

## 17<sup>TH</sup> CENTURY LARGE-SCALE HISTORICAL MAPS OF VIDZEME AS SOURCES FOR ARCHAEOLOGICAL RESEARCH

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The article was created as a result of 2016 project in which the large-scale Swedish land survey maps of Vidzeme were referenced.<sup>1</sup> At the end of the 17th century, professional surveyors mapped what is now largely the territory of Vidzeme. The project as well as this article aims to increase the use of these historic maps in everyday archaeological and historic research. The article focuses on the methods used to adjust the maps and the potential uses of these maps. Various studies from Sweden and Estonia serve as examples both for this project and, hopefully, for further archaeological research.

*Key words:* Maps, Vidzeme, Swedish time, geographic information systems (GIS), Lantmäteriverket, land survey.

### INTRODUCTION

The project aimed at finding all the surviving large-scale 17th century land surveying maps of Vidzeme and making them accessible for further research.<sup>2</sup> These maps provide the most precise and in-depth overview of the pre-modern Latvia landscape made before the 19th century. Although most large-scale maps are stored in the Latvian State Historic Archives available to all, their condition and other factors have kept archaeologists from using them in their research.

The article outlines the methods used for making large-scale maps compatible with modern day coordinate systems. It also provides an overview of the map contents and information most often displayed on them. Finally, the article provides different examples of how these maps can be used further in both historic and archaeological research. More information on each particular map and their accessibility can be found at the Latvian Association of Archaeologists.

## MATERIAL AND METHODS

In 1628, the King of Sweden Gustav II Adolf gave instructions to create large-scale maps over all the farms and villages of Sweden, showing their "... fields, meadows, woods, and land". This was the start of the Swedish National Land Survey – *Lantmäteriverket*. At first, the main reason for mapping was to gain insight into the realms resources. Later this was accompanied by the need to gather information about the newly conquered lands and under King Charles XI to carry out a reduction of nobles' lands.<sup>3</sup>

In 1681, mapping of the newly acquired territory of Vidzeme was started; the surveying continued until 1710. In total about 3000 maps have been created.<sup>4</sup> They can be divided into small-scale maps (< 1:10 000) and large-scale maps (> 1:10 000). Small-scale maps depict manor house lands, parish lands, and towns. Large-scale maps depict whole regions.<sup>5</sup>

Originally, the "Swedish Vidzeme" (which presently includes small parts of modern-day Zemgale and Latgale) was comprised of 37 regional maps (Fig. 1). The project "Zviedru laiku Vidzemes reģiona karšu piesaiste mūsdienu karšu sistēmai" (Referencing of Vidzeme region maps from the Swedish times to the modern mapping system) aimed at finding and referencing all of these maps. However, during the project it was possible to locate only 33 regional maps. The rest probably have not been preserved. Most of the maps were held at the Latvian State Historic Archives. These maps were scanned in 300 DPI. Some maps, which reach into Estonia, were publicly available in the digital database of National Archives of Estonia.<sup>6</sup> The descriptions of maps and other texts from land surveying are located in the National Archives of Sweden, but



Fig. 1. Regions of “Swedish Vidzeme”, from Eduards Dunsdorfs (1974). *Der grosse schwedische Kataster in Livland 1681–1710*. Melbourne: Certamen Literar Constit

mostly have been published in 1974 in *Der grosse schwedische Kataster in Livland 1681–1710*.<sup>7</sup>

The maps were referenced using a coordinate system; in this case ETRS89 / TM Baltic93 (European Terrestrial Reference System 1989); the software Qgis (QuantumGis) 2.10. Pisa version.

The chosen GIS method was *thin plate spline*, which is best suited for hand-drawn maps. This method allows to adjust irregularly occurring faults that are common for hand-drawn maps. The method skews the map according to the next closest reference points, adjusting the area between them even if the mistakes are not linear. This method does cause small inaccuracy along all the referenced area, but does not result in large systematic errors, as would other methods. As the size and quality of preservation of the maps varies, the number of reference points used in a map varies from 1:48 000 to 1:57 600. Theoretically, the more reference points

are used the more precise the referenced map should be. However, this does not mean that maps with the least number of reference points are the most imprecise; quite often, it is quite the opposite. As maps usually are quite accurate, they do not require much adjustment. The maps that had ripped and were glued back together improperly, for example, of Alūksne, required more reference points.<sup>8</sup>

The reference points chosen had to be both precisely marked on the ancient maps, and known in the modern landscape. The best features which fit both requirements are building sites that have not changed their location. It is visible on the ancient maps that land surveyors used church buildings and manor houses as reference points for their measurements. Therefore, these should be marked quite precisely on the ancient maps.<sup>9</sup>

In modern times, churches are the most reliable reference points. Even if damaged they were usually rebuilt in the same place. Manor houses have sometimes changed their location, but not so often as farms. Over time, the name of the farmstead generally changed and in some cases, the original name was transferred to other farmsteads. Here a great help has been *Der grosse schwedische Kataster in Livland 1681–1710* by E. Dunsdorfs, in which he linked the old farm names to farms that were still present in the 1930s. As was concluded during the referencing work, Dunsdorfs was not always correct in his assessments, but his work was a sound base for further adjustments. After primary adjustments, more points were added depending on the needs and possibilities of each individual map. These usually are both natural and man-made features; such as notable road crossings and river bends. As they usually were not so precisely marked on the ancient maps, they were used only as secondary reference points adjusting an already partially referenced map.

The modern maps used to locate the reference points were the Latvia military maps (Ģenerālštāba kartes) made from 1921–1940 in the scale 1:75 000. These maps are not only very precise and detailed, but also show the landscape before the resettlement of people, extensive land drainage, changes in road networks and other extensive changes of land-use during the Soviet time. In addition to these also ortophoto and infrared ortophoto maps were also used when needed. Both the Latvia military maps and the

orthophoto maps had already been referenced by map services of University of Latvia Faculty of Geography and Earth Sciences<sup>10</sup>.

## RESULTS

The map rasters<sup>11</sup> created during the project were saved as Tiff in 300 DPI quality, scale 1:450 000 (Fig. 2). These rasters can be opened both in Qgis and ArcGis and can be used as any modern referenced map. In projects it is possible not only to adjust for any errors, but also to build upon the existing work.

For those without knowledge of GIS and rasters, image files are provided with combined see-through layers of old and modern maps (provided by SIA “Karšu izdevniecība Jāņa sēta”) (Fig. 3.). These combine the modern and old map in one image. They allow assessing the location of particular sites or features without the need of installing any GIS software. The Latvian Association of Archaeologists stores these files, along with some textual information about each map and the project. They are available upon request to all researchers for further study.

It should at this point be noted that even after referencing, these maps will not be entirely correct. These maps are drawn by hand, and despite the best efforts, some points of reference might be misplaced. In addition, some features which were marked in the old map were in the wrong location – usually lakes at that time far out in forests. They were intentionally left unreferenced (incorrect placement). Referencing of these features would have offset the rest of the map and create larger errors. These features are listed in the previously mentioned textual descriptions.

The maps vary not just by size but also by the preservation quality. They have been constantly refolded, kept in different conditions and sometimes have been restored by people who lacked the skills and material for the restoration. The maps were often ripped and glued back together imprecisely; as a result, the original image is often skewed. Sometimes also the text on the maps is faded out or partially missing. However, the majority of maps referenced within this project have been preserved well.

As per the King's instructions, the focus of land surveyors was the usable land and ownership rights. The land surveyors precisely



Fig. 2. Salaspils 17th century map raster, by Daniel S. E. Gunnarsson, from LVVA, Fund 7404 Inventory: 3, File no: 22



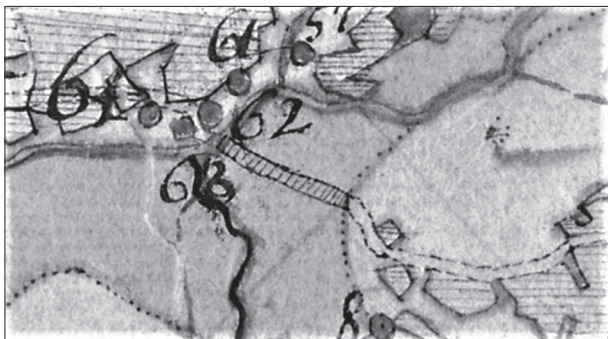
Fig. 3. Segment from a referenced 17th century Ropaži region map, combined with modern day map, by Daniel S. E. Gunnarsson, from LVVA, Fund 7404 Inventory: 3, File no: 21. Made using Ltd. "Karšu izdevniecība Jāņa sēta" data

mapped out lands and sites that were of economic value (fields, pastures, mills, road networks, harbours etc.). However, only occasionally marked were such features as burial sites, road stones and nature features. Landscape features of no economic value or significance were marked only roughly. For example, the surveyors precisely mapped the exact shape of each field, but only approximately marked the shoreline of lakes and bogs not located near the farmed land.

The measurements made are surprisingly precise for the time and the available tools. The most precisely marked areas are densely populated lands and the surrounding area of important roads. Understandably, sole farms surrounded by forests may not be placed as precisely.

## DISCUSSION ON MAP APPLICATION IN RESEARCH

The most obvious use of ancient maps in historic research is the study of economic and agricultural history during the 17th



*Fig. 4. Log road in Gaujiena, from National Archives of Estonia, EAA.308.2.167*

century. The maps show the size and placement of fields and allow seeing the prosperity of manors, villages, etc. Industrial features like water mills can be connected to larger production sites, used not only for processing of grain but also iron. Sparser, but just as informative are the additional sites which have been included in the map after the land surveyor's discretion. These are places of punishment, log roads (Fig. 4), road signs, cemeteries marked as old already in the 17th century and other features.

Less obvious, but just as wide is the usefulness of these maps in the study of prehistoric times. Although the maps were made at the end of 17th century, the landscape depicted in them is slow to change and probably has been the same for several hundreds of years. Studies successfully using early modern maps to interpret a much older landscape have been conducted in other parts of Europe.

The maps largely depict arable land versus areas covered by forests and bogs. When settling new sites, the landscape was usually the primary factor for choosing one place or the other. Stray fields away from larger inhabited areas can indicate an abandoned area (Fig. 5). Even if a previous settlement was destroyed by war or plague the land remained, and it was much more practical for the next people to take up an already cultivated field than to take down a new stretch of forest. For example, it is considered that in Sweden arable land of Iron Age corresponds to the one used during the 17th century, as creating a new field was quite time consuming, and that similar soils were preferably used in both periods.<sup>12</sup> The location of settlements during the 17th century can thus indicate locations of even older settlements.



*Fig. 5.* Small, stray fields in an uninhabited part of the Salacgrīva forest, from National Archives of Estonia, EAA.308.2.16



Another example is from Bosnia Herzegovina, where 19th-century maps from the Austrian-Hungarian Empire were used, in order to interpret the Roman Iron Age cultural landscape. The natural landscape in this case was interpreted as quite static over long periods up to the modern time. Therefore, old maps were a valuable source of information.<sup>13</sup>

Roads were also created by taking the path of least resistance; as such, they follow the landscape and, once established, can remain unchanged for long periods. Studies of other regions have concluded that certain roads still existing in present day have been in use for several centuries, for example, J. Turchettos article on caravan routes in Turkey.<sup>14</sup> Though this region is admittedly historically quite different from Latvia, it still highlights the longevity of road networks. It takes much work, cooperation, and a clear goal to straighten a winding road; such were only organised by central governments. In the case of Latvia, such centralisation appears quite late. It has been noted that bends in the road that today



*Fig. 6.* Empty patches in a ploughed field in Bērzaune, from LVVA, Fund 7404 Inventory: 3, File no: 2

seem to have no reason sometimes are going around houses that no longer exist.<sup>15</sup>

For example, the road networks depicted on 17th century maps could partially overlap with the land routes that connected the Late Iron Age hillforts and other places of power. Although over time, some places lost their importance and others gained it anew, the large roads connecting distant places usually remain important.<sup>16</sup> This allows assessing, for example, the possible ancient land trade routes and routes used during different war campaigns.<sup>17</sup>

Other things deserving attention in the land surveyors maps are those that are not marked. Namely, unused patches of land in the middle of otherwise cultivated fields (Fig. 6). These usually were areas taken up by something else and thus impossible to plough. In the case of the maps of Latvia, this might be particularly important for areas known to contain burials marked by stone settings, or other culturally significant stone constructions.<sup>18</sup> With industrial farming, the impeding stones were often removed, but during the 17th century, it was more common to plough around such impediments.

As these maps are usually the oldest precise depiction of ancient landscape available to us, they are often used as part of archaeological surveys or as part of preliminary research to scientific excavations.<sup>19</sup> The maps together with aerial photos sometimes give indications to possible abandoned settlements or forgotten burial sites and allow estimating which are the best potential excavation sites. It is possible to go even further and correlate the information on the maps (location of roads, cultivated land, water bodies etc.) with stray finds. Mathematically analysing how far a settlement could be from each of the variables, it is possible to estimate where a potential settlement could have been.<sup>20</sup>

This is particularly useful in cases where in some areas only burials, but no living places, have been found.

## SUMMARY

The referenced 17th century maps provide an overview of Vidzeme, only three of the respective regional maps seem not to have preserved. The rest of the area is now possible to work with in GIS and, in a simpler level, in JPG.

These large-scale maps provide researchers with an overview of the ancient landscape, both natural and manmade. It is possible to assess settlement distribution, road networks, and resource availability in particular regions. However, to analyse landscape in very fine detail it is needed to include small-scale maps of manor house and parish lands. It was not possible to reference these maps within a single project, but it provides a great base for further work with them.

The referenced regional map projects include information on all the used reference points with their coordinates in modern days. By linking the small-scale maps with these points, they would already be partly referenced. Further work would be only to make them more precise.

## REFERENCES AND NOTES

- <sup>1</sup> Adjusted to correspond to modern day coordinates.
- <sup>2</sup> State Culture Capital Foundation financing; 2015-3-KMA036, "Zviedru laiku Vidzemes reģiona karšu piesaiste mūsdienu karšu sistēmai".
- <sup>3</sup> Gustaf Svedjemo (2008). Historical Maps, Ancient Remains GIS database & other data in Landscape Analysis, p. 2. [Vēsturiskās kartes, antīko pēdu GIS datubāze un citi dati par vides analīzi]. Available at: [https://www.academia.edu/1965286/Ancient\\_remains\\_database\\_historical\\_maps\\_and\\_GIS\\_in\\_landscape\\_analysis](https://www.academia.edu/1965286/Ancient_remains_database_historical_maps_and_GIS_in_landscape_analysis) (accessed 24.01.2014).
- <sup>4</sup> Estimation based on the amount maps found in the Latvian State Historic Archives.
- <sup>5</sup> Gustaf Svedjemo (2008). Historical Maps, Ancient Remains GIS database & other data in Landscape Analysis, p. 2.
- <sup>6</sup> Available at: <http://www.ra.ee/kaardid>.
- <sup>7</sup> Eduards Dunsdorfs (1974). *Der grosse schwedische Kataster in Livland 1681–1710*. Melbourne: Certamen Literar Constit.
- <sup>8</sup> A report on the precision/offset of each referenced map and the image files themselves are held by the Latvian Association of Archaeologists and

is given out upon request. Contact the association or the authors of this article.

- 9 Methods of referencing ancient maps are widely used in Swedish archaeology, but rarely discussed in writing. The leading Swedish specialist/archaeologist of 17th century map analyses PhD, Fil. lic. Gustaf Svedjemo put together the methods as best appropriate for these maps. The best example is G. Svedjemo's monograph *Landscape Dynamics – Spatial analyses of villages and farms on Gotland AD 200–1700*. Available at [http://www.academia.edu/6901595/Landscape\\_Dynamics\\_Spatial\\_analyses\\_of\\_villages\\_and\\_farms\\_on\\_Gotland\\_AD\\_200-1700](http://www.academia.edu/6901595/Landscape_Dynamics_Spatial_analyses_of_villages_and_farms_on_Gotland_AD_200-1700), or Swedish Large-Scale Historical Maps as Sources for Archaeological Research: Examples from Gotland Maps from 1693–1705 by the same author (see reference 20).
- 10 LU ĢZZF WMS. Available at: <http://www.geo.lu.lv/kartes> (accessed 01.11.2016).
- 11 Referenced maps – image files with imbedded coordinates that are recognised by GIS software.
- 12 Dan Carlsson (1986). The Ancient Cultivation of Arable Land. In: L.-K. Koningsson (ed.). *Quaternary Biology and Ecology*. Vol. 24, Uppsala, p. 89.
- 13 Tomasz Dziurdzik (2016). Gračine-Central place in the hinterland of ancient Naronā? Preliminary results of cultural landscape project in Ljubuški Obcina, West Hercegovina. In: *Landscapes in the Past & Forgotten Landscapes*. Institute of Archaeology, Jagiellonian University, Kraków, p. 300.
- 14 Jacopo Turchetto (2012). Beyond the myth of the Cicilian Gates. The ancient road network of central and southern Cappadocia. In: *La Cappadoce Méreidionale – de la préhistoire à la période byzantine Institut Français d'Études Anatoliennes Georges – Dumézil*. Istanbul, p. 181.
- 15 Dan Carlsson (2007). The deserted Fjåle farm in Ala parish. In: *Europeanization at the Base of Society: The Case of the Baltic Rim 1100–1400 AD*. CCC Papers: 9, Visby, pp. 25–37.
- 16 Martti Veldi (2009). Keskused ja kommunikatsioon Kagu-Eestis rauaajal (vara) uusaegsete kaartide taustal. Fig. 3, Magistritöö. Tartu Ülikool.
- 17 Martti Veldi (2014). Roads and hill forts in southern Estonia during the German conquest in Henry's Chronicle of Livonia In: H. Valk (ed.). *Strongholds and Power Centres East of the Baltic Sea in the 11th–13th Centuries*. Tartu: Institute of History and Archaeology.
- 18 Gustaf Svedjemo (2008). Historical Maps, Ancient Remains GIS database & other data in Landscape Analysis, p. 18.
- 19 Martti Veldi, Heiki Valk (2010). Archaeological investigations at Pikasilla Vooremägi hill fort and settlement site. In: *Archaeological Fieldwork in Estonia 2009*. Tallin: Muinsukaitseamet, pp. 85–93.
- 20 Gustaf Svedjemo (2010). Swedish Large-Scale Historical Maps as Sources for Archaeological Research: Examples from Gotland Maps from 1693–1705. In: P. Wallin, H. Martinsson-Wallin (eds.). *The Gotland Papers: Selected Papers from the VII International Conference on Easter Island and the Pacific: Migration, Identity, and Cultural Heritage*. Visby: Gotland University Press, pp. 475–489.

## 17. GADSIMTA VIDZEMES LIELA IZMĒRA KARTES KĀ AVOTS ARHEOLOĢISKAJIEM PĒTĪJUMIEM

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Zinātniskās intereses: vēsturiskā vide, senās kartes, Zviedrijas vēsture, ĢIS datu apstrāde.

Rakstā plašāk aprakstītas un izskaidrotas 2016. gada karšu telpiskās piesaistes projektā izmantotās metodes, rezultāti un to tālākās izmantošanas iespējas. Projekta “Zviedru laiku Vidzemes reģiona karšu piesaiste mūsdienu karšu sistēmai” ietvaros ieskenētas un telpiski piesaistītas (*referenced*) liela izmēra 17. gs. zemes uzmērīšanas kartes, kurās ir apskatāma lielākā daļa Vidzemes teritorijas. Zviedru zemes uzmērīšana ir precīzākais senais materiāls, kas parāda, kā ir izskatījusies Latvijas teritorija pirms jaunāko laiku industrializācijas ieviestajām pārmaiņām. Aplūkota karšu apstrādes nepieciešamība, apstrādē lietotās ģeogrāfisko informācijas sistēmu (ĢIS) metodes, kā arī tālākās karšu izmantošanas iespējas arheoloģiskajā izpētē. Minēti arī vairāki piemēri, kā šīs kartes izmanto kaimiņzemēs.

### MATERIĀLS UN METODES

Zviedrijas karalis Gustafs II Ādolfs 1628. gadā rosināja izveidot kartes, kurās būtu attēlotas visas Zviedrijas zemes. Karšu galvenais mērķis bija apkopot informāciju par karaļvalstij pieejamajiem resursiem – lauksaimniecības zemēm, kokmateriāliem, apdzīvotām teritorijām, ostām un citiem svarīgiem infrastruktūras objektiem. Vēlāk kartes bija nepieciešamas arī, lai apzinātu nesen iekarotās zemes un īstenotu muižu redukciju. Tādējādi kartēs visprecīzāk ir attēlota infrastruktūra, derīgo resursu atrašanās vietas un īpašumtiesības.

Baltijas teritorijā zemes uzmērīšanu 1681.–1710. gadā veica zviedru un vācu mērnieki. Kartes kā Zviedrijā, tā Baltijā iedalījās divos veidos – *liela izmēra kartes* (> 1:10 000) un *maza izmēra kartes* (< 1:10 000). Maza izmēra kartes aptver atsevišķu muižu, ciemu un pagastu zemes. Liela izmēra kartes rāda novadu līmeni. Zviedru laiku Vidzeme sastāvēja

no 37 novadiem (1. att.). Līdz mūsdienām saglabājušās tikai 33 liela izmēra kartes, kuras glabājas Igaunijas un Latvijas nacionālajos vēstures arhīvos. Kartēm ir attiecīgi apraksti, kur ir atšifrēti māju nosaukumi. 1974. gadā izdotajā monogrāfijā “Der grosse schwedische Kataster in Livland 1681–1710” Edgars Dunsdorfs publicēja karšu aprakstus un saistīja senos sētu nosaukumus ar mūsdienu māju vietām.

Liela izmēra kartes, kuras izdevās iegūt, ieskenēja 300 DPI kvalitātē un telpiski piesaistīja, izmantojot aktuālo koordinātu sistēmu ETRS89/TM Baltic93 (European Terrestrial Reference System 1989). Izmantota brīvpieejas programmatūra Qgis (QuantumGis), kas ir saderīga ar plaši lietoto ArcGIS. Piesaistīšanai izmantota *thin plate spline* ĢIS datu apstrādes metode, kas ir vislabāk pielāgota ar roku zīmētu karšu un neregulāru kļūdu apstrādei.

Telpiskā piesaistīšana ļauj atsevišķiem punktiem senajā kartē piešķirt koordinātas un novietot visu karti atbilstoši šīm koordinātām. Uz senajām kartēm atrada sasaistes punktus, kurus varēja lokalizēt arī uz mūsdienu kartēm, un ieguva to koordinātas. Pirmā līmeņa sasaistes punkti bija baznīcas, muižas un sētas. Baznīcas un muižas reti maina atrašanās vietas, līdz ar to ir visstabilākais atskaites punkts. Arī senajās kartēs mērniekiem bija svarīgi pareizi atzīmēt baznīcu atrašanās vietas.

E. Dunsdorfa veiktais darbs palīdzēja atrast vecās sētu vietas. Pēc pirmās telpiskās piesaistes kartes precizēja, izmantojot citus zīmīgus cilvēku un dabas veidotus objektus – ceļu krustojumus, upju ielejas u.c. Karšu precizēšanai izmantoja arī infrasarkanos un parastā krāsojuma ortofoto. Tie vietām ļāva saskatīt seno lauku robežas, ceļu un upju vietas. Mūsdienu kartēs, lai atrastu sasaistes punktus, izmantoja 1921.–1940. gada Latvijas armijas Ģenerālštāba kartes mērogā 1:75 000. Tās bija īpaši noderīgas mūsdienu sasaistes punktu atrašanā, jo rādīja situāciju Latvijā pirms padomju laiku deportācijām, kolhozu izveides un citām vides izmaiņām. Ģenerālštāba un ortofoto kartes jau bija telpiski piesaistītas mūsdienu koordinātu sistēmai un pieejamas Latvijas Universitātes Ģeogrāfijas fakultātes karšu serverī.

## REZULTĀTI

Projekta galvenais rezultāts ir radītie karšu rastrī (apstrādāti karšu attēli ar koordinātām), kas ir pieejami Latvijas Arheologu biedrībā. Tie ir saglabāti Tiff formātā, 300 DPI kvalitātē un mērogā 1:450 000 (2. att.). Rastrus var atvērt visās populārākajās ĢIS programmās un izmantot kā jebkuru citu karšu slāni. Lai citi pētnieki varētu pārliecināties par veiktā

darba precizitāti vai arī uzsākto darbu turpināt tālāk, pieejami arī visi karšu projekti. Karšu projektā var redzēt, rediģēt un papildināt visus sasaistes punktus. Īpaši noderīgi tas būtu tālākam darbam ar maza izmēra pagastu un muižu kartēm. Šo karšu telpiskai piesaistei tagad var izmantot jau atrastos sasaistes punktus un to koordinātas. Atrasto sasaistes punktu koordinātas var pārķopēt uz mazāka izmēra karti un, balstoties uz tiem, veikt primāro telpisko piesaisti.

Lai kartes būtu pieejamas arī pētniekiem bez ĢIS priekšzināšanām, sagatavotas jau kombinētas kartes, kurās ir redzams senais slānis, savietots kopā ar mūsdienu situāciju (3. att.). Senās, apstrādātās kartes padarītas 50% caurskatāmas un novietotas pa virsu mūsdienu kartēm no SIA "Karšu izdevniecība Jāņa sēta". Lai atvieglotu skatīšanos, katrai kartei ir divas dažādas versijas – vienā virsējais slānis ir senā karte, bet otrā mūsdienu karte.

Tomēr jāņem vērā, ka arī šīs apstrādātās kartes nebūs pilnīgi precīzas. Tās ir ar roku zīmētas, un, pat izmantojot pašas labākās ĢIS apstrādes metodes, zināma nobīde ir nenovēršama. Tas attiecas gan uz visu karti kopumā, gan uz atsevišķām vietām, kur nobīde ir apzināti atstāta. Vietām mērnieki atzīmēja objektu ar lielu nobīdi – tipisks piemērs ir ezers meža vidū. Šādā situācijā problemātiskais objekts tika atstāts neīstajā vietā, jo, to telpiski piesaistot, tiktu nobīdīta visa pārējā teritorija un radītas daudz plašākas un nezināmas kļūdas. Katra karte ar apzinātajām nobīdēm un kļūdām ir aprakstīta projekta atskaitē. Attēli un atskaite glabājas Latvijas Arheologu biedrībā.

#### DISKUSIJA PAR IESPĒJĀM KARTES IZMANTOT PĒTNIECISKAJĀ DARBĀ

Pirmais karšu izmantošanas virziens, protams, ir 17. gs. pētniecība – vide, ekonomika, infrastruktūra, apdzīvotība utt. Piemēram, kartēs ir precīzi attēloti aramzemes lauku izmēri un formas, kas ļauj spriest par dažādo reģionu pārticību. Retāk uz kartēm ir redzamas arī dažādas ar ekonomiku nesaistītas senvietas, piemēram, Salaspils soda vieta, Gaujienas baļķu ceļi (4. att.). Šādus objektus būtu interesanti pētīt gan ar vēstures, gan arheoloģijas metodēm.

Taču kaimiņvalstu zinātnieki tikpat plaši 17. gs. kartes lieto, pētot arī senākus laika posmus. Lai gan kartes izveidoja 17. gs. beigās, pirms industriālās revolūcijas vide mainījās salīdzinoši lēni. Pat ja kāds ciemats iznīka kara vai slimību rezultātā, nākamajiem iecelotājiem bija izdevīgi pārņemt jau kultivētās zemes, nevis veidot jaunus līdumus. Aramzemes, ko izmantoja 17. gs., visticamāk lielā mērā pārklājās ar

dzelzs laikmeta aramzemēm. Līdz ar to aramzemju atrašanās vietas var būt indikators, pēc kā atrast vēl senākas dzīvesvietas (5. att.).

Precīzi uzņēmītie lauki vietām arī attēlo īpatnējus “neizmantojamas zemes” ieslēgumus apartā laukā (6. att.). Šādiem ieslēgumiem ir vērts pievērst īpašu uzmanību teritorijās, kur ir zināmi akmeņu krāvumu kapi vai kultakmeņi. Ja saimnieka lauka vidū bija akmeņu krāvums vai pietiekami liels akmens, to pārvietot varēja būt pārāk sarežģīti. Lauka vidū šo akmeņu krāvumu varēja atstāt neskartu tīri praktisku iemeslu dēļ. Savukārt 19. gs. un 20. gs. tehnika ļāva šādus akmens šķēršļus novākt. Zviedru arheologs un ģeologs Gustavs Svedjemo, šādi izmantojot kartes, atrada vismaz vienu daļēji iznīcinātu akmeņu krāvumu kapu.

Svarīga senās vides daļa ir ceļi. Lai gan senatnē pārvietojoties daudz izmantoja ūdensceļus, svarīgi bija arī zemesceļi. Tos cilvēki parasti izveidoja, pielāgojoties esošajai topogrāfijai. Reiz izveidoti ceļi pamatā paliek nemainīgi. Ja zūd nepieciešamība pēc konkrēta ceļa, tas var ātri aizaugt. Taču, lai iztaisnotu joprojām lietotu ceļu, bija nepieciešams skaidrs mērķis un organizēta valsts vara. Citādi likumi, kas nogriezās uz sen sabrukšām mājām, lielākoties saglabājās. Igaunņu arheologs Marti Veldi zviedru kartēs redzamos 17. gs. ceļu tīklus analizējis saistībā ar vēlā dzelzs laikmeta apdzīvotām vietām. Šāds darbs ļauj gūt ieskatu dzelzs laikmeta tirdzniecības un karagājienu ceļos.

#### ATTĒLI

1. att. Zviedru laiku Vidzemes novadi. No: Edgars Dunsdorfs (1974). *Der grosse schwedische Kataster in Livland 1681–1710*. Melbourne: Certamen Literar Constit
2. att. Salaspils 17. gs. kartes rastrs. Ilustrācijas autors: Daniels S. E. Gunnarsons. No: *LVVA*, 7404–3–22
3. att. Telpiski piesaistītas 17. gs. Ropažu novada kartes segments, kombinēts ar mūsdienu karti. Ilustrācijas autors: Daniels S. E. Gunnarsons. No: *LVVA*, 7404–3–21. Karšu sagatavošanā izmantoti SIA “Karšu izdevniecība Jāņa sēta” pamatdati
4. att. Baļķu ceļš Gaujienā. No: *Igaunijas Nacionālais arhīvs*, EAA.308.2.167
5. att. Mazi, savrupi lauciņi neapdzīvotā Salacgrīvas meža daļā. No: *Igaunijas Nacionālais arhīvs*, EAA.308.2.16
6. att. Neapstrādāti laukumi aparta lauka vidū Bērzaunē. No: *LVVA*, 7404–3–2