modes, Intermodal links was used. Intermodal links showed up 10 possible connections. A transport time up to three days is feasible for the shipper so the first eight connections were explored. Due to the fact that the Terminal in Schkopau is in nearest distance to Elsteraue, only routes with start in Schwarzheide were considered. The same applies to the destination in Novara. So it happens that just one route was analysed in more detail.

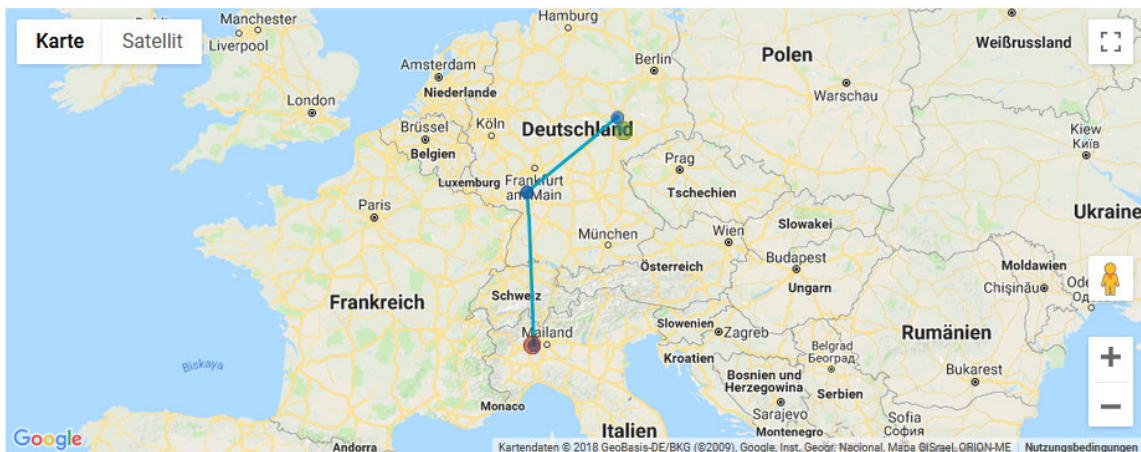
### ELSTERAUE - NOVARA

#### TOP RESULTS

Route	Transport time (days)	Frequency (per week)	Number of transshipments	Modality
Hannover - Novara	1	2	0	
Schkopau (Halle) - Ludwigshafen - Milano	3	6	1	
Leipzig - Duisburg - Milano	3	5	1	
Schkopau (Halle) - Duisburg - Milano	3	4	1	
<b>Schkopau (Halle) - Ludwigshafen - Novara</b>	<b>3</b>	<b>4</b>	<b>1</b>	
Schkopau (Halle) - München - Milano	3	2	1	
Leipzig - München - Milano	3	2	1	
Schkopau (Halle) - Antwerp - Milano	3	2	1	

The route is from the Terminal in Schkopau to the Terminal in Novara via Ludwigshafen. The operator is HUPAC.

**SCHKOPAU (HALLE)**  **LUDWIGSHAFEN**  **NOVARA**



Pre haulage is 57 km and End haulage 7 km. The main haulage of about 420 km to Ludwigshafen and then 600 km to Novara - so in total 1,000 km - is organised by HUPAC by multimodal transport. The modal split

is 94% rail and 6% road. This option causes 42.58 tons CO<sub>2</sub> emission and that means a total CO<sub>2</sub> reduction of 49.15 tons - even the multimodal transport route is a bit longer than the road transport. The CO<sub>2</sub> emission is calculated with the ChemMultimodal CO<sub>2</sub> calculator using the option of custom distance entry.

### Result of the Pilot

- proposed transport reorganisation under evaluation by company decision-makers

### Success Factors

Like INEOS Radici Chimica has some good experiences with multimodal transport. Years ago they had a large number of container transports to the Asian market, but Asia built its own factories for adipic acid in the meanwhile. Now the situation on the market for adipic acid changes a lot. They only have small recipient enterprises - that means that in most cases a truckload is sufficient. In addition to small volumes the market is very fast and the producer under pressure from very short lead times. Another problem is the reliability of tank containers that has decreased and the unpunctuality cause container be worse of in rail network.

### Use of Tool-Box

Tool-Box Element	Who used this tool-box element? (project representatives/logistics service provider/chemical company representatives)	How was the element evaluated? (scale: not useful, somewhat useful, very useful, not used)
IT-Visualization	project representatives, chemical company representatives, logistic expert	Very useful
Consulting services	project representatives, chemical company representatives, logistic expert	Very useful
Planning Guideline	project representatives, logistic expert	Not useful
CO <sub>2</sub> -Calculator	project representatives, chemical company representatives, logistic expert	Somewhat useful

### COMMUNICATION

∴



## E. Conclusion and further plans

### a. Task of the national project team

#### Partner 1: MLV

##### Main tasks:

- active participation in the Working Group Meetings in Budapest, Bratislava and Novara
- organisation and documentation of 3 workshops with about 200 participants
- bilateral discussion/consulting with 6 chemical companies
- provide interview documentation of bilateral discussions
- provide advices for modal shift to 3 chemical companies

##### Approximate project resources spent for local pilot (including personnel):

- meetings 6.582,34 Euro
- external expert 36,900 Euro
- staff 41.914,48 Euro (expected all WPT2 Staff costs)
- travel 1.352,49 Euro (expected all WPT2 Travel Costs)

#### Partner 2: isw

##### Main tasks:

- active participation in the Working Group Meetings in Budapest, Bratislava and Novara
- organisation and documentation of 3 workshops with about 200 participants
- bilateral discussion/consulting with 2 chemical companies
- provide interview documentation of bilateral discussions
- provide advices for modal shift to 1 chemical companies

##### Approximate project resources spent for local pilot (including personnel):

- staff 27.130,09 Euro (expected all WPT2 Staff costs)
- travel 1.613,76 Euro (expected all WPT2 Travel Costs)

#### Partner 3: OVGU

##### Main tasks:

- active participation in the Working Group Meetings in Budapest and Bratislava
- organisation and documentation of 3 workshops with about 200 participants
- usage of the toolbox elements and analysis of the requirements for further development
- further development of the toolbox elements planning guidelines and CO2 calculator

##### Approximate project resources spent for local pilot (including personnel):

- staff 32.279,12 Euro (expected all WPT2 Staff costs)
- travel 1.472,60 Euro (expected all WPT2 Travel Costs)

## b. Sustainability and transferability

About 200 logistics managers from chemical companies, logistics service providers and railway authorities met during the pilot project to discuss possibilities and opportunities of multimodal transport. With four events “exchange of experiences with multimodal transport in the chemical industry” cross-company contacts were established that are solidified well beyond the pilot project phase. The pilot project underlined the importance of good contacts to get early and comprehensive information about existing and planned multimodal transport routes.

The ChemMultimodal Toolbox - in particular the Elements Visualisation and CO2 Calculator - can be even used after the end of the pilot project phase. All participating companies were advised sufficiently how to use the Toolbox elements. Beyond that the Elements Visualisation and CO2 Calculator can be transferred to any other industry sector that carries a critical transport quantity.

## c. Lessons learned

The chemical logistics sector is not as good interconnected as expected - this is not so much valid for the region, but certainly for the transnational base. Although chemical transports often were handled beyond national borders, the big picture is not seen by the people involved. As part of the project, contacts from the different regions of the participating countries could be linked with each other to obtain an optimal information situation about existing and planned multimodal transport connections.

The information possibilities are very limited and intransparent. There is no common planning platform - in Germany and certainly not on a European base. So it was a big added value of the project to be able to use the contacts and the knowledge of the project partners.

The attempt to create a planning guideline fails because of the fast moving business environment and the lack of capacity to collect and update all required data and guidelines - especially outside the program area.

## Annexes

Document	Cloud link
Manuli Stretch route Bristol	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=Manuli%20Stretch%20Bristol.pdf">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=Manuli%20Stretch%20Bristol.pdf</a>
Ineos route Saragossa	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=INEOS_Saragossa.pdf">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=INEOS_Saragossa.pdf</a>
Ineos route Milano	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=INEOS_Milano.pdf">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=INEOS_Milano.pdf</a>
Ineos route Gyöngyös	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=INEOS_Gy%C3%B6ngy%C3%B6s.pdf">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=INEOS_Gy%C3%B6ngy%C3%B6s.pdf</a>
Radici Chimica route Novara	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=Radici%20Chimica%20Novara.pdf">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2Fcompany%20work%20&amp;files=Radici%20Chimica%20Novara.pdf</a>
Documentation pilot project workshop	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2FWS1%2020171102%20Schkopau&amp;files=DT2%20X%202%20Pilot%20workshop%20documentation_final.docx">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2FWS1%2020171102%20Schkopau&amp;files=DT2%20X%202%20Pilot%20workshop%20documentation_final.docx</a>
Documentation mid term project workshop	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2FWS2%2020180123%20Schwarzheide&amp;files=DT2%20X%202%20Midterm%20workshop%20documentation%20final.docx">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2FWS2%2020180123%20Schwarzheide&amp;files=DT2%20X%202%20Midterm%20workshop%20documentation%20final.docx</a>
Documentation final project workshop	<a href="https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2FWS3%2020180529%20Leuna&amp;files=DT2.3.4%20Final%20workshop%20documentation.docx">https://ifsl50.mb.uni-magdeburg.de/owncloud/s/vECivs6xxAHmLWq/download?path=%2F04%20WPT2%20Pilot%20Implementation%2FSaxony-Anhalt%2FWS3%2020180529%20Leuna&amp;files=DT2.3.4%20Final%20workshop%20documentation.docx</a>