Appendix 1. The visibility analysis

The visibility analysis was carried out in two stages (Fig. 1). Stage 1 of the analysis proper involved preparing input data and performing analyses by means of the QGIS software to obtain points and areas visible from individual viewpoints (raster 0/1). Stage 2 was aimed at transforming the results of the analysis proper and preparing GIS visualisations for easier interpretation by experts and stakeholders.

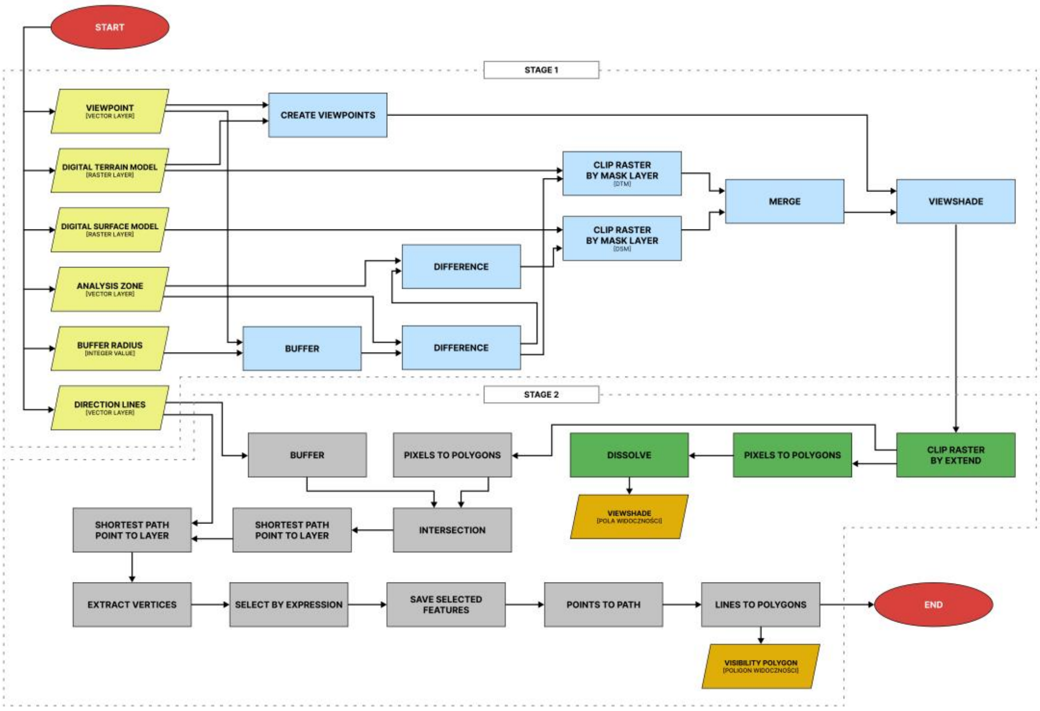

Fig. 1 Diagram of the visibility analysis algorithm

During stage 1, the following baseline data were prepared: 1) selected viewpoints – vector layer; 2) UAV photogrammetric raid data with 3 cm resolution (Digital Terrain Model DTM – a raster layer based on data collected during the leafless period and Digital Surface Model (DSM) – a raster layer based on data collected during the growing season); 3) size of the buffer radius – a numerical value indicating the extent of the radius where stand correction is assumed (the analysis was performed based on the DTM); 4) analysis zone AZ ('slice of cake') – the space in which visibility from the vantage point is analysed, delimited in a polar system – it is the area with a defined radius and a horizontal angle between the vantage point and the observed object.

Subsequently, the analysis parameters were defined, specifying, among others, the observer's height (1.7 m) and the corresponding altitude model. A buffer was calculated in the area where the DSM is replaced by the DTM. The data processed in this way are then used in the viewsheds tool (Visibility Analysis[1]), which is widely used for visibility analysis (Llobera, 2003).

During the next step, obscuration analyses were conducted for each AZ, with the aim of exploring different scenarios for possible land cover correction (vegetation). The first stage was an analysis based solely on the DTM model, i.e. assuming no vegetation cover in the area under study. The analysis made it possible to determine the maximum extent of visibility from a given point, which allowed assessment of whether a land cover correction could reveal the target site. Then, a series of visibility analyses were conducted using DSM and DTM, assuming a resection of vegetation in the buffer around the viewpoint, starting at 1 m, and gradually increasing the distance from the viewpoint. This determined at what distance from the viewpoint the vegetation correction could effectively reveal the desired view. The second stage of the algorithm involved transforming the data to facilitate interpretation. The results of the analysis proper were generalised and converted to vector data. In addition, a visibility polygon was generated, containing the total area visible from the viewpoint. The visibility polygon juxtaposed with the visibility field data provides the opportunity to determine the density of obscuration. The scenarios were juxtaposed and analysed to determine the geometrically optimal correction area.

1 Advanced viewsheds analysis: a Quantum GIS plug-in for the analysis of visual landscapes by Zoran Čučković in The Journal of Open Source Software 4(1). doi: 10.21105/joss.00032.