Methodological support for ERDF and Cohesion Fund result indicators in the field of transport post 2020

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Paul Riley, Maurits Van der Hoofd, Fergal Trace
JASPERS – European Investment Bank

Key Details of Indicator RCR55:

Annual Users of newly built, reconstructed, upgraded or modernised roads

- Overview of the indicator

- Measures the total number of passenger-km travelled on roads newly built, reconstructed, upgraded or modernised due to ERDF or CF financial support
- Provides a measurement of the intensity of use over 1-year
- Takes into account all passengers (including also the driver) in the vehicles travelling on the road

- Data required: Annual Average Daily Traffic (AADT); Lengths of sections; Vehicle Occupancy Rates

- Sources of Data: Field Surveys (e.g., manual counts); installed technology; published datasets

Calculating Indicator RCR55

Step 1: AADT estimation

$$[AADT] = COUNT \times EXPANSION \times CONVERSION = [COUNT] \times [PC_{DT}] / [PC_{H}] \times [PC_{AADT}] / [PC_{DT}]$$

Where	*AADT:*	*Annual Average Daily Traffic*
	COUNT:	*The traffic volume observed for the selected period*
	PC_{DT}:	*The 24-hour count from the Permanent Counter for the survey day(s)*
	PC_{H}:	*The count from the Permanent Counter for the short period*
	PC_{AADT}:	*The AADT from the Permanent Counter for the survey year*

Step 2: Passenger-km estimation

$$[Passenger\text{-}Km] = \sum_{j=1}^{n} AADT_j \times Length_j \times Occupancy \times DAYS$$

Where	*Passenger-Km:*	*The value of the Indicator*
	$AADT_j$:	*The Average Annual Daily Traffic on section j*
	$Length_j$:	*The length of section j*
	n:	*The number of sections defined for the scheme*
	Occupancy:	*The average number of passengers per vehicle*
	DAYS:	*The number of days in the year in question (365 or 366)*

Key Details of Indicator RCR56:

Time savings due to improved road infrastructure (road passenger-hours/year)

- **Overview of the indicator**
  - Measures the total number of passenger-hours saved due to newly built, reconstructed, upgraded or modernised roads with ERDF/CF support
  - Provides a measurement of how much time was saved over 1-year
  - Takes into account all passengers (including also the driver) in the vehicles travelling on the road
- **Data required:** Annual Average Daily Traffic (AADT); lengths of sections; vehicle occupancy rates [see Indicator RCR55]; average speeds
- **Sources of Data:** Field surveys (e.g., speed surveys); online tools (e.g., Google Maps)

Calculating Indicator RCR56

Step 1: Hours saved calculation

[HOURS SAVED] = $\sum_{j=1}^{n}$ ([Length$_j$ b / Speed$_j$ b] – [Length$_j$ f/a] / Speed$_j$ f/a]) * Occupancy * AADT$_j$ f/a * DAYS

Where	*HOURS SAVED:*	*Passenger hours saved per year*
	Length$_j$ b:	*Length of the existing road on section j in baseline scenario*
	Speed$_j$ b:	*Average speed on existing road on section j in the baseline scenario*
	Length$_j$ f/a:	*Length of the new road on section j (forecast or achieved)*
	Speed$_j$ f/a:	*Average speed on the new road on section j (forecast or achieved)*
	Occupancy:	*Average occupancy per vehicle*
	AADT$_j$ f/a:	*Annual Average Daily Traffic on section j (forecast or achieved)*
	n:	*The number of sections defined for the scheme*
	DAYS:	*Number of days in the year (365 or 366)*

Key Details of Indicator RCR64:

Annual Users of Dedicated Cycling Infrastructure (users/year)

- **Overview of the indicator**
  - Measures the total annual number of users of dedicated cycling infrastructure
  - Taken at the most busy point on the new cycling infrastructure and represents a conservative estimate of usage of new cycling infrastructure.
- **Data required:** Bike counts
- **Sources of Data:** Field Surveys (e.g., bicycle counts); installed technology (e.g., automatic counters); online tools

Calculating Indicator RCR64

Step 1: Users of cycling infrastructure

[USERS] = (COUNT) * (EXPANSION) = (COUNT) * (PCAT) / (PCH)

Where	*USERS:*	*Annual users of cycling infrastructure*
	COUNT:	*The cycling volume observed for the selected period*
	EXPANSION:	*The expansion factor from selected period to annual users*
	PCAT :	*The Annual Users from the permanent counter*
	PCH:	*The count from the permanent counter for the selected period.*

Key Details of Indicator RCR60: Freight Transport on Inland Waterways

- **Overview of the indicator**
  - The number of tonne-kilometres produced on an inland waterway, over one year.
  - It covers all types of inland waterway freight.
- **Data required:** Freight volumes in each direction per section; Nr. of vessels in each direction; Disruption periods; Lengths of sections
- **Sources of Data:** River management authorities; Operators

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Step 1: Tonne-km calculation

$$[\text{TONNE-KM}] = \sum_{j=1}^{n} [\text{TONNE}_j] \times [L_j]$$

Where		
	n:	The number of defined sections
	TONNE-KM:	The value of the indicator
	TONNE_j:	The volume of tonnes carried for the year on each section
	L_j:	The length of the section in question

Key Details of Indicator RCR59:

Freight transport on rail (tonne-km/year)

- **Overview of the indicator**
  - The number of tonne-kilometres produced on the scope of railway infrastructure that is the subject of the Project investment, over one year.
  - It covers all types of rail freight.
  - Measures the total number of tonne-kms realized due to newly built, reconstructed, upgraded or modernised railways with ERDF/CF support
- **Data required:** Freight volumes per section; Lengths of sections
- **Sources of Data:** Infrastructure Managers; Railway Undertakings

Calculating Indicator RCR59

Step 1: Net tonne-km calculation

$$[\text{TONNE-KM}] = \sum_{j=1}^{n} [\text{TONNE}_j] \times [L_j]$$

Where	**n:**	**The number of defined sections**
	TONNE-KM:	**The value of the indicator**
	TONNE_A:	**The volume of net tonnes carried per year on the section in question**
	L:	**The length of the relevant section**

In case gross tonnes are provided, these need to be converted to net, see the methodological support document for instructions.

Indicator RCR58

Annual users of newly built, upgraded, reconstructed or modernised railways in passenger-kms per year

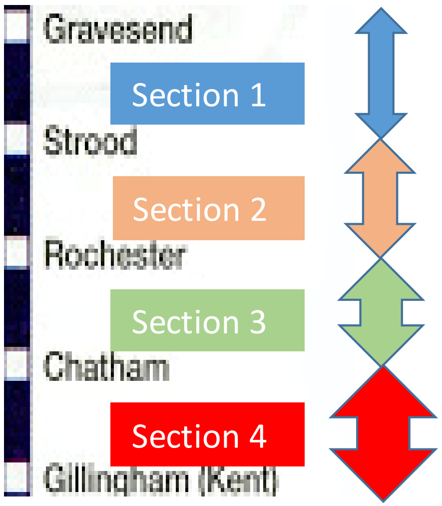
What does it Measure ?

Sum of annual distance travelled by all users (passengers).

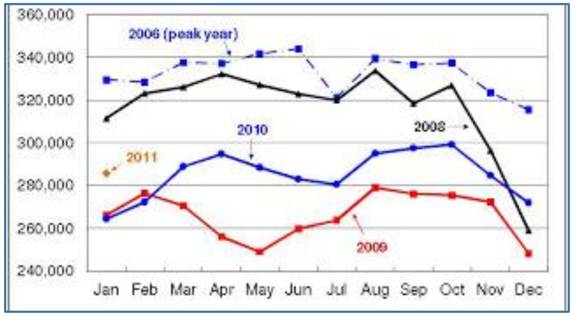
Need to know numbers of passengers and lengths of sections

Data usually required

- **Passenger Volumes per Project section**
  - Project broken down to homogenous sections with same or similar levels of traffic
  - Usually sections between railway stations or entry directions of a big station project
  - Passengers counted/estimated for each section / train type / hour for a certain period
  - **Daily Passenger Traffic$_{Section}$**



- **Data to factor up Daily Passenger Traffic to annual value : Annual Expansion Factors**



- **Length of sections (infra. manager) : Length$_{Section}$**

Passenger Volumes Data Sources (1)

Source	Details / options	Advantages / disadvantages / risks
Rail Passenger Service Operator	• Regular passenger counts on trains either manual or using permanent technology • Ticket sales data • Both for Project and wider network	✓ Can give good coverage across the year ✓ Useable to build Annual Expansion Factors ✓ If data offered for free, cheapest method ↓ Availability, reliability, completeness issues ↓ May need substantial data fusion ↓ May not be available for all operators
Field surveys	• Manual counting most likely in trains or on platforms • Hand-held technologies can be used to support manual counting • Temporary installed technology can help with counting or extend period of count	✓ Reliable source of data, control over quality ✓ Short period counts relatively cheap ↓ Potential site access issues ↓ Costs need to be covered ↓ Measurement period tends to be short

Passenger Volumes Data Sources (2)

Source	Details / options	Advantages / disadvantages / risks
Other published data sets, on-line tools	• Usually statistical publications at international/national/regional level • E.g. monthly, weekly, daily traffic data profiles • Network GIS, passenger reservations	✓ Useable to build Annual Expansion Factors ↓ Rarely available at project level, unlikely for Project sections
Permanent Installed Technologies	• Typically infrared counters/video on trains • Usually owned by Rail Operator • Data could be for Project, wider network or other sections.	✓ Complete source of annual data ✓ Useable to build Annual Expansion Factors ↓ Availability issues ↓ Still rare (often in new trains) ↓ Can be inaccurate in peaks ↓ Probably unavailable for Project sections

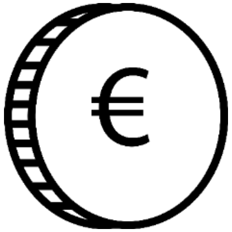
Experience and Cost Considerations - Manual Field Surveys

JASPERS country experience

- ✓ Many consultants experienced with manual public transport field surveys
- ✓ Ministries or Railway infrastructure managers may have limited experience but should be able to procure it, if necessary with some external advice

Costs of manual field surveys

- ➢ Depends on the complexity of the Project (extent of sections and train services)
- ➢ Several temporary employees (through agency) with limited skill requirements will be needed for a day **AND** one/two experts to plan, train, organise, supervise, evaluate
- ✓ Small cost compared to other project studies, design or investment, fundable by TA



Summary on Passenger Volume Data Collection

If data available and of sufficient scope and quality

- ✓ Railway Operator passenger count and ticket data
- ✓ Try to map whole year traffic
- ✓ If necessary seek other available aggregated datasets to build Annual Expansion Factors

If operator sources not sufficient to estimate daily traffic for the Project

- ✓ Do manual counts for a short (at least 2 days) period
- ✓ Seek other available aggregated datasets to build Annual Expansion Factors

Final Calculation Steps

Annual Passenger Traffic$_{Section}$ =

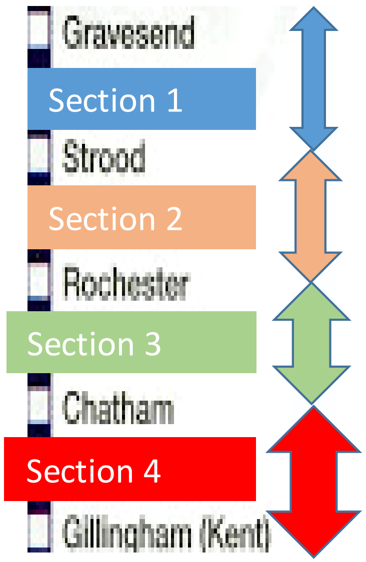
Daily Passenger Traffic$_{Section}$

x

Annual Expansion Factor

INDICATOR RCR58 Annual Users =

$\Sigma_{(All\ sections)}$ (Annual Passenger Traffic$_{Section}$) x (Length$_{Section}$)



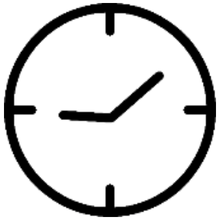
Indicator RCR101

- **Time savings due to improved rail infrastructures in person-hours per year**

What does it Measure ?

Sum of annual time savings across all users (passengers)

Need to know numbers of passengers and travel times in Project and Base-line situation



Basic Data Usually Required

- **Travel Time Savings** / Section / Train type
  - From timetables before and after Project
  - Train type e.g. IC express, regional all-stopping

http://bombay-local.blogspot.com

Panvel-Nerul-Thane time table 29th May 2010

LEAVING PANVEL AT	LEAVING NERUL AT	REACHING THANE AT
4.40		5.34
5.09 (From Belapur)		5.49
5.45		6.38
_	6.32	7.04
6.45		7.38
6.47 (From Belapur)		7.19
_	7.09	7.41
7.24		8.17
_	8.02	8.34
8.06 FAST	**8.27**	**8.52**
_	8.32	9.03
_	9.24	9.56
9.16	9.40	10.11
_	9.51	10.22
9.56		10.49

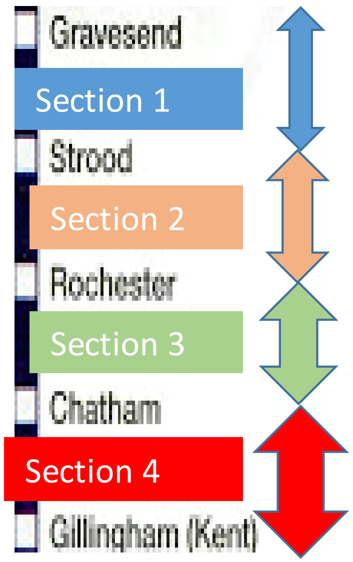
- **Annual Passenger Traffic** / Section / Train type
  - **Daily Passenger Traffic** derived from passenger volumes data
  - Data to factor up Daily Passenger Traffic to annual value : **Annual Expansion Factor**
  - usually collected for indicator RCR58 (annual railway users)

Basic Calculation Steps for Travel Time Savings in Trains

$$\text{Annual Time Savings}_{\text{Section, Train type}} = \text{Time Savings}_{\text{Section, Train type}} \times \text{Daily Passenger Traffic}_{\text{Section, Train type}} \times \text{Annual Expansion Factor}_{\text{Train type}}$$

INDICATOR RCR101 =

$$\Sigma_{(\text{Sections, Train types})} \left(\text{Annual Time Savings}_{\text{Section, Train type}}\right)$$



Other Potential Sources of Time savings

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Source of time savings	Is a significant benefit when…	Measurement / Calculation
Increased Train Service Frequency • Means reduced waiting time and increase of perceived comfort of service	**Project focused on increasing track capacity for service frequency increase**	**Number of boarding passengers at each impacted station** **X** **Perceived travel time saving**
Improvement to Railway Station Accessibility and Efficiency • relocated or new stops • new station underpasses, access points • improve integration with buses • changes to train transfer requirements	**Project is new/modernised railway station**	**Best calculated with use of transport network model :** • Measured data on traffic can be used to calibrate the transport model. • Door-to-door time savings can be exported as direct output of model.
Improved Service Reliability • reductions in average delay and variability of arrival time enabled by the project.	**Project addresses a major bottleneck** • e.g. major railway station or inter-station section with insufficient capacity for desired timetable.	**Needs regular measurement of reliability of train services.** • Reliability time is calculated as for other travel time with use of weighting of delay and time variability

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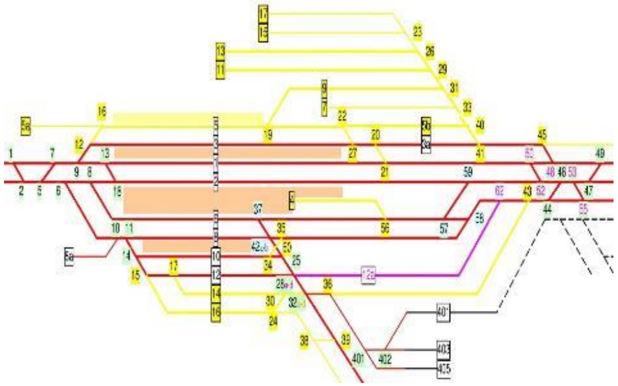
Increased Train Service Frequency

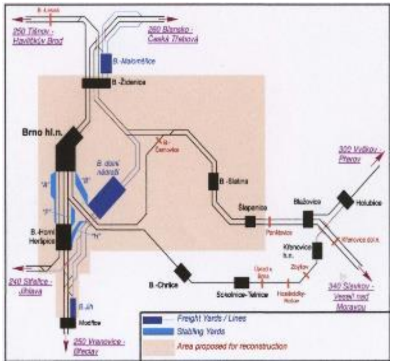
- Often rail infrastructure capacity investments leading to higher service frequency e.g.
  - New station tracks and platforms
  - Double-tracking of a line between cities
- Benefits for those using more frequent services
- Service Frequency can be converted to perceived travel time as
  - Service Interval Penalty = Function(Service Interval)
- Example calculation in fiche

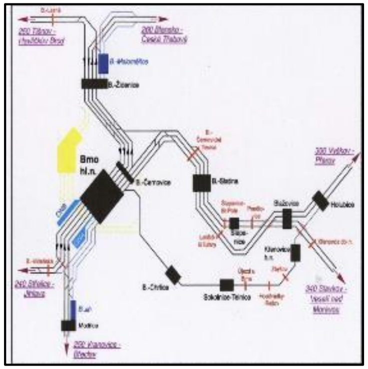


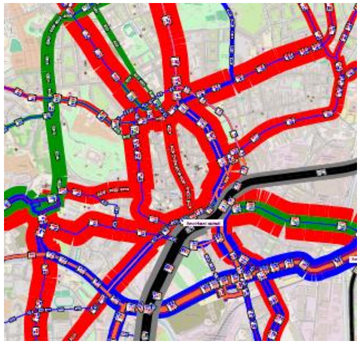
Train (regular spaced) interval (minutes)	Service interval penalty (minutes) for rail Recommended average values In-vehicle time (IVT) equivalent
5	5
10	10
15	14
20	18
30	24
40	27
60	33

Improvement to Railway Station Accessibility and Efficiency

- Often urban rail investments with new stops /stop relocations or station layout improvements
- Door-to-door perceived travel time improvements
  - Travel time spent outside of a train can be weighted (e.g. UK TAG standards)
  - Best estimated with detailed transport multi-modal or public transport network model calibrated with measured traffic data
  - Door-to-door travel time can be exported as a direct output of a transport model.

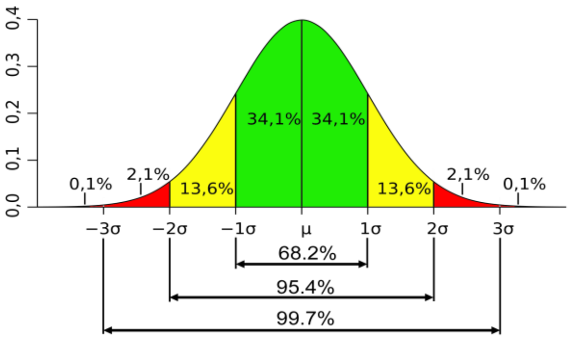


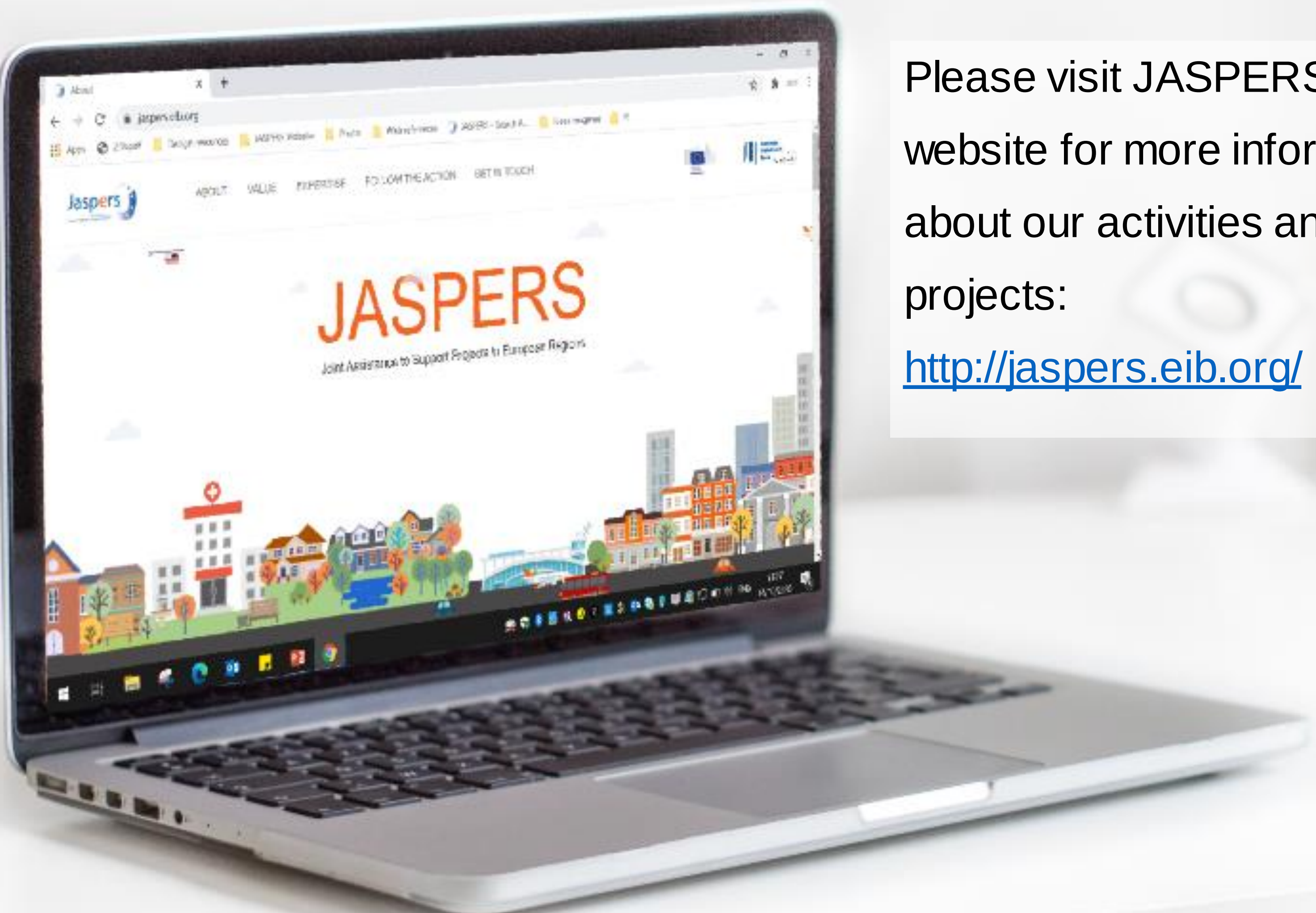




Improved Service Reliability

- Often relevant to bottleneck investments
- Requires systematic monitoring and assessment of delay and travel time variability
  - Data collected by infrastructure managers/railway operators
- Standard ways to convert reliability issues into perceived time savings
- E.g. UK TAG guidance : Perceived time savings =
  - 2.5 x Average (μ) Delay +
  - 3.5 x Standard Deviation (σ) of Delay





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JASPERS contacts

Paul Riley
Senior Transport Sector Specialist
European Investment Bank
JASPERS
Mattiellistrasse 2-4i
A-1040 Vienna

tel. +352 437982010

p.riley@eib.org
http://jaspers.eib.org/

Maurits van der Hoofd
Transport Engineer
European Investment Bank
JASPERS
Rue de la Loi 227
B-1040 Brussels

tel. +32 27124171

m.vanderhoofd@eib.org
http://jaspers.eib.org/

Fergal Trace
Transport Economist
European Investment Bank
JASPERS
Rue de la Loi 227
B-1040 Brussels

tel. +32 27124184

f.trace@eib.org
http://jaspers.eib.org/