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Social logistics: Rethinking public transport as a regional distributor of goods in rural areas. Chances for the long-term establishment of a sustainable regional logistics approach

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Abstract

This paper presents initial findings on the establishment of a social logistics project in a peripheral rural region in Germany. As part of a real-life laboratory, two services were developed and tested with the aim of improving rural supply: the delivery of regional goods and the return of online orders in cooperation with a regional public transport provider, regional retailers and parcel services. An evaluation team provided support to the project in identifying, monitoring, and documenting the societal impact of the services and promoted impact-oriented project management. The concept of providing services of general interest through social logistics and testing them in a real-world laboratory was based on preliminary work in the region. The results indicate that this approach can promote this type of social logistics in the long term. A social logistics approach does not focus solely on economic aspects but emphasises social and environmental benefits for the region. A real-world laboratory approach enables an environment that promotes open exchange, involvement of different stakeholders and joint problem solving in a reflective, iterative process. This methodological approach enabled the continuation and out-scaling of the service's core offerings immediately after ending the test phase and is seen as an important prerequisite for establishing a long-term perspective.

Keywords: Social Logistics ▪ Rural Areas ▪ Regional Economics ▪ Social Innovations ▪ Real-World Laboratory

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Soziale Logistik: Öffentlicher Nahverkehr als regionaler Verteiler von Gütern in ländlichen Regionen. Chancen für die langfristige Etablierung eines nachhaltigen regionalen Logistikkonzepts

Zusammenfassung

In diesem Beitrag werden erste Erkenntnisse zur Etablierung von Soziallogistik in einer peripheren ländlichen Region in Deutschland vorgestellt. Im Rahmen eines Reallabors wurden zwei Dienstleistungen mit dem Ziel der Verbesserung der Versorgung des ländlichen Raums zwei Dienstleistungen entwickelt und erprobt: die Zustellung regionaler Waren und der Rückversand von Online-Bestellungen in Zusammenarbeit mit einem regionalen ÖPNV-Anbieter, regionalen Händlern und

Paketdiensten. Ein Evaluationsteam unterstützte das Projekt bei der Identifizierung, dem Monitoring und der Dokumentation der gesellschaftlichen Wirkungen der Dienstleistungen und förderte eine wirkungsorientierte Projektsteuerung. Der Ansatz der Etablierung von Dienstleistungen der Daseinsvorsorge in Form sozialer Logistik und die Erprobung im Rahmen eines Reallabors erschienen auf der Basis von Vorarbeiten in der Region sinnvoll. Die bisherigen Ergebnisse weisen darauf hin, dass dieses Vorgehen Potenzial hat, die Langfristperspektive für den entwickelten Logistikansatz zu fördern: Soziale Logistik stellt nicht allein auf ökonomische Aspekte ab, sondern betont den sozialen und ökologischen Mehrwert für die Region. Ein Reallaboransatz ermöglicht ein Umfeld, das den offenen Austausch, die Einbeziehung verschiedener Interessengruppen und die gemeinsame Problemlösung in einem reflexiven und iterativen Prozess fördert. Dieses methodische Vorgehen ermöglicht darüber hinaus eine Weiterführung und Ausbreitung der Kernangebote der Dienstleitung unmittelbar nach der Testphase und wird als wichtige Voraussetzung für die langfristige Perspektive angesehen.

Schlüsselwörter: Soziale Logistik ▪ Ländliche Räume ▪ Regionalökonomie ▪ Soziale Innovationen ▪ Reallabor

1 Introduction

In recent decades, various political, economic and socio-demographic developments have led to a declining quality of public and private services in many rural areas of Europe. This has resulted in social inequality and increasing spatial polarisation (ARL 2021: 9–10). This is highlighted by the number of small shops that have closed in rural regions, leading to a lack of access to everyday products for people who do not own private motorised vehicles (Kokorsch/Küpper 2019: 5–7; Jürgens 2019: 13–14).

Despite these examples, Steinführer (2020: 382–384) argues for a differentiated view, especially in former East German regions. She points out that in parallel to the dismantling and thinning out of services, there has also been reconstruction and development, expansion and new creation. Tangible examples of this are the progress made by expanding the availability and quality of technical infrastructure and the modernisation of social and medical care facilities. The infrastructure for individual mobility by private car is not affected by reduced public services as road quality has been improved, the main road network has been expanded and the density of services has increased (Gather/Lenz 2020: 443–445). This development has enabled the rise of individual strategies for dealing with the reduced availability of public and private services. Key factors are the individual use of cars and online ordering with individual delivery options in rural areas (Jürgens 2019: 14).

Increasing individualised traffic of passengers and goods has led to a decline in the number of users of publicly financed local transport. Consequently, the provision of public transport in structurally weak and sparsely populated rural regions has often been reduced (Laschewski/Steinführer/Mölders et al. 2019: 32). This contributes to inequality because residents without access to individual mobility increasingly face challenges in gaining access to local supplies. Therefore, many projects are currently being developed to investigate possible solutions to this problem (see Section 2). A viable solution for sharing the responsibilities and costs of local supply as well as local transport in rural areas requires an innovative approach and the involvement of actors from different spheres (ARL 2021: 19–22).

In this vein, we developed the concept of UCKER Warentakt (hereafter UWT) as a social logistics approach. Our project aims at counteracting the aforementioned negative trends in a peripheral, structurally weak and sparsely populated region in Eastern Germany. By setting up UWT within the frame of a real-world laboratory, in close cooperation with regional actors (from the private sector, public sector and civil society), we developed and tested two services. The new offers incorporate economic, social and (rudimentary) ecological dimensions of an enhanced social logistics approach.

The main objective of this paper is to use a real-world laboratory to evaluate transdisciplinary research and development that aims to facilitate the permanent establishment of an innovative social logistics approach in rural, sparsely populated regions. The next two sections present the state of the art in research (Section 2), and the study region and regional experiences in logistics (Section 3). Section 4 explains our hypotheses and research approach. In Section 5, we then present the results of the social logistics approach we developed in the context of this real-world laboratory. Finally, in the sixth section, we reflect on the conditions necessary for the permanent establishment of a social logistics approach in rural areas, review our hypotheses and draw a brief conclusion.

2 State of research

90 % of Germany's territory can be described as rural. These areas account for around 25 % of purchasing power and thus represent an important sales market (BMEL 2023: 6). However, being only sparsely populated, the spatial distances that characterise such regions pose challenges for supply systems in terms of economic efficiency (Merlin/Bickert 2020: 81). Around 60 % of rural regions show

a stagnating or declining population,[1] which also has a negative impact on supply. There are further reasons for this decline especially in local supply. Thus the supplier side, small shops in particular, cannot meet the increased demands of customers in terms of variety, quality and price, and face growing competitive pressure and unfavourable supply conditions. On the customer side, habits of residents such as regular car trips to larger regional cities to pursue various activities, including shopping, reinforce this negative trend (Küpper/Tautz 2015: 139).

Access to physical infrastructures such as public transport can be regarded as critical in most rural areas. After significant centralisation of the public transport network in the past, another 500,000 kilometres of transport routes had to be cut (for example) in the Uckermark by 2019 – according to information given by the state of Brandenburg (Skoupy 2016). The public transport companies are under considerable pressure to adapt their strategies in order to utilise the rolling stock (their buses) more efficiently and to respond to new needs and requirements.

A major part of the population commutes daily from rural areas to work in the cities. At the same time, online ordering helps supply to be organised in a way that is time efficient and adapted to individual needs (Jürgens 2019: 14). As a result, parcels "commute" into rural areas by means of courier, express and parcel service providers, and supplement the local supply. The number of parcel shipments per capita in rural areas is slightly below the national average.[2] The cost of last-mile delivery can account for more than 50 % of total costs (Brabänder 2020: 34). Simultaneously, there are many empty runs.

Küpper and Tautz (2015: 144–149) examined strategies to maintain local supply in rural areas in seven European countries. Their results show that one of the factors underlying existing strategies is the perception of local supply being a service of general interest and thus the adoption of public responsibility for it. In addition, civic engagement, network structures, local identity, mutual trust, shared values and leadership personalities are also central to emerging new logistic concepts such as crowd logistics. However, the ability of the private sector to sustain small local businesses in sparsely populated regions remains essential for regional value creation and needs to be taken into account in integrative logistic concepts.

This means that while digitalisation promotes new supply approaches, they are dependent on viable regional logistics. To date, assessments of viability have been carried out primarily with a focus on economic aspects. There is a lack of analyses of other contributing factors to the long-term sustainability of logistics in peripheral, structurally weak, rural regions. Nonetheless, there are indications that social (and other) aspects should play a role in the design and assessment of sustainable regional logistics concepts. So far, however, the specific nature of these social aspects remains undefined. Furthermore, a combination of the strategies and resources of different actors (e.g. public and private) seems to be relevant for the viability of approaches that strengthen regional supply. However, here too, it remains rather unclear which aspects need to be combined and how a long-term perspective for the regional logistics approach and for rural supply could be developed.

Therefore, efficient logistics solutions for rural areas are important in order to maintain and strengthen the supply (Krüger/Lüer 2020: 29; Schroth/Maier/Wagner-Hanl et al. 2021: 13–14). Digitalisation can contribute to this (Williger/Wojtech 2018: 10–11). In this context, Troeger-Weiß and Anslinger (2015: 20–22) show that digitalisation can enable regional businesses to become better connected, which can increase local and regional value creation, competitiveness, etc. Williger and Wojtech (2018: 10) also point out that digitalisation and the opportunities of digital distribution can create a more flexible range of services and significantly expand their reach. Thus, transport cost disadvantages (Bauer 2009: 98) that arise due to long distances in rural regions could be reduced. As a result, regional logistics approaches could become more economically viable.

This is where concepts from the field of regional logistics – often referred to as smart or micro logistics – come in. They explore how physical and digital approaches can be combined, how public transport, private transport and other forms of transport can be synchronised, and how viable, attractive logistics infrastructures can be created in sparsely populated regions (Uckelmann 2008: 273; Bischoff/Maciejewski 2019: 357). Schäfer and König (2018: 69–72) and Wegner (2019: 285–286) show how smart logistics approaches that link digital and physical offers can help to leverage the potential for cooperation between companies and thus generate growth on the part of regional producers on the one hand and an improvement in local supply for the consumers on the other.

Crowd logistics can be regarded as a relevant approach to regional logistics. According to Buldeo Rai, Verlinde, Merckx et al. (2017: 10–11), crowd logistics is an information-based marketplace concept that brings together supply and demand for logistics services. An undefined crowd with free capacities of space and time provides the service on a voluntary or paid basis. Such a crowd consists of "an undefined number of people who come together randomly and unintentionally, usually without knowing each other and

[1] Authors' calculation based on https://www.inkar.de (21.07.2023).

[2] Comparison between city-states and territorial states; BIEK (2018: 1).

therefore do not necessarily interact with each other" (Hastenteufel 2022: 469). Currently, examples of crowd logistics can mostly be found in urban areas (Kokorsch/Küpper 2019: 19–20). However, some studies also see potential in crowd-based logistics approaches in rural areas: innovative local or regional logistics solutions for goods that are not easily accessible could increase the reach of existing offers. Retailers could benefit from offering orders via an online shop or by telephone. Regional marketplaces in the form of a digital association of retailers provide another option to strengthen the retail sector (Dörrzapf/Berger/Breitfuß et al. 2016: 205).

Despite these approaches, coping with the high costs for the last mile in rural areas poses a challenge. Providers have to cover long distances to the destination and personal delivery often fails. Packing stations are expensive and the remoteness of the neighbourhoods makes it extremely difficult to find alternative delivery options (Fillies/Pöttker/Häusler et al. 2020: 812–813). Consequently, there is to date no successful, comprehensive and scalable model of smart or crowd logistics for rural areas. Economically viable crowd logistics appears to be rather difficult in rural areas. However, based on an innovation barrier analysis, Rösch and Conrad (2022: 40) argue that the positive social and ecological aspects are sufficient reasons to implement and operate crowd logistics in rural regions. Szołtysek and Twaróg (2011: 29–30) give indications of the possible social aspects of logistics approaches. They illustrate that changing conditions (such as demography, digitalisation, climate change and technological development in modern supply chains) make it necessary to rethink logistics and that socially oriented logistics are relevant for adapting to these changes (Szołtysek/Twaróg 2011: 30).

According to Zaczyk (strongly following Szołtysek/Twaróg 2011: 29–30), social logistics can be defined as a system that organises the exchange of goods and related information and fulfils a specific social role. This implies that the social logistics system offers an additional benefit as it responds to the needs of society and contributes to its functioning (Zaczyk 2019: 85). This additional benefit is ultimately reflected in the fact that social logistics enables an exchange of goods precisely where purely economy-based approaches are no longer able to do so, and where some parts of society no longer have access to basic supplies (Zaczyk 2019: 87–88).

3 Study region and prior regional experience in the field of regional logistics approaches

The study region is the district of Uckermark, which is situated in the northeast of the federal state of Brandenburg and borders on the neighbouring country of Poland. It mainly shows the typical structure of a rural, peripheral area without remarkable industries (except for the city of Schwedt).[3] With approximately 38 inhabitants per square kilometre, the district is one of the least populated in Germany. Issues such as demographic development, the migration of young people to urban areas, the difficulty to attract trainees and skilled workers, and an above-average unemployment rate (10.3 % compared to the national average of 5.7 %)[4] pose major challenges for the Uckermark. In 1990, the population of the Uckermark totalled about 169,000. 30 years later, only about 118,000 inhabitants were recorded. This equals an absolute decline of 51,000 inhabitants or a loss of about 30 % (IHK Ostbrandenburg 2022: 4). Forecasts show that the population in the Uckermark will continue to decline in the coming years to around 108,000 in 2030 and around 88,000 in 2050 (IHK Ostbrandenburg 2022: 10).[5]

The Uckermark interacts with the metropolitan regions of Berlin and Szczecin. While Berlin has a pull effect as a sales market and a market for training and labour, the inhabitants of Berlin show great interest in nature tourism. The north-eastern Uckermark is part of the cross-border metropolitan region of Szczecin. The regional centres of Angermünde, Prenzlau, Schwedt and Templin play a significant role as places to live, sales markets, suppliers and sources of new impulses. In contrast to other German regions, existing potentials are insufficiently harnessed. In order to counteract this situation, initiatives have formed that aim to improve regional prospects (for example the Innovation Alliance Region 4.0).[6]

[3] The Uckermark forms the core of the "Innovation Alliance Region 4.0" that is looking at new value creation approaches. Within its strategy framework, the alliance carried out various projects. As a result, our research team could not choose the study region but it could decide on different topics. The logistics topic was chosen on the basis of a SWOT analysis for the region and the needs of regional actors.

[4] https://statistik.arbeitsagentur.de/SiteGlobals/Forms/Suche/Einzelheftsuche_Formular.html?topic_f=jobcenter-arbeitslose-quoten&r_f=bb_Uckermark (24.07.2023); https://statistik.arbeitsagentur.de/DE/Navigation/Statistiken/Interaktive-Statistiken/Eckwerte-Arbeitsmarkt/Dashboard-Eckwerte-Arbeitsmarkt-Nav.html (24.07.2023).

[5] https://ec.europa.eu/eurostat/databrowser/view/PROJ_19RP3/default/table?lang=en (24.07.2023).

[6] https://region40.de/.

In 2019, Region 4.0 launched (among other things) a series of workshops on the topic of supply and regional logistics. The participants were stakeholders from politics (mayors, district councils), business (public and private transport and logistics companies, regional business development) and civil society (citizens' initiatives to improve supply in rural areas, representatives of the transport advisory board of the Uckermark). The initiative aimed both to identify opportunities to improve regional supply by regional logistics and to simultaneously discuss prior approaches and the results of previous projects. The region could draw on experiences with testing and establishing new supply channels that involved combining passenger and freight transport since 2012. However, these approaches could not be successfully implemented. A crucial finding was that previous approaches had had a purely economic focus, the potential of which was limited in the region due to little demand. In addition, such approaches focused primarily on bilateral relationships, namely between a logistics service provider and its customers. Solutions developed for this constellation could not be applied to other relationships.

Regarding the requirements for sustainable regional logistics, the following questions were essential: How can the tasks and costs associated with the operation of regional logistics be distributed among the greatest possible number of regional actors in order to establish the services permanently? What motivates these actors to assume tasks and costs in the long run? How is it possible to resolve the conflict between the desire to use regional logistics, revitalise villages and improve supply on the one hand and the need to ensure economic viability of the services on the other?

4 Hypotheses and research approach

4.1 Hypotheses derived from the current state of research and the regional background

In view of the state of research and the regional experiences and needs, we derived the following three hypotheses:

The literature on regional logistics shows that approaches such as crowd logistics in rural areas cannot be regarded as viable in the long run, as long as only economic aspects are considered. The experiences from the study region support the findings in the literature that social aspects could be important arguments to justify the introduction of a regional logistics approach. However, the literature and the statements from the study region remain rather unspecific about the social aspects.

Hypothesis 1: In peripheral, structurally weak, rural areas, a permanent establishment of regional logistics can only be achieved by considering social aspects as part of the benefits to the region. To enable an evaluation of such social benefits, they have to be clearly defined.

Literature and experience in the field of regional logistics show that organising the improvement of regional supply in peripheral rural areas while depending exclusively on the private sector is challenging.

Hypothesis 2: A sustainable regional logistics approach includes a mix of different strategies, involving the private and the public sectors as well as voluntary engagement by a range of regional actors. This makes it necessary to adapt previously practised organisational and individual routines to new logistics processes or supply concepts as part of the spectrum of social aspects mentioned above.

We assume that the complexity of the pursued regional logistics approach (e.g. integration of social aspects, the mix of different strategic approaches) requires that a variety of actors with different experiences, resources and goals need to cooperate for its establishment.

Hypothesis 3: A suitable procedural approach must be chosen that allows the knowledge and experience of different actors to be integrated and the logistics concept to be developed and optimised in a joint iterative "trial-and-error process". A transdisciplinary format such as the real-world laboratory is particularly suitable since it promotes social learning and problem solving in a co-creation process as a basis for the long-term establishment of the innovation.

With a focus on these three hypotheses, we have chosen approaches and methods that make it possible to deduct plausible explanatory correlations from the available empirical material.

4.2 Approaches and methods

4.3 UCKER Warentakt as a social logistics approach

The project UCKER Warentakt (UWT) is a social logistics approach within the framework of a real-world laboratory. Based on hypothesis 1, the research team developed UWT as a regional logistics approach that explicitly includes social aspects. The social aspects chosen were very relevant in the evaluation of the approach and the decision about whether it will be established in the long run.

In setting up the UWT[7] as a regional logistics concept in the district of Uckermark, we included specific social aspects which can be assessed. We tested the initial model

[7] https://uckerwarentakt.de/; https://www.facebook.com/uckerwarentakt (24.07.2023).

of UWT for one year from April 2020 until March 2021 and continuously improved it based on the experiences made. In this pilot phase, we developed two social services using the structures and resources of the local public transport system Uckermärkische Verkehrsgesellschaft (UVG).

The first service was called *Regionale Lieferangebote* (Regional supply options). Residents from three villages (Gerswalde, Flieth and Brüssow) in the region of Uckermark were offered the opportunity to order goods from participating retailers in nearby medium-sized cities (Prenzlau, Templin). The retailers brought the ordered products in packages to the central bus station in their city where they handed them to the public transport drivers. At the bus stop in the village, the employees of small local shops picked up the packages and kept them in the shops until the consumers then claimed them later.

The second service, referred to as *Retouren-Service*, allowed residents to send return shipments of courier, express and parcel services to the parcel shop in the nearest larger city from where they were then forwarded to the respective service. These shipments could be returns from national or international online retail. Promoting the service also involved communicating the benefit for the region beyond the benefits for the individual, such as the contribution it made to the maintenance of local supply and the existing public transport.

Our regional logistics approach encompassed the following social aspects:

- Citizens buy locally and are willing to make a greater effort to experience this new way of having products delivered from local retailers for the sake of maintaining an infrastructure that provides access for less mobile members of the population.
- Small local shops are willing to provide access to goods of local retailers, without having short-term economic advantages.
- The public transport company (UVG) supports the process by offering the delivery for free during the funded test phase.
- Different actors (citizens, local retailers), previously inexperienced in the field of logistics, work together, exchanging social information (e.g. on needs, challenges, problems) in addition to logistics information, collectively acquiring new competences (e.g. solution approaches) and adopting new practices (e.g. in the field of communication and organisation).

In short, all the stakeholders involved had to mobilise resources to establish UWT's services, going beyond their organisational or individual self-interests. The approach required a mix of different strategies to support the long-term viability of the logistics approach as formulated in hypothesis 2.

4.4 UCKER Warentakt as a real-world laboratory

The central aim of UCKER Warentakt (UWT) was to test and adjust the two services implemented jointly by social and academic actors in order for them to become established permanently. In the literature, authors recommend a real-world laboratory as a methodological framework for this kind of transformation-oriented experimental approach involving cooperation between science and practice (Schäpke/Bergmann/Stelzer et al. 2018; Bergmann/Schäpke/Marg et al. 2021). Therefore, a core team of partners from academia and practice (UVG acting as one partner in the consortium) jointly designed the framework for the test run as a real-world laboratory in which all actors worked together in repeated process loops. 14 local retailers from two larger cities in the Uckermark district, small stores in three villages, bus drivers and a Hermes parcel store interacted in different constellations to carry out the services in a number of consecutive steps. Since all inhabitants living in the three villages are potential users of the two services, we regarded them as relevant knowledge providers for the project. In the design process of both services, the research team interviewed ten inhabitants. During the test phase, users shared their experience of using the services of UWT and brought forward their ideas for improvements using semi-standardised templates in telephone interviews and in questionnaires, which they received with their orders. In both formats, the questions focused on the relevance of social aspects, the effects of the UWT and its long-term prospects. In addition, specific questions related to the individual benefit of participating in the UWT and to the evaluation of the cooperation within the framework of the real-world laboratory. The minutes of the telephone interviews were then used for the refinement of the UWT.

The test itself was set up as a "second order transformation experiment" (Fazey/Schäpke/Caniglia et al. 2018: 65) resembling a learning by doing process, which allowed for iterative trial and error as well as continuous improvement of the services. In addition to individual and collective learning, the academic team fostered capacity building. For this purpose, there were personal conversations on specific challenges in delivering the services. Two research assistants, who were continuously available for the cooperation partners, established an accompanying feedback process. On an almost daily basis, this provided the practitioners with relevant information and with quick solutions for problems and challenges to enable them to adapt their procedures easily

and improve the quality of the services. In two workshops, the participants jointly reflected on the processes and adjusted them where necessary and possible. The decisions about adaptations took into account the capacities, competences, needs and possibilities of all participants. The team documented insights gained through trial and error and could therefore transfer discussed suggestions for improvement to the entire test setting.

Furthermore, an accompanying formative process evaluation by the Centre for Technology and Society (ZTG, Technische Universität Berlin) stimulated joint periodic reflection on the methodological challenges of the real-world laboratory by serving as a sparring partner for the academic team (Di Giulio/Defila 2018: 22–24; Fazey/Schäpke/Caniglia et al. 2018: 66). The formative evaluation also provided a framework for systematically planning and recording the societal effects (Belcher/Davel/Claus 2020: 10; Nagy/Schäfer 2022) as well as for impact-oriented monitoring of research processes particularly related to the long-term perspective, going beyond the funded existence of the lab. The formative evaluation applied only methods of qualitative empirical social research such as questionnaires, semi-standardised interviews and workshops for joint reflection on processes and results.

5 Results and effects of the test run from different perspectives

5.1 UCKER Warentakt as a real-world laboratory

Co-production for adjustment of the services The scientific monitoring of the processes showed that the concept of the real-world laboratory worked: during the testing of the UWT services, the actors involved cooperated constructively in providing the new services and in finding solutions to challenges. The practitioners also adjusted the processes spontaneously in order to improve the service and to make it smoother and more efficient. Some of the participating actors reported experimental changes they made to adapt the service to their daily routines. They also discussed the possibilities and limits of adaptation transparently and constructively in the workshops. Most suggestions could be integrated unless they would have affected the schedule or the routes of the buses. Users also shared their experiences of using the services of UWT and suggested their ideas for improvements in interviews and on questionnaires.

During the real-world laboratory, the retailers also acted as co-creators within the communication strategy. The research team asked them to share information about the service and their participation in their networks – online or in personal communication with their customers. The academic team provided draft texts and designs for this purpose – which also helped achieve a uniform appearance and a high quality of communication. The retailers were able to advertise the new offers in a range of ways. Some put out flyers from UWT or informed their walk-in customers in personal conversations. Others promoted the service through their online presence or their social media channels. These variations in communication about the service resulted in learning opportunities for the whole logistics network.

Different resources and needs for support There were differences in the intensity of support the participants needed: those who could build on existing competences, structures and routines in online retailing needed less support. Therefore, new routines for the services were implemented at different individual paces. Bookshops in particular had advantages in this respect as they could also draw on their experience with the nationwide service of overnight delivery in the German book trade. This kind of offer was integrated into the UWT service quickly and without any difficulties. UVG also already had the necessary structures for the new services, at least partially (from former approaches). The drivers were already used to the handling of parcel deliveries and analogue parcel tracking. Based on former experiences, an adept route coordinator was able to respond to suggestions to improve the service and co-create solutions within the logistics network.

The stakeholders also possessed different resources, capacities and capabilities for taking on new tasks to successfully establish the test routes. Nevertheless, all of the actors involved who implemented the service had to learn new practices such as online marketing, adequate packaging or using QR-codes. In part, these changes required the acquisition of new skills and the establishment of new routines. They had to adapt familiar procedures and time management while additional human resources were generally not available for the test.

Motivation to carry on with the new services Concerning the engagement of the participants in the project and the adaptation processes, we observed differences due to the retailers' individual personnel resources and their locations. We found evidence that retailers who received regular orders were more motivated to participate and contribute to the improvement of the service. However, most of the retailers did not take on a role as active co-creators of an innovative regional logistics approach. Although they did occasionally communicate about UWT, they mainly acted as individuals and not as part of a wider network. In general, it became clear that only a few of the retailers were able to see "the big picture" concerning their contribution

as part of a broader vision towards a sustainable development of the region. Some retailers showed commitment to the project and understanding of the challenges of the test phase, whereas others were noticeably impatient. At the end of the test phase, several retailers, in particular the two participating bookshops, were eager to further develop and extend the services while others withdrew from the project.

On the side of the UVG, we witnessed a learning curve in terms of a long-term perspective towards sustainable development. During the project, the perspective of the UVG shifted from a short-term economic perspective towards an acknowledgement of the other societal and environmental advantages of the services. At the end of the test phase, the management confirmed in an interview that the company is increasingly focusing on improving its public perception and image by emphasising the social and environmental aspects of UWT.

5.2 UCKER Warentakt as a social logistics approach

The test phase showed two important results: the logistics process worked and there was continuity both in offers and in demand. UWT proved to be a regional logistics approach that includes relevant social aspects – as formulated in hypothesis 1.

Functioning logistics process The statistics on shipments and the surveys in the form of interviews and questionnaires clearly showed that customers appreciated the reliability and speed of the service. UVG transported the ordered products to the villages. Locals could drop off returned items at village shops from where they were then transported to the city. Customers stated that they were willing to pay a financial contribution in the future (1-euro ticket). Retailers said that they were willing to adapt their business processes (e.g. using the system's labels and handing over their shipments to the UVG). The UVG has set up its processes and advertised the offer. After establishing the test route, there were 20 to 30 shipments per month on average.[8]

UWT is a social logistics approach As described in Section 4.2.1, a social logistics approach is characterised by specific features. These include the particular social relevance, the co-transportation of relevant social information, the use of the approach to improve quality of life in the region or the collective acquisition of new competences and the development of new practices.

In the interviews (n=13), retailers indicated that they participate in UWT for more than just economic and pragmatic reasons. From their perspective, UWT is not only a new service that provides them with new opportunities to improve their retail options. It also has the potential to strengthen regional value creation, in contrast with globally operating online retailers.

The interviewed customers (n=6) claimed that by using UWT they wanted to support local retailers with whom they often have a personal relationship. While this aspect supports the social orientation of the logistics approach, others differed from this perspective: some users used the service mainly to save time, avoid extra trips and for reasons of convenience. However, they were not particularly interested in supporting regional retail.

At the level of regional leaders (mayors, district council), a workshop showed that they associate the new service with benefits for the region, above all, the maintenance of quality of life. The regional actors understood social logistics as an infrastructure, similar to a road or the internet. The infrastructure helps to ensure access to goods for all sections of the population in all parts of the region.

UVG was the main project partner in the implementation of social logistics. It has been able to develop new solutions to the challenges identified within the delivery process. As mentioned above, UVG's view of the project shifted from a short-term economic perspective to recognising the additional social and environmental benefits UWT could provide in the future. In the long-term, the company wants to contribute to the mobility transformation by showing how existing infrastructures can be utilised more effectively. Accordingly, UWT is applying an approach to social logistics as it contributes to handling social challenges constructively and cooperatively.

It has been a challenge for customers and retailers to change their habits in accordance to the services offered. As the project worked with limited resources, the services could not compete with the offers of professional online shops, online platforms or supra-regional offers of courier, express and parcel services. Consequently, participants in the project had to compromise if they wanted to use UWT. They encountered imperfect technology[9] or somewhat unharmonised delivery offers (e.g. concerning the processing of payments). Thus, they had to jointly acquire competences or find alternatives. In this respect, continuous exchange or

[8] Are 20 to 30 shipments relevant? The answer depends on the perspective. In interviews, regional booksellers made it clear that they have seen an increase in orders from the villages because of the UWT. From the perspective of the parcel shop provider, the number of additional returns can be described as manageable.

[9] This refers to a mobile application WTapp developed in the project for handling parcel shipments.

feedback was necessary. This underlines the concept of social logistics in that an exchange of social information is generated, e.g. about how to compensate shortcomings of the system.

The interviews with customers and retailers demonstrated that they appreciated the UWT as providing reliable, low-threshold access to local supply even in very peripheral rural regions. Furthermore, the interviews showed that the exchange between the retailers and their customers as well as among the retailers has improved. Retailers who had not been in contact before, got in touch with each other in order to cooperate in the UWT. Customers visited new retailers or visited them more frequently to choose, pick up or drop off shipments. All these circumstances led to a reinforcement or even the emergence of social nodes in the region.[10] Considering this, these results can be seen as an indication that UWT contributes to an increase in the quality of life in the region, as understood in the social logistics approach we discussed above.

6 Discussion, conclusions and limitations

6.1 Discussion of the results of the UWT approach

In this section, we discuss the three hypotheses underlying our experiment. We reflect on the empirical results and on the concept of social logistics. We describe the strategies that enabled us to establish a social logistics approach and provide recommendations for ensuring its long-term prospects.

Hypothesis 1: In peripheral, structurally weak, rural areas, a permanent establishment of regional logistics can only be achieved by considering social aspects as part of the benefits to the region. To enable an evaluation of such social benefits they have to be clearly defined.

Our results support this hypothesis. In addition to previous definitions of social logistics (shown in Section 2), this paper considers the associated social exchange of information to be a characteristic feature, in addition to the exchange of goods. Our social logistics project UWT has the potential to contribute to the improvement of people's quality of life and helps to satisfy social needs in the long run. In interviews, the participants emphasised the added value of the service for themselves and for the communities in the region. However, some of the participants were only seeking a functional new service.

Within social logistics, the actors involved are often engaged citizens who have little experience in regional logistics. Exchange among the actors involved enables a constant reflection process that helps improve competences and practices as well as optimise the services. The mutual exchange is essential for the success of social logistics. Socially oriented logistics does not exclude anyone, but instead it tries to specifically include those who are cut off from purely economically oriented logistics systems.

Participating retailers understood their role in securing regional supply and were motivated to be involved without significant additional economic benefits. This engagement contributes to the quality of life in structurally weak rural regions. However, there is a risk that the private sector will reduce its own infrastructural contributions because it assumes that the public sector will provide the necessary access to all private goods and services (Conrad 2022: 1). The test phase of one year has not been long enough to provide evidence for such a potential trade-off.

Concerning its functions in the long run, it is insufficient for social logistics to succeed solely in one target dimension (the economic one). In the aftermath of the test phase, the UVG introduced a 1-euro ticket for the shipments which generates some profit. Due to the limited number of shipments, the effect remains marginal so far. Still, the 1-euro ticket demonstrates that social logistics is of relevance as it can be integrated into public transport options and can be scaled up.

Social aspects may play the most essential role for social logistics in its starting phase. When evaluating social logistics, it is important to consider how it contributes to strengthening social structures, how it affects the quality of life of the actors involved in and connected to it, and which new qualities are created.[11] Social logistics is thus very much in the tradition of many crowd (logistics) approaches, which deal with challenges of economic viability, especially in peripheral rural areas. Their benefits for sustainable regional development lie specifically in various

[10] We understand the village shops (but also the parcel shop and the railway stations of UVG) that are connected to the UWT as new social nodes. They fulfil new social tasks within the framework of the UWT. This is true, for example, regarding communication: the village shops exchange information on new services and topics with a variety of new actors (UVG, retailers in the towns, customers who did not use the village shop before) within the framework of the UWT.

[11] The project has improved communication between village shops, logistics providers, retailers and customers. New social nodes have been created. Among other things, the new social structures are characterised by sufficient trust and communication to make the complex logistics approach work.

positive effects for society and the opportunity to participate in it (Rösch/Conrad 2022: 39–41).

Nevertheless, it should be pointed out that, in view of the financial challenges many regions are facing, social aspects alone are not sufficiently convincing drivers for action. We are currently experiencing this in the district of Uckermark, where the sanctions against Russia in response to the war of aggression against Ukraine threaten the economic existence of many companies. Hence, social and ecological objectives are attracting less attention (o.V. 2022).

Hypothesis 2: A sustainable regional logistics approach includes a mix of different strategies, including the private and the public sectors as well as voluntary engagement by a range of regional actors. This makes it necessary to adapt previously practised organisational and individual routines to new logistics processes or supply concepts as part of the spectrum of social aspects mentioned above.

Our results support this hypothesis. UWT brought together the three strategies which Küpper and Tautz (2015: 144–149) had identified in rural areas of seven European countries. First of all, private-sector offers complemented local supply with selected goods in the UWT delivery area. Secondly, within UWT we used targeted subsidies to initially focus on the use and experience of the services developed and not on competition with the offers from the courier, express and parcel services. This allowed the social logistics services to be offered free of charge during the test phase. In the long run, the strategy of targeted subsidies helps UVG to continue to provide the services and infrastructure developed in the project, even if no substantial profit is made. In addition, the third strategy is related to the engagement and responsibility of residents for the local supply of their communities. In the test phase, we realised that these strategies could be brought together in synergy. Nevertheless, it should be considered how the interaction of strategies that target different actors can be coordinated. In their analysis, Küpper and Tautz (2015: 151) do not directly address how the three individual strategies might interact and reinforce each other. Instead, they refer to the need for further research in this regard.

Hypothesis 3: A suitable procedural approach must be chosen that allows the knowledge and experience of different actors to be integrated and that develops and optimises the logistics concept of UWT in a joint iterative "trial-and-error process". A transdisciplinary format such as the real-world laboratory is particularly suitable since it promotes social learning and problem solving in a co-creation process as a basis for the long-term establishment of the innovation.

Our results support this hypothesis. Actors who were involved in co-designing the processes – e.g. through participation in adaptation workshops – were not discouraged by the fact that the experiment took a long time to find the best mode of operation. Mutual learning from failures or solving problems together empowered the actors. These new competences of the actors involved contributed to the resilience of the social logistics approach we tested. The joint practice of exchanging goods and information worked well.

However, it would have been useful to involve potential customers more intensively in the co-design of the services. Greater involvement might have strengthened their commitment and could have led to a more intensive use of the services. Moreover, UVG has been very reluctant to play a role in co-designing and communicating the service due to a lack of resources and experience in acting as a "social-ecological" service provider. However, throughout the duration of the project, a learning process led to stakeholders adopting responsibility for a continuation of the service after the research project ended. The retailers had to make their decisions mainly according to economic criteria in a period of multiple crises (i.e. restrictions due to Covid-19, Russian invasion of Ukraine). In this situation, only those retailers who already had adaptable structures and did not have to invest many resources in restructuring and establishing new practices were able to provide the new services without any difficulties.

The application of the real-world laboratory approach produced useful results but it required intensive support from the research team and thus many resources. The adoption of new practices (especially among clients) usually takes longer than one year and is subject to the influence of many external factors. For the permanent establishment of the services, the continuity of the structures of the real-world laboratory and especially the maintenance of exchange among the cooperation partners, continuous support is essential.

6.2 Conclusions and limitations

We encountered various challenges while testing the social logistics prototype. Many of these challenges are also relevant for attempts to permanently establish the UWT services in particular and for the lasting establishment of social logistics in general. The lack of equipment, structures, resources and competences of the actors involved can impede active participation in innovative activities. During the acquisition of retailers to participate in the project, we observed a decreasing willingness to experiment and engage in activities beyond their usual daily business. Only few of them could draw on established structures and competences, such as setting up and operating online shops. Additionally, the Covid-19 pandemic and the resulting lockdown tied up many of the stakeholders' financial resources and personnel. Smaller and regional retailers often did not have the

resources or competences to present their offers online and to consider how to effectively integrate their online and offline channels (Rimmer/Kam 2018: 15–18). Therefore, training and networking opportunities in a real-world laboratory are necessary to enable the development of innovative ideas and the necessary cooperation among different actors in the region to implement them.

As a research project, UWT could neither offer low price products like the contemporary large online retailers or platforms, nor the convenience of ordering directly with just a few clicks. Therefore, the largest challenge was the acquisition of customers. Küpper and Tautz (2015: 150–151) emphasise that creating a willingness to use new private-sector offers requires, first and foremost, intensive communication of the added values for individual users, for the community and for society. As UWT requires changes in behaviour such as shopping habits, this aspect is particularly important. Allocating sufficient financial resources and personnel for a broad communication campaign are essential for the long-term establishment of a social logistics approach. Therefore, regional or national institutions that are capable of providing the required subsidies and competences should be integrated from the very beginning. Such institutionally embedded resources could help different actors to build or expand their capacities and to further develop and adapt their business models to provide improved and diversified private sector offers.

The methodology of the real-world laboratory could only be implemented within limits as it was challenging to involve all actors to the same extent in the co-design, co-creation and evaluation process. Most of the actors have very limited time available in their daily lives. In addition, it was also challenging to involve users in the process of innovation development. The Covid-19 restrictions were also a considerable barrier in the research process. As meetings and workshops were only possible online, they were less effective and were confusing for many actors.

Originally, we also intended to explore the ecological perspective of the UWT approach. The aim was to determine which ecological effects the UWT has and whether these support the long-term establishment of the UWT. However, collecting the information and data needed for this assessment proved extremely difficult. Within the time period available, it was not possible to find out whether the use of the services actually reduces the use of private vehicles. However, we can see the potential for measurable ecological effects through upscaling the services to all bus lines of the UVG. We expect that the investigation of long-term effects could result in interesting findings. Even if each case of using the UWT only results in minor savings of CO_2, these could nonetheless add up to a relevant amount.

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