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RISK MANAGEMENT FOR GREEN TRANSPORT CORRIDORS

Meike Schröder[1], Gunnar Prause[2]

[1]Hamburg University of Technology
Institute of Business Logistics and General Management
Am Schwarzenberg-Campus 4, 21073 Hamburg, Germany

[2]Tallinn University of Technology
Tallinn School of Economics and Business Administration
Akadeemia tee 3, 12618 Tallinn, Estonia

E-mails: [1]Meike.Schroeder@tuhh.de ; [2] Gunnar.Prause@ttu.ee

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Abstract. The Green Corridor concept represents a cornerstone in the development and implementation of integrated and sustainable transport solutions based on trans-nationality, multi-modality and a high involvement of public and private stakeholders, including the political level. Hence, the implementation and management of a Green Transport Corridor is connected with a variety of risks due to the high level of complexity and the strong frame conditions of the concept. E.g. stakeholders' violation of ecological and sustainable obligations might jeopardize the achievement of defined green targets and therefore hinder the implementation of a Green Transport Corridor system. For this reason, it is important to regard possible risks in advance in order to apply adequate measures and reduce the impact in time.

The paper addresses the research questions what kind of risks might occur in Green Transport Corridors and how they can be classified. The empirical results of this paper investigate the risks that might occur in Green Transport Corridors and classify them into the three categories economical, ecological and social risks. Based on this analysis the development of a comprehensive risk management concept for Green Transport Corridors has been started.

Keywords: Green Transport Corridors, Risk Management, Risk Classification, Mitigation Measures

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1. Introduction

Freight transport plays a crucial role for economic activities and is an incremental element of logistics as well as supply chain management. Current estimations for Europe are predicting a 50% increase in freight and passenger transport within the next 20 years (Tetraplan 2009). The European Commission reacted on the development by setting a political framework for an EU Transport Policy Development called Green Transport Corridor, which was presented in the White Paper on Transport (COM 2011): A competitive European transport system should be introduced for the next decades that will increase mobility and employment, remove major barriers in key areas and reduce fuel consumption. E.g. a European transhipment route should be implemented which is on the one hand characterized by a concentration on freight traffic between major hubs and on the other hand by relatively long distances of transport marked by reduced environmental and climate impact. Thereby it aims to increase safety and efficiency by applying sustainable logistics solutions, inter-modality, ICT infrastructure, common and open legal regulations and strategically placed transhipment nodes (COM 2011).

Since Green Transport Corridors are characterised by transnational network structures based on multimodal infrastructures involving complex public and private stakeholders together with strong frame conditions their implementation is connected with different kind of risks. E.g. stakeholders' violation of ecological and sustainable obligations might jeopardize the achievement of the defined green targets and therefore hinder the implementation of a Green Transport Corridor system. For this reason, it is important to regard possible risks in advance in order to apply adequate measures and to reduce the impact in time. Until now, little research has been carried out on the role of risks within Green Transport Corridors. A literature review of existing risk management strategies focusing on Green Transport and on transport corridors indicates a research gap in this specific field. For this reason, the paper addresses the research questions what kind of risks might occur in Green Transport Corridors and how they can be classified. The aim is to compile measures and strategies to manage risks in Green Transport Corridors.

In the remainder of the paper, at first the theoretical background is provided for Green Transport Corridor as well as for risk management in general and in the field of transport. Afterwards, the research methodology for the empirical part is described. Subsequently, the empirical results of the conducted expert interviews and workshops are presented. They show which risks might occur in Green Transport Corridor. In addition, a framework of strategies and measures to manage risks in Green Transport Corridors is developed. Finally, the paper finishes with conclusions and implications.

2. Literature Review

2.1. Supply Chain Management and Green Transport Corridors

Although the term Supply Chain Management (SCM) is often used in both academia and practice, there is no consistent understanding of the construct. There are several definitions of SCM referring to the different conceptual perspectives on SCM versus logistics which have been evaluated during the last years (Mentzer *et al.* 2001). Some definitions contain operational activities involving the flow of materials and products, whereas others view it as a management philosophy or in terms of a management process (Tyndall *et al.* 1998). Christopher (1998, p. 15) stresses the cooperation of supply chain partners as well as the importance of the customer and defines SCM as *"the management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole"*. Stock and Lambert (2001, p. 54) point out the integration of tasks in their explanation: *"SCM is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders."*

Logistics plays an important role as part of SCM. As with SCM, there is no consistent understanding of the term logistics. This is reflected by the numerous existing definitions and furthermore by the scope of duties which are allocated to logistics and which differ from each other (Göpfert 2005; Arnold *et al.* 2004). Following Russell – and based on Plowman – logistics aims to *"get the right product to the right customer, at the right time, at the*

right place, in the right condition, in the right quantity, at the right cost" (Russell 2007, p. 59; Plowman 1964).

In the following, the flow-oriented definition of logistics by the Council of Supply Chain Management Professionals (CSCMP) is used. It defines logistics as *"the process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirement. This definition includes inbound, outbound, internal, and external movements"* (CSCMP 2015, p. 117). Moreover, it emphasizes transport as a very important activity which may also be regarded as the key element in the logistics chain (Weber, Kummer 1998). The transport system moves goods and products at the least-cost principle. It affects the results of logistics activities and influences production and sale (Tseng *et al*. 2005). Besides, a sound transport system provides increased logistics efficiency, reduces operational cost, and promotes service quality. These objectives are included in the Green Transport Corridor concept whereas an emphasis is laid on a minimization of environmental impact and on the creation of safe and sustainable logistics solutions by promoting trans-nationality and co-modality (Hunke, Prause 2013; 2014).

Since there are different interpretations of the main characteristics of Green Transport Corridors a number of international initiatives and concepts for Green Transportation Corridors have been developed, partly implemented and tested so far, in order to find a more practical approach to this issue. Most of the initiatives represent EU-funded regional development projects due to the political background of the Green Corridor concept with its links to the EU White Paper on Transport (COM 2011). The Baltic Sea Region (BSR) became in recent years an important arena for sustainable transport projects since in several logistics projects on European and regional level aspects of green transportation have been studied in order to design more efficient and safe processes for multi-modal transport (BSR Transportcluster 2013). All these projects highlight the efficient use of the available transport infrastructure, inter-modality and high-performance ICT-solutions together with intelligent transport systems (ITS) as well as specific organisational frame conditions as main pillars for Green Transport Corridors (Prause, Hunke 2014).

But since implementations of Green Transport Corridors are based of different understandings and realizations of the concept it is necessary to evaluate, compare and benchmark existing Green Corridor implementations. Due to the main characteristics of Green Transport Corridors which are related to sustainable aspects, multimodality and network concepts, Hunke and Prause (2013) pointed out that green SCM represents one important source for theoretical foundations since green SCM reveals interdependency between conventional SCM and eco-programs (Sarkis 2001; Prause, Hunke 2014). In this understanding the performance evaluation of Green Transport Corridors requires management control systems for supply chains comprising ecological aspects as well as the assessment of its international network environment by taking into account the international and cross-company aspects (Sydow, Möllering 2009). Prause (2014) proposed a management control system in form of a Green Corridor balanced scorecard approach by integrating different sets of Key Performance Indicators (KPI) for monitoring and management of Green Transport Corridors as well as cooperative and network-oriented concepts from SCM (Prause, Schröder 2015).

By surveying the current management control systems and existing KPI systems for Green Transport Corridors it turns out that they are stressing sustainability, growth and inter-organizational cooperation aspects by neglecting risk issues which are related to the supply chain characteristics of a corridor (EWTC 2012; Hunke, Prause 2013; Prause 2014). Already the multi-modal challenges within a Green Transport Corridor which are related to the green SCM issues to choose the right mode of transportation, to use the right equipment, and to use the right fuel have to consider risks related to costs, lead time, environmental performance and availability (Dekker *et al.* 2012). Consequently, a lot of risks with a negative impact on the supply chain may occur during the transport process, i.e. also within the multi-modal transportation chains within a Green Transport Corridor (Giunipero, Eltantawy 2004). The multitude of actors integrated into transport services and Green Transport Corridors as well as their diversity even increases the number of potential risks. In the next chapter, risk management in general as well as risk management in the field of transportation are described.

2.2. Risk Management and its process

Within risk management, two perspectives of risks can be distinguished. On the one hand, risks follow from the uncertainty of future events. Knight (1921) characterizes measurable uncertainty as risk in contrast to non-measurable uncertainty. On the other hand, there are different approaches depending on the disciplines. While in mathematics, risk does not yet contain a value judgement; in the field of business economics the construct indicates a potential loss or damage and therefore means the opposite of a chance (Diederichs, 2004; Holzbaur, 2000; Peker *et al.* 2014). This article follows the latter approach. Hence, supply chain risk is *"the damage – assessed by its probabilityy of occurrence – that is caused by an event within a company, within its supply chain or its environment affecting the business processes of more than one company in the supply chain negatively"* (Kersten *et al*. 2011a, p. 154). Risks may have an influence on the flows of products, services, finance and information. Companies are often exposed to a large variety of potential risks which may be classified differently. While Tummala and Leung (1996) for example distinguish between catastrophic, critical, marginal and negligible risks on the level of hazard severity, Narasimhan and Sahasranam (2007) differentiate between strategic, tactical and operational risks on the planning level. According to the business function or area of operation, Christopher and Peck (2004) refer to supply, demand, process, control and environmental risks while Rogler (2002) names supply, production, distribution, financial and personnel risks. Transport risks form part of both supply and distribution risks in the latter case and can be specified as default (loss of the entire cargo), quantitative (partial destruction during transport), quality (damage during transport), cost (increase in transport costs) and time risks (delay/earliness of delivery) (Schröder *et al.* 2013).

In order to cope with risks and to achieve corporate goals, it is necessary to implement risk management. Due to several corporate crises and insolvencies, specific pronouncements as well as regulatory requirements exist in numerous countries relating to the analysis, communication and monitoring of risks (Kajüter 2003; Peker *et al.* 2014). The typical risk management process is based on the generic management process (e.g. see Terry 1972; Peker *et al.* 2014) and encompasses the following steps: risk identification, analysis, handling and control. The risk identification step is often considered as most important since only those risks which have been identified can be managed afterwards (Schröder *et al.* 2013). During risk analysis, the gathered risks are assessed at first by indicating the likelihood of occurrence and the possible damage. Then, the risks are prioritized in preparation for the risk handling step. Methods supporting risk identification and analysis are for example brainstorming or the failure mode and effects analysis (FMEA). Risk handling represents the third step of the risk management process. Strategies in order to handle risks target at avoiding, reducing, transferring, sharing or taking the risk (Norrman, Lindroth 2004, Schröder *et al.* 2013). Since Porter (1998, p. 55) declares a strategy to characterize *"[...] the creation of a unique and valuable position, involving a different set of activities"*, there are various measures which can be assigned to a strategy. Finally, during risk control it is the intention to review whether the measures have been applied and if they have been effective. Generally, the risk management process should be run through iteratively because single risks or the whole risk situation may change over time (Eberle 2005).

This paper focuses on the step of risk identification and risk handling. The number of identified risks and of potential measures in order to handle risks is high. Therefore, several authors allocate mitigation measures to risks (e.g. see Rice and Caniato 2003; Johnson 2001) or develop classifications for measures. For example, Tang (2006) chooses supply, demand, product and information management as categories while Manuj and Mentzer (2008) distinguish between postponement, speculation, hedging, control/share/transfer, security and avoidance. However, there is no composition of measures focusing on risks in Green Transport Corridors yet.

3. Risk Management for Green Transport Corridor

3.1. Research Questions and Design

It is not the aim of this paper to focus on risks which only have an effect on one company but to also look at risks impacting the Green Transport Corridor concept. However, in order to deal with Green Transport Corridor risks, the different stakeholders like corridor managers, transport service providers, shippers or infrastructure provid-

ers should be aware of the different options to manage these kinds of risks. Therefore, the research question is:
RQ 1: What kind of risks might occur in Green Transport Corridors?
RQ 2: How can these risks be classified?
RQ 3: What measures can be applied in order to manage these risks?

Based on the literature review and the identified research gap, this study targets at presenting a list of identified risks in Green Transport Corridors. In addition, a compilation of measures and strategies is developed to mitigate the identified risks and therefore to enable and to promote an efficient Green Transport Corridor concept. For this purpose, the research design constitutes as follows. The empirical evidence in this paper is based on the qualitative research style (Blaxter *et al.* 2006). Here, the complexity of the research question requires personal interviews and a qualitative approach. The willingness to answer questions in a greater depth and in an open discussion can only be achieved by personal and individual conversations with selected interview partners. Furthermore, risk management addresses a sensitive issue. Hence, it is of great importance to build trust with the different stakeholders.

The authors conducted case studies, expert interviews and workshops between 2006 and 2013 within several national and European projects comprising the BSR projects LogOn Baltic, EWTC II, C.A.S.H. and BSR Transportcluster to get a better understanding of the risks that might occur during transport services in general and in supply chains within Green Transport Corridors (Kersten et al. 2007; 2011b; EXTC 2012; BSR Transportcluster 2012). For this, surveys, interviews and workshops that have been conducted by the authors during the European projects together with corridor managers, transport service providers, shippers and infrastructure provider have been analysed.

3.2. Identification and Categorisation of Arising Risks in Green Transport Corridors

In different interviews the experts were asked to name important transport risks to their company as well as risks that might occur in Green Transport Corridor. The interviewed experts primarily understand the term risk as a negative event which affects the company or the corridor itself. Hence, risk is seen as a threat to the success of the company and/or corridor and the company's and/or corridor's aims, respectively. Taking a bottom-up approach, the authors of this paper clustered the risks in main categories describing the sources of risks. The main categories were chosen in accordance with the three pillars of sustainability that are essential for the success of the Green Transport Corridor concept (Hunke and Prause, 2013). Furthermore, the authors built subcategories to further differentiate the risks that might occur in each main category (Figure 1).

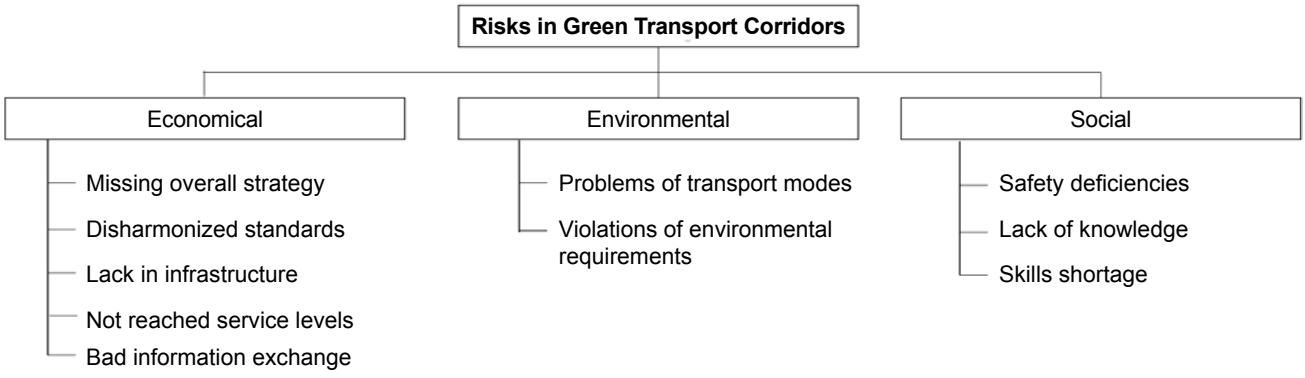

Figure 1. Main and subcategories of arising risks in Green Transport Corridors

For risks regarding "economical" aspects the authors built five subcategories. The subcategory *"Missing overall strategy"* includes risks like a delayed implementation of the Green Transport Corridor concept due to a missing overall Green Transport Corridor logistics strategy or the risk of opportunistic behaviour, meaning that the Green Transport Corridor concept is running too slowly, because stakeholders follow their own interests first. In addition hindrance of innovative solutions and uncertainty in the planning process for logistics

companies were mentioned due to long time scales of infrastructure development as well as a related lack of a comprehensive development strategy. One expert also indicated that KPI for Green Transport Corridor might be fulfilled on company level but not on upper (e.g. regional or country) Green Transport Corridor level. The second subcategory regarding economical risks deals with *"Disharmonized standards"*. Problems with country-specific border crossing, customs and different handling of police inspection or even corruption can lead to delayed deliveries. Bad services resulting from delayed delivery; unexpected higher costs due to disharmonized regulations of infrastructure standards (weights and measures of vehicles, hours of operation, load security) were mentioned by the expert in that field.

A third subcategory *"Lack in infrastructure"* summarizes the poor logistics infrastructure in some regions of the BSR (e.g. lack of warehouse and distributions centres, limited space available for port development etc.) as well as weaknesses in ICT infrastructure, because there exist very few ICT service providers which are specialised in logistics in some areas of the BSR and those that are established in the market exist in parallel. The subcategory *"Not reached service levels"* deals with reputation risks, due to not-fulfilled requirements (e.g. not reaching the predefined targets of total cargo volume, on-time delivery, relative transport costs, frequency, reliability or transit time). In the subcategory *"Bad information exchange"* risks like absence of information or bad information exchange among parties are listed as well as time delay by using intermodal transport due to no easy and fast access to information to guarantee good on-time service. The increased cyber risks due to increasing amount of electronic services as well as the mismatch of broadcasted transport information were named by the experts together with problems with IT interfaces in Green Transport Corridor. The second main category "environmental aspects" consists of two subcategories: In the subcategory *"Problems of transport modes"* the difficulties in resource planning, the non-optimal choice of transport routes, as well as long waiting times at transfer nodes of the corridor, or long delays at port gates are summarized. The second subcategory in this field contains the *"Violations of environmental requirements"*, as there are causing a too big carbon foot print, not reached predefined targets regarding total energy use, greenhouse gases, CO2 emission, engine standards, etc. to fulfil the Green Transport Corridor standard, or a wrong or missing documentation of environmental and climate impact. The third main category "social risks" was divided by the authors into three subcategories: Among *"Safety deficiencies"* the expert named risks like not achieved social efficiency (ISO 31000, 2009; ISO 39000, 2012), different safety cultures in countries, regions and companies along the Green Transport Corridor, as well as a lack of experience which can lead to misinterpretation of driving dynamics resulting from different weather conditions within the BSR. In addition, problems during transport (e.g. police inspection) due to unknown safety regulations, or different legal systems can appear, that have been allocated to the subcategory *"Lack of knowledge"*. The third subcategory *"Skills shortage"* deals with the shortage of qualified labour within the Green Transport Corridor regions in the BSR.

3.3. Measures to Manage Risks in Green Transport Corridors

Within risk handling, the risk management literature suggests five basic strategies which have been described in section 2.2, i.e. avoiding, reducing, transferring, sharing or taking the risk. The measures that have been identified to manage risks in Green Transport Corridors aim to a large extend at reducing or even avoiding the risks within the corridor. For each of the risks described in chapter 3.2 the authors have worked out specific measures that can be applied by the different stakeholders in the Green Transport Corridor. The measures are listed in Table 1. The risks of a delayed implementation of the Green Transport Corridor concept could e.g. be reduced by elaborating and adopting an overall Green Transport Corridor logistics strategy integrating all stakeholders. Or problems with IT interface could be reduced or even avoided by setting IT standards for the Green Transport Corridor.

Table 1. Catalogue of measures to manage risks in GTC

Economical Risks		
SUBCATE-GORIES	RISKS	EXAMPELS OF MEASURES
Missing overall strategy	Delayed implementation of the Green Transport Corridor concept due to a missing overall Green Transport Corridor logistics strategy	Elaboration and adoption of an overall Green Transport Corridor logistics strategy integrating all stakeholders
	Opportunistic behaviour: Green Transport Corridor concept is running too slowly, because stakeholders follow their own interests first	
	Uncertainty in the planning process for logistics companies due to long time scales of infrastructure development; lack of a comprehensive development strategy	
	Fulfilling the KPI for Green Transport Corridor on company level but not on upper (e.g. regional or country) level	Building a steering committee for different corridor sections
	Hindrance of innovative solutions	Development of a platform for innovative logistics solutions
Disharmonized standards	Problems with country-specific border crossing/ customs/ and different handling of police inspection/ corruption can lead to delayed delivery	Harmonizing training requirements of inspection for officials in the BSR and enhancing cooperation between authorities involved in border crossing transport
	Bad services resulting from delayed delivery; unexpected higher costs due to disharmonized regulations of infrastructure standards, weights and measures of vehicles; hours of operation, load security	Create a common regulative framework and harmonized regulations within the BSR
Lack in infra-structure	Poor logistics infrastructure in some regions of the BSR (e.g. lack of warehouse and distributions centres, limited space available for port development etc.)	Elaborating a supra-regional infrastructure concept considering the strengths and weaknesses of each region in the BSR
	Weaknesses in ICT infrastructure, because there exist very few ICT service providers which are specialised in logistics in some areas of the BSR and those that are established in the market exist in parallel	Building regional ICT cluster to establish a positive environment for ICT companies and to attract innovative ICT services provider and highly-educated people
Not reached service levels	Reputation risks, because requirements have not been fulfilled (e.g. not reaching the predefined targets of total cargo volume, on-time delivery, relative transport costs, frequency, reliability or transit time)	Usage of digital waybills to increase inter-modal efficiency
Bad information exchange	Absence of information / bad information exchange among parties	Implementation of data exchange between major transport hubs in the corridor to increase transport efficiency
	Time delay by using intermodal transport – no easy and fast access to information (speed and volume of information that must be handled to guarantee good on-time service)	Establishing a well-developed ICT system, supporting the increasing use of track and tracing systems
	Increased cyber risks due to increasing amount of electronic services	The increasing digitalization of the value chain requires a greater focus on cyber risks and ICT security
	Mismatch of broadcasted transport information	Better matching of broadcasted transport information with the needs of logistics actors
	Problems with IT interfaces, possible errors in data transmission, loss of data, etc.	Setting IT standards for the Green Transport Corridor

Environmental Risks		
Problems of transport modes	Difficulties in resource planning	Improved cargo tracking to facilitate resource planning for consignors, consignees and transport operators
	No optimal choice of transport routes	Using route planning systems with real time information, well-developed ICT system, increasing use of track and tracing systems
		Up-to-date traffic information within the supply chain allows drivers and other operators to choose alternative routes
	Long waiting times at transfer nodes of the corridor	Improving the provision of information at transfer nodes of the corridor by terminal service providers
		Standardisation and harmonization of ICT system interfaces and electronic documents for e-Freight enables more efficient multi-modal transports
		Automatic Identification System data about ship locations and estimated time of arrivals allow better resource management
	Long delays at port gates	Intelligent Port Access Control by using open integrated ICT systems for pre-registration according to the EU security and terrorist regulations as well as transnational transports for reduction of delays at the port gates
Violations of environmental requirements	Not achieved KPI / not reached the predefined targets regarding total energy use, greenhouse gases, CO2 emission, engine standards, etc. à not fulfilling the Green Transport Corridor standard	Developing and implementing transport planning systems which integrates the relevant KPI in one single system
	Wrong or missing documentation of environmental and climate impact	Prepare a standardized guideline/ template for the documentation
	Causing too big carbon foot prints	Easing of small cargo shipments by rail and sea in order to increase inter-modal operations related to rail and maritime transport since currently small shipments are dominated by road transport causing big carbon foot-prints
Social Risks		
Safety deficiencies	Not achieved social efficiency (ISO 31000, ISO 39000)	Establish intelligent truck parking systems to increase corridor efficiency
	Different safety cultures among countries, regions and companies	Preparing guidelines for international safety regulations
	Lack of experience leads to misinterpretation of driving dynamics resulting from weather conditions, etc.	Up-to-date information about traffic and weather conditions in the whole BSR, offering driving training
Lack of knowledge	Problems during transport (e.g. police inspection) due to unknown safety regulations, or different legal systems	Offering free training material e.g. about regulations about cargo securing and liabilities in the transport chain
Skills shortage	Shortage of qualified labour	Require the regions to educate and attract more logistics professional, establishing logistics clusters

The measures to manage risks in Green Transport Corridors must be undertaken on the strategic as well as on the operational level. Therefore, they differ in terms of financial, personal und technical resources needed for the application. The compiled measures can be used by different stakeholders, like corridor managers, logistics service providers, shippers or infrastructure providers to manage Green Transport Corridor risks. But to achieve a high efficiency and to safeguard a cross-regional implementation of measure a bottom-up-approach should be applied which requires transnational corridor governance structures oriented at multi-level governance concepts. Unfortunately, the development and discussions of Green Corridor governance concepts have just begun and the implementation of those concepts are still open (TransGovernance 2014; Prause, Hunke 2014). Consequently, the implementation of risk management measures in Green Transport Corridors are concentrated currently on local level mainly related to infrastructure or logistics hubs in order to remove infrastructural obstacle and to reduce risks. On the long term well-coordinated measures are nec-

essary to reduce the implementation costs for the whole Green Transport Corridor system but therefore first solutions for Green Corridor governance concepts together with common ownership and financing models have to be implemented.

Nevertheless, the compiled measures require a monitoring of actions taken to reduce the Green Transport Corridor risks. Until efficient management and governance structures in Green Transport Corridors are implemented steering committees consisting of representatives from politics and business should accompany the implementation of risk measures of the strategic level. On the operational level the existing KPI and management control systems should be amended and enlarged by risk indicators and should be integrated in well-developed ICT systems in order to monitor relevant risks related to performance and development of Green Transport Corridors (Prause, Schröder 2015).

4. Conclusions

Green Transport Corridors represent a cornerstone in the development and implementation of integrated and sustainable transport, but due to high level of complexity their implementation and management is connected with a variety of risks. Until now, the research focussed on sustainability, growth and trans-organisational cooperation whereas the role of risks has been neglected.

The empirical results of this paper investigate the risks that might occur in Green Transport Corridors and how they can be classified. Based on this analysis the development of a comprehensive risk management concept for Green Transport Corridors has been started. The implementation of an effective risk management concept depends heavily on the existence of powerful corridor management and governance concepts which are heading towards multi-level governance models but which are unfortunately still under development so far. Therefore, first steps for risk reduction should be done on local level, i.e. in infrastructural projects like logistics hub development. It should be continued on operational level by amending and enlarging the existing KPI system for Green Transport Corridors by risks indicators in order to be able to monitor risks related to corridor performance and development.

Due to the limited number of empirical measures, the evidence of this research is limited as it is typical for empirical work. Therefore, further research is needed. Firstly, risks have to be identified before they are evaluated. After assessing the risks, they need to be prioritized in preparation for risk handling. Subsequently, depending on the kind of Green Transport Corridor risk, the stakeholder may select measures from the compilation. Furthermore, it is possible to choose a measure from one of the groups depending on the impact the measure has. When deciding on the mitigation measures, costs for their implementation and occurrence of further potential risks should also be taken into account. Hence, interdependencies with general operational risks must be observed to ensure an efficient Green Transport Corridor concept.

Further research is needed in order to strengthen the evidence of this work. Additional expert interviews should be conducted. Subsequently, the results should be confirmed by a large-scale empirical survey. In addition, case studies should be carried out to apply the compilation of measures and strategies to manage Green Transport Corridor risks and to develop a corridor benchmark.

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