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Master thesis in human geography

Distinguishing Tourism Destinations Using Mobile Positioning Data

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1. INTRODUCTION

The rapid development of information and communication technology (ICT) is changing the essence of tourism, the research methods to study it, and the management methods to develop it (Buhalis & Law, 2008; Law, Buhalis & Cobanoglu, 2014). There have been significant advances in ICT, including a substantial increase in the availability and importance of using big data sources and digital and mobile communications, which has also modified marketing processes (Roberts, Kayande & Stremersch, 2014). The availability of these datasets has given the opportunity to rethink and renew the current concepts and methodologies used in tourism studies. With regards to destination marketing, the new digital space-time tracking methods (Shoval & Isaacson, 2007) can be used to differentiate tourists and destinations. In the current study, a more comprehensive theoretical conceptualisation of the tourism destination in the light of new available space-time tracking data sources is proposed.

Tourism destination is one of the key concepts in tourism because it characterises the tourism trips taken by the visitors. The World Tourism Organisation (UNWTO) defines the main destination

> as the place visited that is central to the decision to take the trip. However, if no such place can be identified by the visitor, the main destination is defined as the place where he/she spent most of his/her time during the trip. Again, if no such place can be identified by the visitor, then the main destination is defined as the place that is the farthest from the place of usual residence (2010, p.13).

However, this widely recognised definition does not provide definitive information about the spatial or temporal dimensions of the visit, and it can have multiple interpretations. Definitions explaining tourism destination tend to be rather vague due to the large number of different users with distinct interests (Framke, 2002; Hall, 2005; Murphy, Prichard & Smith, 2000; Saraniemi & Kylänen, 2011). In fact, the term is quite often left undefined because it is taken for granted (Pearce 2014). Nowadays, due to increasing mobility, globalisation, and rapid advances in digital technologies, the destination is not seen merely as a geographical area or a production unit, but also as a social construct. This means that the destination is constantly changing (Saarinen 2004); it can be perceived differently depending on the individual's cultural and social background (Buhalis, 2000; Iwashita, 2003) and thus the destination's boundaries are hard to define (Framke, 2002; Saraniemi & Kylänen, 2011).

According to Oppermann (2000), tourism destination choice is a high involved decision and therefore instead of using attitudinal approaches, he recommends the use of behavioural data relating to actual purchases, which necessitates studying tourists' actual visits and preferences. The increasing number of different ICT-based tracking methods has given the opportunity to follow tourists' actual movements in time and space more precisely (Ahas, Aasa, Roose, Mark & Silm, 2008; Girardin, Fiore, Ratti & Blat, 2008; Grinberger, Shoval & McKercher 2014; Hawelka et al., 2014; Nilbe, Ahas & Silm, 2014; Shoval & Isaacson, 2007). Such data can be used to obtain new insights into the theoretical problem of conceptualising and framing the destination. There is a need to better delimit and define destinations to

improve the practices of destination management, marketing and infrastructure development (Blumberg, 2005; Pearce, 2014; Saarinen, 2004).

The use of spatially and temporally precise positioning data with a fast collection cycle is methodologically interesting, and a promising way to develop tourism monitoring systems and management tools for destination development. **Therefore the objective of this research is to identify which indicators from mobile phone-based tracking data could be used to analyse and distinguish destinations in time and space empirically.** For the current study, call detail records of a mobile network operator are used to measure the composition of tourists and the temporal and spatial distribution of visits in different destination areas. Visitors to the whole destination country of Estonia are compared to visitors to two geographically separate counties, Saare and Tartu. In order to distinguish the visitation patterns in these separate destinations within a geographically defined area, the following research question was framed: **how do the (1) geographical movement patterns of the visits; (2) temporal characteristics of the visits; (3) composition of visitors by country of origin; vary in different destination areas?**

This master's theses is divided into four main parts. First, a conceptualisation of tourism destination is made in the light of new available space-time tracking data sources in chapter two. It is proposed that the destination has five dimensions – spatial, temporal, compositional, social and dynamic. Second, the used data and methodology and study area are introduced in chapter three. Chapter four presents the results of data analysis. It is followed by discussion and conclusions in chapter five. A shorter version of this study is submitted as a full length research article to a social sciences journal Annals of Tourism Research (Appendix 1) together with Prof. Rein Ahas and Margus Tiru. Hence hereinafter the "we" form is used in the thesis to describe the actions and decisions made. Therefore it is important to emphasize the author's contribution in this study. The author is primarily responsible for composing the study design, formulating the research questions and composing the theoretical part; is partially responsible for data collection and processing; is fully responsible for data analysis and interpretation and for writing the manuscript including the aforementioned main parts.

2. THEORETICAL CONCEPTS FOR THE TOURISM DESTINATION

The concept of tourism destination has often been neglected in discussions due to its complicated nature. Framke (2004) has studied the concept in greater depth and stated that each approach (e.g., destination as a narrative, as an attraction, as a geographical unit, as an empirical relationship, as a marketing object, as a place where tourism happens etc.) to define the destination emphasises only one aspect and ignores any others. Framke (2002, p. 105) himself combined the views of economic and socio-cultural writes in the field of tourism research and concluded "that the sum of interests, activities, facilities, infrastructure and attractions create the identity of a place - the destination."

However, few authors have tried to create a holistic framework for defining destinations. One of the first was Lew (1987), who divided studies on tourism attractions into three general groups based on the following perspectives: ideographic, organisational and cognitive. Saraniemi and Kylänen (2011) also identified three conventional views of the tourism destination: economic geography-oriented, marketing- and management-oriented, and customer-oriented. They also proposed an alternative cultural approach. Pearce (2014) used five sets of concepts found in tourism literature to describe destinations: industrial districts, clusters, networks, systems, and social constructs. He identified the key elements of each concept and synthesised them to create a new integrative framework for destinations consisting of a geographical dimension, a mode of production, and a dynamic dimension (Pearce, 2014).

Although the need for empirical research on destination concepts has been highlighted (Framke, 2004; Pearce, 2014; Saarinen, 2004), not many studies have been undertaken in this area. The increasing availability of spatially and temporally precise data on tourists' movements opens up an opportunity to change the approach to the analysis of tourism destinations by distinguishing them based on tourists' actual behaviour (Ahas et al., 2008; Girardin et al., 2008; Grinberger et al., 2014; Hawelka et al., 2014; Nilbe et al., 2014; Shoval & Isaacson, 2007). Therefore based on earlier theoretical and empirical studies, we propose that the tourism destination is a combination of five measurable dimensions: geographical, temporal, compositional, social and dynamic. Named dimensions are subsequently described in more detail.

2.1 Geographical dimension

Traditionally, a destination has been observed on several different geographical levels. Continents, countries, regions, local government units, resorts, or even individual attractions designed for tourists can be regarded as destinations (Framke, 2002; Saarinen, 2004; UNWTO, 2007). For example, all of Europe can be the destination of a Japanese holiday tourist who visits six different cities within two weeks, while London alone may be the destination of a German business tourist (Buhalis, 2000). In many cases, a larger destination comprises several smaller attractions or places (Lew & McKercher, 2006). The differences that appear in respect of the spatial extent and scale of tourism destination are also

emphasised in Lew's (1987) organizational perspective and Pearce's (2014) geographical dimension.

Destinations are also often artificially separated by geographical or administrative borders. These are often of no importance to tourists and remain unnoticed (Jenkins, Dredge, & Taplin, 2011; Klepers & Rozite, 2010; Saarinen, 2004). This is evidenced by the case of the Alps, which cover several countries but are perceived as a unitary area by skiers (Buhalis, 2000). Framke (2002) researched in detail the physical geographical borders of a destination. He concluded that both business and sociology oriented authors see destinations as places without specifically defined geographical boundaries (Framke, 2002), whereas some economic authors tend to see destination as a territorial system (Andergassen, Candela, Figini, 2013; Candela & Figini, 2010). Hence there is still ongoing debate whether the geographic boundaries of a destination are fixed or fluid, functional or administrative (Pearce & Schänzel 2013).

However, being able to delimit tourism destinations in time and space is important for development, planning, management and marketing activities (Blumberg, 2005; Pearce, 2014; Saarinen, 2004; UNWTO, 2007). From destination management perspective Beritelli, Bieger, and Laesser (2014) offered a dynamic viewpoint for seeing destinations as heterogeneous contexts instead of traditional static territorial systems. Bertitelli et al (2014, p. 406) defined destination using the idea of "variable geometry" where "destination's space is the playground of different supply networks activated by visitor flows at different times of the year (week) and with different durations". Hence also the complex behaviour of tourists has to be considered when analysing destination boundaries. Dredge (1999, p.781) has pointed out that the "boundaries of destination regions are tied to travel patterns and characteristics." Therefore the advances in tracking technologies (Ahas et al., 2008; Shoval, 2008; Shoval & Isaacson, 2007) can help to measure tourists' movements in quantitative terms and delimit the destination in time and space more precisely.

Tourists' movements in space can be seen on inter- and intra-destination level. Inter-destination movements are strongly connected to destination choice, which is mostly dependent on overall supply and demand factors such as income, price level, time availability, etc., human 'push' factors (personal motivations, prior visits, etc.) and physical 'pull' factors (destination geomorphology and configuration) (Lau & McKercher, 2006). On the other hand, intra-destination movements are influenced by destination characteristics (e.g., trip origins and destinations, locations of accommodation and attractions, transportation accessibility) and tourist characteristics (e.g., time budget, tourists' motivations and interests, knowledge and information of destination, emotional attachment) (Lew & McKercher, 2006).

Based on previous studies (Flognfeldt, 1999; Lue et al 1993; Mings & McHugh; 1992, Oppermann, 1995), Lau and McKercher (2006) summarised the patterns of inter-destination movements into six categories comprising single, multiple and complex patterns. The single destination pattern (from home to a single main destination and returning back home) is the only one that does not raise any questions concerning the identity of the tourism destination (Lew & McKercher, 2002). All other inter-destination travel patterns consist of more than one

destination region and it is hard to define which of them is the main destination (Lew & McKercher, 2002). The variety in geographical range in relation to the tourism destination further compounds the difficulties encountered in defining multi-destination trips (Hwang & Fesenmaier, 2003).

In the case of intra-destination movements, the study area is already considered as a (local) tourism destination and there is no discussion about whether it is a destination or not. Research on intra-destination movements has gained more attention over the past decade, especially due to the rapid advances in GPS-based tracking technologies (Shoval & Isaacson, 2007). GPS-based intra-destination studies have, for example, been used to analyse daily movements within a specific destination city (Edwards & Griffin, 2013; Lau &McKercher, 2006; McKercher, Shoval, Ng & Birenboim, 2012; Shoval 2008, Shoval, McKercher, Ng & Birenboim, 2011), natural recreation area (Orellanna, Bregt, Ligtenberg & Wachowicz, 2012; Smallwood, Beckley & Moore, 2012; Zakrisson & Zillinger, 2012), or a theme park (Birenboim, Anton-Clave, Russo & Shoval, 2013).

2.2 Temporal dimension

The temporal aspects of tourism destination have not received much attention in theoretical studies on destination. Lew (1987) described temporal features from the organisational perspective, focusing on how long and when the attraction (destination) occurs and how much time the visitor spends there. According to Saraniemi and Kylänen's (2011) cultural approach, destinations can appear in various temporal contexts. Framke (2002) stated that a destination can exist at any time at a place where a tourist actually engages in any kind of social practice. Overall, time is considered more in relation to the issues of destination development and change (Butler, 1980; Pearce, 2014; Saarinen, 2004).

However, tourism involves movements of people that cannot be observed without including the time factor. One of the ways to study tourism flows is to use the concept of time geography postulated by Hägerstrand (1970), that has been rediscovered because of the availability of tracking datasets (Miller, 2007; Neutens, Schwanen & Witlox, 2011). The time geography approach has been used in tourist behavioural studies (e.g., Huang & Wu, 2012; Zillinger 2007) and more recently also together with tracking technologies in studies by Birenboim et al., (2013) and Grinberger et al., (2014). According to time geographic approach, the movements of individuals can be projected not only with spatial coordinates, but also with temporal parameters This again opens up the possibility of measuring quantitatively when tourism is 'happening' in destinations.

In the time-geographical approach, spatial and temporal dimensions of movements are closely connected and influenced by limiting constraints (Hägerstrand, 1970). Capability constraints come from the individual's physical (e.g., the need for sleep) and socioeconomic (e.g., income) abilities and limit spatial mobility. Coupling constraints (e.g., opening hours, arrival and departure times of means of transport) define when, for how long, and where people can be. Authority constraints refer to situations where some things, events, actions etc. are under

the control of a certain group or individual in order to protect resources (e.g., movement restrictions in nature reserves) (Hägerstrand, 1970).

The constraints described above influence our everyday movements. According to Lefebvre (2004), our life is interwoven with rhythms such as day and night, the months and the seasons, and biological rhythms. This applies to tourism as well, where similar to the geographical dimension, destination can exist on different temporal levels. On a large scale, inter-destination movements are strongly connected to destination choice and can be described by seasonal and weekly rhythms (Ahas, Aasa, Mark, Pae & Kull, 2007). Seasonality is caused by climate variations and tourists themselves have their own holiday seasons and traditions (Higham & Hinch, 2002). Hence, for example, summer, winter, weekend getaway, second home, urban, seaside, rural, alpine destinations, etc. can be differentiated.

On a small scale, intra-destination movements are studied primarily at the diurnal and intra-diurnal level (Birenboim et al., 2013; Lau & McKercher, 2006; McKercher & Lau, 2008; Shoval et al., 2011; Vassiliadis, Priporas & Andronikidis, 2013) and cover duration of stay and percentage of time spent (Birenboim et al., 2013), as well as entrance and exit times (Huang & Wu, 2012). In studies by Shoval et al. (2011) and Zakrisson and Zillinger (2012) it is pointed out that season does not influence visitor movement patterns on the intra-destination level.

In some cases, the formation of a destination may be completely dependent on time. According to Kuusik (2011), the meaning of a destination depends on the aim of the visit. Hence, for example, attending a concert or sports event at a fixed time may be the aim of the visit. In this case, a certain place where the event takes place can act as a destination for a specific time period. Getz (2005, 2008) defines a tourism event as a spatial-temporal phenomenon. Such events have a clear beginning and end and are confined to a certain place (Getz, 2007), which is in contrast to the concept of a destination, where the boundaries of a destination are by definition more vague (Zakrisson & Zillinger, 2012). Yet the event and the destination can become inseparable over time (Getz, 2005).

2.3 Compositional dimension

Tourists themselves have been quite often neglected in the studies that address the conceptualisation of the tourism destination; they tend to be taken for granted. Pearce (2014) states that tourists and residents are less frequently included as actors involved in the destination compared to tourism firms or local authorities. Nevertheless an empirical study done in China by Bowden (2006, p. 257) indicates that "tourism flows are not random, but patterned by the geographical and national background of tourists." Hence the new digital data sources are becoming more and more valuable, as they allow us to measure the tourist composition in time and space more precisely. For instance geo-tagged photographs from the photo-sharing website Flickr (Girardin et al., 2008) or geo-located Twitter messages

(Hawelka et al., 2014) can be used to segment tourists based on their country of residence and their spatiotemporal movement patterns.

Tourists can be segmented in many different ways (e.g., country of origin, length of stay, purpose of visit, mode of travel, gender, age, religion, etc.), depending on the available data sources. In the case of mobile positioning data, country of origin, time of visits, length of stay, number of visits (first-time and repeat visitors), and the geographical locations of visits can all be considered for segmenting tourists (Kuusik, Tiru, Ahas & Varblane, 2011; Tiru, Kuusik, Lamp & Ahas, 2010). When analysing country of origin, one of the most important factors influencing the number and composition of tourists is the distance decay principle, according to which more visitors tend to come from geographically closer countries (e.g., in Estonia there are more tourists from Finland and Latvia) (Nilbe, et al., 2014). The effect of distance decay can be seen also inside countries with larger territories (e.g., China) as the number of tourists declines when the distance inside the country increases (Bowden, 2003).

2.4 Social dimension

According to Larsen, Urry and Axhausen (2007, p 258),"Tourism is not merely an isolated 'exotic island' anymore but often also a significant set of social and material relations". They proposed a networking approach that stressed tourism as a social practice, where tourism patterns are relational and embedded within social networks and their obligations (Larsen et al., 2007). Tourism destinations can be also viewed in this light as socio-cultural structures that are internally active and influence their own future (Iwashita, 2003; Pritchard & Morgan, 2001; Saarinen, 2004; Saraniemi & Kylänen, 2011). Destinations are not only static places with physical features, they also include immaterial aspects such as culture and symbolical meanings (Iwashita, 2003; Lichrou, O'Malley & Patterson, 2008). They are formed in the course of a social practice (communication, activities, perception) and it is hard to define their boundaries (Framke, 2002; Saraniemi & Kylänen, 2011). Destinations can be interpreted differently by each consumer depending on their cultural background, level of education, the aim of the visit, the itinerary of the journey, and previous experiences (Buhalis, 2000).

Larsen et al. (2007, p. 259) suggested "that the analysis of obligations, social networks at-a-distance, and social capital should be central to 21st century tourism analysis" and they also stated that it was important for future research to "decipher the interconnections among place, events, and sociabilities, where experiences of place are complexly multifaceted" (2007, p. 259). Nowadays, this can be analysed empirically using various digital datasets containing behavioural data about tourists' actions and communications. For example, Zoltan and McKercher (2015) used destination cards with an embedded chip to analyse their patterns of usage in the Canton of Ticino Switzerland. This approach enabled the authors to cluster tourists based on their spatial behaviour and preferred activities. The knowledge thus gained about connected places and activities can be used for better destination management and marketing (Zoltan & McKercher, 2015). The importance of identifying connected places based on tourists' actual behaviour and bundling them together as a destination for marketing and management purposes has been noted in other studies (Asero, Gozzo & Tomaselli, 2015;

Huang & Wu, 2012; Hwang & Fesenmaier, 2003; Hwang, Gretzel & Fesenmaier, 2006; Lew & McKercher, 2006).

2.5 Dynamic dimension

It has already been stated by Butler (1980, p. 5) that "There can be little doubt that tourist areas are dynamic, that they evolve and change over time." However, traditional approaches towards defining destination do not include the creation, development and reformulation of the destination (Saarinen, 2004; Saraniemi & Kylänen, 2011). Saarinen (2004) concentrated on change, viewing tourist destinations as dynamic historical socio-spatial units that evolve over time through certain discourses. Likewise, Pearce (2014) in his integrative framework outlined the dynamic dimension of destination. He indicated that the identified elements of destination are closely linked and will change over time due to different driving factors (Pearce, 2014).

The need to concentrate on the change in the nature of the tourism destination is especially important considering globalisation and advances in ICT. Dredge and Jamal (2013, p. 560) saw destinations as mobile constructions that "are shaped and reshaped by the movement of people, things and ideas; they are constructed differently and they are shaped by the practices and performance of people, things and ideas." Pearce (2014, p. 150) stated that "more empirical research is needed now to demonstrate the ways in which and extent to which the performance of destinations can be explained by particular concepts or elements." However, the absence of longitudinal data might be considered one of the reasons why the dynamic dimension has not yet received much attention in empirical studies.

3. DATA AND METHODS

3.1 Passive mobile positioning data

Passive mobile positioning data are automatically stored in the memory or log files of mobile network operators and consist of the location coordinates of the mobile phone (Ahas et al., 2007; Ahas & Mark 2005; Ahas, Miller & Witlox, 2014; Eurostat, 2014; Ratti, Pulselli, Williams & Frenchman, 2006). The database used for the current study consists of the roaming data of the foreign mobile phone call detail records of Estonia's largest mobile telephone operator, EMT. At the beginning of 2014 the market share of EMT was estimated to be 44%, and its network is covering 97% of the country with 4G internet (EMT, 2014).

The term 'roaming' means that mobile phones registered outside Estonia can be used in the Estonian network, and the operator is able to recognise the country of origin of the phone (Ahas et al., 2007). Roaming activities are recorded during any active use of a mobile phone in the EMT network: outgoing and incoming calls; sending and receiving SMSs; using the internet and data services. EMT has a long-term contract with positioning company Positium LBS, which stores the dataset and has been processing queries for end-users including scientists since 2005 (Ahas et al., 2008).

If a foreign mobile phone is used in Estonia, the operator generates a random ID number for the phone, which is not related to the user's phone number, and provides that user with full anonymity. The random ID remains the same for all of that user's call activity records, even if he/she leaves Estonia and comes back at some other time, which allows us to track the spatiotemporal behaviour of tourists over a long period of time (Tiru et al., 2010). Here, tourists are defined as all non-resident, foreign visitors who use their mobile phones in Estonia and spend time (which is not dependent on length of overnight stay or the type (e.g., business or leisure) or means of travel) in the country. Hence the terms 'visitor' and 'tourist' are used interchangeably.

The spatial precision of the locations of roaming activities in the passive positioning database is dependant on the density of the mobile network. Hence the accuracy of pinpointing roaming activities is at the level of the service area of a mobile antenna (Figure 1). The density and location of mobile network is determined by the population patterns and transportation frequency, so it follows the structure of highways and local communities (Ahas et al., 2007; Ahas et al., 2008). For example the average size of a network antenna coverage area is 0.8 km^2 in capital Tallinn and 15.3 km^2 in the Tallinn functional urban region, and in less populated areas approximately 120 km^2 (Järv, O., Ahas, R., Saluveer, E., Derudder, B., & Witlox, F. 2012). Therefore the accuracy is higher in more densely populated areas (100–500 m in cities) and lower (500–5000 m in rural areas) in more sparsely populated areas (Ahas et al., 2008).
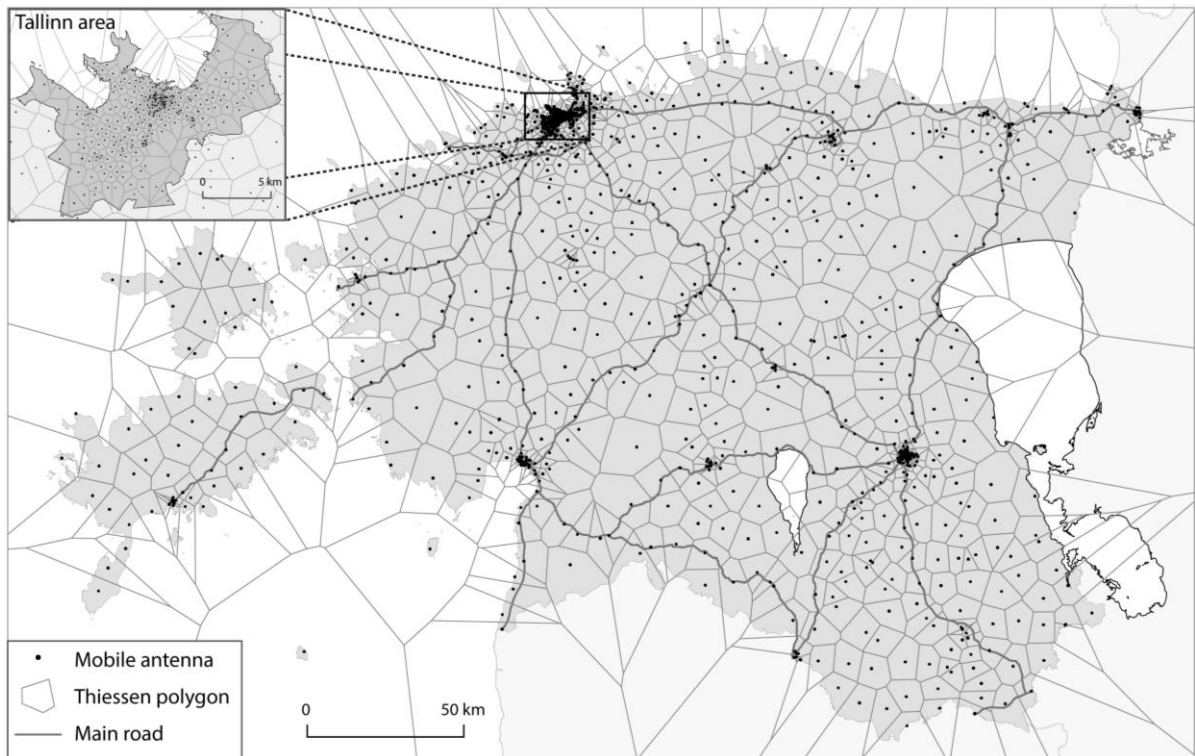
Figure 1. Distribution of network antennas in Estonia with Thiessen polygons (coverage area of antenna, where boundaries define the area that is closest to each point (antenna) relative to all other points).

The positioning data correlate quite well with conventional accommodation statistics in Estonia. Ahas et al. (2008) found correlation values of up to 0.99 in most commonly visited tourist regions (e.g., Saare County) and around 0.6 in regions with less tourism infrastructure and a high number of transit tourists. The collection, storage, and processing of the data obtained complies with European Union (EU) requirements regarding the protection of personal data according to EU directives on handling personal data (European Parliament, 1995) and the protection of privacy in the electronic communications sector (European Parliament, 2002). Separate approval was acquired from the Estonian Data Protection Inspectorate.

3.2 Mobile positioning dataset

Each call activity in the positioning database for the current study includes: (a) the time of the call event; (b) the randomly generated ID number for every visit made; (c) the randomly generated ID number of every phone used as the ID of one person; (d) the country code of the phone (the country where the mobile phone is registered is seen as the country of origin and determines the nationality of the tourist); and (e) x and y coordinates of the antenna. The trip duration and the number of days spent in different counties or local municipalities can be calculated based on the available data. An example of an original log statement of the mobile positioning database is shown in Table 1.

Table 1. Example of roaming dataset used in analysis.

Time	Random trip ID	Random user ID	Country	N	E
2011/07/22 12:01:57	19231853	10673449	FI	58.2236124	22.3727735
2011/07/22 12:02:05	17560331	14242040	DE	59.4648637	24.8237014
2011/07/22 12:02:47	18732237	12984734	FI	58.2483289	22.4991730
2011/07/22 12:03:12	24853218	14228860	LT	57.9777773	22.0791618
2011/07/22 12:03:13	17954429	13886274	RU	59.4191658	24.6444341

We use the roaming data of foreign mobile phones in Estonia for the period from 1 January 2011 to 31 December 2013. The analysis focuses on call events in three distinct geographical areas: (a) Estonia (excluding the capital Tallinn and Harju County); (b) Saare County, and (c) Tartu County. The first dataset is a random sample of 25% tourists who visited Estonia travelling beyond Tallinn and Harju County. This means that the visits recorded only by call activities made in Tallinn or Harju County are not included. Tallinn dominates the tourism market significantly in terms of inbound arrivals because of the presence of the harbour and international airport. According to a survey of foreign visitors conducted in Tallinn in 2014, the capital city functions as a sole destination for 50% of foreign tourists, and the share was even higher in 2011 when it reached 69% (TNS Emor, 2014). Hence if one-city visits had been included, the statistical analysis of tourists' regional movements would have been distorted. The database consists of a total of 406 590 visits by 215 643 different phone IDs (visitors). This means that many of the visitors made more than one trip during the study period.

The second dataset is a random sample of 50% tourists who visited Saare County during the study period. The database consists of a total of 59 401 visits by 47 377 different phone IDs (visitors). The third dataset is a random sample of 50% tourists who visited Tartu County during the study period, consisting of 167 540 visits by 98 833 different phone IDs. Trips longer than 14 days are excluded from the current study because staying in one place (country) for more than 14 days may also mean that this place functions as a secondary home, which is no longer considered to fall under classical tourism. The time of the first call activity is seen as the visitation time. The visitation time is divided into four categories according to the season: spring (1 March to 31 May), summer (1 June to 31 August), autumn (1 September to 30 November) and winter (1 December to 28 February) visits. Time spent in Saare County or Tartu County is based on the number of different call days in that county.

3.3 Study area and methods

The study is conducted in Estonia at the whole country level and at the county level to compare the spatiotemporal characteristics of destinations on different geographical scales (Figure 2). The two Estonian counties of Saare and Tartu are chosen because they are widely known popular tourist areas and are also known to have temporally and geographically different visitation patterns from those of Estonia as a whole. Visits made to these counties are compared to visits made to the whole of Estonia (excluding Tallinn and Harju County). In

2013, a total of 1 297 122 nights were spent by foreign tourists in Estonia not including Tallinn and Harju County.

In Saare County, Saaremaa is the main island and also the largest island in Estonia (2673km², 31756 residents) and 141 840 nights were spent there by foreign visitors in 2013. Saaremaa is an important nature and recreational tourism area in the Baltic Sea region which has retained its uniqueness due to its location and relative isolation. Saaremaa is famous for its historical ambience (windmills, stone fences and thatched roofs), beautiful preserved nature and landscapes such as wooded and coastal meadows with junipers. It is also known as a good place for recreation with many different spas and tourism facilities.

Tartu County is the second largest county by population (2993km^2, 152188 residents) after Harju County. Foreign tourists spent a total of 199 489 nights in Tartu County in 2013. The capital of the county is Tartu city, which functions as a regional centre of southern Estonia. Tartu city is known as the university capital of Estonia because the nation's oldest university – the University of Tartu – is located there and the proportion of students among residents is relatively high. The city is also famous for its historical heritage and culture and nowadays it is a popular conference tourism area.

Figure 2. Location of study areas in Estonia.

In order to analyse the spatiotemporal character of individual destinations, we use the following software: SPSS for statistical analyses and ArcGIS for spatial analyses. Binary logistic regression is carried out to compare the overall visits to Estonia with visits made to the two smaller study areas in Estonia. Regression analysis is undertaken to assess the

probability of visiting Saare or Tartu counties against that of visiting the whole of Estonia. First, we use models separately for each variable: country of origin, visitation time, trip duration and number of counties visited. Then we use full models for the two areas including all the aforementioned variables. The probability of visiting other counties in Estonia is also assessed. Hereinafter the names Saaremaa and Tartumaa are used interchangeably with Saare County and Tartu County, respectively.

4. RESULTS

4.1 The geographical pattern of visits

According to call activities, almost half (48.3%) of the visits made to Estonia are made only to one county, while 35.8% of visits are made to two counties (Table 2). Four or more counties are visited in only 4.4% of cases. The most visited county in Estonia is Harju (40.7%), but as mentioned above visits made only to Harju County and Tallinn are excluded from the analysis. This demonstrates that Tallinn performs a gateway function for Estonian tourism. The other most visited areas are concentrated around the bigger towns of Pärnu, Narva, and Tartu (Figure 3).

Table 2. Percentage distribution of the visitation parameters in three study areas.

Visitation parameter	Estonia (excluding Harju County)	Saare County	Tartu County
Number of visited counties			
1	48.3	41.7	44.6
2	35.8	30.2	30.0
3	11.9	18.9	14.2
4-7	4.0	9.0	11.1
7-15	0.04	0.2	0.2
Visitation time			
Spring	23.6	17.7	27.5
Summer	35.6	52.5	29.5
Autumn	21.4	19.2	21.7
Winter	19.3	10.7	21.3
Trip duration			
1 day	43.6	30.5	43.7
2 days	18.2	17.9	17.8
3 days	12.8	15.1	12.0
4-7 days	19.2	27.4	18.8
7-14 days	6.3	9.2	7.7
Country of origin			
Russia	25.7	6.2	20.3
Latvia	25.2	22.9	33.8
Finland	23.0	35.3	20.1
Poland	5.1	2.3	4.0
Lithuania	4.9	6.7	4.6
Sweden	3.0	7.9	2.3
Germany	2.6	4.9	3.2
Others	10.6	13.8	11.6

The average number of counties visited including Saare County is 2.03 and including Tartu County is 2.10, both of which are higher than the Estonian average of 1.76. In the case of Saare County more than 9% and in the case of Tartu County more than 11% of the visits are made to more than three counties (Table 2). The most visited counties when visiting Saare County are Harju (39.5%), Lääne (24.3%) and Pärnu (16.5%). In the case of Tartu County, the most visited county is also Harju (30.5%), followed by the counties of Jõgeva (11.5%) and Valga (11.4%) with an almost equal share. The geographical distribution of call events illustrates the main transportation corridors used for getting to these destinations (Figure 3). The probability of visiting Saare or Tartu County instead of visiting other places in Estonia is greater when at least three counties are visited, and it is roughly five times greater when more than seven counties are visited (Table 3).
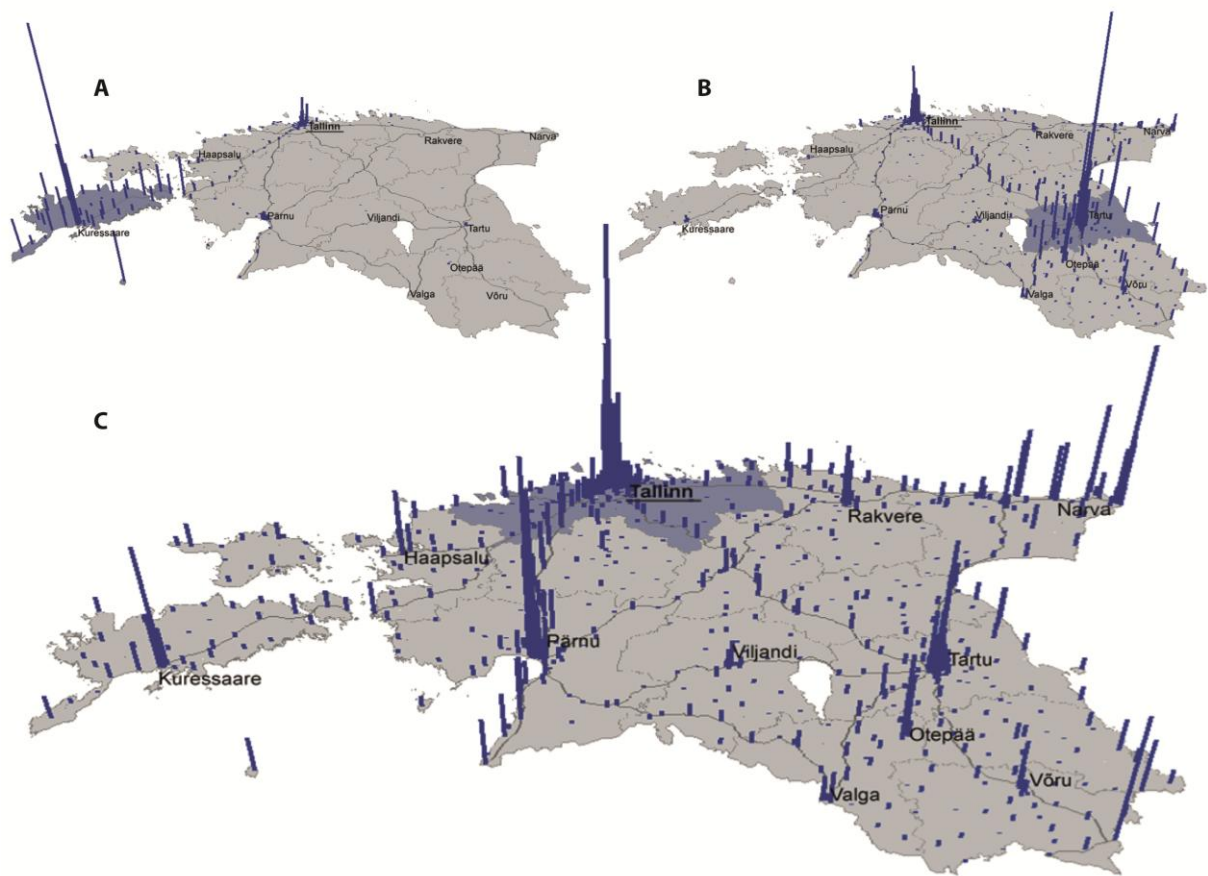

Figure 3. Distribution of call events in antennae locations when visiting (A) Saare County, (B) Tartu County and (C) Estonia excluding visits made only to Harju County.

Binary logistic regression models were developed for visits made to all the other 14 counties to assess the probability of visiting Saare or Tartu county in reference with the visits that had not been registered in those other 14 counties. The probability of visiting Saare County instead of visiting the whole of Estonia was 32% higher in the case of visits made to Lääne County (Table 3). Visits made to other counties excluding Lääne were more likely to be made to the whole of Estonia. In the case of visiting Tartu County the visits made to Jõgeva County have a 90% higher probability of being made to Tartumaa than to the whole of Estonia. Visits made to other counties excluding Jõgeva were more likely to be made in conjunction with visits to the whole of Estonia rather than just to Tartumaa (Table 3).

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Table 3. Binary logistic regression models of the probability of visiting Saare County or Tartu County instead of visiting the whole of Estonia as part of a visit including other counties.

County	Saare County *exp (β)*	Tartu County *exp (β)*
Harju	0.835***	1.013
Hiiu	0.704***	0.073***
Ida-Viru	0.017***	0.153***
Jõgeva	0.088***	1.899***
Järva	0.083***	0.995
Lääne	1.321***	0.172***
Lääne-Viru	0.100***	0.264***
Põlva	0.024***	0.698***
Pärnu	0.132***	0.115***
Rapla	0.091***	0.210***
Saare	-	0.105***
Tartu	0.040***	-
Valga	0.051***	0.945***
Viljandi	0.104***	0.555***
Võru	0.025***	0.484***
-2LL	245581.448	574121.463

*** Significant at 0.001

4.2 Temporal pattern of visits

Temporal differences occur in the visits to the three studied destination areas. Tourism in the whole of Estonia can be described as seasonal because more than one third of visits to the country are made during summertime. The share of visits is highest in July and lowest in the winter months (Figure 4). Spring and autumn visits have a similar share to each other. In the case of Saare County, the odds of visiting the County rather than the country are higher in the summer than in the spring, winter and autumn. In contrast, the odds of visiting Tartu County instead of visiting the whole of Estonia are greater off-season (Table 4). Both these trends are also evident in the overall models that include all the visitation parameters.
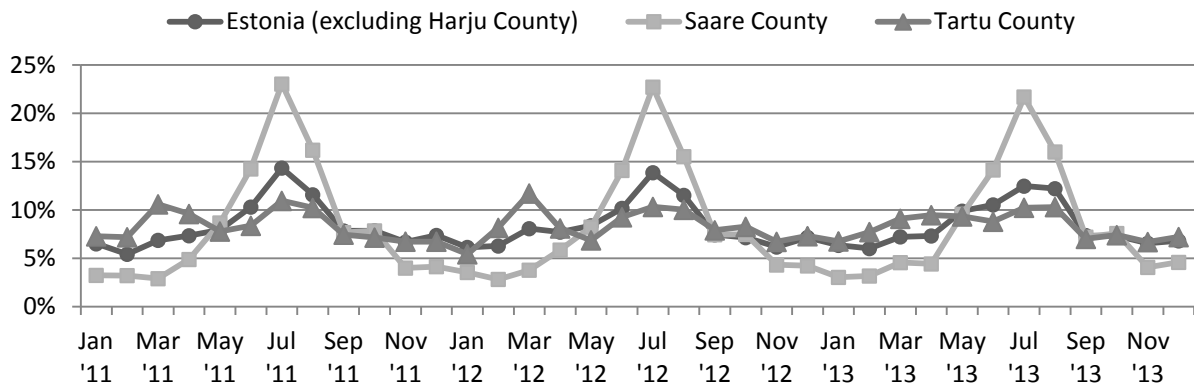
Figure 4. Share of visits during 2011 – 2013 in the three case study areas.

A comparison of the seasonal pattern of visits to the destination areas indicates that Saaremaa functions more as a summer destination. In Saare County more than half of the visits were made during the summer months with only about 11% in winter. Visits made to Tartu County are more equally distributed throughout the whole of year with slight peaks in July and March (Figure 4). The majority of the visits are still made during summertime (29%), but the other seasons have a higher share compared to the pattern for the whole of Estonia and for Saaremaa.

As for the duration of visits (which ranged from one to 14 days), in the case of Tartu County the average length of stay (2.9 days) does not differ much from the Estonian average (2.8 days). In contrast, the average length of visit to Saare County is much longer (3.4 days) than the Estonian average. The time spent in these two counties constitutes 70% of the total visitation time to the country. One-day trips account for the largest share (almost 44%) of the total visits to Estonia. In Saare County the proportion of one-day visits is less than the national average, at 30%, and 3–14-daytrips account for more than half of the total visits to the county (Table 2). Compared to one-day visits, trips longer than three days are two times more likely to take place in Saare County than in Estonia as a whole. The odds are a bit lower in the overall model, at just below two times (Table 4). In Tartu County the distribution of visits according to length follows the same trends as for the whole of Estonia. Only trips longer than seven days are 0.22 times more likely taking place in Tartu County rather than in the whole of Estonia and this trend is not evident in the overall model, where compared to one-day visits, all visits are more likely to take place in the whole of Estonia (Table 4).

Table 4. Binary logistic regression models of the probability of visiting Saare County or Tartu County instead of visiting the whole of Estonia.

Visitation parameter	Separate models for each parameter $exp\ (\beta)$		Overall model for all parameters $exp\ (\beta)$	
	Saare County	Tartu County	Saare County	Tartu County
Number of visited counties (ref.: 1 county)				
2	0.979*	0.907***	0.683***	0.982*
3	1.850***	1.290***	1.301***	1.460***
4–7	2.646***	3.027***	1.626***	3.592***
7–15	5.118***	4.848***	2.960***	5.676***
-2LL	350336.968	682050.825		
Time of visit (ref.: summer)				
Autumn	0.607***	1.227***	0.789***	1.306***
Winter	0.374***	1.330***	0.572***	1.464***
Spring	0.506***	1.406***	0.651***	1.500***
-2LL	348587.2	690995.9		
Duration of visit (ref.: 1-day)				
2 days	1.410***	0.978**	1.346***	0.904***
3 days	1.688***	0.940***	1.470***	0.860***
4–7 days	2.044***	0.976**	1.733***	0.874***
8–14 days	2.099***	1.224***	1.939***	0.989
-2LL	350884.9	692864.1		
Country of origin (ref.: Finland)				
Latvia	0.591***	1.532***	0.815***	1.621***
Russia	0.158***	0.901***	0.150***	0.869***
Lithuania	0.894***	1.090***	0.860***	1.049**
Poland	0.291***	0.902***	0.272***	0.846***
Sweden	1.737***	0.894***	1.460***	0.810***
Germany	1.240***	1.441***	0.719***	1.323***
Others	0.849***	1.254***	0.560***	1.135***
-2LL	335713.2	687500.9	306884.036	666977.111

* Significant at 0.05

** Significant at 0.01

*** Significant at 0.001

4.3 The composition of visitors

Destinations within a country can also be distinguished based on the unique visitor composition. In the case of visits to Estonia (excluding Tallinn and Harju County), the majority of visits are made in similar proportions by Russian (25.7%), Latvian (25.2%) and Finnish (23.0%) tourists, whereas in the case of Saaremaa, there is a greater proportion of Finnish tourists (35.3%), with Russian visitors being considerably underrepresented (6.2%) (Table 2). The relative importance of Swedish (7.9%), Lithuanian (6.7%) and German (4.9%) tourists to Saaremaa is also notable. In contrast to the results for the whole of Estonia and for Saaremaa, in the case of Tartu County, the largest proportion of visitors are Latvian (33.8%), but Russians (20.3%) and Finns (20.1%) are also strongly represented (Table 2).

Variations can be seen in the geographical movement patterns of the visits made by different nationalities. Figure 5 shows the distribution of the call events made by Finns and Latvians during the study period when visiting Saaremaa and Tartumaa. The maps indicate a clear difference in the geographical movement patterns and directions among nationalities and destinations.
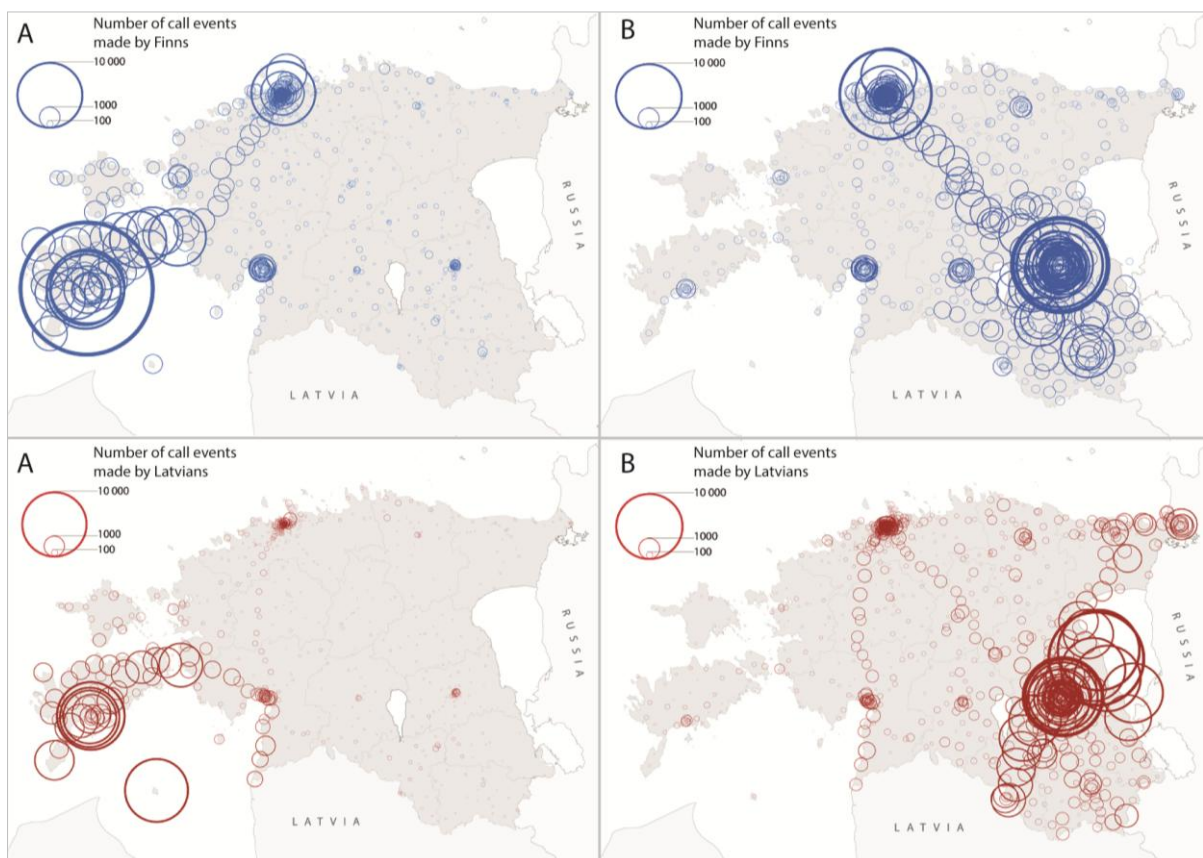

Figure 5. Distribution of call events in antennae locations made by Finns (blue) and Latvians (red) when visiting (A) Saare County and (B) Tartu County during the study period.

The results of a binary logistic regression showed that the probability of visiting Saare County instead of visiting the whole of Estonia is greater among Swedes and Germans; 73.7% or 24.0% higher, respectively (Table 3), than among Finns. The importance of Swedish tourists also remains significantly greater (1.46) in the overall model, which takes account of all

visitation parameters, while the probability of German tourists visiting (0.719) decreases significantly. The probability of visiting Tartu County instead of the whole of Estonia is notably higher among Latvian (53.2%) and German (44.1%) than Finnish tourists. In the overall model, the odds are similar (Table 3).

Tourists from different countries also exhibit different seasonality patterns. The most summer-oriented tourists in all study areas among the top seven nationalities are Germans, whereas the visits by Russian tourists are the most equally distributed (Figure 6). In Saaremaa more than half of the visits made by tourists from Germany, Lithuania, Finland and Poland are done during the summer months. In Tartu County only German tourists' visits in the summer amount to 50% of the total visits made by visitors from a particular country. It is notable that the highest share of Latvian visits to Tartu county occurs in March.
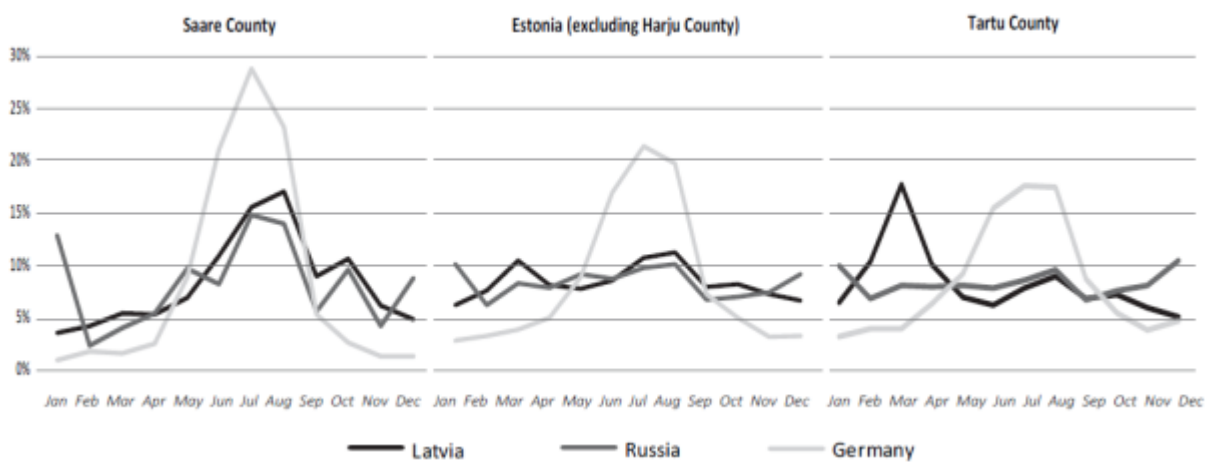

Figure 6. Share of visits made by Latvians, Russians and Germans to the three destination areas during the study period.

5. DISCUSSION AND CONCLUSIONS

From the various destination concepts expounded in theoretical chapters it can be concluded that in the light of new ICT-based space-time tracking technologies, tourism destinations have five measurable dimensions: spatial, temporal, compositional, social and dynamic. In the current study we analysed empirically the geographical, temporal and compositional dimensions, by using data on the actual visits of foreign visitors to Estonia gathered through access to the anonymised passive mobile positioning data of the major mobile network operator.

The analysis revealed that visitation patterns to the selected destinations vary on different geographical levels, as pointed out by many authors (Buhalis, 2000; Framke, 2002; Saarinen, 2004). According to the results of the analysis, Saare and Tartu counties differ significantly from each other and from the whole of Estonia in terms of three dimensions of destination studied herein, and as such can be considered as distinct destination areas inside Estonia (see Figure 3). Connections and disconnections in space were also revealed between the counties, where the statistical analysis showed that visits to Lääne County are associated with Saaremaa while visits to Jõgeva County are associated with Tartumaa. Despite the fact that spatial visitation patterns are distinguishable, it is hard to define the exact geographical boundaries of a destination. It is problematic because of the methodological issues involved. In our case we can delimit destinations by county, local municipality, or network cell level, but this may not mean anything to the individual tourist. However, such analysis is important because it can guide marketing and management in areas such as infrastructure and transport planning or in managing the environmental effects of tourism (Lew & McKercher, 2006).

In the temporal analysis, questions such as when and how much time visitor spends in a destination were considered, following Lew's (1987) theoretical framework. The results of our analysis indicate that the studied destinations have different seasonal visiting patterns. Saaremaa is very summer oriented while Tartu County functions as a destination all year round (Figure 4). The popularity of coastal areas in the summer months in Estonia was also shown in the study by Ahas et al. (2007). The reasons for seasonality lie mainly in climate variations and in the traditions relating to when people are used to going on holiday (Higham & Hinch, 2002). Differences also appear in the duration of stay, where Saaremaa stands out with substantially longer stays than Tartu or the whole of Estonia. This might be explained by the relative isolation of the island, where tourists' movements are limited by coupling constraints (e.g., arrival and departure times of ferries) (Hägerstrand, 1970).

Distinguishing destinations by the unique visitor composition helps us to identify which places are popular among different nationalities. Our analysis shows that the three destination areas attract tourists from different countries. For example, Saaremaa functions as a destination for Finns and Swedes while Tartu County attracts more Latvians. The overall visitation shares are in accordance with the principle of distance decay in Estonia (Nilbe et al., 2014). Analysis of the top seven nationalities also revealed temporal preferences: German tourists are very summer-oriented, whereas Russian tourists are relatively insensitive to season in all three destination areas. One peculiarity can be seen in the case of Latvian

tourists' visits to Tartu County, where the largest proportion of visits is in March, which can be explained by the large numbers of Latvian fishermen coming to fish on Lake Peipus. The results for the composition of visitors to the whole of Estonia might be influenced by the fact that we have excluded visits made to only Harju County, which means that the proportion of Finns is likely to be an underestimate (e.g., Finns' one-day trips to Tallinn are excluded).

As suggested in the theoretical chapters of this study, destinations also have a social dimension, but the data used in the current study do not enable us to measure this. To do so, we would need, for example, social network data, as suggested by Larsen (2007), which could help us to understand how places are experienced in a multifaceted way. The focus of this paper is on mobile phone data only, but social network datasets are becoming a useful source for a greater number of scientific analyses. The dynamic dimension, which emphasises the change and development of destinations over time (Butler, 1980; Saarinen, 2004; Pearce, 2014), is also not included in the current empirical analysis due to the relatively short study period. However, one of the strengths of passive mobile positioning datasets is that when access to data is granted it is very easy and cost-effective to analyse such data on a longitudinal basis (Ahas et al., 2014). For example, the dataset of foreign visitors' roaming activities in Estonia goes back to the year 2004.

Distinguishing destinations empirically based on a quantitative dataset is important above all for solving management, marketing and development-related issues. Our results show the actual movement patterns of consumers and indicate the preferred areas and places that work together as destinations for the tourists themselves. These results, which identify the places actually visited, and which of them are connected or disconnected, can help in making better marketing and management decisions. This approach can also eliminate the gap in defining a destination as a spatial unit from the consumption and production perspectives, a gap that was pointed out by Hall (2005, p.161). The need to delimit a destination in space more precisely has been noted in Blumberg's (2005) study conducted in New Zealand, and the use of passive mobile positioning data gives us an opportunity to do that. Knowledge about tourists' movements in time and space is especially important in planning transportation, developing a destination product and image, and managing the effects of tourism (Lew & McKercher, 2006). Hence our results can be used to optimise transportation connections or to evaluate the need to open new ones. We can also see which places need better marketing or which should be managed together and we can assess the effects of tourist flows on different levels in time and space.

Distinguishing destinations based on positioning data has several advantages because we can analyse the behaviour of foreign tourists at the country level at low cost, not least because data collection is an automatic process. For instance, we can set different time frames ranging from a day to a decade and delimit the research geographically. This is in contrast to GPS-based tracking studies, where GPS loggers are distributed to a handful of people who move usually in a predefined area in a set time frame (Birenboim et al., 2013; Edwards & Griffin, 2013; Lau & McKercher, 2006; McKercher et al., 2012; Orellanna et al., 2012; Shoval, 2008; Shoval et al., 2011). The data collected via GPS cannot be used to distinguish destinations on a large scale, but it can reveal preferences on the micro scale and it is easier to obtain

additional information about trip purpose and experience. These are also the disadvantages of mobile positioning, where the spatial accuracy of a visit is defined by the cell sizes and we do not know any other information about the tourists besides country of origin.

Using space-time tracking data always raises questions concerning data protection and the privacy of the subjects being tracked. These issues are receiving more and more attention in the light of researchers' access to new data sources, and there is no doubt that full consideration must be given to these matters (Eurostat, 2014). However, in terms of further developments in research using space-time tracking data for theorising destination concepts and developing destination monitoring tools, we suggest the following study directions: first, there is a need to undertake more detailed space-time analysis and to generate numerical values from individual or aggregated movement tracks for statistical analysis. Second, it is important to use visual analytics and cartography to distinguish the 'destinations within a destination' that can be derived from big data sources. Third, we need to harmonise geographical analyses with actual needs and tools for marketing and destination development.

Turismisihtkoha määratlemine mobiilpositsioneerimise andmetega

Janika Raun

Kokkuvõte

Tänapäevase muutuva maailma üheks oluliseks märksõnaks on info- ja kommunikatsioonitehnoloogia (IKT) kiire areng. Sealsed arengud on üha enam jõudmas erinevatesse eluvaldkondadesse, sealhulgas ka turismi. Muutumises on eelkõige seni kasutuses olnud meetodid turismi uurimisel, arendamisel ja turundamisel (Buhalis & Law, 2008; Law, Buhalis & Cobanoglu, 2014; Roberts, Kayande & Stremersch, 2014), kuna erinevate digitaalsete ja suurte (BIG data) andmeallikate kättesaadavuse paranemine on loonud hulgaliselt uusi võimalusi turismi edendamiseks. Näiteks turistide liikumiste ja sihtkohtade segmenteerimiseks on võimalik kasutada nii geolokaliseeritud Twitteri säutse (Hawelka et al., 2014) ja turismireisil tehtud fotosid (Girardin et al., 2008) kui ka GPS (Grinberger et al., 2014; Shoval & Isaacson, 2007) ja mobiilpositsioneerimise (Ahas et al., 2008; Kuusik et al., 2011; Nilbe et al., 2014) andmeid. Uued andmed loovad omakorda võimaluse uurida seni turismi käsitlemisel käibel olnud kontseptsioone uuest vaatenurgast.

Sihtkohta võib ilma kahtluseta pidada üheks keskseks mõisteks turismis. Varasemad käsitlused on aga jäänud küllaltki üheplaaniliseks ja staatiliseks, lähtudes sageli ainult üksikutest sihtkoha aspektidest (kuvand, turundus, asukoht, atraktsioonid jne) (Framke 2002). Viimastel aastakümnetel on mitmed autorid (Framke, 2002; Lew 1987; Pearce 2014; Saarinen, 2004; Saraniemi & Kylänen, 2011) püüdnud luua ühest teoreetilist raamistikku sihtkoha käsitlemiseks ning rõhutanud vajadust empiiriliste uuringute järele. Paraku ei sobi need lähenemised üheselt rakendamiseks uute aegruumiliste jälgimisandmete korral. Seetõttu on antud töös senisele teooriale tuginedes välja pakutud uus viis sihtkohtade käsitlemiseks aegruumiliste jälgimisandmete valguses. Uue lähenemise alusel on sihtkoha olemus empiiriliselt mõõdetav ja see koosneb viiest dimensioonist: geograafiline, ajaline, koosseisuline, sotsiaalne ja dünaamiline.

Käesoleva magistritöö eesmärgiks on välja selgitada, missuguste mobiiltelefonipõhiste jälgimisandmete parameetrite alusel on võimalik sihtkohti analüüsida ning ajas ja ruumis eristada. Selleks kasutatakse 2011-2013 aastal Eestit külastanud välisturistide passiivse mobiilpositsioneerimise andmeid kolme erineva ruumilise üksuse kohta. Kogu Eesti külastusi võrreldakse kahe väiksema geograafiliselt eraldiseisva piirkonna, Saare ja Tartu maakonnaga. Erisuste tuvastamiseks püstitati järgmine uurimisküsimus: kuidas varieeruvad erinevatesse sihtkohtadesse tehtud külastused oma ruumilise ja ajalise iseloomu ning turistide päritolu poolest?

Lähtuvalt loodud teoreetilisest raamistikust ja analüüsitavate andmete iseloomust kasutati geograafiliste tunnustena erinevate maakondade külastamist ja külastatud maakondade koguarvu ning vaadeldi kõnetoimingute ruumilist jagunemist mobiilsidemasti täpsusega. Ajaliste tunnustena olid analüüsi kaasatud külastuse kestus ja külastusaeg ning koosseisulise tunnusena uuriti turistide päritolu (rahvust). Lisaks kirjeldavale statistikale kasutati analüüsiks binaarset logistilist regressiooni, hindamaks Saaremaa ja Tartumaa külastamise tõenäosust

vastukaaluks kogu Eesti külastamisele. Kasutatud andmete nõrkustest lähtuvalt ei kaasatud empiirilisse osasse sotsiaalse (sotsiaalsete tunnuste puudumine) ja dünaamilise (lühikene ajaperiood) dimensiooni analüüsi.

Vahemikus 2011-2013 Eestit väisanud välisturistide külastusandmete analüüsist selgus, et külastuste geograafiliste, ajaliste ja koosseisuliste tunnuste alusel on võimalik ruumiliselt suurema sihtkoha sees eristada väiksemaid eraldiseisvaid sihtkohti. Saare- ja Tartumaale tehtud külastuste korral väisatakse Eesti keskmisest rohkem maakondi. Samuti on uuritavate maakondade külastamise tõenäosus võrreldes kogu Eesti külastustega suurem, kui viibitud on vähemalt kolmes maakonnas. Läänemaa külastustel on suurem tõenäosus olla seotud Saaremaa külastamisega ja Jõgevamaal Tartumaaga kui kogu Eesti külastamisega.

Sihtkoha ajaliste tunnuste analüüsist selgub, et Saaremaa toimib eelkõige suvise sihtpunktina (üle poolte külastustest on tehtud suvekuudel). Tartumaal seevastu on hooajalisuse mõju kõige vähem märgata ning tõenäosus maakonna külastamiseks võrreldes kogu Eesti külastamisega on suurem just hooajavälisel ajal. Saaremaa külastused on võrreldes kogu Eesti (2,8 päeva) ja Tartu külastuste (2,9 päeva) kestusega oluliselt pikemad (3,4 päeva). Võrreldes ühepäevaste külastustega leiavad vähemalt neli päeva kestvad külastused suurema tõenäosusega aset just Saaremaale kui kogu Eestisse.

Peamisteks Eestit külastavateks rahvusteks on meie lähinaabrid soomlased, lätlased ja venelased. Saaremaa on aktraktiivne sihtkoht eelkõige soomlastele, Tartumaa lätlastele. Võrdluses soomlastega külastavad suurema tõenäosusega Saaremaad kui kogu Eestit rootslased ja sakslased, Tartumaad aga lätlased ja sakslased. Eri riikidest pärit turistide hulgas tulevad selgelt välja ka erinevad ruumilised ja ajalised külastusmustrid. Saksa turistid on selgelt suvele orienteeritud (üle poolte külastustest on tehtud suvekuudel), kuid Vene turistide külastuste hulgas suvine kõrghooaeg nii suurelt välja ei tule ning nende külastused on jaotunud küllaltki ühtlaselt läbi kogu aasta.

Kirjeldatud empiirilised tulemused on väärtuslikud eelkõige turismi paremaks korraldamiseks ja sihtkohtade turundamiseks. Mitmed autorid on rõhutanud sihtkoha täpsema piiritlemise (Blumberg, 2005; Pearce, 2014; Saarinen, 2004) ning kohtade ja atraktsioonide vaheliste ühenduste tuvastamise vajadust (Asero et al., 2015; Huang & Wu, 2012; Hwang & Fesenmaier, 2003; Hwang et al, 2006; Lew & McKercher, 2006). See on oluline eelkõige kohtade koosturundamiseks ning infrastruktuuride kavandamiseks ja rajamiseks. Käesolevas töös kasutatud positsioneerimisandmed omavad suurt potentsiaali nende kitsaskohtade lahendamiseks. Andmete ajaline ja ruumiline täpsus ning kiire kogumistsükkel loob võimaluse välja arendada turismi seiresüsteeme ning lihtsustada sihtkohtade juhtimist ja turundamist.

Käesolevas magistritöös pakuti välja teoreetiline raamistik turismisihtkohtade uuringuks uute IKT-põhiste andmete valguses. Pakutud lähenemise kohaselt koosneb sihtkoht viiest mõõdetavast dimensioonist: geograafiline, ajaline, koosseisuline, sotsiaalne ja dünaamiline. Neist esimest kolme analüüsiti empiiriliselt 2011-2013 aastal Eestit külastanud välisturistide passiivse mobiilpositsioneerimise andmete alusel. Kõik analüüsi kaasatud külastustunnused

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osutusid olulisteks parameetriteks sihtkohade olemuse selgitamisel ja eraldiseisvate sihtkohatade tuvastamisel. Tulemused loovad võimaluse sihtkohtade eristamiseks või ühendamiseks sihtkoha juhtimis- ja turunduseesmärkidest lähtuvalt, põhinedes turistide tegelikul käitumisel.

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APPENDICES

Appendix 1: Article submission confirmation to Annals of Tourism Research

Abstract: We conceptualize tourism destinations in the light of new available space-time tracking data sources. Based on literature review we propose that a destination has five dimensions - spatial, temporal, compositional, social and dynamic - that can be measured with space-time tracking data. Here we analyze three of these dimensions, namely the spatial, temporal and compositional diversity of three distinct destinations using the mobile positioning data of foreign visitors in Estonia from 2011 to 2013. Results show that smaller destination areas can be differentiated inside the whole country by the geographical, temporal and compositional parameters of the visits. These findings demonstrate applications of "BIG" data in destination management. Monitoring tool based on this methodology is currently used by Estonian Tourist Board.

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