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Working Paper 51369 **Oslo, 31.10.2018**

4632 SPADE

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SPADE: Collected literature and collection process for the review and validation of best practices

Content

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1 Introduction

This working paper is the first deliverable from *Work Package 3* in the SPADE project. The objective of Work Package 3 is to provide an up to date literature review and validation of best practices on the appraisal of infrastructure investments and projects, and their relation with spatial development both urban and rural.

When it comes to the development of the transport system, investment strategies are often based upon a cost-benefit analysis (CBA). However, the broader benefits of infrastructure development are not always seen or taken into account and thus not sufficiently considered in planning and evaluation processes. A broader view can provide a better basis for agreement on transport investments and contribute to an efficient allocation of investments.

The transport user benefits are often labelled as direct effects and the additional economy wide effects caused by market imperfections as indirect effects or wider economic impacts. In addition, there is a growing literature on wider non-economic impacts such as wider environmental effects, health, quality and other wider social impacts of transport policy measures and infrastructure investments.

The literature review will distinguish between different classes of direct and indirect effects, theoretical and empirical research, methods for calculating or assessing different impacts, and how different these impacts are treated in official guidelines for transport appraisal and their relation with spatial development.

1.1 The SPADE project

The SPADE (Assessing the added value from **SPA**tial **DE**velopment as a factor in infrastructure planning) – project refers to the central question raised by CEDR on *How to achieve integrated project development of infrastructure and its spatial surroundings?* The project relates to the assessment of an integrated spatial and infrastructure development (issue C in the DoRN). This issue focusses upon the assessment of the added value of the integrated plans and designs, in order to get an insight in the societal relevance of collaborative planning. In order to meet the main objective, a consortium of Panteia (lead), TØI, HaCon and AIT has taken the challenge to develop an assessment method, based upon a literature review and existing knowledge.

The proposed assessment method in the SPADE project is based on a process and a tool:

- The process comprises a description of collaborative planning in which stakeholders from different backgrounds, with different 'wish lists' and different planning procedures need to work together.
- The tool is a combination of a digital workshop and an assessment tool. The assessment tool has been developed for Rijkswaterstaat (NL) and combines a multicriteria analysis (MCA) with a cost-benefit analysis (CBA).

CEDR seeks inclusive methods for assessing costs and benefits of combined infrastructure and spatial development, building on existing knowledge and including specific contexts such as nation-wide, urban or rural regions. The development of an assessment method puts us for some challenges:

1. There is a need for improved understanding of the relation between spatial and multimodal infrastructure development
2. The question is how to assess the societal value of combined multi-modal infrastructure and spatial development for decision-making on investments. This requires answers to specific questions such as:
    a. How to make an assessment beyond the value-of-time and monetary terms?
    b. How to address topics such as social cohesion or health in the assessment?
    c. How to carefully weigh the different aspects?
    d. How to take the specific contexts (nation, urban and rural) into account?
3. How to capture the added value from combined infrastructure and spatial development and how to translate the added value as a driving factor for infrastructure planning?
4. Mapping of consequences from such an inclusive assessment and capturing added value for the NRAs responsibility for road infrastructure development.

1.2 The literature review

The literature review should provide an overview and synthesis of previous research and current best-practice. The review should be an objective review of published research literature, official guidelines, technical reports and other written sources relevant to our topic. The DoRN (Direction of Research Needs) outlines the expected output as: A review of the state-of-the-art literature and good practice cases of valuation and capturing of combined spatial and (multi-modal) infrastructure development – taking into account different contexts (urban and rural regional contexts). As outlined in the description of *Topic C* in the DoRN, "an integrated planning approach calls for assessment of infrastructure investments beyond value-of-time, which addresses actual issues and future trends as: climate change, economic development potential, health, social cohesion and the spatial structure for future development of counties, as well as cities and rural regions."

The literature review should:

1. Identify the key theories, concepts and ideas
2. Distinguish what has been done from what needs to be done
3. Identify how the knowledge on the topic is structured and organized
4. Identify major issues and debates
5. Place the research project in a historical context

The review is intended to bring valuable input both for the researchers in the project as well as for the client. For the researcher the review helps to clarify the scope of the research project by creating a narrative of what is and is not known in the field and where there are areas of dispute. For the customer of the research and other readers, the review also provides valuable context, establishes the researcher's expertise, and relates the findings of the project to what is already known (Avni et al. 2015).

We have divided the literature review research task into the following sub tasks:

1. General literature on integrated transport and land-use planning strategies, as well as literature that review current practice in transport appraisal and/or spatial planning.
2. A review of the scientific literature on wider economic and non-economic impacts of infrastructure investments and transport policy measures and the relation to spatial development.
3. A review of literature on collaborative / integrated planning in transport appraisal and spatial development
4. Beyond cost-benefit analysis: A review of complementary and/or alternative assessment methods. With a focus on MCA and combinations of MCA and CBA.
5. Review of official guidelines for transport appraisal with the aim of identifying broader effects of transport policy measures that are considered important, classifying these effects and their accompanied suggested assessment methods

A systematic review is an explicit systematic method for reviewing literature based on certain predefined criteria by attempting to identify, appraise and synthesize all relevant studies in order to answer a particular question (Gough et al. 2013). In a systematic review, a set of inclusion criteria have to be established in the literature search process. Normally, these inclusion criteria are key words used in the active literature search in the literature databases. Examples of such databases for scientific literature are Google Scholar, Web of Science, TRID and Science Direct.

1.3 The literature search

The literature search process in a literature review is an iterative process conducted across a series of sources and databases, it is a process that (Avni et al. 2015):

- Collects relevant material
- Merges and refines overall results, and
- Structures the results to add value,

To add to the list of literature contained through the systematic search process, one option is to apply snowballing techniques. Forward snowballing implies finding citations to a particular paper, while backward snowballing is to follow the citations in a particular paper. These techniques could add relevant literature omitted by the predefined inclusion criteria. Another option to check the relevance and completeness of the list of collected literature, is to circulate it among experts. Where the final list is a list of resources that have been identified as relevant to the subject and that brings information to the literature review. A common "problem" when working with literature reviews is that a search in the literature databases often results in too many papers being found for inclusion in the review. If this is the case, then we must impose selection or exclusion criteria. However, there should be a clear rationale behind the selection criteria such as publication year, number of citations, geographical area, etc.

Often there is a need to trim the initial literature search in order to identify what is relevant from the literature and what is not relevant. The retrieved sources can then be organized into three categories according to the relevance for our topic:

1. Definitely relevant
2. Possibly relevant
3. Not relevant

Snowballing techniques can then be applied on the sources categorized as definitely relevant.

2 Collected literature

2.1 Review articles and general literature on integrated transport and land-use planning strategies.

2.1.1 Review articles

In the collection of literature reviewing current practice in transport appraisal and/or spatial planning, we have limited the literature search to articles and technical reports written after 2013 (i.e. not older than 5 years). This should provide a good overview of the state-of-the-art in this field.

- (Mackie and Worsley 2013)
- (Wangsness et al. 2017)
- (Mackie et al. 2014)
- (Annema and Koopmans 2015)
- (Arts et al. 2016)
- (Kasraian et al. 2016
- (Fossheim and Andersen 2016)
- (Emberger 2017)
- (Fichert 2017)
- (Zembri-Mary 2017)
- (Chen 2014)

2.1.2 Integrated transport and land-use planning strategies

- (Te Brömmelstroet and Bertolini 2010)
- (te Brömmelstroet and Bertolini 2008)
- (Arts et al. 2016)
- (Arts et al. 2014)
- (Beukers et al. 2014)
- (de Roo and Boelens 2014)
- (J. Laird et al. 2014)
- (Heeres et al. 2012)
- (Heeres et al. 2018)
- (Heeres 2017)
- (Stead et al. 2004)
- (May et al. 2005)
- (Tennøy et al. 2016)
- (Vonk 2006)

2.2 Wider economic and non-economic effects of transport infrastructure investments and policy measures

2.2.1 Wider Economic Impacts

Theoretical background

- (Mohring 1993)
- (Jara-Diaz 1986; Kanemoto and Mera 1985)
- (Dodgson 1973)
- (Fujita 1988)
- (Marshall 1890)

Well cited papers written prior to 2010:

- (Glaeser et al. 1992)
- (Rosenthal and Strange 2004)
- (Duranton and Puga 2004)
- (Banister and Berechman 2001)
- (Graham 2007)
- (Venables 2007)
- (Melo et al. 2009)
- (Oosterhaven and Knaap 2003)
- (R Vickerman 2007)

Papers on WEI written after 2010

- (Deng 2013)
- (J. J. Laird and Mackie 2014)
- (J. J. Laird and Venables 2017)
- (de Groot et al. 2016)
- (Hansen and Johansen 2017)
- (Gibbons et al. 2016)

Empirics of agglomeration

- (Behrens et al. 2014)
- (Graham and Dender 2011)
- (P.-P. Combes and Gobillon 2015)
- (P. P. Combes et al. 2012)
- (Redding and Rossi-Hansberg 2017)

2.2.2 Wider non-economic impacts

- (Thomopoulos and Grant-Muller 2013)
- (Taale et al. 2016)
- (Geurs et al. 2009)
- (Delbosc 2012)
- (Carse 2011)
- (Hickman et al. 2012)

- (Hamersma 2017)
- (Shirley and Winston 2004)

2.3 Collaborative planning in transport appraisal and spatial development

- (Salter et al. 2009)
- (Pelzer et al. 2014)
- (Tornberg and Odhage 2018)
- (Grêt-Regamey et al. 2017)
- (Macharis et al. 2009)
- (Macharis et al. 2012)
- (Cornet et al. 2018)
- (Kourtit et al. 2014)
- (Piantanakulchai and Saengkhao 2003)
- (van Lier et al. 2017)
- (Macharis and Crompvoets 2014)
- (Bulckaen et al. 2016)
- (Faehnle 2014)

2.4 Beyond Cost-benefit analysis – complementary and/or alternative assessment methods. With a focus on MCA and combinations of MCA and CBA

- (Roger Vickerman 2017)
- (Sager 2013)
- (Dodgson et al. 2009)
- (Ecorys 2014)
- (Hickman et al. 2012)
- (Panteia 2017)
- (Romijn and Renes 2013)
- (Gibson 2006)
- (Barradale and Cornet 2018)
- (Annema et al. 2015)
- (Annema et al. 2015)
- (Barfod and Salling 2015)
- (Gühnemann et al. 2012)
- (De Brucker et al. 2011)
- (Makowski et al. 2009)
- (Okoli and Pawlowski 2004)
- (Ward et al. 2016)
- (Velasquez and Hester 2013)
- (Prosser et al. 2015)
- (Schutte and Brits 2012)

- (Sijtsma 2006)
- (Shang et al. 2004)
- (Curtis 2004)
- (García-Melón et al. 2012)
- (Gamper et al. 2006)
- (Munda 2017)
- (Hyde 2006)

2.5 Official guidelines and handbooks in transport appraisal

The following table shows the collected official guidelines and handbooks in transport appraisal. Before reviewing, we will look for updated versions of the guideline.

2.5.1 Official guidelines

Australia (nationally)	(Commonwealth of Australia 2006), (Austroads 2011), (Australian Transport Council 2006), (Department of Infrastructure and Regional Development 2014), (Infrastructure Australia 2012)
Australia (New South Wales)	(Transport for New South Wales 2013), (Hensher et al. 2012), (Douglas and Brooker 2013)
Australia(Victoria)	(Department of Transport 2010), (Department of Transport 2012)
Austria	(Bundesministerium für Verkehr and Österreichische Forschungsgesellscaft Strasse – Scheiene – Verker 2010a, 2010b)
Belgium	(Vlaamse Overheid-Departement Mobiliteit en Openbare Werken and RebelGroup Advisory Belgium nv 2013b, 2013a) (Vlaamse Havencommissie 2007) (MORA Mobiliteitsraad 2014)
Canada (nationally)	(Transport Canada 1994), (Treasury Board of Canada Secretariat 2007)
Canada (BC)	(Ministry of Transportation and Infrastructure 2014), (National Cooperative Highway Research Program 2014) Correspondence with The Highway Planning & Programming Branch's Manager for Economic Analysis
Denmark	(Transportministeriet 2003, 2015), (Copenhagen Economics 2014)
Finland	(Liikennevirasto 2011, 2013)
France	(Commissariat général à la stratégie et à la prospective 2013a, 2013b)
Germany	(Federal Ministry of Transport 2003a, 2003b) (Federal Ministry of Transport and Digital Infrastructure 2016)

Greece	(EU Structural Fund – ERDF et al. 2003b, 2003a)
Iceland	Correspondence with Icelandic Road and Coastal Administration and School of Science and Engineering, Reykjavik University
Ireland	(National Roads Authority 2011a, 2011b, 2011c), (National Transport Authority 2010), (T. a. S. Department for Transport 2016)
Italy	(Nuclei regionali di valutazione e verifica degli investimenti pubblici 2001), (Beria et al. 2012), (Nuclei regionali di valutazione e verifica degli investimenti pubblici 2011, 2014; Unita di valutazione degli investemeti pubblici 2014)
Japan	(Ministry of Land Infrastructure 2009, 2010)
The Netherlands	(Centraal Planbureau and Nederlands Economisch Instituut 2000), (Ministerie van Verkeer en Waterstaat and Ministerie van Economische Zaken 2004), (Rienstra 2008), (Nijhuis 2014)
New Zealand	(NZ Transport Agency 2018), (Kernohan and Rognlien 2011)
Norway	(Vegdirektoratet 2014)
Spain	(Centro de Estudios y Experimentación de Obras Públicas (CEDEX)/ Ministerio de Fomento 2010), (Rus 2009)
Sweden	(Trafikverket 2014)
Switzerland	(Bundesamt für Strassen (ASTRA) 2003), (Bundesamt für Strassen and Ecoplan 2010)
UK (England)	Department for Transport (2013, 2014a, 2014b), (Environment Agency 2007), (DfT 2014b, 2014a), (DEFRA 2005)
UK (Scotland)	(Transport Scotland 2008, 2014)
USA (nationally)	(Federal Highway Administration 2003), (US Department of Transport 2012b, 2012a), (National Cooperative Highway Research Program 2014), (Strategic Highway Research Program 2014), (Weisbrod 2013)
USA (California)	(California DOT 2007), (American Association of State Highway and Transport officials (AASHTO) 2003)
USA (Kansas)	(Kansas DOT 2010)
USA (Minnesota)	(Minnesota DOT 2009, 2012), (American Association of State Highway and Transport officials (AASHTO) 2003)
USA (NC)	(North Carolina DOT 2014)
European Commission	(European Commission 2008), (European Commission 2014b), (European Commission 2014a)
EIB	(European Investment Bank 2013)

2.5.2 Best practices and lessons learnt

European Commission (EC) (2015): Fact-finding studies in support of the development of an EU strategy for freight transport logistics Lot 1: Analysis of the EU logistics sector. Final Report.

European Commission (EC) (1997): Regional development studies: The EU compendium of spatial planning systems and policies. European commission, Brussels

Knoxville Regional Transportation Planning Organisation (TPO) (2017): Mobility Plan2040. Connecting people and places, Knoxville

Reimer, M. (2013): Planning Cultures in Transition: Sustainability Management and Institutional Change in Spatial Planning. ILS-Research Institute for Urban andRegional Development, Dortmund

Steinhauser. C. (2011): International Knowledge Transfer – Analysis of planning cultures. Department International Planning Systems. Kaiserslautern University of Technology. Presentation at Real Corp Conference 2011, Essen

Urban Node Workshop in Vienna. Results and Lessons learnt. Project report of Vital Nodes. 2018.

Pau Lian Staal-Ong, Tom Kremers, Per-Olov Karlsson, Stuart Baker (2016). 10 Years of Managing Large Infrastructure Projects in Europe. Lessons Learnt and Challenges Ahead.

Hertogh, M., & Westerveld, E. (2010). Playing with Complexity. Management and organisation of large infrastructure projects.

Urban development in Antwerp. Designing Antwerp. 2012.

2.5.3 Other relevant existing research projects and resources

Europe wide

CEDR Transnational Research Programme

Call 2010 Effective Asset Management Meeting Future Challenges (completed) Programme information, links to project deliverables and final report available at http://www.cedr.eu/era-net-road/call-2010-effective-asset-management-meeting-future-challenges/

Call 2011 Mobility (completed) Programme information, links to project deliverables and final report available at http://www.cedr.eu/call-2011-mobility/

Call 2013 Traffic Management (completed) Programme information, links to project deliverables and final report available at http://www.cedr.eu/call-2013-traffic-management/

Call 2014 Asset Management (near completion) Programme information available at http://www.cedr.eu/cedr-call-2014/call-2014-asset-management-maintenance/ Final report and project deliverables due for publication c. end of 2017.

Call 2014 Mobility and ITS (near completion) Programme information available at http://www.cedr.eu/cedr-call-2014/call-2014-mobility/ Final report and project deliverables due for publication in 2017.

Call 2015 Freight and Logistics in a Multimodal Context (on-going programme) Programme information available at http://www.cedr.eu/call-2015-freight-logistics-multimodal-context/

FALCON project – Due for completion in 2018. Aims to provide NRAs with a clearly written handbook explaining the principles of freight markets, logistics strategies, and how multi-modal transport works and can be influenced.

FLUXNET project – Due for completion in 2018. Aims to provide insight into the tools for NRAs that help to optimise the multi-modal use of the infrastructure networks by the freight and logistic sector. Special attention is being paid to the connection between land use and infrastructure planning.

Other European projects

H2020 VitalNodes (on-going) Giving the EC validated recommendations for a better and more effective integration of urban nodes into TEN-T corridors, thereby focusing on long-distance transport and last mile freight logistics. More information at: www.nuvit.eu

H2020 AM4INFRA (on-going) Imply measures for Asset Management – standardisation, dissemination, policy dialogues, etc – where no research is involved. The CSA is a first step in delivering the mission that by 2025 various key European infrastructure agencies have implemented the Asset Management structure to ensure effective and efficient life cycle management of transport asset systems. Practitioners will be enabled to address various and often diverging trends in economy, society and environment (including governance issues of interaction between infrastructure and broader spatial development). For more information: http://www.am4infra.eu/

Netlipse Research on best practices and lessons learnt in large infrastructure projects in Europe, focusing on all relevant phases of the project (from initiation to realization). The network is still active after ten years. For more information: http://netlipse.eu/

TRACC - ESPON 2013-programme Transport Accessibility at Regional / Local Scale and Patterns in Europe, which is a analogous type of study as this research call but that focuses on the spatial perspective: https://www.espon.eu/main/Menu_Projects/Menu_ESPON2013Projects/Menu_AppliedResearch/tracc.html

Logistics in the EU and multi-modal transport in the new TEN-T Corridors" by the TRAN Committee.

Gre-cor (ERDF) The North Sea Region Programme Secretariat http://www.trafikverket.se/en/startpage/operations/Operations-railway/GreCor---Green-Corridor-in-the-North-Sea-Region/ or http://results.northsearegion.eu/en/projects/Green-Corridor-in-the-North-Sea-Region.144/

Swiftly Green https://www.swiftlygreen.eu/en founded by TEN-T/INEA

Scandria®2act (ERDF) Interreg, Baltic Sea Region http://www.scandria-corridor.eu/index.php/en/projects/scandria2-act

National programmes

Finland Urban Zones I, II, III, by Finnish Environment Institute, 2017

Travel related zones on urban development in Finland 1990 – 2040

- Urban Fabrics, by Peter Newman, Leo Kosonen, Jeff Kenworthy

- Theory of travel related urban fabrics: http://online.liverpooluniversitypress.co.uk/doi/abs/10.3828/tpr.2016.28?journalCode=tpr

- Bemine project, by Aalto University & alt, New practises for strategic urban planning: http://www.demoshelsinki.fi/en/projektit/bemine-beyond-malpe-coordination/ National Main Roads in Growing Cities, by Finnish Transport Agency, 2017

- National transport network meeting expansion of cities

Norway: Study into the impacts of transport infrastructure investments on urban- and regional development (IMPACT), financed by the Norwegian Research Council and conducted under leadership of the Norwegian Institute of Transport economics (TOI.no): https://www.itf-oecd.org/sites/default/files/docs/02rtrinveste.pdf

Austria Studies into improvement of the multi-modal interface of transport systems (in German): http://www.combinet.at/

Flanders Examples of projects where infrastructure and spatial development are coordinated: Trajectory by the intendant for the "Ring: http://www.antwerpen.be/docs/Stad/Stadsvernieuwing/9746949_urbandevelopment_English.pdf 4 tram connections to and around Brussels (Brabantnet) – integrated evaluation framework. http://deredactie.be/cm/vrtnieuws.english/News/1.1798375

Netherlands 'Beter Benutten' Programme ('Better use'): Government, regions and businesses are working together to improve road, waterway and railway accessibility in the busiest regions. One of the aims was reducing congestions at the busiest points by 20% in 2014 and using a package of around 300 practical and quantifiable measures. More information and a complete overview of the program: http://www.beterbenutten.nl/en

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