

# Connecting European Regions using Innovative Transport

Summary Report  
May 2017



  
**sintropher**

Investing in Opportunities



This project has received  
European Regional  
Development Funding  
through INTERREG IV B.

INTERREG IV B

 **UCL**



○ Fylde Coast **UK**

○ Arnhem-Nijmegen **NL**

○ West Flanders **BE**

○ Flanders **BE**

Valenciennes **FR** ○

○ North Hesse **DE**

Saar-Moselle **DE/FR** ○

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INTERREG IV B  
North-West Europe is a financial instrument of the European Union's Cohesion Policy. It funds projects which support transnational cooperation.



## **Authors**

This summary report was authored by Robin Hickman and Colin Osborne, UCL, with inputs from Sintropher project partner organisations. We are very grateful to all those who have commented and contributed to the report.

## **Acknowledgements**

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## **In Memoriam**

In 2014, our friend and colleague Professor Sir Peter Hall, Director of the Sintropher project, died. The ongoing work of Sintropher is dedicated to him.

Cover photo: KASSEL, North Hesse, Germany

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# 1. The Sintropher project

This summary report gives results from the EU-funded Interreg IVB Sintropher transnational cooperation project, aimed at improving the connectivity of poorly-connected regions in North West Europe, using innovative rail-based technologies that can deliver sustainable, cost-effective solutions.

## What is Sintropher?

Sintropher (Sustainable Integrated Transport Options for Peripheral European Regions) is a transnational cooperation project bringing together seven regions in five countries in North West Europe. The aim is to develop sustainable, cost-effective solutions to improve connectivity for poorly-connected regions in North West Europe (NWE).

The project began in 2009, was completed in 2014, and then extended for follow-on work to 2016. It has involved fourteen (from 2014 onwards, sixteen) partner agencies – public transport operators, local authorities, regional transport bodies, and universities – with University College London (UCL) as the lead partner. Seven regions are covered: Valenciennes (France); Fylde Coast (UK); western West Flanders (Belgium); North Hesse (Germany); Arnhem-Nijmegen

(Netherlands) Saar-Moselle (a France-Germany cross-border region) and eastern West Flanders (Belgium). The last two regions were added in 2014, as part of the project extension.

The €26.8 million budget has been part-financed by the EU INTERREG IVB programme with €7.9 million European Regional Development Fund (ERDF). It has involved feasibility evaluations; pilot investments and demonstration projects; overviews of EU good practice; and a series of transnational workshops, two major conferences in Brussels and London, and a final seminar in Brussels in 2015. The latter included many European transport-related organisations, and a plenary session with Michael Cramer MEP, the Chair of the European Parliament Transport & Tourism Committee.

## Project objectives

Sintropher has examined tram-train systems for improving public transport connectivity, pioneered in Germany, firstly in Karlsruhe and developed in Kassel, allowing urban tram systems to extend over national rail tracks to serve extensive city regions. The project has also looked at other innovative systems, such as single-track tramways, as well as high-quality transport interchanges that link systems to national or transnational rail or air hubs.

The five project objectives are to:

- Promote possible cost-effective technology-based solutions.
- Assess the appraisal procedures used by different countries for investment in regional tram systems, and improve the development process for business cases.
- Promote high-quality, effective interchange between regional tram systems and regional rail and air hubs.
- Promote and market the benefits of regional tram-based systems to users and stakeholders.
- Test technologies for low cost transport links in different regional contexts, linked to more integrated territorial corridor plans which help these links realise wider economic and regeneration benefits – and better recognise these benefits in the investment case.

## Partner activities

The initial Sintropher project, in five regions, covered the feasibility of proposed new tram-based links, and investments in pilot and demonstration projects – informed by overviews of EU good practice. This covered various dimensions of investing in innovative tram-based systems – technical, organisational, economic and financial, connection to wider networks via good transport interchange hubs, and marketing to promote passenger demand and territorial development opportunities.

The project extension covered five regional cases to show how a more integrated approach to territorial planning and transport investment could help promote such tram-based systems for better regional connectivity – and generate urban regeneration and territorial development opportunities, which in turn can strengthen the investment case. The project developed a wider framework and appraisal tool for evaluating investment projects, extending the conventional monetary cost-benefit analysis required by government agencies in many countries of the NWE programme area.

See the project website at: [www.sintropher.eu](http://www.sintropher.eu)

## 2. Impacts and legacy

Partners have used funding from the Sintropher project to develop projects on the ground in their regions. This includes feasibility studies, influencing policies and programmes for investment, and investing in infrastructure projects – a process continuing after the formal end of the project in 2015. Project results are also relevant to other cities and regions in Europe.

### Achieving physical impacts

Sintropher's total expenditure of €26.8 million has been financed by €7.9 million ERDF and €18.9 million by project partners. Over 80 per cent of the funding (€22.3 million) has been invested in pilot and demonstration projects for innovative tram-based systems and related multi-modal transport interchanges, or technical and economic feasibility assessments leading to these. This reflects a strong focus on implementing projects of benefit to the project partners and on knowledge transfer concerning project development to other European cities and regions in the NWE programme area.

Partners are using Sintropher results to exert leverage for follow-on investments associated with the infrastructure projects and promote related development opportunities in the respective corridors. To 2015, around €340 million direct investment and an estimated €1,000–€1,450 million of potential leverage have been realised (some schemes are planned over the longer term with less certainty) (See table).

Examples include:

- Valenciennes: Sintropher helped to finance innovative aspects of the €150 million scheme for the new Ligne 2 single-track, bi-directional tramway system – now constructed and a major European demonstration project. The tramway is being used to support a priority urban regeneration corridor in the Valenciennes urban plan (Schéma de Cohérence Territoriaux, SCOT).
- West Flanders: a proposed extension to the coastal tram (Kusttram) is in the Flanders NEPTUNUS regional transport plan, with the Flemish Government considering funding of €40 million to construct the link.
- Fylde Coast: Sintropher helped to finance the €140 million Blackpool Tramway upgrade to state-of-the-art European standards. This has been constructed and is operational. Feasibility studies to extend the system gave a preferred option of a link to Blackpool North Station to create a tram/rail/bus interchange



hub. This is a priority scheme in the Fylde Coast Masterplan and Lancashire regional transport programme.

- Fylde Coast/wider Lancashire: upgrading of the South Fylde rail line has been examined, including tram or tram-train as preferred options. This is a priority scheme in the Fylde Coast Master Plan and a longer-term investment scheme in the Lancashire Strategic Transport Prospectus, recognising the case for investment based on wider regional economic benefits.
- North Hesse: improved marketing of the RegioTram regional tram-train network was reflected in revised marketing plans of the regional transport agencies, resulting in annual growth of passenger numbers. Although extensions of RegioTram to major companies and employment areas in the region has low economic feasibility, the initiative has resulted in a new RegioTram station and mobility services to better connect economic zones to RegioTram.
- Saar-Moselle: feasibility studies for tram-train extensions and an investment case have been developed, based on seeing the infrastructure investment as part of a wider urban regeneration and regional development initiative, rather than solely a transport project. This has been positively received by the French and German authorities and may lead to a related cross-border regeneration agency.
- West Flanders: the planned extension of Kusttram has acted as catalyst for the development of transport interchanges in three towns along the route. The Masterplans evolved to cover development opportunities in the surrounding urban areas, and are being implemented by the municipal authorities and private sector.

### Wider impacts

The Sintropher project extends beyond investing in physical infrastructure and linking this to developmental impacts, to include reviews and dissemination of good practice, consideration of appraisal processes, and the better integration of transport and planning strategies. This has contributed to refined approaches to project development by transport agencies, governmental authorities, and transport practitioners – both in the partner regions and, it is hoped, more widely across the NWE programme area.

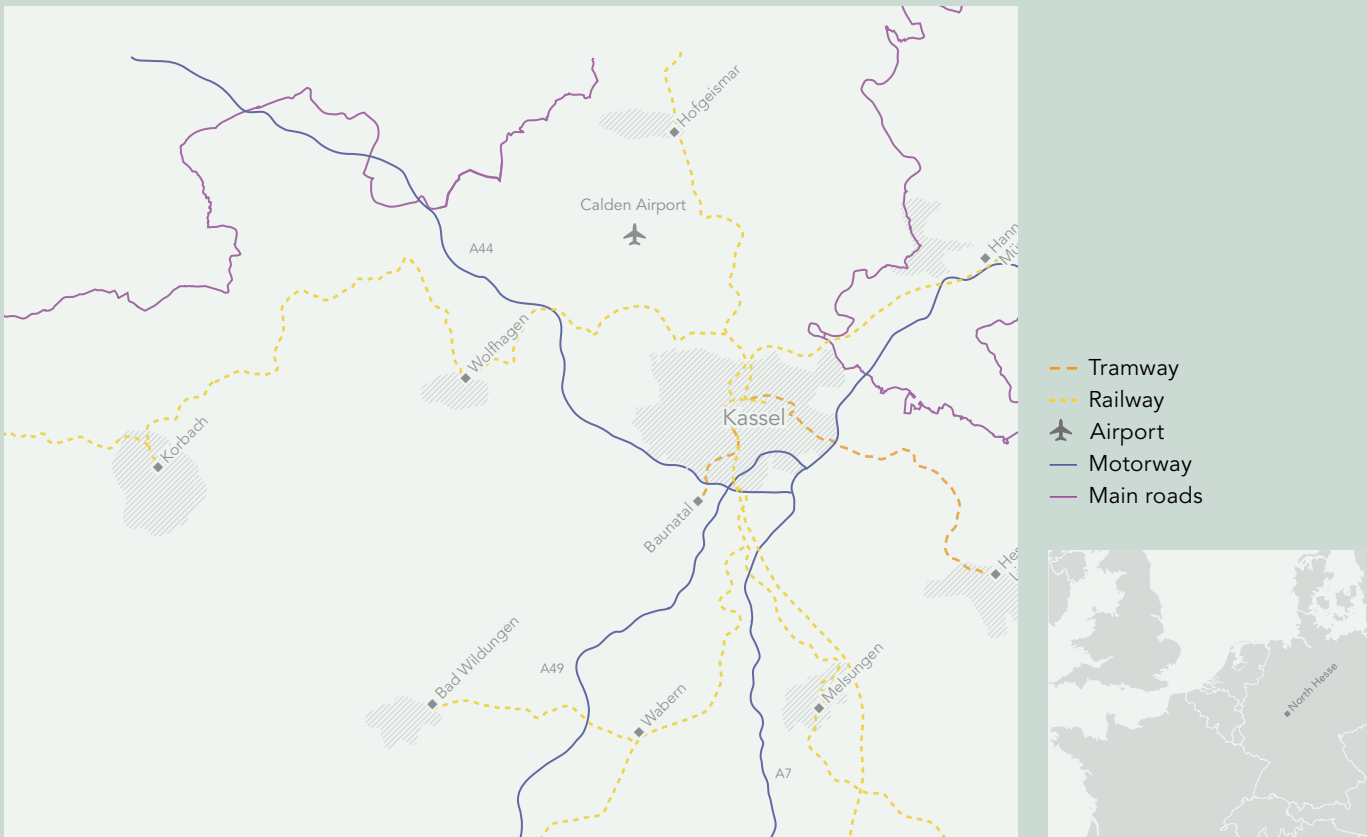
Examples include:

- Innovative technologies: there is more interest by cities and regions in the potential for tram-train and innovative tram-based technologies, especially where these offer lower cost solutions. For example, the UK Government is examining the potential for low-cost light rail/tram systems, especially for under-used rail infrastructure. Since Sintropher began, a UK tram-train trial has commenced in Sheffield-Rotherham; Network Rail has reported on innovative systems; and metropolitan authorities are actively investigating opportunities, including in Manchester.
- Transport scheme decision-making, cost-benefit analysis (CBA) and multi-criteria analysis (MCA): Sintropher has reviewed national approaches and contributed to the current debate on appraisal approaches, suggesting that a reliance on the use of CBA is too limited to effectively develop integrated transport and planning strategies. There are signs that, in some countries, attitudes and processes are changing to better take account of wider territorial and economic benefits within project appraisal.
- Better integration of new transport links with wider territorial development: more authorities are seeing new projects in terms of achieving wider planning objectives, including economic growth, rather than simply developing a transport project in isolation. There is much potential here to more effectively use transport projects to help achieve economic, environmental and social policy goals.
- Innovative financing of transport schemes: Sintropher's reference resource of briefing papers, hosted by European transport network POLIS in liaison with UITP, will contribute to government and transport agencies considerations of these issues.
- Transport interchanges: Sintropher produced 'Guidelines for Good Transport Interchanges', aimed at practitioners – and this was used in the West Flanders demonstration projects.

## Sintropher project impact and legacy

Region and scheme	Expenditure € million Total (ERDF) Investments	Leverage € million Additional Potential	Comment
<b>BLACKPOOL/FYLDE COAST</b>			
	<b>5.4m (1.5m)</b>		
Upgrade of Tramway including potential tram-train operation	<b>5.0m (1.35m)</b>	140m	Part of £100m (est. €140m) Tramway Upgrade, completed and operational in 2012
Feasibility of extension to Tramway	<b>0.2m (0.1m)</b>	25m	Now £18m (est. €25m) priority scheme in regional strategy: link to Blackpool North Station
Feasibility of upgrade of South Fylde Line including tram or tram-train link	<b>0.2m (0.1m)</b>	<b>99m-372m</b>	<b>Preferred options: short term rail (£71m, €99m) and long term tram/tram-train (£266m, €372m)</b>
<b>VALENCIENNES</b>			
	<b>13.2m (2.6m)</b>		
Innovative single-track tramway system	<b>13.0m (2.5m)</b>	150m  Yes	Sintropher elements part of new Ligne 2 scheme, completed 2013  <b>Related urban regeneration projects in Ligne 2 corridor</b>
<b>NORTH HESSE</b>			
	<b>1.9m (0.95m)</b>		
Feasibility of extensions to RegioTram	<b>0.4m (0.2m)</b>	10m est.	Increased RegioTram capacity in Kassel (dual tram sets) (2013)
<b>SAAR-MOSELLE</b>			
	<b>0.2m (0.1m)</b>		
Feasibility of extending tram-train network to new corridors in region	<b>0.2m (0.1m)</b>	<b>132m-170m 437m</b>	<b>Preferred options, Saarbrücken-Forbach (2015) Preferred option for route around wider region</b>
<b>WEST FLANDERS (WESTHOEK)</b>			
	<b>3.2m (1.3m)</b>		
Feasibility and case for extension to Kusttram	<b>0.3m (0.1m)</b>	<b>40m</b>	<b>Case under consideration by Flanders Government (2013 estimate)</b>
Koksijde, demonstration interchange rail/bus/future Kusttram	<b>1.0m (0.4m)</b>	0.1m	Other elements in masterplan – park and ride, cycle facilities (completed 2012)

Region and scheme	Expenditure € million Total (ERDF) Investments	Leverage € million Additional Potential	Comment
Veurne, demonstration interchange rail/bus/future Kusttram	1.1m (0.5m)	14.4m  210m-270m	Scheduled remaining elements in masterplan – bus station relocation, new station building (2013 estimate)  Planned urban regeneration projects in surrounding area (2013 estimate)
Diksmuide, demonstration interchange rail/bus/future Kusttram	0.4m (0.2m)	1.2m  60m-70m	Scheduled elements in masterplan – platform heights, under-pass, renovated station office (2013 estimate).  Planned urban regeneration projects, in surrounding area (2013 estimate)
<b>ARNHEM-NIJMEGEN</b>	<b>0.4m (0.2m)</b>		
Feasibility of tram/tram-train links Nijmegen-Kleve and Weeze airport	0.2m (0.1m)		Scheme deferred, technically feasible but no consensus on best option, and unfavourable economic appraisal for tram-train option
Feasibility of battery power trains or electrification Arnhem-Winterswijk	0.2m (0.1m)		Scheme deferred, questions over battery option, unfavourable economic appraisal for electrification
<b>WEST FLANDERS (BRUGES -ZEEBRUGGE SUBREGION)</b>	<b>0.1m (0.05m)</b>		
Feasibility of new tram or tram-train link in Brugge-Zeebrugge corridor	0.1m (0.05m)	100m  Yes	Preferred option under consideration by Flanders Government (2015 cost)  Planned urban development projects, in the corridor, support for Zeebrugge port expansion (freight, tourism)
<b>WORK WIDER THAN PHYSICAL PILOT AND DEMONSTRATION PROJECTS</b>	<b>2.4m (1.2m)</b>	<b>40m</b>	European good practice reviews, project investment appraisal processes, marketing of tram systems, guidelines for good transport interchanges, communications (e.g. transnational workshops, two major conferences, seminars), dissemination of results
<b>TOTAL SINTROPHER</b>	<b>26.8m (7.9m)</b> <b>22.3m (5.9m)</b>	<b>340.7m</b> <b>1,078m–1,459m</b>	



## Kassel's RegioTram: a tram-train network linking the city to the region

North Hesse (Nordhessen) lies at the centre of Germany, at the crossroads of many national road and rail links. With Frankfurt a major centre in the southern part of the federal state, maintaining and growing the economic competitiveness of the northern part of the state is important. Good transport links are central to this. Germany has been a leader in tram-train operations, whereby infrastructure and rolling stock allow for through running between heavy rail and urban light rail systems. Building on the success of tram-train technology pioneered in Karlsruhe, North Hesse's central city, Kassel, has developed the RegioTram network, which connects the city's tram network to the mainline railway.

## Project focus

Kassel's tram-train system has been operating since 2007 and the aim of Sintropher's work was to examine: what effect the RegioTram network has had on regional development, the economy and local communities in its catchment area; the feasibility of future extensions; and marketing to capitalise on the RegioTram and extend it.

Key areas for investigation were:

- The links between the Kassel region and major north-west European cities
- The effects of the RegioTram on regional development, including how it is perceived by industry and the real estate market, to enhance the region's economic vitality
- A possible tram extension to Kassel-Calden airport
- A possible tram extension to key employment centres

## Kassel's RegioTram: a tram-train network linking the city to the region



The tram serving the urban area, providing a high quality public transport service. Kassel, Germany





Tram and tram-train integration in the city centre.  
Kassel, Germany



A new route has been developed under the Hauptbahnhof to allow the tram-trains into the city centre. Kassel, Germany





The regional urban centres and villages are now well linked to Kassel – services are integrated across the region, and the villages and city are booming in economic terms. Melsungen, Germany



### 3. Investing in light rail and tram systems: the technological dimension

Light rail can represent a cost-effective approach to linking relatively peripheral areas to core urban areas and national/transnational networks. Project partners investigated the technical feasibility of options for their regions, including conventional light rail connected to good multimodal interchanges (potential extensions to the Blackpool Tramway, the Kusttram extension in West Flanders), a single-track tram system (Valenciennes) and tram-train systems (extensions to the Kassel RegioTram system and possible applications in other partner regions, such as Arnhem-Nijmegen).

#### Peripheral regions need better connectivity to national and transnational transport networks

Governments can place much more emphasis on enhancing regional public transport connections and the integration of services in peripheral regions with national and international networks. This will help promote economic competitiveness, social equity and environmentally sustainable travel.

#### Exploiting opportunities for innovative light rail

Innovative light rail solutions, such as tram-train and single-track tramway systems, should be exploited as opportunities to build public transport patronage, encourage modal shift, and promote integrated urban regeneration and economic growth. Transport investment can hence be a proactive approach to achieving policy goals, rather than a reaction to a narrow transportation problem.

Tram-trains have operational versatility, the ability to access urban centres, can efficiently use existing rail infrastructure, and can perform both heavy and light rail operations – with street running, gradient climbing and urban penetration. But costs, technical specifications, and service operating parameters mean that routes are best suited to particular urban/regional contexts, including: where the regional heavy rail network has significant spare capacity (this enables sufficient train paths and different operating speeds), a full heavy rail line reinstatement is not feasible, and opportunities exist to connect to an existing or new urban tramway. Tram-train should be considered where former heavy rail routes can be reinstated and where there is potential for interoperation with main line traffic and sections of street running, to give route optimisation in a cost-effective manner.

Single-track, bi-directional tram systems, such as the new Valenciennes Ligne 2, can provide high-quality services at lower capital cost compared with conventional double-track. Single-track tram systems are hence appropriate for smaller urban areas and rural regions, where light rail has often been perceived as too expensive or intrusive. There is also potential in dense urban areas where narrow street width is a constraint and landtake is problematic. Single-track systems however have less network capacity than double-track. They are better suited to cities where future medium or long-term demand will not lead to capacity problems.

Initial capital cost advantages also need to be balanced against potentially higher operating costs relative to conventional double-track systems and potentially less resilience to operational disruptions.

### Innovative light rail/tram technologies

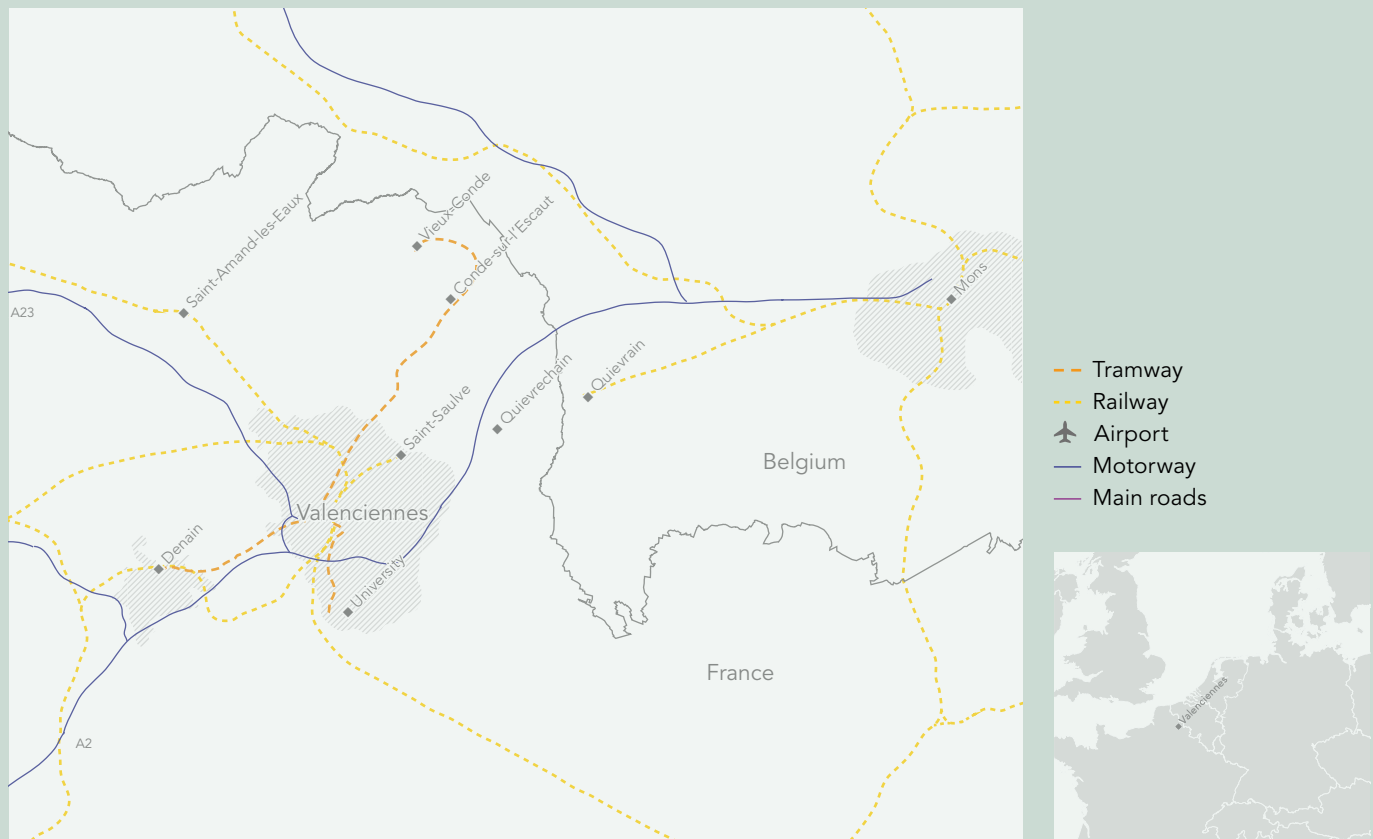
Tram technologies, indeed rail technologies generally, are continually changing. Sintropher's partners investigated the feasibility of other innovative technologies for their regions. The Arnhem-Nijmegen case considered battery-powered trains for operation major non-electrified lines in the region. This also had relevance to tram operations. It was found that this did not lead to lower life-cycle costs relative to the existing diesel trains. Also, the life span and costs of the batteries is uncertain, especially for longer, non-electrified routes as in Arnhem-Nijmegen, which affects the financial cost-benefit analysis and business case. For another technology, biogas, Saar-Moselle shows the great potential of utilising this for tram and bus, especially when integrated with regional waste treatment facilities as supply source.

Sintropher has produced a reference resource of briefing papers, covering current tram-related developments, such as long-life batteries, electric charging systems that boost tram or train battery life by recharging at stops, and technologies that allow electric trains and trams to 'coast' under bridges and through tunnels where it is difficult or too expensive to install overhead catenary.

### Harmonised standards

Technical Standards for Interoperability (TSIs) have been developed by the European Railway Agency to create harmonised operating standards across European railway systems. These have yet to make substantial impacts on local and regional transport infrastructures and could be pursued more rigorously especially in European border regions. Wider application of TSIs will enable infrastructure and rolling stock to be deployed more consistently and comprehensively, and build on economies of scale.

Economies of scale and fleet size apply to the particular context of the tram-train. Specific requirements and small fleet sizes often act as a constraint to economies of scale. It would appear that about 25 vehicles is an economic minimum to offer an attractive unit cost. Collaborative purchasing can facilitate cost advantages and efficient production sequencing. National borders remain significant barriers to regional or local transport infrastructure. But a growing number of local rail operations travel cross European territorial borders by adopting technical and/ or operational practices from one country to another, and this would be helped by using TSIs.



## The Valenciennes tram: transport and regeneration

Valenciennes lies in the north-east of France, in the Nord-Pas de Calais region. The district of Valenciennes has a population of 350,000, and comprises 82 municipalities, including the city of Valenciennes with 45,000 inhabitants. The closure of coal and steelworks industries in the 1980s left much underused land in the region, as well as neglected and inefficient urban infrastructure. But economic activity has revived, through growth in automobile production, development of a cluster for the railway industry (including the European Railway Agency, Alstom, Bombardier and other suppliers), the University of Valenciennes, and the building of a new city tramway (from 2006 onwards). Transport and infrastructure investment was viewed as a tool for urban regeneration – with the tramway acting as the spine for new development. Scheme promoters, SITURV (Syndicat Intercommunal des Transports Urbains de Valenciennes), the city municipality of Valenciennes, and the development agency, Valenciennes Métropole, have used the tramway to stimulate urban development and restore social cohesion across a previous ‘territory in crisis’.

## Project focus

Building on the success of Ligne 1, Valenciennes has constructed Ligne 2, linking the north-east of the metropolitan area, along 15.5 km with 22 stops – this has been part-funded by the Sintropher project. Ligne 2 now acts as a demonstration project, the first new tramway to be designed and operated as a single-track, bi-directional system over a significant length in an urban context. The project saved on funding for track and operations in a relatively low demand corridor and minimised land-take in narrow urban streets. It necessitated passing loops at stations to allow trams to cross, and advanced signaling and control technology to enable bi-directional operation of urban tram services with high frequency. The approach is innovative and could be used in many similar contexts, for example in areas with deprivation problems, where an improved public transport system will help people travel around the urban area in environmentally-friendly manner.

## The Valenciennes tram: transport and regeneration



The tram is used to provide public transport services in a deprived urban area – high quality public transport is not just for successful, thriving urban centres. Valenciennes, France





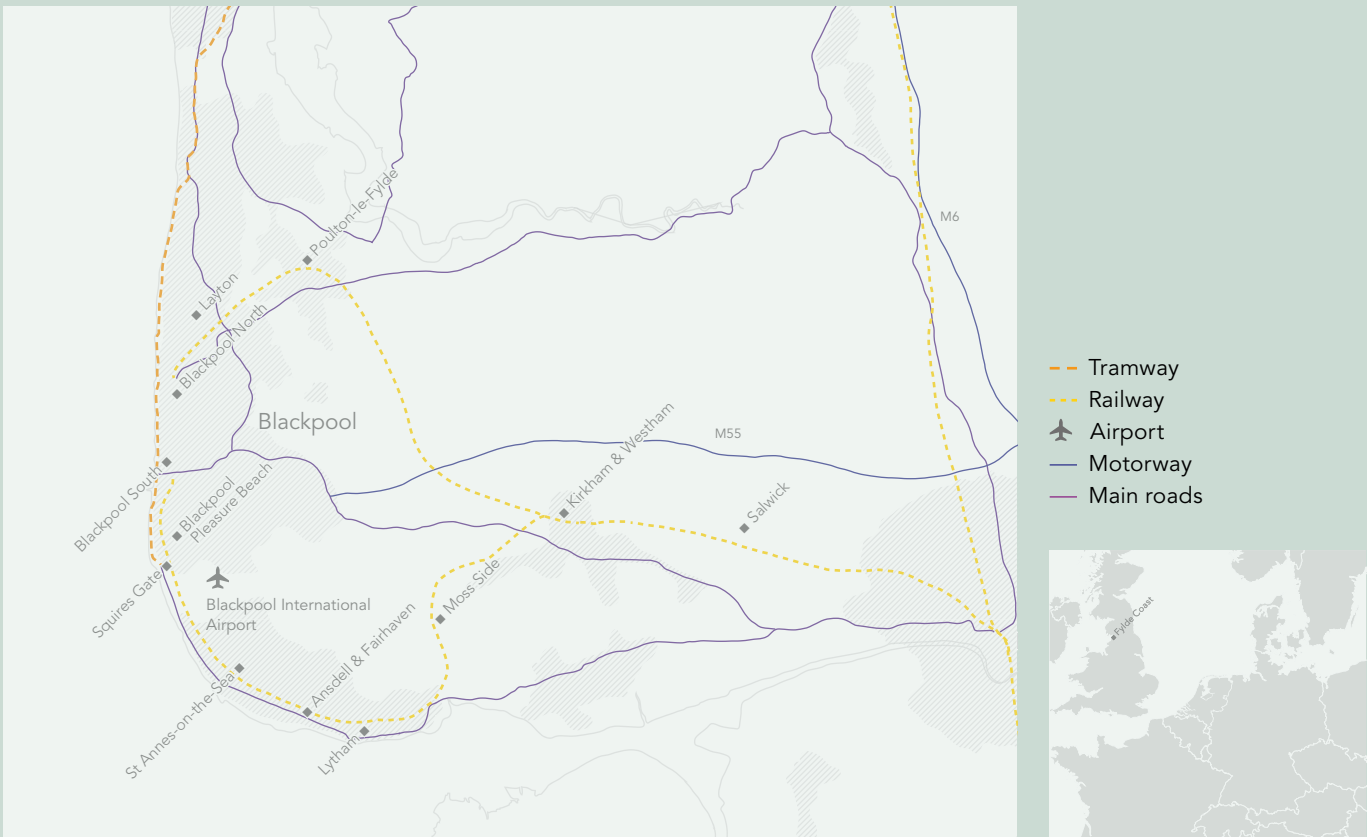
The streetscape is well landscaped and designed – so that the transport infrastructure adds to the urban environment. Valenciennes, France



The single-track system serves deprived, former mining communities, higher income villages and the university. Valenciennes, France







## The Blackpool tramway: a revitalised system with expansion potential

The Blackpool tramway, running over 20km, is the oldest in the UK, dating from 1885. The surviving system's increasing obsolescence, including lack of trams suitable for access by disabled persons, and maintenance costs, threatened its closure. Despite this, the system was carrying four million passengers each year, 85 per cent of these in the tourism season.

## Project focus

Sintropher helped to fund a major upgrade of the tramway, to latest European standards, as well as feasibility studies into extending the tramway onto the mainline railway. This would provide a link from the tram to the Preston regional/national rail hub, Manchester and beyond. The feasibility studies concluded with a preferred option of extending the tramway to Blackpool North Station. Investment of £20 million has been successfully raised for construction, with anticipated completion in 2018. Also, options for upgrading the South Fylde Line (a neglected heavy rail route with a poor service) were examined, including tram or tram-train with a new connection to the existing Blackpool tramway. The investment case was strengthened by linking the infrastructure investment to territorial development opportunities along the corridor.



## The Blackpool tramway: a revitalised system with expansion potential



There is much potential to link the newly-refurbished Blackpool tram to the national rail network, either with an extended tram system or tram-train along the South Fylde Line. Blackpool, UK

## 4. The economic and financial dimension

Sintropher partners undertook economic feasibility studies for new or extended tram or tram-train links in their regions. This included: in the UK, Fylde Coast (extended Blackpool tramway); West Flanders (extended Kusttram); Netherlands (Nijmegen-Kleve, disused cross-border rail link); Germany (North Hesse, RegioTram); and France (Valenciennes, new single-track Ligne 2). To help promote investment in these links, the project examined the direct and indirect territorial impacts and reviewed case study material in over 50 European urban areas. Even when there is a good investment case, partners' experiences show how implementation is often impeded by lack of funding due to constraints on public expenditure.

### Economic feasibility assessments

Appraisal of transport schemes varies between countries, reflecting different political and regulatory frameworks. There is almost always an economic appraisal, usually with cost-benefit analysis (CBA). Application of CBA varies considerably and also when it is used in the process. Often a form of multi-criteria analysis (MCA) is also used, with scheme options assessed against policy objectives. The weight given to CBA and MCA varies.

New or extended conventional tram links to a major rail/bus hub often have a stronger case than tram-train, providing an easier technical solution and lower cost. But they are weaker on the advantages offered by tram-train, such as the ability to operate regional services directly into urban centres, connectivity without need for interchange, and potential wider urban regeneration and territorial development benefits.

Despite these advantages, tram-train is not always a strong option when viewed through a monetary

CBA process. It is often technically viable, but high costs (such as vehicle unit costs and extra technical specifications) undermine economic feasibility. To exploit the potential of tram-train, cost issues need to be addressed and/or the wider benefits of tram-train need to be reflected in the CBA or through a modified appraisal process.

Whether the system is conventional tram, tram-train, or a combination, the capital and operating costs will be a central element in economic feasibility. But these should not prejudice the achievement of strategic transport and territorial development objectives and wider benefits. Transport investment should be made for social and environmental objectives as well as economic. These are likely to be better assessed through an MCA process – against local/regional policy criteria – perhaps followed by a detailed CBA which can be used to modify the preferred option in terms of cost efficiency. This requires a much strengthened MCA of the 'strategic case' for investment.

## Extending the Kassel RegioTram system

Sintropher examined extending the RegioTram system, to serve major economic zones in North Hesse, but these were not economically feasible due to insufficient forecast demand compared to capital cost. The solution was fast regional rail services for commuters into the city station hubs, especially the main city, Kassel, with fast buses providing direct onward connections to the economic zones and major companies. Dialogue with company management is important – a major benefit of the RegioTram initiative undertaken in Sintropher – acting as a catalyst for sustainable mobility initiatives for employees (including cycle purchase, car-sharing, etc.).

## Developing the Valenciennes single-track system

The extension of the regional tram system, by SITURV along Ligne 2, connects the north of region into Valenciennes. State-of-the-art signaling and passing loops mean that a bi-directional service on a single track can be operated. This is the first large-scale system of this type in Europe. It is built and in full operation, acting as a major demonstration project for other European cities to learn from and consider the potential opportunities.

The key advantages over a conventional two-track system are the cost saving and the ability to run through streets too narrow for double track. Capital costs of double-track tramway are high when compared on a like-for-like basis – cost per km for a single-track tramway is almost 50 per cent less in Valenciennes, without influencing level of service.

But a conventional double-track system still offers advantages. The mature technology means costs and safety and acceptance processes are well understood. Switching and signaling systems are standardised, which offers more operating flexibility. The new single-track system involved additional costs for the new technologies. The switching and signaling systems were specifically designed for single-track systems. The projects offers a demonstration of this type of innovative design in practice, with development and manufacturing costs potentially less if adopted elsewhere in Europe.

## The territorial impacts of tram-based schemes

Sintropher commissioned a comparative assessment of the impacts of new and extended tram systems in six European cities: Bergamo (IT), Nottingham (UK) Saarbrücken (DE), Utrecht (NL), Vélez-Málaga (ES) and Valenciennes (FR). This used a qualitative approach across three dimensions – time, space, and role/function of the tram scheme. The review found distinct positive impacts, with the strength and nature of these varying by context. Particularly in France, the tram investment is used as a catalyst for urban renewal – tram projects are implemented with associated urban public realm design works, often with wider urban renewal projects in parallel.

Tramways can be an important factor in generating development impacts. Generally, in the case studies reviewed, impacts reflect an amplification and acceleration of pre-existing trends. There were modest effects in terms of urban and territorial development; and no automatic impacts – the changes were due to strengthening of existing urban and regional dynamics. A package of associated measures, including an integrated planning strategy, are required to make the most of the transport investment. The territorial effects reflect how stakeholders act upon the opportunities and constraints in the tram corridor.

Ex-post evaluation is important to understanding the impacts and successes of a scheme. Impact assessments by tramway promoters and operators often only focus on narrow, 'direct' transport goals, for example passenger use. An evaluation process should incorporate many factors, including developmental impacts, carried out 5-10 years after the project has opened, giving a longer term, wider view of success.



## The effects of tram-based schemes: urban regeneration and and development



Similarly, across the Netherlands, the main rail stations are being upgraded as an integral part of the renewal of urban areas. Rotterdam, The Netherlands



RegioTram has led to large investment and a revitalisation of Kassel city centre and surrounding towns and villages.

- a) Kassel, Germany
- b) Melsungen, Germany

## The potential to help generate economic and territorial development

Sintropher produced a literature review of the effects of light rail or tram-based projects, examining over 50 European cases during the last 20 years. Generally, this revealed a mixed picture, with strong and weak effects in different cities and regions, reflecting different contexts and circumstances. Study methodologies varied greatly, and tram-based projects have resulted in different types of impacts according to context and at different scales (local, city, regional, inter-regional). Impacts are much wider than economic indicators typically used in ex-ante appraisals of project investment. The effects of tram-based systems are not the result of direct causal relationships, but of complex interactions including the territorial planning strategy and governance framework. Territorial effects include urban development and regeneration, and enhanced land and property values around stations.

Transport investments can be catalysts in generating long-term transformative effects, but these are not guaranteed. Tram-based schemes should be accompanied by a complementary package of measures in order to effectively capitalise on the territorial development opportunities. These could include traffic demand management measures, restrictions on car parking, attractive fare schemes, well-located and good quality station interchanges, frequent reliable services, and good passenger information – as part of an integrated transport strategy. Complementary measures can include urban development initiatives, such as priority economic development sites, housing developments, urban regeneration schemes, and skills training for the local population to access jobs using the enhanced accessibility.

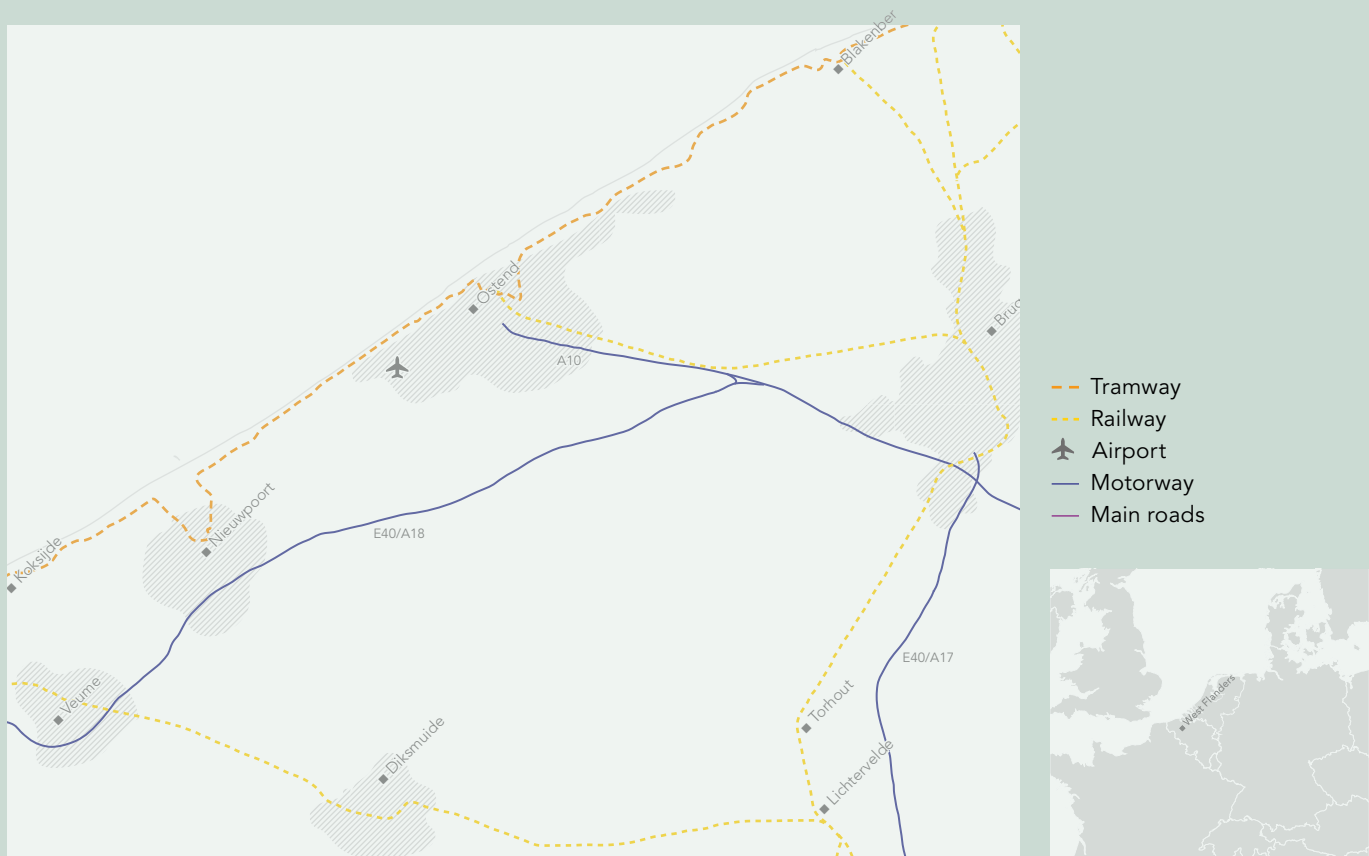
Innovative tram-based schemes should be seen as an integral part of the overall vision and territorial planning strategy for the city/region. The transport investment should not only be appraised against likely impacts – it should be seen as part of the implementation of the territorial planning strategy, as a means to achieve policy goals.

## Financing regional transport links

In their feasibility studies, partners found that new tram or tram-train proposals are usually technically feasible and often offer a positive investment case – especially if this goes wider than conventional monetary-based cost-benefit analysis, to include realisation of territorial objectives and benefits. But implementation is often impeded by lack of funding. Tram-based projects usually involve significant capital investment, with funding often dependent on a large element of national public finance. Centralised (national) decision-making is usually based on economic efficiency rationales. Decentralised arrangements (city, regional) can better match local/regional policy priorities to projects, plus local political leadership and support – but many authorities face difficulties in implementing large projects using their own resources. Regional funding allocations and more innovative financing mechanisms need to be developed, through packages that can mix public and private sources.

Sintropher has developed a reference resource of innovative financing approaches plus city/region examples, in association with the POLIS European transport network, and UITP. Government authorities, and city/regional transport agencies, are invited to look at this, to consider how they could help finance transport links in their regional/national context.





## The Kusttram: a successful coastal tram system

The Westhoek region of West Flanders is semi-rural and coastal, with limited connectivity between the towns, rural areas and coastal resorts. The coast is served by the 68 km Kusttram (coast tram), part of the once-extensive Belgian tram system, running along the Belgian coast from De Panne, close to the French border in the west, to Knokke near the Dutch border in the east. It connects to the Belgian rail network, offering both intercity and local services to Brussels and Ghent. The Kusttram was modernised in the 1990s, and acts as an important local transport link as well as offering a service to tourists.

## Project focus

Technical and economic feasibility studies for the Kusttram extension were undertaken by De Lijn in addition to construction of upgraded interchanges for rail, bus, and potentially tram, in Veurne, Koksijde and Diksmuide. The investments improve regional connectivity, providing demonstration projects of multimodal transport interchanges in smaller stations. An important element of the projects was the marketing of the new transport interchanges in order to promote local development opportunities and urban regeneration.



## The Kusttram: a successful coastal tram system



The Kusttram concept can be used in many similar contexts – a high quality public transport system serving coastal towns.

## 5. Appraising costs and benefits

Project partners' economic feasibility assessments for their tram-based links raised major questions about the system of investment appraisal for transport projects as required in respective countries. Sintropher examined the different approaches in selected European countries, in the UK, France, Germany, Netherlands and Belgium/Flanders. This assessed whether the process helps or constrains the development of tram-based projects and integration with territorial development strategies. Some countries, notably France and Germany, are much better at delivering high quality tram-based systems. It is the appraisal system that contributes, in part, to this.

### Economic feasibility appraisal in context

Sintropher's work on partner feasibility studies and business cases gave experience of different national approaches to transport scheme appraisal in North West Europe. CBA is widely used as a means of quantifying the likely costs and benefits of transport projects; often used alongside forms of MCA, which allow some assessment of projects against policy objectives.

Appraisal is rarely the sole determinant of the project, but it is an important part of the decision-making process. The weight given to economic feasibility differs – in some countries it is the dominant factor; in other countries, environmental and social factors have a strong influence. A key issue is how much weight decision-makers place on economic feasibility, and how the various elements in a 'business case' or a 'strategic case' are organised. The weight given to the CBA and MCA, and the stage at which both are used in the project cycle, differs in the various national systems. In the UK, CBA is given much importance – and projects are often assessed largely against economic efficiency goals. CBA is particularly used where transport funding is heavily centralised as it offers a simple process for

comparing multiple proposed projects. This is the case in the UK, where large transport projects are funded from the national level.

There is wide recognition of the limitations of CBA and the need for a broader framework to fully account for more of the potential benefits of a scheme. For example, there are problems in the limits of quantification, the use and application of time savings, discounting, distributional and equity issues, limited ex-post validation, limited progress against policy goals, and weak integration with territorial planning and wider objectives. Economic feasibility appraisal doesn't show how potential schemes can support territorial development policies and deliver strategic policy objectives for regions and cities.

Various methods have been developed in different countries, including in the UK, France, Germany and the Netherlands, to widen CBA for transport projects by extending the economic benefits covered. In the UK, the increase in urban or regional economic performance due to agglomeration and regeneration impacts (typically measured by Gross Value Added)





Participatory MCA. Sintropher's participatory MCA tool, developed to help discuss project options and including multi-actor views.

can be included in the estimation of benefits. Such approaches can help decision makers consider projects options in terms of contributions to the local economy. But they favour successful larger urban areas, where greater benefits are demonstrable.

Whilst methods of CBA are well established, they are simplistic and can represent a very partial assessment of costs and benefits, particularly for complex infrastructure projects. Costs should be balanced against the wider economic and territorial benefits of a scheme and policy objectives. A more comprehensive approach is needed, going beyond the conventional use of CBA. The strategic case for investment, assessing a proposed project against policy goals, is critical, and it is here that the consistency with urban planning objectives can be ensured. The appraisal processes in Germany and France offer a different way forward, with projects appraised and delivered in a decentralised manner, with less focus on economic efficiency and stronger assessment against local/ regional policy objectives.

### A wider objectives-led framework

Sintropher has developed an appraisal framework and decision support tool, based on participatory MCA, which can be used to test projects and project options against a range of local/regional policy criteria, including wider economic and territorial benefits and incorporate multi-actor views.

The process has been tested in the Fylde coast (UK) regional case, considering the upgrading of the South Fylde rail line, including tram and tram-train options, to improve connectivity in the sub-region and promote regeneration and growth. The process produced a much stronger case for investment compared to the CBA currently required by the UK system. It also resulted in different preferred options – tram and tram-train with a new connection to the Blackpool tram, rather than a modest improvement to the existing heavy rail service. The work demonstrates that the shape of the appraisal framework is important to the projects that follow, and we hope that the Sintropher project can contribute to a much wider and more critical debate on appraisal approaches used in transport planning.

There are, of course, difficult issues concerning the application of a participatory MCA process, including: criteria choice and weighting, impact scoring, consolidation of different views, and potential for manipulation. A process with a large number of stakeholders is not always feasible for all projects and can be resource intensive. However, it is the multi-actor discursive process that can help discussion of issues of policy and scheme objectives. The participatory MCA process offers much promise.

The Sintropher findings are aimed at generating a greater critical debate on appraisal methods in transport, arguing that there should be less reliance on CBA – and that CBA is too simplistic a process for prioritizing funds concerning complex transport projects. Instead, a strengthened application of MCA, with quantitative and qualitative data, can be applied. It is perhaps this type of approach that needs to be developed to allow a much greater discursive approach to transport appraisal, and to take better account of the potential of transport schemes to improve regional connectivity for wider territorial development.

The framework and participatory MCA tool has transnational relevance to other cities and regions which may be seeking to implement new or extended tram-based links to enhance regional connectivity. It can be used in many different contexts, as criteria and impacts can be chosen by the user. There is also much scope for using this type of process in European cross-boundary situations.

## 6. The marketing dimension

Partners' pilot marketing initiatives in five regions combined two perspectives: passenger marketing and location marketing. Tram-based systems typically have a focus on passenger marketing, to increase passenger numbers and satisfaction. But project partners emphasised the importance of also using wider location marketing, to promote investment in the tram scheme, related urban regeneration and development opportunities. The results have included increased passenger demand and stimulation of territorial developments related to the new tram schemes.

### Passenger marketing – contributing to patronage

This can use the same principles that service-orientated business sectors generally adopt – an effective marketing mix based on the seven 'Ps' of product, price, place, promotion, personnel, physical facilities, and process management. Using an overview of good passenger marketing practice elsewhere in Europe and peer review, Sintropher partners found weaknesses in their regions, especially in integrated ticketing, passenger information, and overall image and brand. Fragmentation in transport organisational structures remains a barrier to effective public transport in many regions.

Partners' pilot initiatives in North Hesse, Fylde Coast and West Flanders show how innovative passenger marketing can result in a substantial increase in passengers even though the regional organisation of transport is different. 10 success factors were identified: customer orientation, high quality services, integrated ticketing and services, effective communication and passenger information, targeted initiatives to generate new customers, a strong positive image, capitalising on social media, innovative offers to develop new market opportunities, good transport interchanges, and an integrated organisational approach.

### Location marketing – promoting opportunities

In North Hesse, partners' experience in developing the RegioTram system included active location marketing which be used to gain acceptance and investment in planned new links, by the general public and political actors. Wider positive effects associated with the development of the city and region can be promoted. A good relationship with the local media is required.

Partners' projects in Valenciennes, North Hesse, West Flanders and the Fylde Coast show how new or extended tram lines can be actively used as a location marketing tool, to act as a catalyst for regeneration of the urban areas. In Valenciennes, the streets and squares along the Ligne 2 corridor were upgraded in parallel with the tram route construction. Location marketing should consider use of 'catalyst' public investments in association with a new tram scheme, to attract further investments in the public and private sector. Masterplans are good location marketing tools for this purpose.

Partners' pilot marketing projects in Valenciennes, Fylde Coast, West Flanders and North Hesse show how tram schemes also present an opportunity to transform the image and 'brand' of the city and wider region, for wider promotion of economic investment, territorial development and quality of life.

## Combining passenger and location marketing



New tram systems and locations can be more effectively marketed – to raise advertising income, improve patronage, increase the developmental impacts – and to raise the image of attractive urban areas.

- a) Sarreguemines
- b) Montpellier

## 7. Good transport interchanges

To enhance regional connectivity, light rail and tram systems must be linked to effective transport interchange hubs connected to the regional, national and international transport networks. This dimension has been pursued by pilots in Nordhessen and West Flanders. Sintropher has also developed and published Guidelines for Good Transport Interchanges.

### Regional connectivity and good interchanges

Improved connections between transport interchange hub and region can create benefits in both directions, by directly improving physical regional access, and by changing perceptions about the 'connectedness' of an area, in terms of overall ease and quality of the overall journey.

Although now well understood in relation to strategic transport hub infrastructure, this approach should be applied to smaller interchanges, as in the Sintropher partner regions, where a range of interventions can make significant local impacts.

### European good practice

Sintropher has developed a checklist of components of good interchange, with five themes (Operational Efficiency, Accessibility, Understanding, Quality, Wider Effects) covering principles and benchmarks (required, preferred, not required) for different sizes of interchange. Particular reference is given to small and medium-sized interchanges, which are most relevant to the tram system initiatives in the partners' regions.

Small and medium-sized interchanges are often the poorest quality in design terms, with little funding given to them when they are initially built and also as they are maintained. Many features can usually be improved, including basic functionality, movement within the interchange facility and wider interchange zone, accessibility, legibility, permeability, wayfinding, and service information.

Partners in West Flanders implemented demonstration projects for integrated transport interchanges (rail, bus, tram) to improve the West Flanders network in three towns. This was to support the planned extension of Kusttram. Partners in Nordhessen also undertook pilot initiatives to improve stations on the RegioTram network and integrate these more effectively with their respective towns and villages.

Creating good transport interchanges involves more than the design and development of the interchange itself. The station needs to be effectively integrated into the surrounding area, including consideration of movement in the interchange zone and the role of

the interchange as an element in the place-making of the locality. This requires a wider vision, such as a Masterplan, and co-operation between more stakeholders, typically including the transport authority, transport operators, municipal authorities, including urban planners, and often the private sector.

Integration needs to be addressed in relation to urban development, planning (location/position, architecture, roads and paths and urban form); traffic nodes and links (connections, feeder transport and interchange functions); and related to cognitive issues (information, wayfinding, perception and visibility).

### Guidelines for good transport interchanges

Much good practice exists – the challenge is to find it and use it. Reinventing the wheel for every project is expensive and time consuming. There are a number of good practice examples of newly developed small and medium-sized interchanges, including some considered in the Sintropher project, such as Koksijde, Veurne and Diksmuide in Belgium; Westervoort in the Netherlands; and some RegioTram interchanges in Nordhessen. Many have given carefully thought to the instrumental and affective experience of the interchange – meaning that the journey through the interchange can be much more enjoyable.

Sintropher's 'Guidelines for Good Transport Interchanges' highlight and disseminate good practice in a form that is convenient for transport agencies and practitioners and territorial planners.

### Challenges of implementation

The West Flanders and Nordhessen initiatives highlight many challenges in implementing high quality public transport projects but also opportunities and potential solutions. These are similar across different European national and regional transport contexts, even though details may vary. Creating effective interchanges seems easier for large cities and harder for small or even medium-sized ones. Interchanges in a large city generally need more complex thinking and typically face more difficult challenges of design and implementation. This is in contrast to smaller interchanges where aspects such as accessibility and wayfinding are easier to achieve. However, interchange development is financially harder to implement in small cities and towns due to fewer passengers using the interchanges, and often a lower priority for investment by the public transport providers, who are typically regional or national in scale.

By far the biggest challenges for smaller and medium-sized interchanges are financial and organisational, more than technical and regulatory. Sintropher partners have developed success factors and opportunities to overcome these. For example, multi-sourced financing, multi-stakeholder involvement, masterplans covering both the interchange zone and wider development opportunities in the localities, municipal or community initiatives, developing project champions and political support, passenger orientation rather than too much operator orientation, effective inter-agency leadership and co-operation, and perhaps local/regional flexibility for national standards of provision and operation of facilities (especially when national rail operators are involved).



## Good transport interchanges – linking light rail and tram systems to the regional and national transport networks



An exemplar small station improvement – a new station has been built to link the outlying village to Arnhem, leading to a revitalised local community. Westervoort, The Netherlands



Easy rail, tram and bus interchange – and connection into the urban centre. Saarbrücken, Germany





The French town now has an excellent tram-train link across the national border to Saarbrücken, Germany. Sarreguemines, France





Effective electronic ticketing and plentiful cycle parking.  
Arnhem, The Netherlands



The refurbished Hauptbahnhof – now a cultural station with cinema, shops and restaurants. Kassel, Germany

## 8. Linking with city and regional development

Partners pursued follow-on work in five regional case studies, on themes arising from the original feasibility studies and pilot investments. Firstly, to test the innovative low-cost tram-based solutions, in different city and regional contexts, in order to improve regional connectivity. Secondly, to promote a more proactive approach to investment in these links as an integral part of a territorial development strategy. This can help realise wider economic, environmental and social benefits, and in turn strengthen the investment case.

### Bruges-Zeebrugge

This assessed the economic and technical feasibility of a new tram or tram-train link for the Bruges-Zeebrugge corridor, a route of 19km, to improve passenger services (including tourism) and enable the existing badly-routed heavy rail line to be used completely for freight, to support expansion of the port of Zeebrugge. Partners used the option of a single-track bi-directional tramway as built and demonstrated, partly through Sintropher, in Valenciennes. This strengthened the case for investment through lower capital cost and efficient use of land, utilising existing public land such as alignments alongside roads. It also shows how inclusion of wider benefits for the corridor, such as tourism, rail freight capacity to support expansion of Zeebrugge, better connectivity for planned development poles in the corridor, can change the case for a new tramway link. This changed from non-viable (with a BCR lower than 1 using standard Flanders government CBA methodology) to viable.

### Saar-Moselle

Technical and economic feasibility studies were undertaken to extend the existing tram-train line serving Saarbrücken, in Germany, and to create a wider network for the region. This includes a new 10km line between Saarbrücken and the French town of Forbach, to improve capacity for the major cross-border commuter flows. The investment case was helped by using the tram-train option to exploit cost-efficient use of existing rail routes and/or disused private industry rail routes. Although the capital cost is high, an assessment of the social and economic impacts and spatial plan of the urban regeneration and development opportunities along the preferred route has encouraged the main stakeholder agencies to consider investment in the preferred options. This may lead to the establishment of a cross-border urban regeneration agency, in recognition that the tram-train initiative is not simply a transport project, but part of the overall regional development.

## South Fylde

This focused on options to upgrade the neglected 19km South Fylde rail line for tram or tram-train, and seeing this as part of the development corridor from Blackpool to Preston, Manchester and beyond. The option of converting the entire South Fylde Line to a new tram-train line with connection to the existing Blackpool Tramway has a perceived low value for money through the CBA process, in particular due to high infrastructure costs and operational factors relating to existing rail services. The option of a new link to connect to the existing Blackpool tram, combined with tram-rail inter-operation on the South Fylde Line (possibly segregated) offers good value for money.

A key objective was to develop the investment case based on urban regeneration and regional economic growth, not simply an improved transport link, since the scheme will need to access UK regional funding which has a strong emphasis on economic growth and competitiveness. The addition of wider economic benefits to the CBA process (including GVA business productivity arising from improved connectivity and agglomeration of businesses and labour supply) produced a more attractive investment case and a higher BCR for all of the options. Linkages to local development opportunities in the corridor also helped. A different evaluation approach based on MCA, scoring against a wider range of regional development objectives, produced a stronger investment case. It also resulted in a different preferred option – the tram/tram-train rather than simply improving existing heavy rail. But the high capital cost remains a barrier under the current appraisal process.

## North Hesse

The effects of the existing RegioTram network on the development of Kassel and wider Nordhessen region were examined, with recommendations for further exploitation. The RegioTram has been an integral part of regional development, especially the growth of Kassel and the city's university, acting as a key driver in the region's knowledge economy – Kassel has been identified as one of the most dynamic cities in Germany. Investment in the RegioTram system was achieved by promoting its benefits for this wider regeneration and growth and capitalising on the cost-efficient use of existing rail routes and disused rail routes.

## Arnhem-Nijmegen

The feasibility of electrification of two important regional rail routes along growth corridors in the city region were evaluated, the 65km Arnhem-Winterswijk-Doetinchem route and the 40km Arnhem-Elst-Tiel route; plus an alternative possibility of adding battery power to the diesel trains, to enable them to operate on the non-electrified sections of the routes. This was also very relevant to the potential extension of the electric tram system in Arnhem. For the Arnhem-Winterswijk-Doetinchem corridor, this was linked to the spatial development plans of the municipalities and two proposed new regional stations.

The investigation found that battery-powered trains did not lead to lower life-cycle costs relative to the existing diesel trains, but these results reflect the regional context of operator franchises which are using new diesel rolling stock with a long life. Also, a very uncertain aspect is the life span and costs of the batteries, especially for longer non-electrified routes, such as those in the Arnhem-Nijmegen region. For the investment case, partners used a wider social CBA, incorporating a range of monetised external benefits, at an early stage in the feasibility assessment. This was helpful to find a preferred option, although the BCRs remained below 1:1 due to high capital costs. The social CBA includes wider issues than incorporated in a standard CBA, such as pollution, environment, safety, health, labour or real estate market impacts. Hence the societal value of these impacts are included, usually through willingness to pay exercises. This still does not take account of the development opportunities in the regional spatial plan and municipal plans (so-called transit-orientated development) so the case may be revisited in the future. However, the pace of development for housing and business has been slower than anticipated, due to regional economic circumstances, so this is a constraint at the present time.

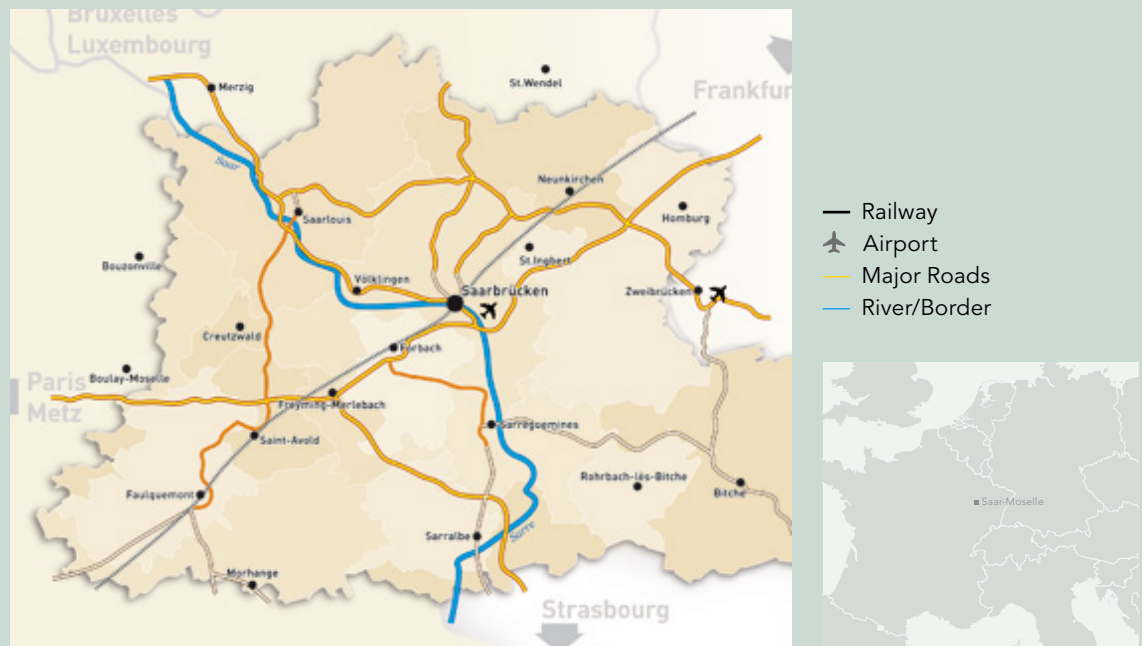


## Saar-Moselle: extending the tram-train network as part of regional development



Tram-train connections for deprived urban areas and also across international borders. Saarbrücken, Germany





## Saar-Moselle: extending the tram-train network as part of regional development

The Saar-Moselle Eurodistrict is governed by French law and made up of the Urban Community of Saarbrücken and seven French inter-communalities in Moselle-East. It covers an area of 1,400 km<sup>2</sup>, and has around 650,000 inhabitants spread over 170 communes. The region is undergoing economic restructuring following the closure of the coal industry and other heavy industry. In Moselle-East, unemployment is 15-20 per cent, and in Saarland around 7 per cent. Many German companies are based on the French side of the border and vice versa. Almost 38,000 people cross the border every day. There are also strong cross-border movements for leisure activities, shopping, and education.

### Project focus

The Eurodistrict commissioned a technical and economic evaluation for options to extend the existing tram-train line and create a wider regional network, capitalising on the cost and technical advantages of using the region's disused industrial rail lines. Possible use of innovative technologies for tram and bus using bio-gas generated by the region's waste recycling system was also evaluated. An important component of the work was to assess the socio-economic effects of the options, including developing a corridor plan for the urban regeneration and development opportunities in Saarbrücken and nearby major economic zones. The government agencies now see the initiative as a regional development project rather than purely a transport project.

## The overall picture

All of the regional cases show how the investment case is strengthened by linking the proposed scheme more strongly to related urban and regional development opportunities, through mechanisms such as integrated spatial plans, corridor plans or masterplans. This needs to be adequately recognised in current national systems of investment appraisal for transport infrastructure schemes.

However, caution is required. Transport investments can be catalysts in generating territorial development and economic growth, indeed wider environmental and social impacts, yet this is not guaranteed – other factors need to be favourable. Hence strategy development needs to consider the most effective package of measures, including transport and non-transport elements. The Arnhem-Nijmegen case shows how weak economic conditions and weak financial and planning incentives can be a barrier to realisation of a masterplan. Schemes should be accompanied by wider measures in order to help realise the urban and regional development opportunities. Transport measures (for example, restrictions on car parking, attractive fare schemes, good station interchanges) and also urban planning initiatives (such as urban regeneration programmes, and incentives for development projects) can be much better integrated in many projects.

Partners found that, even with a favourable investment case, capital cost remains a barrier to project implementation. This emphasises the growing importance of innovative forms of financing for tram-based schemes, both public and private, preferably at a devolved city and regional level.

## 9. Conclusions

Sintropher's strong emphasis on concrete pilot and demonstration investments, combined with European good practice, shows how innovative tram-based systems can often offer lower cost, and promote improved regional connectivity with significant territorial benefits. But it must be part of an integrated territorial (corridor) approach that enables stakeholders to actively pursue territorial development. All sixteen partners in the seven regions have benefited greatly, and continue to benefit, from the projects implemented on the ground. Sintropher has often been the catalyst for the investments which either would not have happened, or would have taken much longer to realise. Transnational co-operation and knowledge-sharing has been central to this success.

### The emerging good practice

Sintropher has examined and invested in public transport options in some of the more peripheral regions in the NWE programme area. The project's pilot and demonstration activities show how innovative tram-based systems can offer inexpensive and very effective public transport solutions, promoting improved regional connectivity with significant territorial benefits, including economic, urban regeneration, social, environmental impacts.

But, a key point is that transport infrastructure needs to be planned and implemented as part of an integrated territorial (corridor) approach that enables stakeholders to actively pursue urban planning objectives. This requires sufficient resource for urban planning. Without this, infrastructure investment can lack strategic direction. Transport strategy and projects cannot be effectively developed by CBA alone – there is too little consideration of important, wider policy objectives. A participatory MCA process helps in prioritising infrastructure investment against policy objectives, and

in progressing environmental, social, economic and urban planning aspirations – and can help involve the public in the decision-making process for transport and urban planning.

### The impact in partners' regions

Sintropher has developed a very wide range of pilot and demonstration investments, developing some excellent practice on the ground, including:

- The new Valenciennes single-track tram system: the first tram system of this nature and scale in Europe, which has become an important demonstration project, and is being used to support an urban regeneration corridor in Valenciennes.
- Enhancements to the North Hesse RegioTram system, which has significantly contributed to development of the region and main city, Kassel, which became the most economically dynamic city in Germany in 2012.

- The Blackpool tram upgrade, which has resulted in a significant increase in passenger use. The Sintropher-initiated tram extension to Blackpool North station has leveraged £20 million in investment to build the link.
- The South Fylde Line tram and tram-train options along the neglected rail route has strong community support and has become more important in terms of funding priority. The estimated cost of £60-200 million for short term and longer term options is now seen as integral to sub-regional development.
- The West Flanders Kusttram extension and bus/rail/tram interchange demonstration projects have leveraged potentially €40 million in funding for Kusttram and an estimated €270-340 million in the wider urban areas.
- In Saar-Moselle, tram-train investment is for future years, but the feasibility results, especially the estimations of wider benefits to the region, have changed attitudes in key stakeholders in this cross-border region. There is now great interest, perceiving the infrastructure investment as integral to regional development.

### Transnational co-operation in action

All the partners have benefited greatly from the Sintropher activities, and continue to benefit from the projects implemented and tested on the ground. Sintropher has often been the catalyst for the investments, which either would not have happened without the project, or would have taken much longer to realise. Since the partners are mainly city and regional authorities or transport agencies, their communities have also benefited from investments in the particular case study contexts.

There has been much transferring of knowledge between the partners, to help achieve results on the ground. For example, the West Flanders case study for the Bruges-Zeebrugge corridor used the option of a single-track bi-directional tramway as built and demonstrated in Valenciennes. Partners in Saar-Moselle saw how the new tram systems in North Hesse and Valenciennes have been used to implement wider urban regeneration programmes and promote urban development, hence widened their case for extending the region's tram-train system from a transport project to a regional development project.

The Fylde Coast partners learnt from North Hesse's experiences in improved marketing for RegioTram. The Arnhem-Nijmegen partners drew on the North Hesse experience of tram-train systems to assess feasibility in their own region. The West Flanders partners used Sintropher's 'Guidelines for Good Interchanges' to inform their demonstration projects related to the planned Kusttram extension. Sintropher helped to widened their perspective so that the initial transport-orientated station master plans have become masterplans for the surrounding urban area.

### Reflections for research and practice

Participating in transnational projects has great benefits, including the transfer of knowledge and learning between different contexts. Sintropher has explored the different decision-making practices in transport and many reflections can be made:

In research:

- More appropriate appraisal processes can be developed which aid investment in public transport, cycling, walking and public realm projects.
- Developmental impacts from such schemes can be examined, with the aim of adding to the assumed benefits in project appraisal. All development, however, may not be positive – issues of gentrification, housing affordability and the quality of development can all be further explored in relation to transport investment.
- Social equity and environmental impacts of different transport investments can be examined, with the aim of better representing these impacts in project appraisal.
- The project development process can be further refined, to help monitor the contribution of transport investment to policy objectives over time.

In practice:

- The development of tram and tram-train systems in Germany and France continues – and this practice which can be usefully transferred to Blackpool and similar regional contexts in the UK and NWE, where public transport networks are very limited.
- The regional centres and coastal towns in NWE can be more effectively connected to the larger cities, urban centres and mainline railways.



- High quality public transport should be developed in areas with social deprivation problems, as well as the successful urban areas, as a critical part of developing sustainable transport options across Europe.

We hope the Sintropher project has contributed, in part, to these improvements in transport decision-making. High quality public transport is difficult to fund in successful urban areas – but even more difficult in smaller urban areas and towns where there are large social deprivation problems. A proactive approach can lead to innovative transport strategies being developed – using transport investment to achieve economic, environmental and social goals. It is this raising of ambition that the Sintropher project calls for. There are excellent examples to draw upon in practice – to demonstrate how transport and urban planning can lead to good cities and better lives.



Sintropher partners exchanging and transferring knowledge of tram and tram-train systems in North West Europe. Saarbrücken, Germany



Impact on the ground – infrastructure funding from a host of partners including Sinropher and INTERREG IVB. Valenciennes, France

## Further Information

The Sintropher project website hosts a set of partners' findings reports, outcomes from project workshops, proceedings of the two transnational conferences in 2011 and 2014, the final briefing seminar in Brussels in 2015, and academic publications which have followed. [www.sintropher.eu](http://www.sintropher.eu)

The full set of published reports on the various dimensions of the project is available at: [www.sintropher.eu/publications](http://www.sintropher.eu/publications)

### Summary Report



Connecting European Regions Using Innovative Transport. Summary Report. London: UCL (2017)

### Best Practice Guide

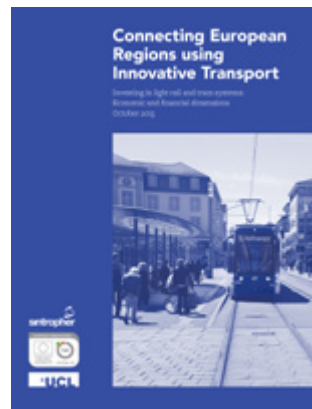


Guidelines for Good Transport Interchanges. London: UCL (2015)

### Integration Reports



Connecting European Regions Using Innovative Transport. Investing in Light Rail and Tram Systems: Technological and Organisational Dimensions. London: UCL (2015)



Connecting European Regions Using Innovative Transport. Investing in Light Rail and Tram Systems: Economic and Financial Dimensions. London: UCL (2015)



Connecting European Regions Using Innovative Transport. Investing in Light Rail and Tram Systems: Good Transport Interchanges. London: UCL (2015)





Connecting European Regions Using Innovative Transport. Investing in Light Rail and Tram Systems: Marketing Dimensions. London: UCL (2015)



Connecting European Regions Using Innovative Transport. Investing in Light Rail and Tram Systems: Towards a More Integrated Approach. London: UCL (2017)

### Briefing Papers

Covering innovative tram-related technologies and financing

Also hosted by the POLIS European transport network:  
**[www.polisnetwork.eu/eu-projects/sintropher](http://www.polisnetwork.eu/eu-projects/sintropher)**

### Conference Proceedings

Using Innovative Transport Technologies to Stimulate Regional Development. Conference Proceedings. London: UCL (2011)

Supporting Growth through Regional Connectivity. Conference Proceedings. London: UCL (2014)

Connecting European regions using innovative transport: Investing in tram- and rail-based systems. Sintropher Final Seminar. London: UCL (2015)

### Project Video

Sintropher project video:  
**<https://www.youtube.com/watch?v=8Ct5BFRzBbU&feature=youtu.be>**

### Academic publications

Chen, C. L., Dean, M. and Hickman, R. (2016) Testing the Effectiveness of Participatory MCA: The Case of the South Fylde Line. Working Paper, EU Sintropher, INTERREG IVB. London, UCL.

Hall, P. (2014) Good Cities, Better Lives. Abingdon, Routledge.

Hamiduddin, I. and Hickman, R. (2018) Transferring innovative public transport practice to the UK. In: Ferm, J. and Tomaney, J. (Eds.) Planning Practice: Critical Perspectives from the UK. New York, Informa UK.

Hickman, R. and Dean, M. (2015) Incomplete cost versus incomplete benefit analysis in transport. Working Paper, EU Sintropher, INTERREG IVB. London, UCL.

Hickman, R. (2017) Transport appraisal: thinking beyond the CBA? In, (Eds.) Docherty, I. and Shaw, J. The Inside Track: why transport matters and how we can make it better. Bristol, Policy Press.

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