



Viewshed analysis for
the UNESCO World Heritage property

Old town of Kuldīga



Institute for Heritage
Management





Figure 2: The currently largely undisturbed view into Kuldīga's wider setting.

Imprint

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Authors: Lea Brönnner, Michael Schmidt and Britta Rudolff

Editing: Mareike Herold

Computer-based analysis: Mirko Filetti

Photo simulations and layout: Alex Kurian Mathew

Maps: Lea Brönnner and Mirko Filetti

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Figure 1 (front page): Kuldīga's historic clay tile roofscape (Photo credit: Municipality of Kuldīga)

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Figure 3: The clay roofscape contrasts with the wide, undisturbed landscape towards the property's east (Photo credit: Municipality of Kuldīga)

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Non-technical summary

Task

To comply with the State Party's pledge to UNESCO to protect the Old town of Kuldīga for future generations, it was the wish of Kuldīga Municipality to integrate landscape protection zones into the 2025 Territorial Plan, which was developed simultaneously to this report. The desired zoning concept should provide guidance to the Municipality regarding the potential negative impacts of wind farm developments surrounding the UNESCO World Heritage property. It should serve both as an internal planning tool and as a support for communication with development agencies.

Key results

1. In total, four viewpoints proved to be of the highest significance, meaning that their loss or impairment would significantly interfere with the property's OUV. These points were (a) the Eastern river bank across from the confluence of Alekšupīte and Venta rivers, (b) the Kuldīga Regional Museum, (c) the brick bridge, and (d) the planned lookout point at the future nature trail north of the property.
2. Based on an overlap of the visibilities from the four viewpoints generating views graded as significance level A+, it showed that all territories within a 15-kilometre-radius from the property are particularly vulnerable for wind farm developments, so that the property's OUV would be significantly harmed if wind farms were to be developed in this area. Wind farms closer than 15 kilometres from the UNESCO property produce a severe damage to the property's OUV and might result in a loss of the World Heritage status. HIAs are additionally always required when developments are planned in the north-west or south-east of the property, as these areas are particularly relevant regarding potential damage to the property's OUV.
3. Two viewpoints from towers (St. Catherine's Lutheran Church and observation tower) resulted in a level A grading of significance. As a result, all wind farm developments at a height of 350 metres need to be assessed on a case-by-case basis within the entire 25-kilometre-radius surrounding the property.
4. Wind farms with a height of 260 metres can be located in the far west of the property, close to Aizpute.



Figure 4: The Venta Valley and the historic brick bridge are two of the attributes vulnerable to adverse effects from potential wind farm development

Recommendations

1. A No-Go zone for wind farm developments of 260 metres and higher is recommended to be established within a radius of 15 kilometres from the Old Town of Kuldīga towards the north-west as well as the east and south-east (according to the presented map).
2. A No-Go zone for wind farm developments of 350 metres and higher is recommended to be established surrounding the No-Go zone for 260 metres. This zone should follow the suggested map or extend 3 kilometres beyond the boundaries of the first zone.
3. No wind farms should be developed without a previous HIA within the entire radius of 15 kilometres surrounding the UNESCO World Heritage property.
4. Due to the remaining visibility of wind farms constructed within a radius of 25 kilometres, it is recommended to limit the development of wind farms within the territory of Kuldīga municipality to a minimum, and to carefully assess them regarding their impact on the OUV by means of photo simulations.
5. It showed that the areas west of Kuldīga are least vulnerable towards wind farm development in the context of the property's OUV. This result should be reflected in the choice of future wind farm territories.
6. It is important for the wind farms north-west of Kuldīga to maintain the current distance to the property and to not extend the Ventspils wind farms in south-eastern direction.
7. It is recommended not to build or repower any wind turbines of 350 metres height in the south-eastern most area of the Ventspils 2 / EKO Ziemeli wind farm, but to maintain lower maximum heights in this area. If possible, repowering of the wind turbines to higher structures should be limited to the north-western areas of the wind farm, as there is no visual interconnection between those areas and the UNESCO property.
8. It might be necessary to reconfirm whether there are separate heritage or environmental areas in the north-west of the planned wind farm that might be impacted by recommendation (7). An assessment in this regard has not been included in this report.
9. It is recommended to establish a mechanism within Kuldīga Municipality to carry out the case-by-case assessments necessary within the relevant zone.
10. Should the Municipality of Kuldīga be informed about specific wind farm development proposals that present heights not considered in this report, for example a wind farm with towers of 300 metres' height, it is highly recommended to conduct an additional computer-based viewshed analysis as well as photo simulations from the potentially impacted viewpoints to guarantee an adequate base for decision-making.
11. It is strongly recommended to raise awareness for the property's attributes of OUV and their potential vulnerability towards wind farm developments. Developers and authorizing entities for wind farm developments should be made aware that all future developments situated within the sightline of one or more attributes of the property's landscape setting need to be carefully assessed, as they may potentially damage the property's OUV. This is also true for wind farm developments that would prolong a sightline onto the clay roofscape of Kuldīga, as well as of the town silhouette.
12. It is furthermore recommended to make the map material of the suggested zoning concept accessible to all relevant stakeholders, and especially to wind farm developers.
13. To facilitate faster decision-making in the future, viewpoints of the property's OUV should be assessed according to the presented methodology to have a complete overview of the status quo of all relevant viewpoints.
14. Independent from new wind farm developments, existing disturbances, such as radio towers that are situated within important view corridors, should ideally be relocated to recreate the historical silhouette of the town.



Figure 5: The Holy Trinity Roman Catholic Church as seen from the Town Hall

1. Introduction and working principles

The viewshed analysis for the potential construction of wind farms in the surroundings of the UNESCO World Heritage property Old town of Kuldīga examines the visual relationships between the UNESCO World Heritage property and its wider setting. In addition, important viewsheds within the property are analysed regarding the potential impact of wind farms on the attributes defining the Outstanding Universal Value (OUV) of the Old town of Kuldīga.

The report follows the guidance of UNESCO for the implementation of Impact Assessments for cultural heritage properties. The presented results are in line with the requirements formulated by UNESCO in terms of their methodological approach and evaluation. The recommendations are based on the assessment of the potential impairment of the protection of the property's visual integrity and aim at enabling the property's site management team to take clear decisions in this regard in the future.

Task and objectives

The World Heritage property Old town of Kuldīga is vulnerable to various development measures, particularly in the context of the climate adaptation strategies that are politically demanded with high priority by the Latvian government as well the international community. This includes, for example, the designation of areas suitable for wind farms as well as the potential repowering of existing wind turbines with heights of up to 350 meters. Such projects have both a direct and indirect impact on the monumental substance of the site and its surroundings. Therefore, the plans for increasing wind farm development need to be critically assessed regarding their potential impact on the Outstanding Universal Value and its four key attributes: (1) landscape setting, (2) urban layout, (3) architecture and building fabric, and (4) craftsmanship (Institute for Heritage Management 2025).

In the context of the renewal of Kuldīga's territorial plan, the Municipality wishes to prevent future impairment of the attributes of the UNESCO World Heritage property by identifying areas to be excluded from future wind farm development that is incompatible with world heritage. For this purpose, this report documents the status quo of significant viewsheds and illustrates their potential impairment by wind farms.

The visualization combines an ArcGIS-based viewshed analysis of an area of 25 kilometres surrounding the Old town of Kuldīga as well photo simulations for those viewpoints that proved to have visual interrelations with existing wind farm development plans. It concludes with a proposal for a zoning concept and related recommendations.



Figure 6: An undisturbed view corridor from the Needle Tower towards the tower of the town's catholic church

2. Methodology

The following assessment was prepared in accordance with the recommended guidance for the preparation of Heritage Impact Assessments (HIA) between autumn 2024 and spring 2025. The assessment was based on the key procedural steps outlined in the “Operational Guidelines for the Implementation of the Convention concerning the Protection of the World Cultural and Natural Heritage” (UNESCO 2021) and the “Guidance and Toolkit for Heritage Impact Assessments” (UNESCO 2022).

The applied methodology is described in further detail below:

Stage 1: Description of OUV and other heritage values

As a first step in any heritage impact assessment (HIA), including this viewshed analysis as a specific subcategory, the Outstanding Universal Value (OUV) of the property needs to be understood. By clearly identifying the attributes that carry the property’s OUV, this chapter serves as a reference point for management entities as well as developers, indicating the specific attributes at the base of all decision-making processes in the context of wind farm developments.

As a thorough analysis of the property’s Statement of OUV along with an analysis of other heritage values (such as national and local values) already exists for the Old town of Kuldīga, no additional analysis of the heritage values was carried out in the course of this viewshed analysis. Instead, the relevant documents were referenced and a description of the OUV and other heritage values was provided based on the 2025 Attribute Mapping report (IHM 2025) and the 2023 Heritage Impact Assessment for the planned visitor infrastructure in Pārventas park (IHM 2023).

Stage 2: Baseline definition

This viewshed analysis is based entirely on the Attribute Mapping report for the Old town of Kuldīga, which lists, describes and localizes all attributes contributing to the property’s OUV. It is the core task of the site management team to preserve those attributes adequately.

For the baseline definition of this viewshed analysis, it is important to understand that different attributes may be affected by different



Figure 7: Walking paths facilitate appreciation of the UNESCO property from both river banks

development projects to varying extents. Therefore, identifying which attributes are potentially impacted by any given development is crucial. This enables the assessment to focus specifically on those attributes that require particular attention when evaluating potential negative impacts e.g. arising from wind farm developments.

The varying levels of vulnerability are illustrated by a colour-coding system:

- **Red** indicates highly vulnerable attributes.
- **Yellow** represents attributes considered vulnerable.
- **Green** is used for attributes not anticipated to be affected by wind farm developments.

Stage 3: Brief description of planned future wind farm areas

The third step of this process contextualizes the presented study by providing a brief description of the characteristics of currently planned wind farms, including technical data such as the design and height of wind turbines. It indicates the location of these predetermined areas as well as their distance from the property.

This chapter is entirely based on publicly available information.

Stage 4: Identification of relevant viewpoints

The primary objective of the viewshed analysis is to prevent future harm to the property's recognized OUV and its contributing attributes. Thus, it is essential to identify relevant viewpoints that contribute to the legibility of the property's OUV, and whose ability to continue doing so might be compromised by wind farm developments.

Therefore, panoramic views and view corridors were identified from where the property's attributes are visible, and whose loss would consequentially negatively affect the OUV. The determination of viewpoints was based on an analysis of the topography and proximity to locations with a high density of attributes. Additionally, all panoramic views, viewsheds and view corridors explicitly recognized as attributes of OUV within the Attribute Mapping report were considered relevant viewpoints and included in the preliminary list of potential viewpoints.

This resulting preliminary list was reviewed – and expanded – together with a team of specialists from Kuldīga Municipality. The selected viewpoints were

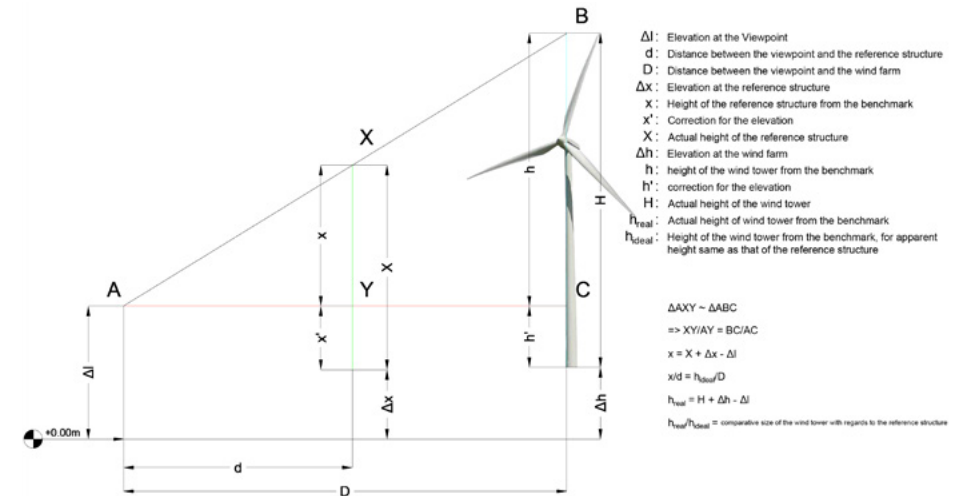


Figure 8: Mathematical consideration of each potential viewpoint's relevance

visited during a corresponding walk-over survey conducted in October 2024 to be confirmed before further assessment. For those points where a visibility of attributes could be confirmed, a mathematical calculation was used to screen them for their potential vulnerability towards wind farm developments (see Figure 8). This calculation considered several factors: the elevation both at the viewpoint as well as at the development site, the distance between the two, the height of the proposed wind turbines relative to already existing vertical structures in the surrounding area, as well as the resulting viewing angle.

Potential viewpoints that proved to be without visibility of relevant attributes do not present a risk of visual impact by future wind farm projects. Therefore, they are neither described nor included in the detailed analysis in the following chapters. This is also true for viewpoints that have visibility of attributes but due to the viewing angle are not vulnerable to wind farm developments in the property's wider setting.

It is important to note that the results of a similar viewshed analysis may vary when assessing the impact of other types of developments – such as large shopping malls or power lines – which may interrupt views at a lower elevation level but extend across a broader horizontal area. Therefore, viewpoints excluded based on the method described above might need to be included in a detailed analysis for other types of development projects.

Stage 5: Documentation of the status quo

For all panoramic views and view corridors identified as potentially affected by the development of wind farms, this viewshed analysis includes both a photo documentation and written descriptions to determine the current condition of each relevant viewshed. Existing impairments to the property's visual integrity are documented to provide context when grading the potential impact of future developments.

To ensure consistency and better comparability of the diverse viewpoints under consideration, three site-specific criteria were developed for Kuldīga. While the overall methodology follows standard practices, it has been tailored to reflect the unique characteristics of the site and adapted to meet the specific objectives of this study. For Kuldīga, the following assessment base was developed to evaluate and rate the status quo of the identified viewpoints using a point-based system (see Table 1):

Table 1: Assessment base for the determination of the current authenticity and integrity of each viewpoint

Criteria	Assessment base	Points
Visibility of attributes	The view contains multiple attributes of high significance and/or multiple significant attributes from three or all attribute groups	3
	The view contains one attribute of high significance and/or multiple significant attributes from two attribute groups	2
	The view contains multiple significant attributes from one attribute group	1
	The view contains no attributes	0
Uniqueness of viewshed	There is no other viewpoint from where a specific attribute or a similar combination of attributes can be observed	3
	There are a maximum of three viewpoints from where a specific attribute or a similar combination of attributes can be observed	2
	There are four to five viewpoints from where a specific attribute or a similar combination of attributes can be observed	1
	There are six or more viewpoints from where a specific attribute or a similar combination of attributes can be observed	0

Intactness of the view's integrity	Attributes can be perceived free of modern developments / no to negligible distraction from view of attributes	3
	Attributes are disrupted by a single medium or multiple minor modern developments / minor distraction from view of attributes	2
	Attributes are disrupted by a single larger or multiple medium modern developments / medium to large distraction from view of attributes	1
	Attributes are disrupted significantly by multiple larger modern developments / significant distraction from view of attributes	0

As a result, the contribution to the legibility of the property's OUV was determined for each viewpoint identified as relevant in stage 4 in order to later correlate with the severity of impact from potential future developments. In this context, current visual impairments of the relevant panoramic views and view corridors were taken into account. Wherever multiple developments affect the property's OUV, their separate impacts are assessed jointly as a cumulative impact. Their joint impact might be more significant than the single impact of each element.

Based on this approach, the status quo of each viewpoint is classified as follows:

Table 2: Possible results of the assessment of the status quo of relevant viewpoints

Status Quo	Assessment	Points
A+	Preservation of this view significantly contributes to the overall legibility of OUV	8-9
A	Preservation of this view largely contributes to the overall legibility of OUV	6-7
B	Preservation of this view somewhat contributes to the overall legibility of OUV	3-5
C	Preservation of this view does not influence the overall legibility of OUV	0-2

This assessment is entirely based on the visual relationship between the property and potential wind farms; other impacts, such as functional impacts, are not considered in this report.

To illustrate this methodology, Figure 9 shows the catholic church district at Raina Street. According to the mathematical calculations, this viewpoint is not vulnerable to wind farm developments in the property's wider setting and was therefore excluded from the later assessment. However, it lends itself well as

an example to illustrate the process of identifying and evaluating the status quo. Each paragraph is structured to describe one of the three predefined criteria in detail to justify the according point allocation, ending with a total score and the respective status quo rating.

Stage 6: Development of zoning concept

The following section identified zones surrounding the UNESCO property where the construction of wind farms may remain permissible and where future developments should be restricted to safeguard the Outstanding Universal Value (OUV) of the Old town of Kuldīga. Due to the high development pressure to extend wind farms, these zones were established based on the findings of the preceding analysis of the status quo of the relevant viewpoints that are to be protected. Following this methodology, the resulting zones can be clearly argued on the basis of the common interest to protect the UNESCO World Heritage property of the Old town of Kuldīga for future generations. This step is of utmost importance for the Municipality of Kuldīga to create a baseline for a future screening process for potential new development proposals presented to them.

Following the assessment of the status quo of each of the relevant viewpoints, a 3D-analysis was carried out to identify the specific visibility of wind farm development projects for each of the relevant assessment points. The digital surface model (DSM) forms the central data basis for this GIS-supported part of the viewshed analysis. In addition to terrain heights, it also contains information on vegetation and buildings and thus enables the height-dependent calculation of visibility as well as the modelling of the visual space of planned projects – in this case potential wind turbines. The selection of the viewpoints integrated into the computer-analysis is based on stage 4, where the relevant viewpoints were identified. Particular attention is paid to matching the GPS altitude values manually collected during the walk-over survey in October 2024 with existing official data in order to enable the most precise analysis possible. The final height for each viewpoint is calculated from the terrain height plus an assumed eye level of 1.6 metres. Any deviations due to the height of individual viewpoints were also taken into account.

Before carrying out the viewshed analysis, all geodata was converted to a standardized format and coordinate system. The DSM data was combined from several tiles into a single coherent TIFF file. The amount of data was selectively reduced to increase efficiency. Observation points were linked to the elevation data of the DSM in order to obtain precise input values for the analysis. The resolution was adjusted to 2 metres.



Figure 9: View along the buildings of the Catholic Church district

The catholic church and the adjoining buildings, including the organist's and the sexton's house, up until this day provide an authentic image of Kuldīga's streetscape of the 17th century. The viewshed along Raina Street allows for unique appreciation of the particular architectural language of Kuldīga that developed in the 17th century, including delicate aspects of local craftsmanship, such as windows and tin elements. The street is a stronghold of urban and architectural development during the Duchy of Courland and Semigallia, integrating a pebble street, log, brick and masonry buildings from the 17th century, the clay roofscape and the church tower in the back. From here, attributes from three different attribute groups are visible, namely the urban layout, architecture and building fabric, as well as craftsmanship. The view would obtain 3 points with regard to the visibility of attributes.

As there is no other viewpoint within the Old town of Kuldīga that allows for a similar view, and the combination of original surface materials on the street in combination with dwellings from different materials and a historic public building is unique, the viewshed would furthermore be graded with 3 points regarding its uniqueness.

As this viewpoint is located within a street, the view it allows is a rather narrow corridor. The viewing angle in combination with the surrounding buildings lead to a complete lack of visible disturbances. Cars that are passing through the street are not considered to disturb the visual integrity of this view. The traditional urban settlement structure is not disrupted and the intactness of the view's integrity would be graded with 3 points.

In total, this viewpoint would reach 9 points. This correlates to significance level A+. Preservation of this view therefore significantly contributes to the overall legibility of OUV.

Subsequently, the 'Visibility' tool from ArcGIS was used to calculate visibility. The visibility of planned wind turbines was examined at assumed heights of between 200 and 350 metres above the terrain. An observer offset of 1.6 metres was assumed as the eye level. Based on the surface model, the tool calculated which terrain points are visible from which POI. The height of the target point was compared with the local horizon in order to evaluate the line of sight.

The result of this part of the assessment are maps depicting the visibility of wind farms of a certain height from each point respectively (see Map 1).

Based on the GIS-based viewshed analysis from the viewpoints that were identified as potentially vulnerable towards wind farm developments, this section developed suggestions for no-go areas and HIA areas, as well as areas where the construction of wind farms with wind turbines of 260 metres and 350 metres height respectively proved unproblematic for the property's OUV. As it can be assumed that planned or potential wind turbines at a distance of more than 25 kilometres from the World Heritage property will not have a significant negative impact on the OUV, the study area covers a radius of 25 kilometres and includes both the boundaries of the World Heritage site as well as the buffer zone confirmed by the UNESCO World Heritage Committee.

This section aimed at indicating four different areas for each of the relevant heights: a no-go-area, an area where HIAs are to be mandatory, an area where HIAs need to be developed on a case-by-case basis, and an area where wind farm developments corresponding to the here discussed variables (maximum height of 350 metres) can be carried out without a previous HIA.

All of the following areas are presented for heights of 350 metres and 260 metres respectively:

No-Go zones (red) were developed based on the calculated visibilities of wind farm proposals from those views graded as A+. All developments within 15 kilometres from those points pose a highly significant threat to the property's OUV and therefore should be prohibited.

HIA zones (orange) were developed based on the calculated visibilities of wind farm proposals from those views graded as A within a distance of 15 kilometres. As the loss of those views will pose a threat to the property's OUV, the necessary mitigation and adaptation measures need to be evaluated for each of the points separately, assessing whether the impaired view leads to the loss of a unique view and needs to be moved.

Case-by-case assessment zones (yellow) were developed based on the calculated visibilities of wind farm proposals from those views graded as A+ within a distance of 16 to 25 kilometres. As those views may pose a threat to the property's OUV, it needs to be decided on a case-by-case basis whether an HIA needs to be carried out. This assessment also takes into consideration conglomerate impacts with already existing disturbances of the OUV.

No-conflict zones (green) are those areas where no conflict is foreseen.

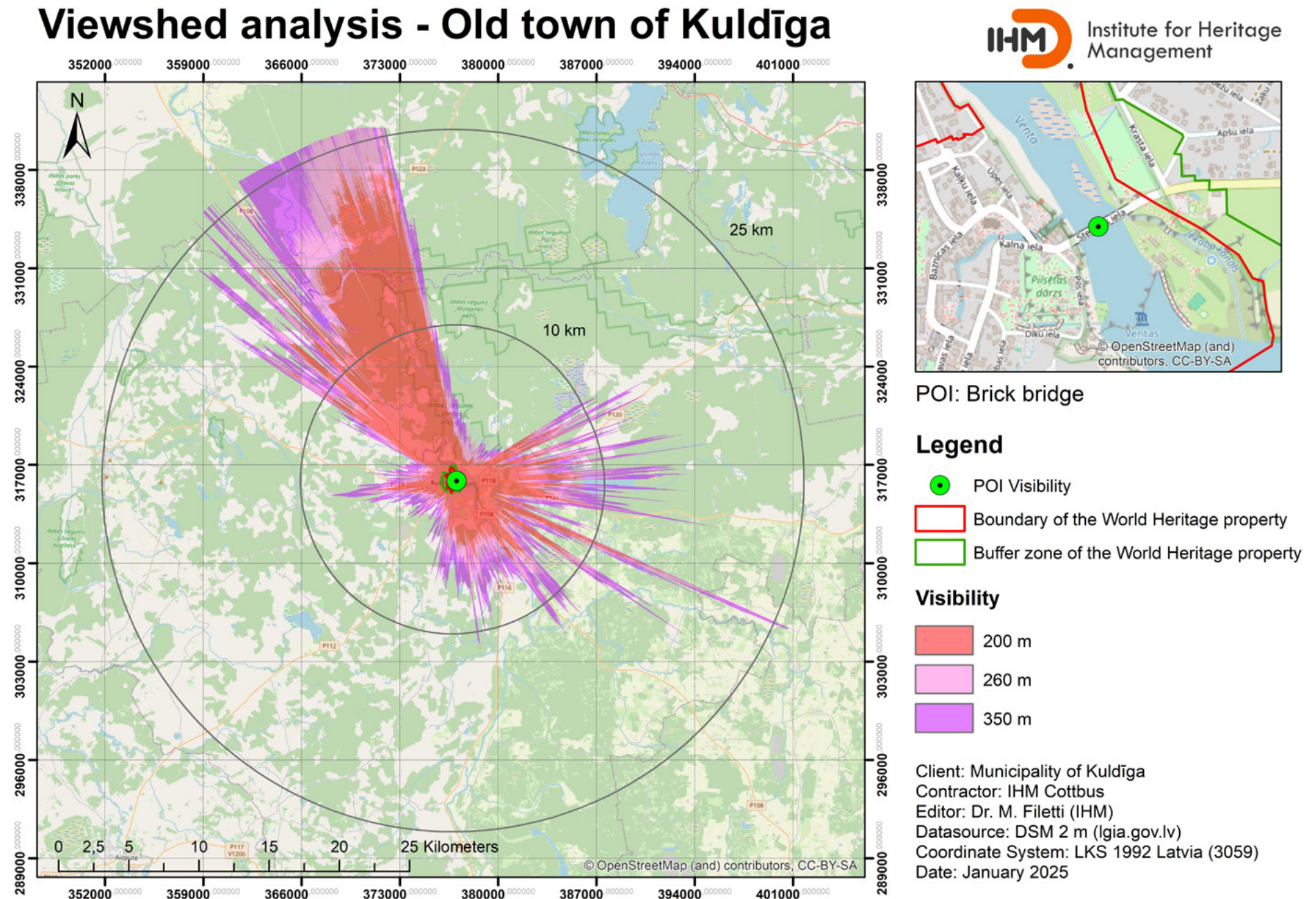
Stage 7: Visualization of planned wind farms

It must be acknowledged that a number of wind energy projects in the property's surroundings have already obtained – or are in the process of obtaining – building permission, and might therefore lie within zones that ask for an HIA. To verify their actual negative impact, photo simulations were carried out for these specific perspectives. The photo simulations enhance the understanding of the actual impact foreseen by a development and allow for more precise judgement of the impact's severity. In comparison, the computer-based maps indicate a general visibility of wind turbines at a specific height, without clarifying whether what can be seen is merely the tip of a rotor blade or the entire wind turbine. For this reason, especially on the outskirts of the visibility zones generated with the 'Visibility' tool from ArcGIS, it is important to inform decisions by additional photo simulations.

The methodology employed to evaluate the visual impact of the proposed wind turbines on the Old town of Kuldīga followed a multi-step process integrating geospatial analysis, 3D visualization, and theoretical calculations. The goal was to produce accurate visual simulations of the proposed wind farms as perceived from the identified key viewpoints, enabling an informed evaluation of their potential impact on the site's OUV - particularly its cultural and aesthetic values.

To prepare those photo simulations, the initial step was to identify the relative height of each wind turbine as seen from the chosen reference viewpoints. This was achieved by applying the principle of similarity of triangles, allowing for the calculation of the apparent height of the towers relative to an existing reference structure visible in the images. Variations in ground level elevation at the proposed turbine locations were incorporated and factored into these calculations to ensure accuracy. The computed heights were subsequently used to precisely scale and position prototypes of the wind towers within the reference images.

Map 1: Example of the GIS-based computed viewshed analysis



Once heights and positions of the wind towers were established, prototypes of the structures were digitally placed at the proposed sites using a combination of AutoCAD, ArcGIS, and Photoshop. These placements were interpolated onto the actual photographic images of the site taken from each reference viewpoint. This process was systematically repeated for all proposed wind farm locations and for each reference viewpoint, creating a comprehensive visual dataset that represents the potential visual impact of the wind towers from multiple perspectives.

To enhance the realism and precision of the visualizations, simulations were conducted at different distances: For all of the points, this included a visualization of the current distances proposed for construction and at 10 kilometres. For some of the points, a distance of 15 kilometres was additionally considered. This approach provided a nuanced understanding of how the visual prominence of the wind towers would vary with distance.

Finally, the resulting visualizations were cross-referenced with the viewshed analysis performed in ArcGIS to verify the visibility of the wind towers from the designated viewpoints. The viewshed analysis ensures that the visibility depicted in the simulations and rendered images accurately reflect real-world conditions, accounting for the terrain, elevation and line-of-sight constraints.

Stage 8: Assessment of the foreseen level of impact of wind turbines

In a full Heritage Impact Assessment, this section would be dedicated to an initial study of all likely impacts – including impacts such as noise pollution, vibrations etc. – and their influence on the suggested OUV of the property. Due to the distance of the proposed wind farms, the focus of this viewshed analysis lies entirely on visual impacts of potential future developments. To achieve this, the potential impact was assessed on the base of the previously generated photo simulations. Similar to the analysis of the Status Quo carried out during stage 5 of this process, the visualizations were assessed based on three criteria reflecting the particular nature of wind farm developments. Different criteria would apply for different development projects, such as high-rise buildings or power lines.

The resulting points led to the determination of impact levels, which were later cross-referenced with the significance levels determined for the status quo of each discussed view corridor. This stage thus verifies the actual impact on attributes considered vulnerable in stage 2.

The criteria were chosen as follows:

Table 3: Assessment base for the determination of the negative impacts of wind farm developments

Criteria	Assessment base	Points
Proportional vertical visibility of wind turbines	All three rotor blades are completely visible and the tower is at least partially visible	3
	Hub visible	2
	Upper rotor blade partially visible	1
	Not visible	0
Proportional horizontal visibility of wind turbines	Wind farm is an extension of the main sightline and/or extends over the entire horizon	3
	Wind farm lies within the central field of sight and/or extends over more than 50% of the horizon	2
	Wind farm lies on the edges of the central field of sight and/or extends over 10 to 50 % of the horizon	1
	Wind farm extends over less than 10 % of the horizon or is not visible at all	0
Dominance of wind turbines in viewshed	Wind turbines dominate viewshed in a way that significantly diverts attention from attributes (typically ≤ 7.5 km)	3
	Wind turbines dominate viewshed in a way that noticeably diverts attention from attributes (typically 7.5-15 km)	2
	Wind turbines are noticeable but do not divert attention from attributes (typically 16-25 km)	1
	Wind turbines are barely visible and negligible/not noticeable (typically >25 km)	0
	Wind turbines are not noticeable (independent from distance)	0

As a result of this assessment, the level of impact is identified for each of the planned wind farms modelled in the photo simulations. The total of points determines the level of impact for each development from each viewpoint separately:

Table 4: Possible results of the assessment of potential impacts

Level of impact	Assessment	Points
(III)	Large to very large impact	8-9
(II)	Medium impact	6-7
(I)	Minor impact	3-5
(0)	No to negligible impact	0-2

Figure 10 illustrates the applied methodology, using a fictional wind farm development south of Kuldīga with towers of 350 metres height and positioned at a distance of 10 kilometres from the chosen viewpoint. Similar to the description of the status quo, the text is separated into three separate paragraphs, focusing on the assessment of one of the predetermined criteria each. For the criterion assessing the proportional vertical visibility, the highest grading would be given already if there was only one wind turbine with full visibility. The number of wind turbines contributing to a potential impact is assessed in the following criterion, examining the proportional horizontal visibility.

The severity of this result would need to be matched with the significance of the current view during the following stage of the assessment (see Stage 9, below).

Stage 9: Assessment of the adverse effects of potential wind farms

Finally, to assess the measures necessary regarding each specific impact, the projected level of impact needs to be matched with the status quo of the particular viewpoint, which also takes into consideration the current state of integrity of this particular angle. For this purpose, the significance level of a specific viewpoint and the impact level of a development within the corresponding viewshed are correlated using a matrix system (see Matrix 1). This approach allows for a clear assessment of the magnitude and severity of impacts, clearly highlighting where particular caution is needed.

It is particularly important to understand that the same project proposal might impact different or multiple views to a varying extent, which is why each project proposal needs to be carefully assessed for each of the potentially disrupted viewsheds contributing to the property's OUV. According to Matrix 1, a minor impact (I) might not be relevant for a view that is considered to be of the lowest significance (C). However, the same impact can be major (III) for a highly significant view A+. To better understand this correlation, the underlying matrix is colour-coded.

Table 5 describes the meaning of each of the different colours in relation to the previously established zoning concept.



Figure 10: Visualization of a potential wind farm development with towers of 350 metres height at a distance of 10 kilometres from the viewpoint

The simulation shows that for this fictional scenario, all three rotor blades are completely visible and the tower is at least partially visible. The proportional vertical visibility would be graded with 3 points.

Regarding the proportional horizontal visibility, the wind farm is an extension of the main sightline and clearly directs the view. For this reason, the proportional horizontal visibility would also receive 3 points.

Lastly, the dominance of such a wind farm would be graded with 2 points. At a visualized distance of 10 kilometres, the projected height of 350 metres clearly distracts from the attributes visible from this viewpoint: the vast Venta Valley, the town silhouette with the tower of St. Catherine's Lutheran Church, and the brick bridge.

In total, a wind farm development such as the one created in this scenario, would result in 8 points, which is considered a large impact (III).

Matrix 1: The correlation of levels of impact with levels of significance

Assessment of status quo \ Assessment of impact	Assessment of status quo			
	A+	A	B	C
III				
II				
I				
0				

Table 5: Overview of the consequences of the assessment of adverse effects

Colour-code	Meaning	Result / Action required
	Developing wind farms in this location would pose a serious threat to the integrity of the property's OUV, resulting in a highly significant conflict.	Construction of wind farms should be prohibited (No-Go zone).
	Developing wind farms in this location will have conflict potential.	An HIA is required to ensure safeguarding of the property's OUV through adaptation or mitigation. Alternative locations must be assessed (HIA zone).
	Developing wind farms may have conflict potential.	An HIA might be required, depending on the specific characteristics of a project proposal (Case-by-case zone). Construction is likely to be possible when applying adequate mitigation measures.
	No conflict potential is attributed to wind farm developments in this location.	Construction is considered unproblematic (No-conflict zone).

The decision whether a full HIA is necessary for wind farms planned in the yellow zone lies within the respective authority issuing the permits. Generally, it is likely that wind farms can be built in those areas, but, depending on their specific nature, mitigation measures might be necessary (different positioning, lower heights, smaller number of turbines etc). For this reason, a mechanism should be established where the responsible person within the municipality looks at a specific proposal and considers whether there might be a potential impact. Such a mechanism could include commissioning of specialists to do a photo visualization based on the exact locations, heights etc. A full HIA would only be carried out if this preliminary visualization shows a conflict. On the other hand, if the project proposal is one with only very few turbines (low proportional horizontal visibility) that are all of 260 metres and under (low proportional vertical visibility), then it could also be possible to decide that it can be carried out as planned without talking further steps. The importance of the yellow zone, as opposed to the orange zone, is to create an awareness that nothing can be built without previous consultation and permission of the Municipality.

Stage 10: Conclusion and recommendations

The report concludes with a final chapter, summarizing the findings and formulating recommendations to be taken into account in future decision-making in the context of wind farm developments. The recommendations were based on the previously developed map material and should be ideally be consulted together.

Limitations of the methodology

The applied GIS-based viewshed analysis is a proven method to assess the potential visual impact of the planned wind turbines on the OUV of the site. However, there are certain limitations:

- The DSM maps tree canopies as closed visual barriers; visual relationships below the tree canopy cannot be represented.
- Minor inaccuracies can arise due to the selection and positioning of the observation points, manual processing steps or differences in the resolution and timeliness of the elevation data.

These aspects must be taken into account especially in sensitive areas where visual changes could directly affect the OUV. For such zones, an in-depth detailed analysis may be recommended. Overall, however, the method provides reliable and comprehensible results for a well-founded assessment.



Figure 11: Sight relationships between the two river banks allow for different viewing angles on the property's attributes

3. Results

3.1 Description of OUV and other heritage values

To assess the impact that newly developed wind farms might have on the UNESCO World Heritage property, its Outstanding Universal Value (OUV) needs to be considered. The values and attributes mentioned in the Statement of OUV are those that the State Party of Latvia committed to protect for future generations. Therefore, it is only possible to develop wind farms in a way that is compatible with the World Heritage context, when both the attributes and their vulnerability to wind farms are clearly understood by management and developers alike.

The Statement of OUV under which the Old town of Kuldīga is recognized as a World Heritage property reads as follows (UNESCO, 2025):

Brief synthesis

Located in the western part of Latvia, in the central Kurzeme (Courland) region, the town of Kuldīga is an exceptionally well-preserved example of a traditional urban settlement. At the confluence of the Venta River and the smaller Alekšupīte stream, the beginnings of Kuldīga, which was called Goldingen at the time, date back to the 13th century. The rivers' intersection is a defining element of the town's structure, contributing to its scenic character. The medieval area of Kalnamiests, located on a hill, is clearly distinguishable in the townscape, given its oval shape.

A significant part of Kuldīga's history and development is linked to the Duchy of Courland and Semigallia, which governed a significant part of the Baltics between 1561 and 1795. The town was the primary residence and administrative centre of the Duchy's first ruler and maintained an important role afterwards. As a result, the town developed into a prosperous trading hub. The international orientation of the Duchy led to a rising number of foreign merchants and craftsmen settling in Kuldīga, who left their mark on the architectural language and building decoration of the region. The town's structure has largely retained the street layout which developed during the period of the Duchy.

Figure 12: Kuldīga's historic clay tile roofscape (Photo credit: Municipality of Kuldīga)

The architectural influences and craftsmanship traditions introduced during the era of the Duchy endured well into the 19th century. However, different laws and regulations, aimed at fire safety, led to the progressive replacement of fire hazardous roofing materials. The proportion of masonry buildings also increased, replacing traditional wooden ones. In the second half of the 19th century, the brick bridge over the Venta River was constructed, connecting Kuldīga to the east.

Unlike other towns in the Baltic region, Kuldīga survived the great wars of the 20th century largely unscathed and modern urban developments were largely implemented far outside its historic centre.

Criterion (v): *The Old town of Kuldīga is an outstanding example of a well-preserved urban settlement, representative of traditional Baltic architecture and urbanism and of multiple historical periods – from the 13th to the early 20th centuries. Its historic urban fabric includes structures of traditional local log architecture as well as largely foreign-influenced techniques and styles of brick masonry and timber-framed houses that illustrate the integration of local craftsmanship with foreign influences from other Hanse towns and centres around the Baltic Sea as well as Russia. The craft skills are prominent in functional and ornamental building details throughout the town and continue to be employed by craftspeople today. The predominance of clay tiles as a roofing material contributes to the harmonious townscape of Kuldīga.*

Integrity

The property encompasses the medieval castle mound plateau, the medieval area known as Kalnamiests, and the urban areas which developed during the ducal period from the 16th until the 18th centuries but continued to organically evolve afterwards. In addition, large areas of the environmental setting of Kuldīga are also included, namely the intersection of the Venta and Alekšupite rivers, as well as the Ventas Rumba waterfall, which was essential for the growth of Kuldīga into a trading centre.

In the past, fires destroyed substantial parts of the urban fabric and remain a risk to this day, since the town has many wooden buildings

as well as buildings with important wooden elements. Floods are another important factor that can potentially affect the property, particularly in view of climate change. To maintain the harmonious townscape, the town's general construction rules stipulate maximum building heights within the property and its buffer zone.

The boundaries of the property coincide, for the most part, with the national designation of the “urban construction monument” of state importance. The area of the Venta Valley is not included in that designation but is protected as a nature reserve. The buffer zone corresponds to the “individual protection zone” and has complementary legal provisions in order to give an added layer of protection to the property.

Authenticity

Kuldīga's urban and architectural heritage is well retained in terms of material, design and craftsmanship. It illustrates continuity in function and use as residences, auxiliary structures and religious spaces for the resident community. The old town further preserves its authenticity in setting and location, which was a fundamental aspect for the development of the urban structure of the town, influenced by the intersection of the Venta and Alekšupite rivers. The river landscape has changed over time but not to the extent that it fundamentally alters the environmental setting of the property.

Protection and management requirements

The property was first nationally recognised in 1969 and received the highest level of national protection as a cultural monument under the national Law “On the Protection of Cultural Monuments”. The landscape elements of the Venta Valley have been protected since 1957 and were recognised in 2004 as part of the NATURA 2000 network. The buffer zone also has legal status as a monument of architecture (urban construction) of local importance in the list of state protected cultural monuments.

On a local level, multiple planning documents, such as a local territorial development plan, define strict legal mechanisms that contribute to the protection of the historic urban settlement and further prevent development pressures that might affect the property's significance.

Kuldīga Municipality acts as the main management authority for the property and its buffer zone. With regards to the conservation of historic buildings, the Kuldīga Restoration Centre is an essential partner of the municipality. The day-to-day management of the World Heritage property is guided by a management plan, which is complemented by subsidiary plans related to risk management and tourism management.

Table 6 provides an overview of values, attributes, and attribute groups of the property, as described in the 2025 Attribute Mapping report.

Additionally, the ICOMOS Toolkit on Heritage Impact Assessments recommends evaluating the potential impact of developments on other heritage values, including national or local values. In 2023, an overview of additional heritage values for the Old town of Kuldīga was drafted as part of the Heritage Impact Assessment for visitor infrastructure in Pārventas Park (Institute for Heritage Management 2023).

As can be seen in Table 7 below, other heritage values associated with the Old town of Kuldīga can be grouped into two categories for the purpose of this viewshed analysis. One category includes values such as the ecological importance of the site, notably the Nature reserve “Venta Valley” (2004). While these values are important and should be assessed in other impact assessments related to, for example, functional relations, they are not relevant to the assessment of visual impairments caused by potential wind farms.

The other category includes values related to the State Protected Cultural Monuments or to the Nature reserve “Venta Valley”, which overlap with values connected to the attributes of the UNESCO property, such as its landscape setting or the architecture and building fabric. Developments that prove to interfere with the property’s OUV will also likely affect these national values, and vice versa.

For the reasons mentioned above, the impacts on other heritage values are not specifically addressed in the following report.



Figure 13: The Old town of Kuldīga allows for an appreciation and understanding of the development of traditional Baltic architecture over time

Table 6: Analysis of the property's Statement of OUV (Source: Attribute Mapping report)

Statement of OUV	Heritage/ conservation values	Attributes	Landscape Setting	Attribute Group		
				Urban layout	Architecture and building fabric	Craftsmanship
Brief description						
Located in the western part of Latvia, in the central Kurzeme (Courland) region, the town of Kuldīga is an exceptionally well-preserved example of a traditional urban settlement . At the <u>confluence of the Venta River and the smaller Alekšupīte stream</u> , the beginnings of Kuldīga, which was called Goldingen at the time, date back to the 13th century.	well-preserved example of a traditional urban settlement	confluence of the Venta River and the smaller Alekšupīte stream		x		
The <u>rivers’ intersection is a defining element of the town’s structure</u> , contributing to its scenic character .	scenic character	confluence of the Venta River and the smaller Alekšupīte stream	x	x		
The <u>medieval area of Kalnamiests</u> , located on a hill, is clearly distinguishable in the townscape, given its oval shape.	well-preserved example of a traditional urban settlement	medieval area of Kalnamiests		x		
A significant part of Kuldīga’s history and development is linked to the Duchy of Courland and Semigallia, which governed a significant part of the Baltics between 1561 and 1795 . The town was the primary residence and administrative centre of the Duchy’s first ruler and maintained an important role afterwards. As a result, the town developed into a prosperous trading hub .	Duchy of Courland and Semigallia as a prosperous trading hub					
The international orientation of the Duchy led to a rising number of foreign merchants and craftsmen settling in Kuldīga, who left their mark on the <u>architectural language and building decoration of the region</u> .	international influence on building traditions	architectural language and building decoration				x
The town’s structure has largely retained the <u>street layout which developed during the period of the Duchy</u> .	well-preserved example of a traditional urban settlement	street layout which developed during the period of the Duchy		x		
The architectural influences and craftsmanship traditions introduced during the era of the Duchy endured well into the 19th century .	Continuity of craftsmanship traditions	architectural influences and craftsmanship traditions				x
However, different laws and regulations, aimed at fire safety, led to the progressive replacement of fire hazardous roofing materials . The proportion of <u>masonry buildings</u> also increased, replacing <u>traditional wooden ones</u> .	progressive replacement of fire hazardous roofing materials	Masonry buildings, wooden buildings			x	
In the second half of the 19th century, the brick <u>bridge over the Venta River</u> was constructed, connecting Kuldīga to the east .	Exchange with other regions	Brick bridge over Venta river		x		
Unlike other towns in the Baltic region, Kuldīga survived the great wars of the 20th century largely unscathed and modern urban developments were largely implemented far outside its historic centre .	Authenticity		x	x		

Statement of OUV	Heritage/ conservation values	Attributes	Landscape Setting	Attribute Group		
				Urban layout	Architecture and building fabric	Craftsmanship
Criterion (v)						
The Old town of <i>Kuldīga</i> is an outstanding example of a well-preserved urban settlement, representative of traditional Baltic architecture and urbanism and of multiple historical periods – from the 13th to the early 20th centuries.	outstanding example of a well-preserved urban settlement, representative of traditional Baltic architecture and urbanism and of multiple historical periods – from the 13th to the early 20th centuries.	traditional Baltic architecture and from the 13th to the early 20th centuries		x	x	
Its historic urban fabric includes <u>structures of traditional local log architecture</u> as well as largely <u>foreign-influenced techniques and styles of brick masonry and timber-framed houses</u> that illustrate the integration of local craftsmanship with foreign influences from other Hanse towns and centres around the Baltic Sea as well as Russia.	integration of local craftsmanship with foreign influences from other Hanse towns and centres around the Baltic Sea as well as Russia	structures of traditional local log architecture, foreign-influenced techniques and styles of brick masonry and timber-framed houses			x	
The craft skills are prominent in <u>functional and ornamental building details</u> throughout the town and continue to be employed by craftspeople today.	Continuation of craftsmanship traditions	functional and ornamental building details				x
The predominance of <u>clay tiles</u> as a roofing material contributes to the <u>harmonious townscape of Kuldīga.</u>		Clay tiles, harmonious townscape	x		x	
Integrity						
The property encompasses <u>the medieval castle mound plateau</u> , the medieval area known as Kalnamiests, and the <u>urban areas which developed during the ducal period from the 16th until the 18th centuries</u> but continued to organically evolve afterwards.		medieval castle mound plateau, Kalnamiests, urban areas which developed during the ducal period from the 16th until the 18th centuries		x		
In addition, large areas of the environmental setting of Kuldīga are also included, namely the <u>intersection of the Venta and Alekšupīte rivers</u> , as well as the <u>Ventas Rumba waterfall</u> , which was essential for the growth of Kuldīga into a trading centre.	environmental setting essential for the growth of Kuldīga into a trading centre	intersection of the Venta and Alekšupīte rivers, Ventas Rumba waterfall	x			
To maintain the harmonious townscape, the town’s general construction rules stipulate <u>maximum building heights within the property and its buffer zone.</u>	harmonious townscape	maximum building heights within the property and its buffer zone		x		
Authenticity						
The old town further preserves its authenticity in setting and location, which was a fundamental aspect for the development of the urban structure of the town, influenced by the <u>intersection of the Venta and Alekšupīte rivers.</u>		intersection of the Venta and Alekšupīte rivers, Ventas Rumba waterfall	x			

Table 7: Other heritage values associated with the Old town of Kuldīga

Level of recognition	Heritage/conservation values	Features	Sources of information	
International	Venta Valley is a united ecologically important complex with protected biotopes, species and habitats of European Union importance.	Biotopes, species and habitats of Venta Valley	Nature reserve "Venta Valley" (2004)	NATURA 2000
National	The monuments show a combined human and natural urban environment and landscape with the respective street network, buildings, historical planning structures and spatial layout as well as distinctive patios and landscape perspectives.	Building design structure, spatial layout, landscape and scale, panoramas and silhouettes, greenery system, plot construction and spatial layout, spatial organization of quarters, cultural layer of ancient buildings, characteristic terrain and waters, ancient brick bridge	Urban construction monument (No.7435) of state importance "The Historic Centre of the Town of Kuldīga" (1969, 2014) and urban construction monument of local importance no. 9320 "The Outskirts of the Historical Centre of Kuldīga with Venta valley"	Law "On Protection of Cultural Monuments" and "Protection Zone Law"
	Archaeological evidence of an important cultural layer of the town's history.	Traditional urban settlement, historical street layout	Archaeological monuments of state importance "Ancient Town of Kuldīga"	
	Archaeological evidence of an important cultural layer of the town's history.	Medieval castle mound plateau	Archaeological monuments of state importance "Kuldīga Medieval Castle"	
	Individual monuments, works of art, facilities and articles with historical, scientific, artistic or other cultural value and the preservation of which for future generations is in conformity with the interests of the State and people of Latvia, as well as international interests.	Architectural language and building details developed from international exchange, historic urban fabric (masonry, brick, timber- framed and log buildings), ancient brick bridge.	State Protected Cultural Monuments: 13 architectural, 1 historic and 58 art monuments of state importance, 7 architectural, 1 historic monuments of regional importance and 3 architectural monuments of local importance.	
	Venta Valley is a united ecologically important complex with protected biotopes, species and habitats of Latvian importance.	Biotopes, species and habitats of Venta Valley	Nature reserve "Venta Valley" (1957)	Law "On Specially Protected Nature Territories"
	Landscape structures, natural and aesthetic values of landscape elements, biologically valuable areas and protected biotopes	Venta Valley	Nature reserve "Venta Valley", nature park area (zone)	
	Scenic character and socio-economic value of the nature reserve	Historic water bodies, the Ventas Rumba waterfall and historical landscape zones	Nature reserve "Venta Valley", landscape protection area (zone)	

Level of recognition	Heritage/conservation values	Features	Sources of information	
National	The natural monument consists of a dolomite ridge with a waterfall and outcrops on the banks of Venta River. The natural monument is the largest and the most impressive of Latvia's waterfalls.	Venta waterfall	Geological nature monument "Ventas Rumba"	Law "On Specially Protected Nature Territories"
Local	The character and uniqueness of the historical urban environment, local building traditions, existing buildings and landmarks with cultural-historical and architectural value, as well as the structure of the city's historical planning, street network and character, cultural layer and landscape singularity.	<p>Urban layout: traditional urban settlement, historical street layout, medieval castle mound plateau</p> <p>Historic urban fabric: architectural language and building details developed from international exchange, historic urban fabric (masonry, brick, timber- framed and log buildings), ancient brick bridge.</p> <p>Environmental setting and scenery</p>	Territory of Local plan – the central part of the city of Kuldīga, which consists of urban construction monument of national importance no. 7435 "The Historic Centre of the Town of Kuldīga" and urban construction monument of local importance no. 9320 "The Outskirts of the Historical Centre of Kuldīga with Venta valley" territory and the adjacent territories of Jelgavas street, Krasta street and Ventspils street.	Local plan for the old town of Kuldīga in Venta Valley

3.2 Identification of attributes particularly vulnerable to potential wind farms in the property's wider setting (baseline definition)

The OUV of the property describes several different attributes that need to be protected to preserve the global importance of the Old town of Kuldīga. The Attribute Mapping report of the property grouped these attributes into four categories that allow for more effective management of the property, namely, (1) landscape setting, (2) urban layout, (3) architecture and building fabric, and (4) craftsmanship.

With regard to the attributes' vulnerability, there are single groups that can be assigned a specific vulnerability level in context of potential visual impairments. For example, all attributes of the landscape setting are highly vulnerable to visual impairment from wind farms within the property's surroundings. This is particularly true in areas where there are no or only negligible current visual impairments. For this reason, developers and authorizing entities for wind farm developments should be made aware that all future developments situated within the sightline of one or more attributes of the property's landscape setting, need to be carefully assessed, as they may potentially damage the property's OUV.

Attributes representing the craftsmanship of the property, on the other hand, are generally not vulnerable to such visual impairments, as they are only legible from close proximity. At the relevant angle, wind farms would only be visible from these attributes if located directly behind the building incorporating said craftsmanship, or if they were multiple kilometres tall. Both scenarios are unrealistic and, therefore, do not require consideration in this assessment.

Regarding the property's urban setting, there are different levels of vulnerability for different attributes. The confluence of Alekšupīte and Venta rivers, the Ventas Rumba waterfall and the town silhouette are particularly vulnerable to such developments, as their value is closely tied to their relation with the surrounding landscape. In contrast, the street and plot layout, as well as public squares, are not expected to be impacted by potential wind farms in the property's wider setting.

Finally, attributes related to the architecture and building fabric are only considered vulnerable towards wind farm developments if these developments fall within view corridors or sightlines that are considered attributes themselves, or if they interfere with the perception of the clay roofscape.

Table 8 provides an overview over the property's attributes and their potential vulnerability. The labelling and numbering follow the system outlined in the Attribute Mapping report (2025).

Table 8: Overview of the property's attributes and their potential vulnerability regarding visual impact from wind farm development

Attribute Group	No.	Attribute.	Level of significance	Vulnerability
Landscape setting	4.1.1	Venta Valley	significance	highly vulnerable
	4.1.2	Confluence of Alekšupīte stream and Venta river	high significance	highly vulnerable
	4.1.3	Ventas Rumba waterfall	significance	highly vulnerable
	4.1.4	Town setting	significance	highly vulnerable
	4.1.5	Panoramic views and view corridors		
	4.1.5 a	View corridor from the pathway of a nature walkway north of the property	high significance	highly vulnerable
	4.1.5 b	View corridor from the riverbank onto the confluence of Venta and Alekšupīte	high significance	highly vulnerable
	4.1.5 c	View corridor from Mārtiņšala beach towards the Medieval castle mound plateau	high significance	highly vulnerable
	4.1.5 d	View corridors from the centre of the brick bridge towards the north and south	significance	highly vulnerable
	4.1.5 e	View corridor from the Kuldīga Regional Museum onto Ventas Rumba waterfall	significance	highly vulnerable
Urban Layout	4.2.1	Confluence of Alekšupīte stream and Venta River	significance	highly vulnerable
	4.2.2	Ventas Rumba waterfall	high significance	highly vulnerable
	4.2.3 a	Street layout (including Kalnamiests, Medieval castle mound plateau, river crossings such as the brick bridge, pathways and streets)	high significance	not vulnerable
	4.2.3 b	Street layout of the Russian Empire within the buffer zone	potential significance	not vulnerable

Attribute Group	No.	Attribute.	Level of significance	Vulnerability
Urban Layout	4.2.4	Public spaces	significance	not vulnerable
	4.2.5	Continuity of urban development proportions		
	4.2.5 a	Plot layout	significance	not vulnerable
	4.2.5 b	Town silhouette	high significance	highly vulnerable
Architecture and building fabric	4.3.1	Architecture and building fabric of Ducal times		not vulnerable
	4.3.1 a	Dwellings and auxiliary buildings of the Ducal era	significance	not vulnerable
	4.3.1 b	St. Catherine's Lutheran Church, Holy Trinity Roman Catholic Church, the sexton's and the organist's homes in Raiņa Street, the old town Hall, the bell tower of the town's first cemetery, the Supreme Court House of the ducal era, the warehouse at 3 Liepājas Street	high significance	not vulnerable
	4.3.2 a	Architecture and building fabric of the Russian Empire	significance	not vulnerable
	4.3.2 b	Orthodox Church of the Holy Virgin, St. Anna's Church	potential high significance	not vulnerable
	4.3.2 c	Orthodox building complex at Liepājas Street	potential significance	not vulnerable
	4.3.3	Architecture and building fabric of Latvia's first independence	significance	not vulnerable
	4.3.3 a	Architecture and building fabric of Latvia's first independence within the buffer zone	potential significance	not vulnerable
	4.3.4	Building materials representative of societal and economical changes based on international relations and trading	significance	not vulnerable
	4.3.4 a	Wooden facades	significance	not vulnerable
	4.3.4 b	Stone facades	significance	not vulnerable
	4.3.4 c	Brick facades	significance	not vulnerable
	4.3.4 d	Plaster facades	significance	not vulnerable
	4.3.4 e	Mixed-method facades	significance	not vulnerable
	4.3.5	Clay tile roofscape	significance	highly vulnerable
	4.3.6	View corridors		vulnerable

Attribute Group	No.	Attribute.	Level of significance	Vulnerability
Architecture and building fabric	4.3.6 a	View corridors from St. Catherine's Church	high significance	vulnerable
	4.3.6 b	View corridor across architecture of different periods along Liepājas Street	significance	vulnerable
	4.3.6 c	View corridor across Catholic church district along Raiņa Street	significance	vulnerable
	4.3.6 d	View corridor across roofscape at Town Hall square	significance	vulnerable
	4.3.6 e	Panoramic view from the needle tower	potential significance	vulnerable
Craftmanship	4.4.1	Doors	significance	not vulnerable
	4.4.2	Canopies	significance	not vulnerable
	4.4.3	Porches	significance	not vulnerable
	4.4.4	Windows	significance	not vulnerable
	4.4.4 a	Front façade windows	significance	not vulnerable
	4.4.4 b	Gable windows	significance	not vulnerable
	4.4.4 c	Lantern windows	significance	not vulnerable
	4.4.5	Windboards	significance	not vulnerable
	4.4.6	Rain gutters	significance	not vulnerable
	4.4.7	Weather vanes	significance	not vulnerable

3.3 Brief description of planned future wind farm areas

In line with global efforts to counteract climate change, Latvia is increasingly building wind farms as a source of carbon-free power. The country's comparatively flat terrain and extensive shores of the Baltic Sea make it a perfect candidate for the development of large wind farms. To increase energy output in the future, current plans include to raise the height of wind turbines from 260 metres to as much as 350 metres.

At present, there are currently no wind farms within an approximate 15 kilometres radius from Kuldīga. Views towards Kuldīga from its wider setting and buffer zone, as well as those from within the property into the surrounding landscape, are currently entirely free of any wind turbines. For this reason, the introduction of even a single visible wind turbine would result in a change to the property's visual integrity.

The following section briefly describes existing plans that lie within a radius of 25 kilometres from Kuldīga, which might have an impact on the property's OUV.

All other currently planned wind farms in Latvia, such as the wind farms Alokste, Gudenieki and Peivika in the district of Liepāja, are situated more than 25 kilometres away. As it is commonly assumed that the visibility of wind turbines beyond such a distance has only a negligible impact on a property's OUV, these development projects are not considered in this report.

Ēdole – Austrumi

The closest planned wind farm is located on the border of Kuldīga and Ventspils municipalities, about 15 kilometres north-west of the property. The wind farm Ēdole – Austrumi proposed by Vestman Zemes Fonds SIA includes plans with up to 20 wind turbines, each with a capacity of 4-9 MW, across an area of approximately 270 hectares (Mana scēna).

EKO Ziemeļi

Right behind Ēdole – Austrumi area, the wind farm EKO Ziemeļi is currently being developed by EKO Ziemeļi SIA. The proposed territory spans 2960 hectares. At the time of this viewshed analysis, the project is undergoing a process of public discussion and consultation in accordance with Latvian legislation.

Currently, two alternative layouts are under discussion regarding location and

number of wind turbines. Both are located within a triangular area defined by the roads V1268, V1288, and P108.

- **Alternative A** proposes a total of 23 turbines, each with a capacity of 8 MW.
- **Alternative B** includes 20 wind turbines that are slightly repositioned but generally following the same overall plan.

In both alternatives, the wind turbines are currently planned to not exceed the present standard height of 260 metres.

Ēdole – Rietumi

A little west of Ēdole – Austrumi, Ēdole – Rietumi is planned, around 25 kilometres north-west of Kuldīga. It is developed by Vestman Zemes Fonds SIA and will hold up to 10 wind turbines with a capacity of 4-9 MW each on an area of approximately 240 hectares.

Ventspils 2

The wind farm Ventspils 2 is already under construction and encompasses an area of 10.375 hectares at a distance between 15 and 30 kilometres north-west of Kuldīga. The current plan proposes up to 60 wind turbines to be built there with a capacity of 8 MW each. The developer is Latvijas vēja parki SIA.

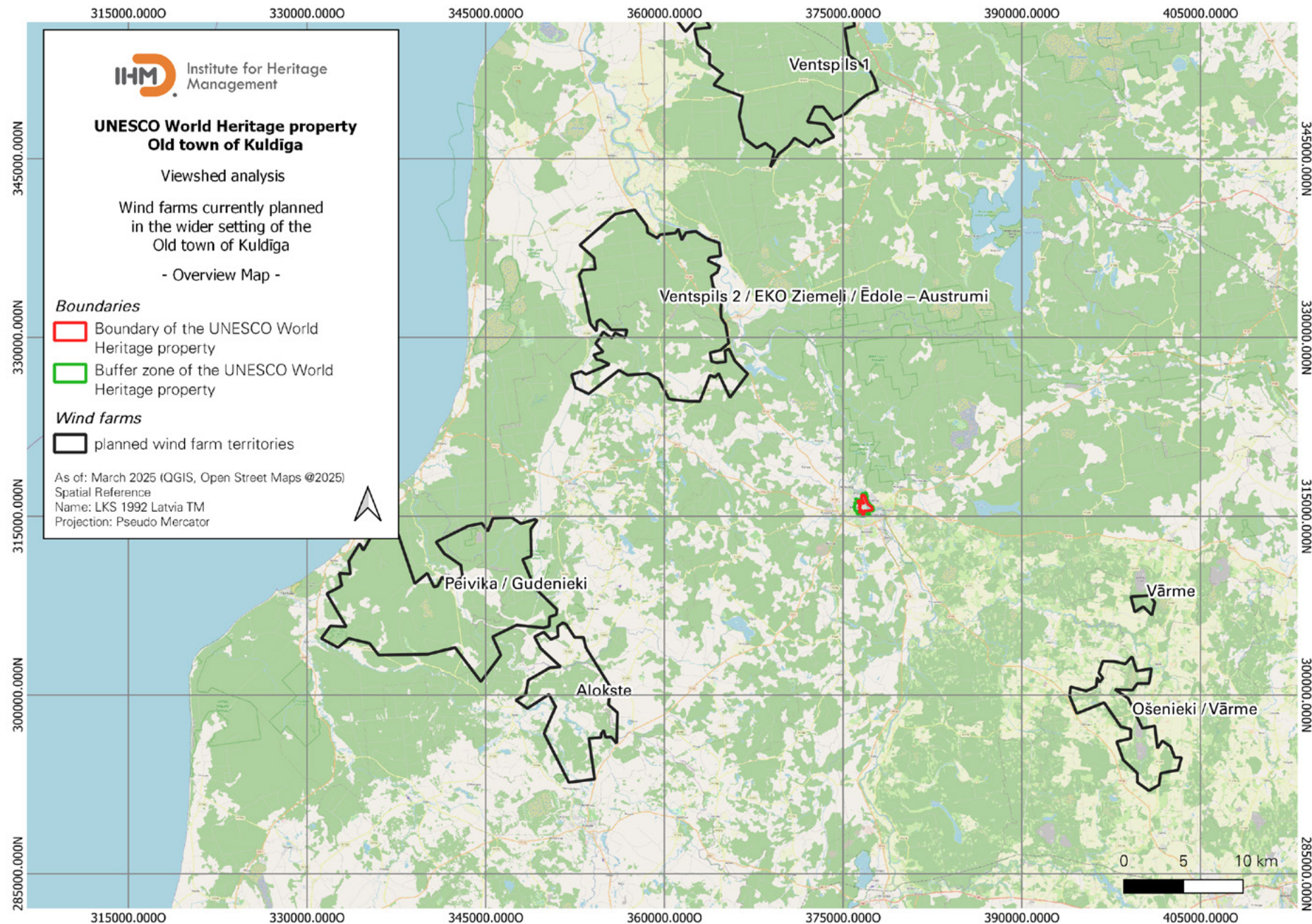
Ošenieki

South-east of Kuldīga, in the district of Saldus, the developer Vindr Latvia SIA is currently developing the wind farm Ošenieki. The total capacity of the farm is planned to be of 144 MW and the maximum height of the individual wind turbines is defined to be 260 metres, in accordance with the current standard. Up to 18 wind turbines are planned to be installed in an area of approximately 1388 hectares.

Vārme

Directly next to Ošenieki, a second wind farm is planned at the border of the districts of Kuldīga and Saldus. The developer SIA "SP Venta" is currently developing the wind farm Vārme with a total capacity of more than 150 MW. The height of the turbines' hubs could reach 180 metres, while the diameter of rotor blades is indicated to be between 160 and 200 metres. Up to 20 wind turbines are planned to be installed in an area of approximately 3310 hectares.

Map 2: Current plans for wind farms in the wider setting of Kuldīga



3.4 Identification of relevant viewpoints

Based on the previous analysis of attributes potentially vulnerable to the development of wind farms in the wider setting of the property, relevant viewpoints were identified from where these attributes can currently be perceived in a rather largely undisturbed state. As many of those views had not been previously documented, the property's site management team was consulted to identify additional viewsheds that might reveal attributes potentially susceptible to visual impacts from wind farms, and therefore warrant an assessment. Additionally, the Attribute Mapping report mentions ten viewsheds that are important for the property's OUV, indicating that they themselves are significant or even highly significant attributes of the site.

In total, 16 viewpoints, that were identified through these different criteria, were visited on site to determine their relevance for this viewshed analysis. This involved assessing whether the Old town of Kuldīga and its corresponding attributes were visible from each location. Viewpoints that, despite their favourable topography, did not offer visibility of relevant attributes - and hence do not contribute to the understanding of the property's OUV - were excluded from further assessment. This was the case for one viewpoint in the wider setting of the Old town of Kuldīga (see Figure 14).



Figure 14: The view towards Kuldīga from the street towards Priedaine (wider setting) illustrates that not all points with a higher topography automatically strengthen the legibility of the property's OUV

Table 9: Overview of all identified viewpoints of the property's OUV

POI	Name	Type of view	Height	Location		
				Property	Buffer zone	Wider setting
1	River bank opposite confluence of rivers	Singular view / specific view corridor	ground level	x		
2	Kuldīga Regional Museum	Singular view / specific view corridor	balcony	x		
3	Mārtiņšala	Singular view / specific view corridor	ground level	x		
4	Bridge towards north and south	360 view	ground level	x		
5	Entrance to UNESCO property	Singular view / specific view corridor	ground level	x		
6	St. Catherine's Lutheran Church	360 view	tower	x		
7	Catholic church district	Singular view / specific view corridor	ground level	x		
8	Liepājas street	Singular view / specific view corridor	ground level	x		
9	Town Hall	Singular view / specific view corridor	balcony	x		
10	River bank opposite observation tower	Singular view / specific view corridor	ground level	x		
11	Lookout future Nature Trail north	Singular view / specific view corridor	ground level	x		
12	Southern view onto city	Singular view / specific view corridor	ground level		x	
13	Observation tower	360 view	tower		x	
14	St Anna's Church	Singular view / specific view corridor	tower		x	
15	Needle tower	Singular view / specific view corridor	tower		x	

Table 9 provides an overview of the viewpoints confirmed to contribute to the legibility of the property's OUV. In total, 15 points were identified as relevant viewpoints for the property's OUV and should be considered in the context of future development projects-not only for wind farms, but also for any other developments that may pose a risk of visual impairment.

Since this report focuses on visual impairments generated specifically from wind farm developments, the identified viewpoints were further assessed regarding potential vulnerability to this type of development. The underlying mathematical theory evidenced that only seven of the fifteen identified viewpoints of the OUV could be potentially harmed by wind farm developments that are built in seemingly large distances from the property of 15 kilometres and over.

In consequence of this process, viewpoints 3, 5, 7, 8, and 9, despite their preservation being highly relevant for the legibility of the property's OUV, are not considered in the identification of exclusion areas, as their specific characteristics, such as the terrain they are located on, protect them from being endangered by the development of wind farms.

To illustrate this, Figure 15 shows the historic view from Mārtiņšala, which is largely preserved until today and therefore significantly contributes to the property's OUV. This view encompasses the town setting on the medieval castle mound as well as the brick bridge and the Venta Valley. Its safeguarding is highly significant to the overall preservation of the UNESCO World Heritage property. Yet, the mathematically evidenced calculations showed that even wind turbines of 350 metres height would only be visible if they were placed at a distance of less than 7 kilometres from this point. Wind turbines of 260 metres and 200 metres would be visible only if built even closer to the old town (see Map 3). Since it is not planned to develop wind farms below a distance of 10 kilometres from the property, and since the vulnerable areas in relation to these points are already included in the much larger exclusion areas resulting from the viewshed analysis for points with a visibility of wind farms up to a distance of 25 kilometres, viewpoints with similar results to the example below were excluded from further assessment.

The points remaining for deeper analysis are summarized in Table 10 and described in the following chapter. They are views where even a seemingly large distance of 15 to 25 kilometres could impact the property's OUV. The resulting exclusion areas for wind farm construction (see Chapter 6) hence already incorporate the areas closer to the property, where a visibility of wind farms would also exist from points such as the one shown in Figure 16.

Relating the results to the baseline definition in Chapter 2, it shows that the viewpoints potentially vulnerable towards wind farm developments are often located next to Venta river, hence facilitating views of the landscape setting, which was generally considered to be highly vulnerable in this regard. Additionally, a number of the identified viewpoints for assessment are in direct relationship of the town's clay roofscape.



Figure 15: Historical view from Mārtiņšala onto the Old town of Kuldīga (Photo credit: Municipality of Kuldīga)



Figure 16: Current view from Mārtiņšala onto the Old town of Kuldīga

Map 3: Visibility of wind farm developments from Mārtiņšala

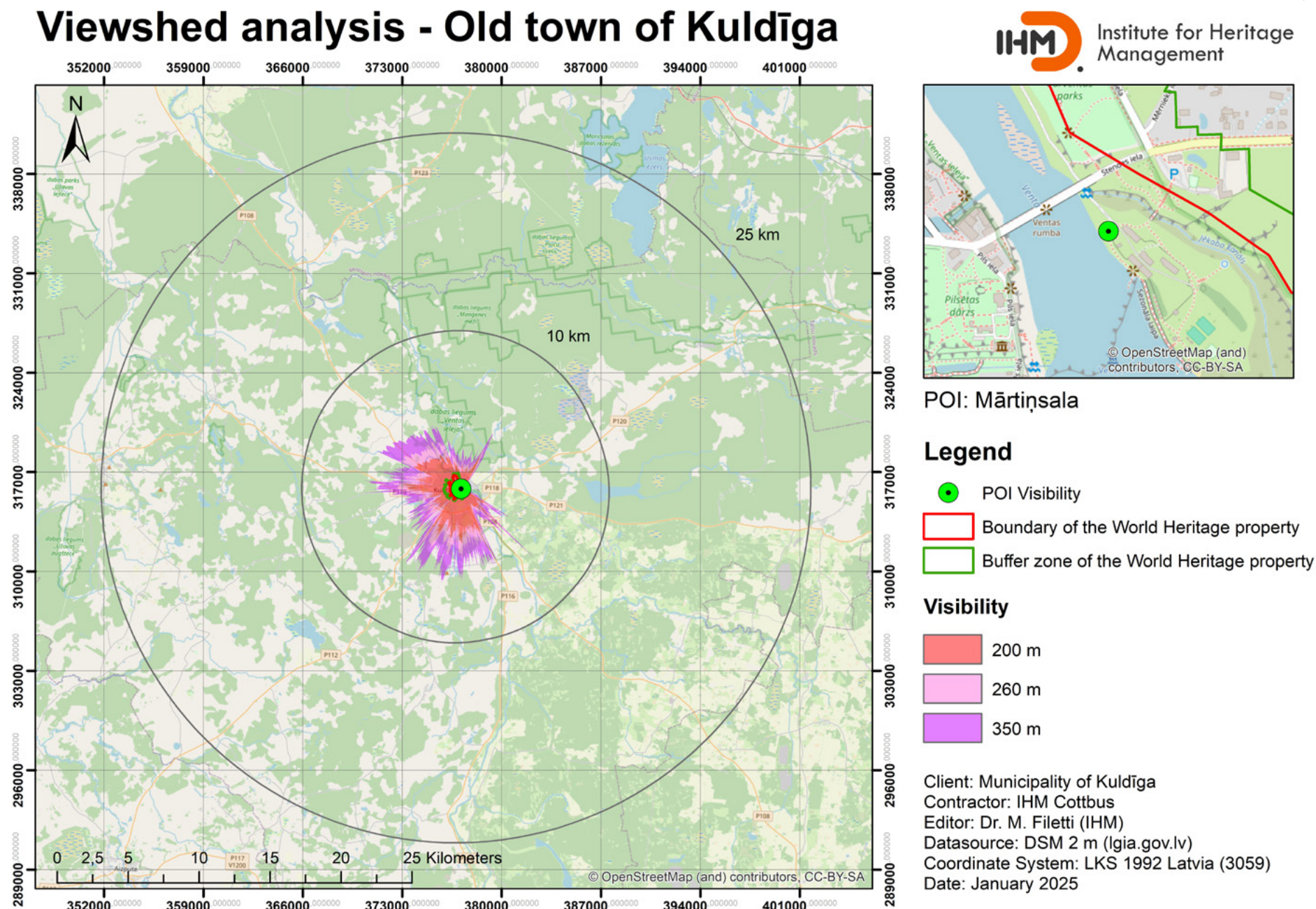




Figure 17: St. Anna's Church is visible behind the Holy Trinity Roman Catholic Church

Table 10: Overview of all identified viewpoints of the property's OUV potentially vulnerable towards wind farm developments

POI	Name	Type of view	Height	Location		
				Property	Buffer zone	Wider setting
1	River bank opposite confluence of rivers	Singular view / specific view corridor	ground level	x		
2	Kuldīga Regional Museum	Singular view / specific view corridor	balcony	x		
4	Bridge towards north and south	Singular view / specific view corridor	ground level	x		
6	St. Catherine's Lutheran Church	360° view	tower	x		
11	Lookout future Nature Trail north	Singular view / specific view corridor	ground level	x		
13	Observation tower	360 view	tower		x	
15	Needle tower	Singular view / specific view corridor	tower		x	

3.5 Documentation of the status quo

This chapter describes the seven views potentially vulnerable to the development of wind farms as a basis for all future assessments in this regard. They are presented in two groups, depending on their location in relation to the property.

Viewpoints within the UNESCO World Heritage property potentially vulnerable to the development of wind farms

POI 1: Eastern river bank

A few metres north of the ancient brick bridge, on the Eastern river bank, a small walking path runs along Venta. This particular perspective has inspired many artists to capture Kuldīga in the past (see Figure 18). For this reason, this view was documented in the property's Attribute Mapping report as an attribute of high significance for the landscape setting of the Old town of Kuldīga.

From this viewpoint, which is an attribute itself, a variety of attributes can be observed. This includes attributes of significance, such as the Venta Valley as well as dwellings and auxiliary buildings of the Ducal era. Furthermore, it encompasses attributes of high significance, such as the confluence of Alekšupīte stream and Venta river, the town setting, the town silhouette, and the brick bridge as part of the street layout. Attributes of three different attribute groups are visible from this view, namely attributes of the landscape setting, attributes of the urban layout, and attributes of architecture and building fabric. The visibility of attributes from this viewpoint is graded with 3 points.

Aside from the later constructed observation tower, this is the only vantage point from which Kuldīga can be fully perceived as an integral part of its landscape setting, offering a direct view of the town next to the bridge and the confluence of the Venta River and Alekšupīte stream. It is a direct continuation of a historic viewpoint that can be found throughout different artistic depictions throughout time. Due to the direct reference to the historic imagery, the uniqueness of the viewshed is graded with 3 points.

Lastly, the viewshed opposite the confluence of Alekšupīte stream and Venta river is graded with 3 points regarding the intactness of its integrity, since no distractions from the attributes are apparent.

In total, POI 1 reaches 9 points. This correlates to significance level A+. Preservation of this view significantly contributes to the overall legibility of OUV.



Figure 18: Historical view from the Eastern riverbank of Venta onto the Old town of Kuldīga with the river's intersection (Photo credit: Municipality of Kuldīga)



Figure 19: Current view from the Eastern riverbank of Venta onto the Old town of Kuldīga with the river's intersection

POI 2: Kuldīga Regional Museum

Kuldīga's Regional Museum is situated at the historic location of the duke's castle. The historical significance of this viewpoint is undeniable despite the lack of historic imagery. The view corridor from this location toward the waterfall provides continuity with the historic vistas from the castle, reflecting the strategic significance of its chosen location. The view itself is therefore considered an attribute of significance for the property's OUV.

From the balcony of the Kuldīga Regional Museum, it is possible to have an undisturbed view of Ventas Rumba waterfall (attribute of high significance) and the surrounding Venta Valley (attribute of significance). During winter, when the vegetation is low, the brick bridge as an element of the street layout (attribute of high significance) as well as several buildings of the ducal era (attributes of high significance) can be seen. While in summer, attributes of only one attribute group, namely the landscape setting, are visible from this view. In months of low vegetation, the visibility increases to three attribute groups, allowing for the perception of attributes of the urban layout and attributes of architecture and building fabric. The viewshed is graded with 3 points regarding the visibility of attributes.

The view from the Kuldīga Regional Museum is striking with regard to the visibility of the waterfall, which lies directly beneath the museum's balcony. Similar views can be obtained from multiple lookout points along the river bank between the museum and the brick bridge. However, given their lower height and the resulting higher impairment by vegetation of comparing views, the uniqueness of the viewshed is graded with 3 points.

There are no major irreversible impairments to be noted for this viewshed. During the summer months, Mārtiņsala beach is a popular attraction with large crowds of people enjoying cooling off in the water of Venta River. Furthermore, the direct view of the waterfall allows for observation of people crossing it on foot. As both people on the beach and crossing the river pose no permanent threat to the visual integrity of this viewshed, it is graded with 3 points regarding the intactness of its integrity. There are no significant distractions from the attributes within this viewshed.

In total, POI 2 reaches 9 points. This correlates to significance level A+. Preservation of this view significantly contributes to the overall legibility of OUV.



Figure 20: View across the waterfall and Venta Valley from the Kuldīga Regional Museum in the location of the ducal castle

POI 4: Brick bridge

When standing on the bridge across Venta River, the view opens itself to the abundant Venta Valley to the north and the Ventas Rumba waterfall to the south. These views could historically only be obtained by merchants crossing the river by horse cart. Since the 19th century, the views became accessible for everyone. The panoramic view from this location is considered to be an attribute of significance for the property's OUV.

The view towards the north (see Figure 21) allows for the appreciation of the wide Venta Valley (attribute of significance), the confluence of Alekšupīte stream and Venta River (attribute of high significance), as well as some dwellings of the Ducal era (attributes of significance). Attributes of three different attribute groups are visible from this view, namely attributes of the landscape setting, attributes of the urban layout, and attributes of architecture and building fabric. The view towards the south (see Figure 22) facilitates an unparalleled view of the Ventas Rumba waterfall (attribute of high significance) as well as the Venta Valley (attribute of significance), some dwellings of the Ducal era (attributes of significance) and the town setting (attribute of significance). It integrates the



Figure 21: View from the brick bridge towards the north



Figure 22: View from the brick bridge towards the south

same three attribute groups as mentioned above. Both views are graded with 3 points regarding the visibility of attributes.

With regard to the uniqueness of the views, both receive the highest possible grading. The location of the bridge in the centre of the river is unique. Both the Venta Valley towards the north and the Ventas Rumba waterfall to the south cannot be similarly appreciated from any other perspective. The views are graded with 3 points in the context of their uniqueness.

The view towards the north is disrupted by minor developments on both edges of the sight of field. As the main sight axis remains free from impairments, the viewpoint's integrity is graded with 2 points. The view towards the south is kept pristine. It is graded with 3 points regarding the intactness of the view's integrity.

In total, POI 4 reaches 8 points for the northern view and 9 points for the southern view. This correlates to an overall level A+ for both views. Preservation of both views contributes significantly to the overall legibility of OUV.

POI 6: St. Catherine's Lutheran Church

From the tower of St. Catherine's Lutheran Church, a unique panoramic view unfolds, which is an attribute of high significance for the property's OUV and therefore needs to be carefully protected. It is the only point within the property boundaries from where a bird's eye view of the attributes can be obtained. The tower is a popular destination for visitors and has one of the highest visitation frequencies amongst tourist attractions in town. Given its height, the viewpoint allows for a unique appreciation of the UNESCO World Heritage property, but it also gives a clear view of any disturbance to the OUV, such as existing radio towers.

The panoramic view from the tower of St. Catherine's Lutheran Church encompasses all of the relevant attribute groups, making the resulting view corridors exceptional for appreciating and experiencing the property's OUV. From this viewpoint, which is particularly popular amongst locals and visitors alike, it is possible to see attributes from the following categories: landscape setting within the Venta Valley, the urban layout with its cobbled streets surrounding the church, the architecture and building fabric, including private, public and auxiliary buildings predominantly from the ducal era, as well as elements of craftsmanship, such as the roof landscape, prominent gable windows and tin decorations, such as weather vanes. The views from St. Catherine's Lutheran Church are graded with 3 points regarding visibility of attributes.



Figure 23: View from St. Catherine's Lutheran Church towards the north of the property



Figure 25: View from St. Catherine's Lutheran Church towards the west of the property



Figure 24: View from St. Catherine's Lutheran Church into the Venta Valley north-east of the property



Figure 26: View from St. Catherine's Lutheran Church into the Venta Valley east of the property

With its almost 360° view and its height, the tower of St. Catherine's Lutheran Church allows for a far-reaching view across the property and its buffer zone into the wider setting of the Old town of Kuldīga. The view obtained from this particular point is without comparison and there is no other viewpoint from which a similar combination of attributes can be observed. The uniqueness of the viewshed is graded with the highest possible number of 3 points.

Looking down onto the landscape, several impairments to the visual integrity become visible, some of which are negligible whereas others are considered to negatively impact the property's OUV. The eastern and southern views are largely free of disturbances. The only visible interferences in those directions are single slim radio towers in the property's wider setting. When it comes to the western view, however, multiple disturbances are clearly noticeable, which were already mentioned as such in the property's attribute mapping: The radio tower next to Kuldīga's police station, which lies within the property's buffer zone, and a group of three radio towers on a hill near Upīškalns. Additional smaller towers are visible further north, when the weather is clear. Regarding the intactness of visual integrity, POI 6 is graded with 1 point.

In total, POI 6 reaches 7 points. This correlates to significance level A. Preservation of this view largely contributes to the overall legibility of OUV.

POI 11: Future lookout nature trail north

From the northern end of the property, near the Venta River, one can trace a historical viewshed of the Venta Valley, showcasing the historic Old town on its Western bank and the brick bridge connecting it with the later capital of Latvia. This view is considered an attribute of high significance to the property's OUV.

Similar to the historic depiction, the view is dominated by the width of Venta River, hence given a full understanding of the impressive Venta Valley (attribute of significance). The tower of St. Catherine's Lutheran Church is visible behind the treeline on the river bank. In months of lower vegetation, additional residential buildings become visible close to the river bank. Together, they represent the town silhouette, which is an attribute of significance that is considered highly vulnerable to wind farm developments. Additionally, the brick bridge is visible from here, representing the third attribute group, urban layout. Beneath the bridge, the Ventas Rumba waterfall is making an appearance. As the view itself is considered an attribute of high significance, and since three different attribute groups are visible from this viewpoint, it was graded with 3 points regarding the visibility of attributes.



Figure 27: Historical view from the north-western riverbank of Venta onto the Old town of Kuldīga (Photo credit: Municipality of Kuldīga)



Figure 28: Current view from the north-western riverbank of Venta onto the Old town of Kuldīga

The specific depiction of the town next to the river, with the full width of Venta and the waterfall depicting the historic origin of the overall development of the town, is unique from this point. Due to the naturally kept riverbends of Venta, the view is entirely different when moving closer to or further away from the town. There is no other viewpoint from where a similar combination of attributes can be observed. The historic image strengthens this argument. Its uniqueness is graded with 3 points.

This view of historic significance (see Figure 27) can still be perceived largely undisturbed today, when walking along the nature trail north of the property. Despite the view being strikingly similar to the historic one, a radio tower near Ābele is clearly visible on the view's horizon, especially on sunny days. The observation tower in Pārventas park also is a new addition to this view. For this reason, the view is graded with 2 points regarding its integrity.

In total, POI 11 reaches 8 points. This correlates to significance A+. Preservation of this view significantly contributes to the overall legibility of OUV.

Viewpoints within the property's buffer zone potentially vulnerable to the development of wind farms

POI 13: Observation Tower

In 2023, an observation tower was constructed in Pārventas park, at the exact location of a previous sightseeing tower that was dearly missed by the local population. The tower is located in the property's buffer zone, just outside the property boundary, and facilitates a unique view onto the Old town of Kuldīga. Since its opening, it has become increasingly popular. The observation tower marks one of the most popular destinations for visitors to the town and is most likely the view that people take in most consciously, as they climb the tower with the intention to get a full view of the UNESCO World Heritage property.

Despite not being a historic element of the town, the view corridors from the observation tower are unique in their ability to showcase all of the property's attribute groups jointly. Towards the north, the Venta Valley (attribute of significance) can be seen in all its width and density of trees and meadows. Towards the west, the tower offers a unique view of the townscape embedded in the landscape setting (attribute of significance), highlighting the confluence of both rivers that played a pivotal role in Kuldīga's development (attribute of high significance). Finally, the view towards the south gives an understanding of the town in the context of the Ventas Rumba waterfall (attribute of significance).



Figure 29: View from the observation tower in Pārventas Park across the Venta Valley towards the northern area of the property



Figure 30: Close-up of the western view from the observation tower in Pārventas Park



Figure 31: Panoramic view of the Old town of Kuldīga from the observation tower in Pārventas Park



Figure 32: View of the Old town of Kuldīga from the Needle Tower with the radio tower interrupting the town silhouette

The panoramic view from the observation tower is graded with 3 points in the context of the attributes' visibility.

Given the tower's location, it enables a particular view that is not obtainable from any other perspective in town. There is no similarly high structure that allows for appreciation of all attribute groups, including the town setting, its silhouette and the landscape elements that build the foundation for Kuldīga's development. Similarly, viewpoints on the ground level might showcase some similar attributes, but they do not allow for the same level of detail and hence do not facilitate the same educational process regarding the property's OUV as this viewpoint. It is graded with 3 points regarding its level of uniqueness.

All of the disturbances listed within the Attribute Mapping report (diverse radio towers and the roofs of Kuldīga's hospital) are visible from this viewpoint. As they are mostly at a far distance, the angle is different looking at them in comparison to the viewing angle when observing the attributes. Nevertheless, the view from this point is disrupted by multiple modern developments that largely distract from the attributes. It is graded with 1 point regarding its integrity.

In total, POI 13 reaches 7 points. This correlates to significance level A. Preservation of this view largely contributes to the overall legibility of OUV.

POI 15: Needle tower

The needle factory of Kuldīga is a unique local heritage site. Built in 1854, the building represents the only needle factory of the Russian Empire. Its location within Kuldīga reinforces that Kuldīga continued to hold importance even after the Duchy of Courland and Semigallia ceased to exist in 1795. Today, the tower houses a museum. From the roof, it is possible to view Kuldīga from above.

The view from this viewpoint mainly allows for distinction of attributes from two attribute groups: urban layout and architecture and building fabric. Along Liepājas Street, a series of residential buildings, especially from the Russian Empire, can be seen (attributes of significance). In addition, the clay tile roofscape is visible from this point (attribute of significance). Finally, all of the town's churches (St. Anna's Church, Holy Trinity Catholic Church, St. Catherine's Lutheran Church and the Orthodox Church of the Holy Virgin) can be seen. Together, they form the town silhouette (attribute of significance). Overall, the visibility of attributes from the Needle Tower is graded with 2 points.

The viewshed is the only bird's-eye view that can be obtained from the Western side of the property. There is no other view from where all church spires of Kuldīga can be seen. It is furthermore the only point from which the particularity of the clay roofscape can be seen and understood in direct contrast to the later roofs in the buffer zone, which no longer continue this tradition. Its uniqueness is therefore graded with 3 points.

Regarding the view's integrity, it is unfortunately entirely dominated by the radio tower next to the police station. The structure's height of 70 metres clearly dominates the view and distracts significantly from the attributes. It particularly interferes with the town silhouette. The intactness of the view is therefore graded with 0 points.

In total, POI 15 reaches 5 points. This correlates to significance level B. Preservation of this view somewhat contributes to the overall legibility of OUV. If the tower were to be removed in the future, the view might result in an A or A+ grading.

3.6 Development of zoning concept

This viewshed analysis was prepared in the context of the development of a new territorial plan for Kuldīga district, which aims at indicating where wind farms can be developed in the future and where such developments could be damaging to the OUV of the UNESCO World Heritage property. To comply with the State Party's pledge to UNESCO to protect the Old town of Kuldīga for future generations, it is the wish of Kuldīga Municipality to develop landscape protection zones that take into consideration the impact new wind farm developments might have on the property and its OUV.

At the basis of these zones lies a computer-based analysis of all points that (a) contribute to the legibility of the property's OUV, and (b) where the previous mathematical assessment, taking into account the terrain, distance and viewing angle, concluded that a general visibility of wind farm developments is given.

In the methodology chapter it was established how different impacts interact with the respective levels of significance. Matrix 1 (p. 20) showed how even minor impacts should be relocated in the context of a viewshed that is assessed as an A+ view. For a view assessed to be of level A, minor impacts can be mitigated, while medium impacts remain problematic and projects of large impacts should not be carried out at all. For level B views, large impacts should be considered for relocation, while medium and minor impacts can likely be mitigated. A view graded to be of level C is irrelevant for the property's OUV and hence does not need any further discussion. Table 11 gives an overview of the results from the assessment of the status quo of each of the viewpoints considered relevant for the UNESCO property.

Table 11: Overview of the assessment of the status quo

Criteria	Viewpoint (POI)							
	1	2	4N	4S	6	11	13	15
a) Visibility of attributes	3	3	3	3	3	3	3	2
b) Uniqueness of viewshed	3	3	3	3	3	3	3	3
c) Intactness of the view's integrity	3	3	2	3	1	2	1	0
Points total	9	9	8	9	7	8	7	5
Level of significance	A+	A+	A+	A +	A	A+	A	B

Based on the walk-over survey and the related assessment of the status quo of the seven viewpoints potentially vulnerable to wind farm developments, it showed that four of them are of the highest significance level A+: (1) The eastern river bank across from the confluence of Alekšupīte and Venta rivers, (2) Kuldīga Regional Museum, (3) the brick bridge (both directions), and (4) the future lookout at the nature trail north of the old town which is currently under construction. Their preservation significantly contributes to the overall legibility of the property's OUV. Vice versa, their disruption by modern developments, such as wind farms, will significantly impact the property's OUV, which is why any developments potentially impacting those views need to be treated with utmost caution. According to the matrix assessing the adverse effects of planned wind farms, any wind farms that have even a minor impact on an A+ viewpoint, are within the orange zone, meaning that they will have an impact on the property and therefore need to be assessed by means of an HIA. Only projects that prove to have no impact at all, or a negligible impact, can be carried out without mitigation or adaptation measures, when situated within these viewsheds. This is mostly the case if the height of the single wind turbines remains below 200 metres.

In addition to the points classified as level A+, there were two viewpoints of level A: (1) St. Catherine's Lutheran Church and (2) the Observation tower. Preservation of both views largely contributes to the overall legibility of OUV, and is equally important to be preserved. These points are a little less vulnerable to impacts than the previous category, which is mainly caused by their current integrity, which is already impaired by high-rise structures, such as radio towers. Similar to the previous category, any impact assessed as level (III) produces a highly significant conflict and therefore cannot be carried out. Impacts graded as level (II) are in need of an HIA, whereas level (I) impacts need to be assessed on a case-by-case basis, meaning that the responsible authority of Kuldīga Municipality is to decide whether or not an HIA needs to be carried out, based on the specifics of the respective wind farm proposal presented to them.

Only one view point proved to hold a lesser significance, correlating to level B. Preservation of this view somewhat contributes to the overall legibility of OUV, yet, it is already disrupted by medium to large developments that lessen its significance level. Currently, for this view, impacts of levels (I) and (II) have to be considered on a case-by-case basis. Only level (III) impacts are in need of a definite HIA. It is important to be aware that this view would be assessed as a higher level of significance in the future, if the radio tower in the buffer zone were to be relocated.

To allow for case-specific decision-making, a computer-based analysis was carried out within a 25 kilometre radius surrounding those viewsheds that proved to have level A or A+ grading and that could be impacted by large development projects. The level B view was not computer-analyzed separately due to the fact that the results of the higher significant viewpoints already integrated all areas of OUV that would be visible from here. The results are presented in the annex to the report (see p. 64).

Above a distance of 25 kilometres, even a clear view of a wind farm is typically negligible regarding the dominance it holds over the property's attributes, which is why no visualization above this radius was carried out. Based on the topography of Kuldīga and the surrounding land, a 15 kilometre radius was identified to be at a higher risk of negative impacts from wind farm development. The selection of 15 kilometres is reasoned by a series of visualizations, which present wind farms of the exact same height at 25 kilometres, 20 kilometres, 15 kilometres, and 10 kilometres distance. While in many cases the visualization of wind turbines at 20 kilometres distance could be considered acceptable, those at 15 kilometres distance did start to produce a significant impact.

Based on an overlap of the computer-generated visibilities of wind farms from each of the relevant viewpoints, a map was created that incorporates all of the relevant areas (see Map 4).

No-Go zone for wind farm developments of 260 metres and higher (red)

A No-Go zone for wind farm developments of 260 metres and higher is recommended to be established within a radius of 15 kilometres from the Old town of Kuldīga towards the north-west as well as the east and south-east. The zone is primarily located within the district of Kuldīga, yet reaches into Ventspils in the north-west. Based on an overlap of the visibilities from the four viewpoints generating views graded as significance level A+, it showed that this area is particularly vulnerable for wind farm developments, so that the property's OUV would be significantly harmed if wind farms were to be developed in this zone.

No-Go zone for wind farm developments of 350 metres and higher (red hatched)

Should wind farm developers plan on building new territories or repowering existing ones with wind turbines of 350 metres height, the effects described above span for an extra 2 to 3 kilometres, dependent on the topography of each specific location.

Map 4: Recommended zoning concept to prevent negative impacts from wind farm development

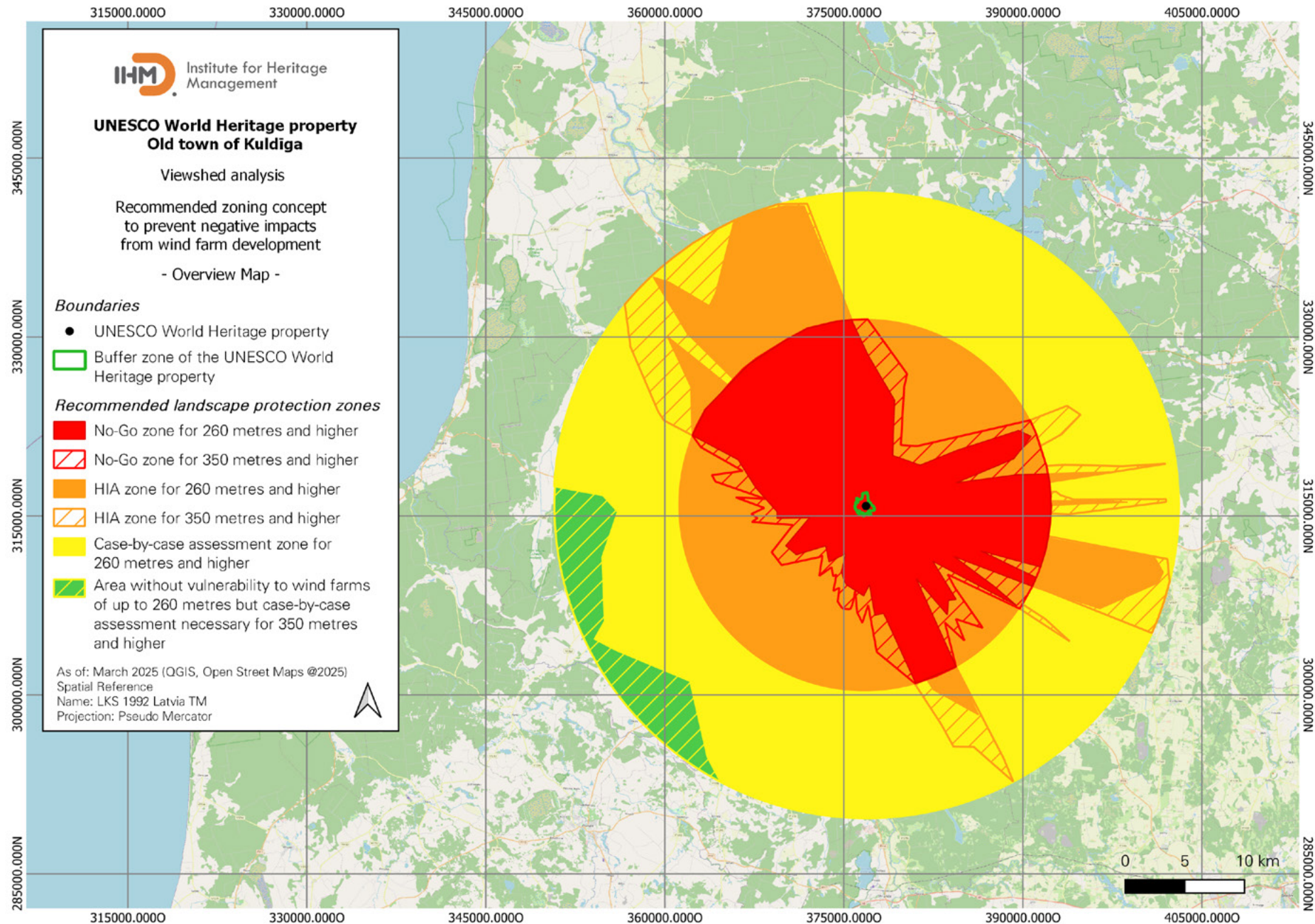




Figure 33: Wind farms of 260 metres and higher are problematic within a radius of 15 kilometres surrounding the property as the entire hub as well as part of the turbines' poles would be visible.

HIA zone for wind farm developments of 260 metres and higher (orange)

The assessment base of the HIA zone for 260 metres was informed by (a) visibility at a distance between 16 and 25 kilometres from a viewpoint graded as A+, and (b) visibility within a radius of 15 kilometres from a viewpoint graded as A. Due to the fact that both level A views are located on viewing towers, and therefore provide for a vast view into the wider setting of the property, the entire area within a 15 kilometre-radius from the town centre is recommended to be declared an HIA zone, meaning that wind turbines of 260 metres or higher can only be located here after an HIA assessed possible adaptation measures as well as alternative locations.

Additionally, wind farms in the area north-west of Kuldīga, towards Piltene and Ventspils, are particularly likely to impair the property's OUV, as they lie within the central sightline across the Venta Valley. Lastly, there are single view corridors towards the south-east that require an HIA also at a distance between 16 and 25 kilometres.

HIA zone for wind farm developments of 350 metres and higher (orange hatched)

HIAs for wind farm developments with wind turbines of a height of minimum 350 metres are necessary within the entire HIA zone defined for wind farm developments of 260 metres. In addition, the previously mentioned areas north-west and east to south-east of the property need to be given attention, when developing structures of this height. Especially towards Ventspils, the entire view corridor with a width of 20 kilometres needs to be assessed by means of HIAs to ensure protection of the OUV.

Zone in need of case-by-case assessments regarding wind farm developments of 260 metres and higher (yellow)

As a result of the two level A-views being located on viewing towers, they have a far reaching visibility (see Annex). For this reason, almost all of the remaining areas within a radius of 25 kilometres require a case-by-case assessment whether a wind farm in this area would be possible. The entire north and north-east of Kuldīga are affected by this this area. They largely correspond to existing nature protection zones in this area that might already hinder a construction of wind farms.

Zone in need of case-by-case assessments regarding wind farm developments of 350 metres and higher (yellow hatched)

In the far south-west of the property, towards Aizpute and Pavilosta, there are two small corridors of up to 5 kilometre width each where wind turbines with a height of 350 metres could be seen, while 260 meters remain invisible.

Areas without vulnerability to wind farms (green)

No areas without vulnerability to wind farms could be identified within a 25-kilometre-radius of Kuldīga, when assessing wind towers of 350 metres' height. Wind turbines of 260 metres can be located in the far south-west of the property, without interfering with the property's OUV. This result is reflected in the recommendation chapter.

3.7 Visualization of planned wind farms/ 3.8 Assessment of the foreseen level of impact of wind turbines on spatial development

The planned wind farms described in Chapter 3.3 are located in the north-west and south-east of Kuldīga. Table 12 documents the distance of the closest point of each of the currently planned wind farms to the relevant viewpoints, without taking into consideration the terrain or the viewing angle. It illustrates that none of the wind farms are being situated within the viewshed of each of the viewpoints, yet, all of them could potentially be seen from at least three of the viewpoints.

The colour-coding system aims at facilitating better readability of the table. Whenever wind farms are at a distance of more than 25 kilometres or lie in the opposite direction of the relevant viewshed, they are marked green, meaning that there is no further assessment necessary. Wherever the distance between a wind turbine and a viewpoint is at 25 kilometres or less, and they have a direct sight relationship, they appear orange to indicate that a conflict will likely arise in this context. As the distance itself does not indicate the potential level of impact, this table only serves as guidance for a general tendency and cannot stand alone. The intensity of arising conflicts is not yet reflected in Table 12.

Map 5 further visualizes how these areas reach into the previously defined protection zones. The map shows that more than half of the complex surrounding Ventspils 2 / Eko Ziemeļi (see Chapter 3.3 for descriptions of the planned wind farms) lies within a zone where a case-by case assessment would be necessary for wind turbines of 260 metres and higher, as they could be seen from the views graded with level of significance A. Wind turbines of 350 metres would be visible from viewpoints that were graded with a current significance level of A+ even if located at a distance of 25 kilometres in the north-west direction, and would therefore be in need of an HIA for a large part of the planned complex surrounding Ventspils 2 / Eko Ziemeļi. Wind towers of 260 metres are recommended to become subjects of HIA in the area closer to the property. With regard to the planned wind farms in the south-east of the property, the Vārme wind farm is in need of an HIA for developments of 350 metres. A case-by-case assessment is relevant for wind turbines of 260 metres.

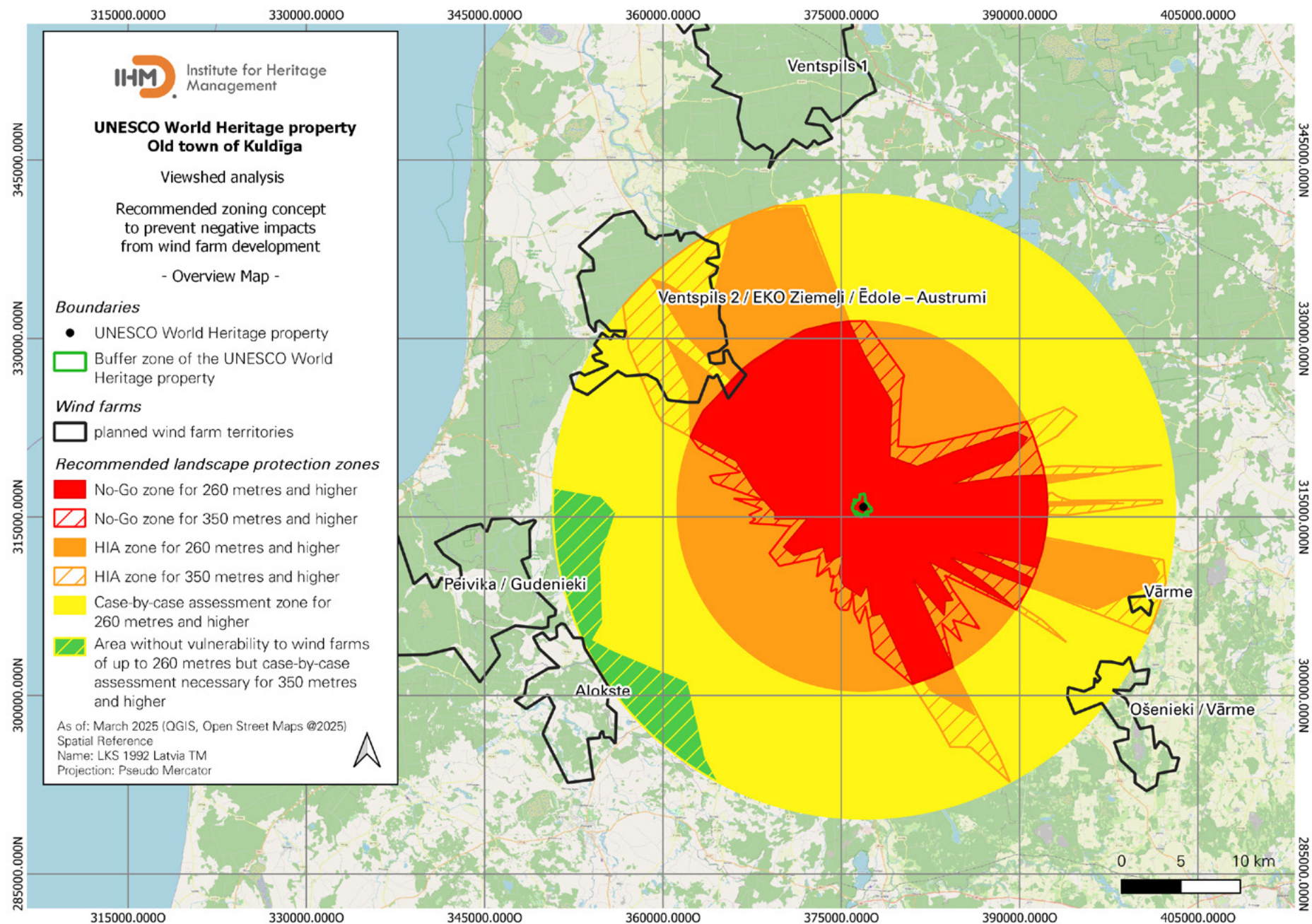
It was mentioned previously that visibility cannot be taken as the sole criterium to judge the actual impact of a wind farm development on the property's OUV. For this reason, the specific impact for the wind farms within the suggested zoning concept will be discussed based on photo simulations below, following

the criteria discussed in the methodology chapter. This is common procedure and corresponds to the type of assessment that needs to be carried out within yellow areas in the future. The impact is assessed for the currently planned maximum height of 260 metres, as well as for the potential height of wind turbines in the future, which is currently foreseen to be 350 metres, respectively.

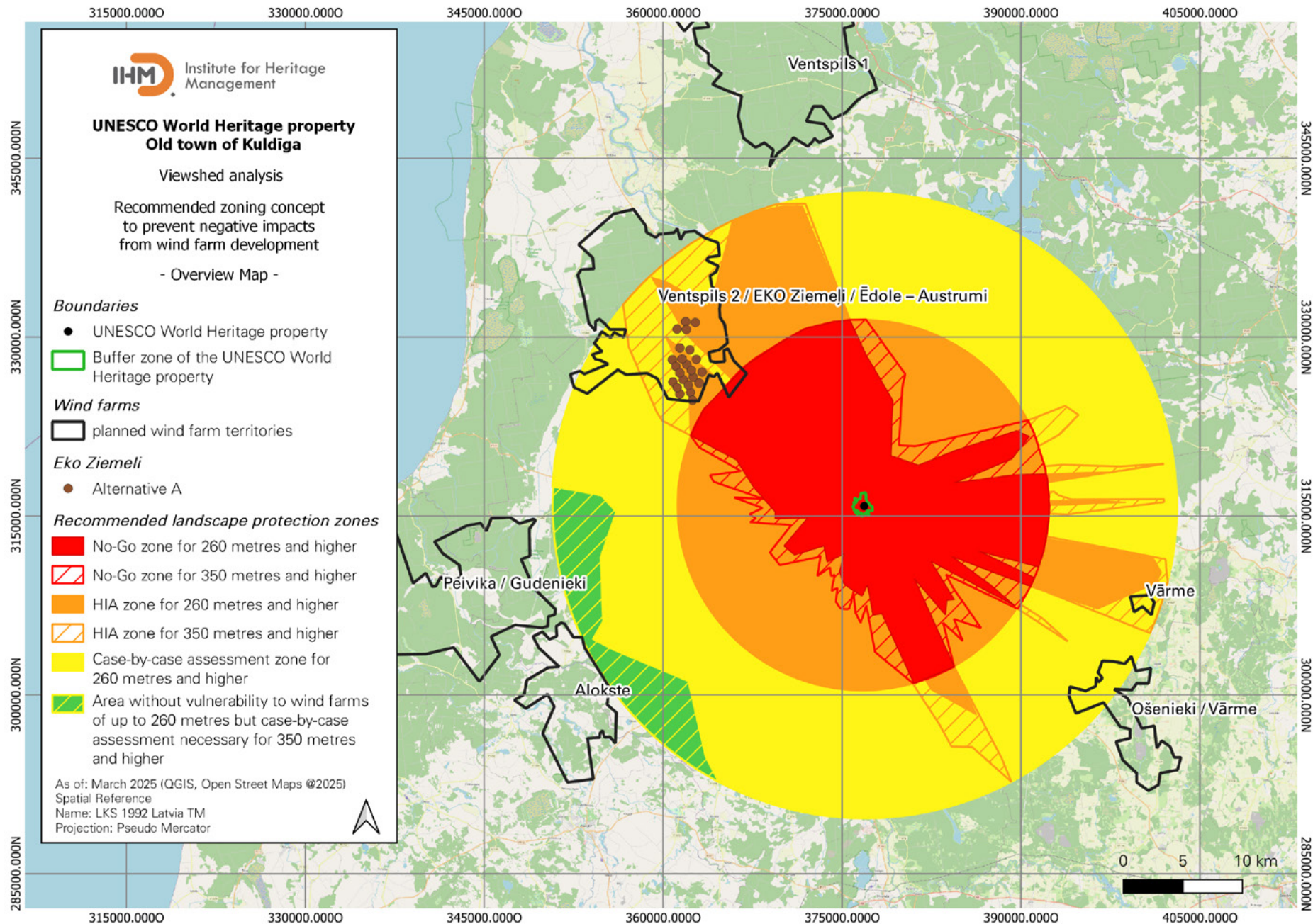
Table 12: Overview of the distance from each of the planned wind farms to the viewpoints of the UNESCO property

		Ēdole – Austrumi	EKO Ziemeļi	Ēdole – Rietumi	Ventspils 2	Ošenieki	Vārme
UNESCO property	River bank opposite confluence of rivers	16 km	16 km	25 km	14 km / not within relevant viewshed	24 km / not within relevant viewshed	23 km / not within relevant viewshed
	Kuldīga Regional Museum	16 km / not within relevant viewshed	16 km / not within relevant viewshed	25 km / not within relevant viewshed	15 km / not within relevant viewshed	24 km	23 km
	Bridge towards north and south	16 km	16 km	25 km	15 km	24 km	23 km / not within relevant viewshed
	St. Catherine's Lutheran Church	16 km	16 km	25 km	14 km	24 km	24 km
	Lookout future Nature Trail north	15 km / not within relevant viewshed	15 km / not within relevant viewshed	24 km / not within relevant viewshed	14 km / not within relevant viewshed	24 km	24 km / not within relevant viewshed
Buffer zone	Observation tower	16 km	16 km	25 km	14 km	24 km	24 km / not within relevant viewshed
	Needle tower	16 km / not within relevant viewshed	16 km / not within relevant viewshed	25 km / not within relevant viewshed	14 km / not within relevant viewshed	24 km	24 km

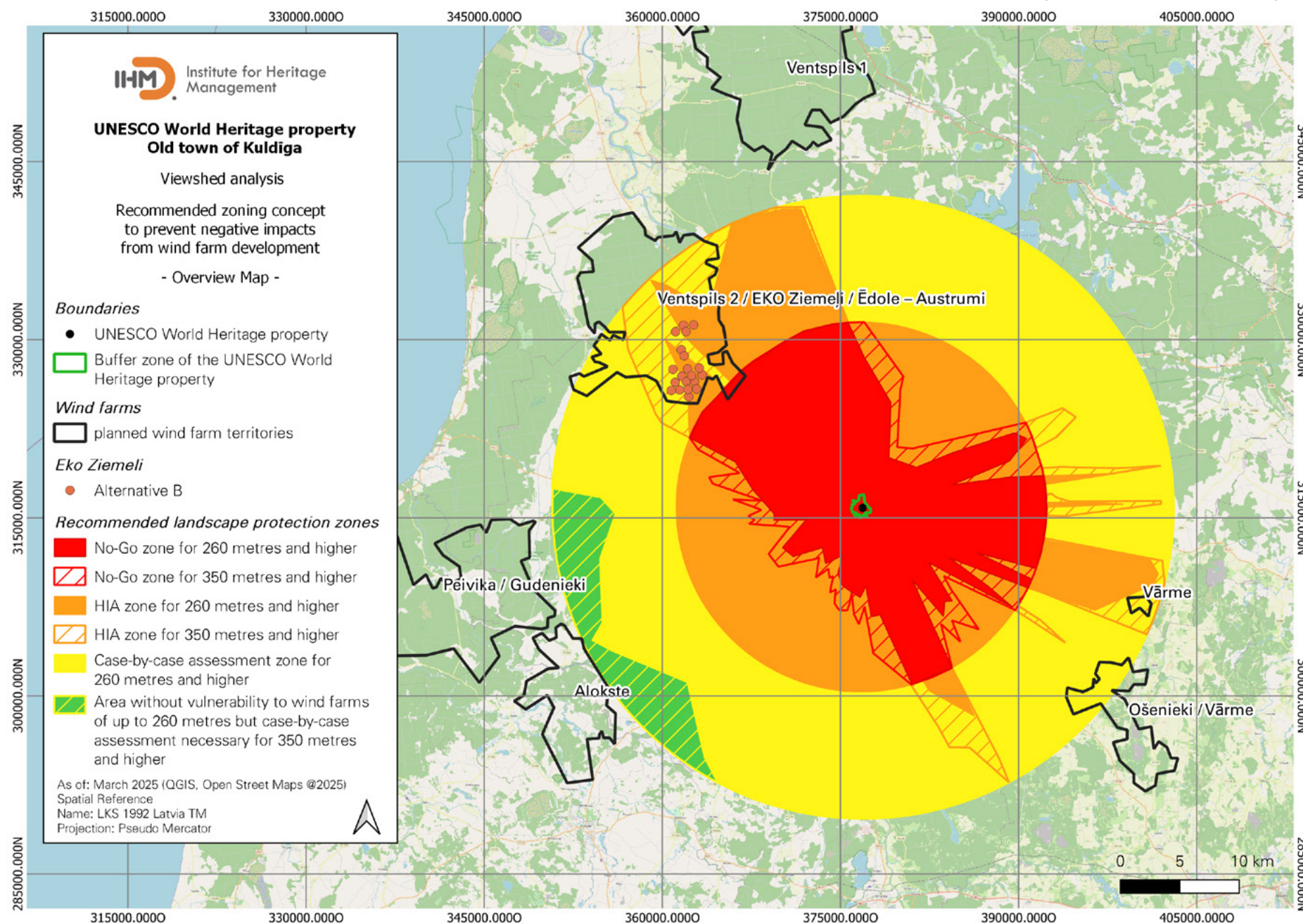
Map 5: Location of planned wind farms in relation to the previously defined recommended zoning concept



Map 6: Location of Alternative A of the planned EKO Ziemeļi wind farm with regard to the recommended zoning concept



Map 7: Location of Alternative B of the planned EKO Ziemeli wind farm with regard to the recommended zoning concept



Due to their proximity, the six relevant planned wind farms are joined into two geographical clusters that are analysed together. The impact of the complex north-west of Kuldīga, which lies at a minimum distance of 14 kilometres from the property, is discussed for the view from the brick bridge towards the north, from St. Catherine's Lutheran Church and from the observation tower. The impact of the complex south-east of Kuldīga, which lies at a minimum distance of 23 kilometres from the property, is discussed for Kuldīga Regional Museum, St. Catherine's Lutheran Church, and the observation tower.

Viewpoints within the property potentially vulnerable to the development of wind farms in the north-west of Kuldīga

POI 4: Brick bridge

When standing on the brick bridge, the photo simulation (see Figure 34) shows that despite being situated within the HIA-zone that is foreseen to have potential visibility of wind farm developments, at the currently planned height of 260 metres, the individual wind turbines would not be visible behind the tree line. The proportional vertical visibility of wind turbines is therefore graded with 0 points. Given the lack of general visibility, the proportional horizontal visibility of wind turbines, as well as the dominance visible of wind turbines in the viewshed, are also graded with 0 points. In total, no impact is foreseen for the planned wind farms in the district of Ventspils, if executed with the currently planned height of 260 metres. It is assessed as an impact of level (0).

To be able to ensure a sustainable future with renewable energies, there is a strong tendency worldwide for the individual height of wind turbines to increase. For this reason, it is important for new wind farms to consider not only the impact of the current state of the art, but to furthermore take into consideration the potential impact of later height increases when deciding on the exact location of the wind turbines.

The photo simulation of the wind turbines planned at the south-eastern most point of the complex north-west of Kuldīga was therefore repeated with an increased height of the individual wind turbines (see Figure 35). In months of low vegetation, the hub of single wind turbines would be visible behind the tree cover. The proportional vertical visibility was therefore graded with 2 points. However, the small number of wind turbines actually visible leads to a grading of 0 points regarding the proportional horizontal visibility of wind turbines. The individual wind turbines are interrupted by trees and are not perceptible as a larger wind farm. Despite being only 16 kilometres away, they are not



Figure 34: Potential impact of 260-metre-high wind turbines at Ventspils 2 / EKO Ziemeli on the view of the Venta Valley from the brick bridge over Venta River



Figure 35: Potential impact of 350-metre-high wind turbines at Ventspils 2 / EKO Ziemeli on the view of the Venta Valley from the brick bridge over Venta River



Figure 36: Potential impact of 260-metre-high wind turbines at Ventspils 2 / EKO Ziemeli on the view of attributes of architecture and building fabric as well as attributes of craftsmanship from St. Catherine's Lutheran Church



Figure 37: Potential impact of 350-metre-high wind turbines at Ventspils 2 / EKO Ziemeli on the view of attributes of architecture and building fabric as well as attributes of craftsmanship from St. Catherine's Lutheran Church

dominating the viewshed and do not distract from the view of the Venta Valley. The dominance is therefore also graded with 0 points. In total, the placement of wind turbines of a height of 350 metres at the planned wind farms in the north-west of Kuldīga, is graded with a total of 2 points in the context of the brick bridge. Despite the partial visibility of single wind turbines, the impact is foreseen to be negligible. It is assessed as an impact of level (0).

POI 6: St. Catherine's Lutheran Church

St. Catherine's Lutheran Church historically builds the highest viewpoint within the property boundary. Today, it is possible to access the church tower for a unique panoramic view of the Old town of Kuldīga. As described above, a series of different attributes can be observed from here in a way that is not possible elsewhere. A simulation of the planned Ventspils 2 / EKO Ziemeli wind farm shows that due to the tower's height, it is possible to distinguish the hubs of the wind turbines in the distance, right behind the exhaust pipe located at the Duna brewery, when looking into the wider setting of the property towards the north-west. The proportional vertical visibility of wind turbines of a height of 260 metres is therefore graded with 2 points.

With regard to the proportional horizontal visibility of wind turbines, the wide panoramic view seems almost limitless. The wind farm would extend over less than 10% of the horizon, receiving 0 points in context of horizontal visibility.

The planned wind turbines are located in a far distance and can only be seen when focusing the view on the horizon. The appreciation of the property's attributes of OUV, however, requires a different viewing angle when standing on the tower of St. Catherine's Lutheran Church. The roofs and streets contributing to the property's OUV are right beneath the church tower. For this reason, the planned Ventspils 2 / EKO Ziemeli wind farms are situated entirely outside of the view corridor relevant for appreciation of attributes of OUV. Whereas in the east of the property, the view towards the north-west stretches across the Venta Valley, from St. Catherine's Lutheran Church the largest proportion of the north-western view spans across the property's buffer zone and wider setting. When looking at the attributes of OUV, the wind turbines are therefore not noticeable. The dominance of wind turbines in this viewshed is graded with 0 points.

In total, the impact of the foreseen wind turbines with a height of 260 metres within the wind farm in the district of Ventspils reaches 2 points from this viewpoint, showing a negligible impact. It is assessed as an impact of level (0).

When rising the height of the turbines to 350 metres, the impact becomes higher from this perspective. As the wind turbines are located at a distance of between 16 and 22 kilometres from this point, they are generally noticeable. The proportional vertical visibility increases along the height of the wind turbines. At a height of 350 metres, the hub is entirely visible for all towers. For single examples, all three rotor blades are completely visible and the tower is at least partially visible. Overall, the proportional vertical visibility of towers of a height of 350 metres is graded with 3 points.

Given the wide view from this view point, the horizontal visibility of the wind farm remains at under 10 % of the horizon. It is graded with 0 points in context of horizontal visibility.

Similar to the previous assessment of towers with a height of 260 metres, at 350 metres, the towers remain outside of the relevant viewing angle. Despite the wind farm being noticeable on the horizon due to the increased height and the movement of the wind turbines, it was assessed not to divert attention from the attributes located within this view. The dominance of the wind turbines is graded with 1 point.

In total, the impact of the foreseen wind turbines with a height of 350 metres within wind farms in the district of Ventspils reaches 4 points from this viewpoint, showing a minor impact. It is assessed as an impact of level (I).

Viewpoints within the buffer zone potentially vulnerable to the development of wind farms in the north-west of Kuldīga

POI 13: Observation tower

When standing on Kuldīga's observation tower, the upper rotor blades of the individual wind turbines planned in the context of the wind farm Ventspils 2 / EKO Ziemeli are visible above the tree line in the far north-west of the property. The tree line largely covers the wind farm, and is expected to do so more even in the future, as trees are continuing to grow. The proportional vertical visibility is graded with 1 point for a height of 260 metres.

With regard to the proportional horizontal visibility of wind turbines, the height of the viewpoint allows for a panoramic view, similar to that from St. Catherine's Lutheran Church. Within this panoramic view, the planned wind farm covers a small area, extending over less than 10% of the horizon. Visibility might even be less, depending on the chosen option for placement of the individual wind



Figure 38: Potential impact of 260-metre-high wind turbines at Ventspils 2 / EKO Ziemeli on the view of the Venta Valley from Kuldīga's observation tower



Figure 39: Potential impact of 350-metre-high wind turbines at Ventspils 2 / EKO Ziemeli on the view of the Venta Valley from Kuldīga's observation tower

turbines. This view is therefore assessed with 0 points in context of horizontal visibility.

The view in direction of the wind farm spans across the Venta Valley, which is a significant attribute of the property's OUV. The main views, however, focus areas further north and south of the sightline towards the wind farm, respectively. When facing the wind farm, the wind turbines are noticeable depending on the weather. Due to the fact that the attributes are distributed in areas that are not directly within the sight relationship between the observation tower and the wind farm, the dominance of wind turbines in this viewshed is negligible, and therefore graded with 0 points.

In total, the impact of the foreseen wind turbines with a height of 260 metres within the wind farm in the district of Ventspils reaches 2 points from this viewpoint, showing a negligible impact. It is assessed as an impact of level (0).

At a height of 350 metres, the wind turbine hub is visible, while the tower itself is largely covered from the vegetation and terrain in front of it. The proportional vertical visibility of the Ventspils 2 / EKO Ziemeli wind farm reaches 2 points when assessed from this viewpoint.

The horizontal visibility remains below 10 % of the horizon and is therefore graded with 0 points.

The dominance of the planned wind farm is minor, as the view generally focuses south-east towards the town's silhouette rather than north-east in direction of the wind farm. Nevertheless, when facing the direction of the wind farm, the wind turbines are noticeable but do not divert attention from attributes. The dominance of wind turbines in this viewshed is graded with 1 point.

In total, the impact of the foreseen wind turbines with a height of 350 metres within the wind farm in the district of Ventspils reaches 3 points from this viewpoint, showing a minor impact. It is assessed as an impact of level (I).

Viewpoints within the property potentially vulnerable to the development of wind farms in the south-east of Kuldīga

According to the computer-based viewshed analysis, developments of the Vārme wind farm are only a potential impact from the Kuldīga Regional Museum. However, the existing tree coverage along Venta river leads to a lack of actual visibility of this wind farm, even at a potentially increased height. No

visualizations could be generated, as the view would remain similar to the status quo.

When standing on the observation tower, the wind farm would be located left to the bridge and hence would not interfere with the view of the property's attributes, so that no visualization was generated for this viewpoint.

Taking into consideration factors such as the tree coverage, it proved that the Vārme windfarm only needs discussing in context of St. Catherine's Lutheran Church, a view graded as level of significance A.

POI 6: St. Catherine's Lutheran Church

When looking south-east from St. Catherine's Lutheran Church's tower, at a height of 260 meters, the hub of the individual wind turbines of the Vārme wind farm is visible, while the rotor blades disappear when reaching the bottom of their movement pattern. The proportional vertical visibility is graded with 2 points for a height of 260 metres.

With regard to the proportional horizontal visibility of wind turbines, the panoramic nature of the view allows for an overall wider view corridor. Within this view, the planned wind farm, as it was visualized now, covers an area extending over less than 10% of the horizon. This view is therefore assessed with 0 points in context of horizontal visibility. It is important to note that no exact locations are currently known for the planned maximum of 20 wind turbines. The visualized scenario already displays the worst case where all of the wind turbines are visible. It is likely that they will be placed in a way that some disappear behind each other.

The view in direction of the Vārme wind farm spans across Kalna street, and allows mainly for appreciation of attributes of architecture and building fabric. The viewing direction is not the main one, however, and can only be seen from a window located above the stairs of the tower. Out of the existing four windows, this is likely the one least observed and photographed. The main view of attributes results from the other windows. When looking through this window, wind turbines are noticeable but do not divert attention from attributes. Due to the fact that the main attributes are distributed in areas that are not directly within this specific sight relationship, the dominance of wind turbines in this viewshed is negligible. It is graded with 0 points.

In total, the impact of the foreseen wind turbines with a height of 260 metres

at Värme wind farm reaches 2 points from this viewpoint, showing a negligible impact. It is assessed as an impact of level (0).

When rising the height of the turbines to 350 metres, the impact becomes higher also from this perspective. At a height of 350 metres, for all towers, all three rotor blades are completely visible and the tower is at least partially visible. The proportional vertical visibility of towers of a height of 350 metres is therefore graded with 3 points.

The proportional horizontal visibility of the wind farm remains low and is graded with 0 points.

Similar to the previous assessment of towers with a height of 260 metres, at 350 metres, the towers remain outside of the prominent viewing angles. Despite the wind farm being noticeable on the horizon due to the increased height and the respective higher visibility of the wind turbines themselves, it was assessed not to divert attention from the attributes located within this view. This corresponds to the typical result for a wind farm at this distance. The dominance of the wind turbines is graded with 1 point.

In total, the impact of the foreseen wind turbines with a theoretical height of 350 metres at Värme wind farm reaches 4 points from this viewpoint, showing a minor impact. It is assessed as an impact of level (I).



Figure 40: Potential impact of 260-metre-high wind turbines at Värme on the view of attributes of architecture and building fabric from St. Catherine's Lutheran Church



Figure 41: Potential impact of 350-metre-high wind turbines at Värme on the view of attributes of architecture and building fabric from St. Catherine's Lutheran Church

3.9 Assessment of the adverse effects of planned wind farms

Viewpoints potentially vulnerable to the development of wind farms in the north-west of Kuldīga

The visualization of wind towers in the area of the planned Ventspils 2 / EKO Ziemeli wind farm shows that with the calculated heights of 260 (planned) and 350 (potential) metres for the separate wind turbines, the maximum impact on the potentially impacted views was graded as level (I), which is considered a minor impact. Tables 13 and 14 summarize the findings of the above assessment of the potential impact of the currently planned wind farms north-west of Kuldīga. These findings are based on photo simulations that take into account the placement and distance of the planned wind turbines.

Adverse effects of wind farms of 260 metres

According to the computer-based analysis, a potential visibility was foreseen for all of the tested views, which is why site-specific photo simulations were conducted to be able to determine the real negative impact. The integration of the specific locations and heights proved that construction is not foreseen to cause negative impacts on the property's OUV. The assessment showed that the wind farms, as they are currently planned, are expected not to have an impact on the UNESCO property and its attributes. They were assessed to be of level of impact (0), meaning that despite the partial vertical visibility of singular wind turbines, the visibility is limited in a way that does not negatively impact the UNESCO property (see Table 13).

Matching the impact levels with the previously defined levels of significance of each of the potentially affected views, they remain in the green zone and could be carried out as planned (see Matrix 2). This shows that photo simulations are a powerful and indispensable tool for decision-making, as they add to the tendency that can be obtained regarding general visibility from the computer-based analysis.

Table 13: Assessment of levels of impact caused by wind turbines of 260 metres north-west of the UNESCO property

Criteria	Viewpoint (POI)		
	4	6	13
d) Proportional vertical visibility of wind turbines	0	2	1
e) Proportional horizontal visibility of wind turbines	0	0	0
f) Dominance of wind turbines in viewshed	0	0	0
Points total	0	2	1
Level of impact	0	0	0

Matrix 2: Assessment of adverse effects caused by wind turbines of 260 metres north-west of the UNESCO property

Viewpoint (POI)	Assessment of status quo		Level of significance	Level of impact
	Assessment of potential impact			
4: Brick bridge	0	8	A+	0
6: St. Catherine's Lutheran Church	2	7	A	0
13: Observation tower	1	7	A	0

Adverse effects of wind farms of 350 metres

When rising the height of the individual wind turbines, the proportional vertical visibility as well as the dominance of the viewsheds increase. While the impact of the planned wind farm remained negligible from the view point from the brick bridge, the views from the two viewpoints located on viewing towers were affected by this change. Here, the impact would increase from level (0) to level (I), turning from a negligible into a minor impact (see Table 14). Matrix 3 shows that the colour changes from green to yellow for the views from St. Catherine's Lutheran Church as well as the observation tower, in case wind turbines are repowered and increased in height in the future. This means that a case-specific decision would be necessary here. Generally, construction is expected to be possible, while mitigation measures, such as different positioning, lower heights, or a lower number of turbines, might be appropriate.

Despite these results showing only negligible or minor impacts of the currently planned wind farms north-west of Kuldīga on the UNESCO property, it is important to maintain the current distance to the property and to not extend the Ventspils wind farms in south-eastern direction. If possible, repowering of the wind turbines to higher structures should be limited to the north-western areas of the wind farm, as there is no visual interconnection between those areas and the UNESCO property. It might be necessary to reconfirm whether there are separate heritage or environmental areas in the indicated area that might be impacted by this recommendation. The given recommendation does not take any other potentially valuable sites into consideration.

Table 14: Assessment of levels of impact caused by wind turbines of 350 metres north-west of the UNESCO property

Criteria	Viewpoint (POI)		
	4	6	13
d) Proportional vertical visibility of wind turbines	2	3	2
e) Proportional horizontal visibility of wind turbines	0	0	0
f) Dominance of wind turbines in viewshed	0	1	1
Points total	2	4	3
Level of impact	0	I	I

Matrix 3: Assessment of adverse effects caused by wind turbines of 350 metres north-west of the UNESCO property

Viewpoint (POI)	Assessment of status quo		Level of significance	Level of impact
	Assessment of potential impact			
4: Brick bridge	2	8	A+	0
6: St. Catherine's Lutheran Church	4	7	A	1
13: Observation tower	3	7	A	1

Viewpoints potentially vulnerable to the development of wind farms in the south-east of Kuldīga

Adverse effects of wind farms of 260 metres

The assessment of the potential negative impact of the planned Vārme wind farm on the view from St. Catherine's Lutheran Church showed that there is no damage to the OUV foreseen, if the single wind turbines are kept at current standard heights of 260 metres and lower. The potential negative impact was assessed to be of level of impact (0) (see Table 15). In comparison to the previously defined level of significance of this view, the correlation of the view's level of significance and the impact's severity remain in the green zone and could likely be carried out as planned (see Matrix 4).

Table 15: Assessment of levels of impact caused by wind turbines of 260 metres south-east of the UNESCO property

Criteria	Viewpoint (POI) 6
d) Proportional vertical visibility of wind turbines	2
e) Proportional horizontal visibility of wind turbines	0
f) Dominance of wind turbines in viewshed	0
Points total	2
Level of impact	0

Matrix 4: Assessment of adverse effects caused by wind turbines of 260 metres south-east of the UNESCO property

Viewpoint (POI)	Assessment of status quo		
	Assessment of potential impact	Level of significance	Level of impact
6: St. Catherine's Lutheran Church	2 / 7	A	0

Adverse effects of wind farms of 350 metres

The assessment of the potential negative impact of the planned Värme wind farm on the view from St. Catherine's Lutheran raises to a minor impact, graded with 4 points and level (I), if the single wind turbines are risen to 350 metres (see Table 16). In comparison to the previously defined level of significance, this conflict appears within the yellow zone and would likely benefit from mitigation measures (see Matrix 5). These should be decided by the responsible entity within Kuldīga Municipality.

Table 16: Assessment of levels of impact caused by wind turbines of 350 metres south-east of the UNESCO property

Criteria	Viewpoint (POI) 6
d) Proportional vertical visibility of wind turbines	3
e) Proportional horizontal visibility of wind turbines	0
f) Dominance of wind turbines in viewshed	1
Points total	4
Level of impact	I

Matrix 5: Assessment of adverse effects caused by wind turbines of 350 metres south-east of the UNESCO property

Viewpoint (POI)	Assessment of status quo		
	Assessment of potential impact	Level of significance	Level of impact
6: St. Catherine's Lutheran Church	4 / 7	A	I

4. Conclusion

It was the objective of this report to analyse the potential negative impacts that future wind farm development projects in the buffer zone and the wider setting of the UNESCO World Heritage property might have on its recognized Outstanding Universal Value.

For this purpose, a preventive viewshed analysis was carried out. As a first step, relevant viewpoints were identified and graded based on the visibility of attributes they facilitate, as well as their uniqueness and their current visual integrity. Seven viewpoints, five within the UNESCO property and two within the buffer zone, proved to be relevant for further assessment and were graded according to the criteria mentioned in the methodology chapter of this report. To understand the visual impact of wind farm developments on these viewpoints, the general visibility of wind farms within those view corridors was generated based on the digital surface model of Kuldīga and its surroundings. For this end, the viewpoints were fed into a computer-based calculation which identified developments of which height can be visible from what points within the property. The resulting maps showed the visibility of heights between 260 and 350 metres in a radius of 25 kilometres around each specific viewpoint (see Annex).

An overlay of the respective results facilitated the creation of the proposed zoning concept. In total, four viewpoints proved to be of the highest significance, meaning that their loss or impairment would significantly interfere with the property's OUV. These points were (a) the Eastern river bank across from the confluence of Alekšupīte and Venta rivers, (b) the Kuldīga Regional Museum, (c) the brick bridge, and (d) the planned lookout point at the future nature trail north of the property (see Table 17). Due to their significance, these views informed the creation of the No-Go zone within the defined radius of 15 kilometres as well as the HIA zone within a radius of 16 to 25 kilometres.

Based on an overlap of the visibilities from the four viewpoints generating views graded as significance level A+, it showed that all territories within a 15-kilometre-radius from the property are particularly vulnerable for wind farm developments, so that the property's OUV would be significantly harmed if wind farms were to be developed in this area. Wind farms closer than 15 kilometres from the UNESCO property produce a severe damage to the property's OUV and might result in a loss of the World Heritage



Figure 42: The streets of Kuldīga feature architecture and building fabric from different building periods

status. In addition, HIAs are always required when developments are planned between a distance of 16 and 25 kilometres in the north-west or south-east of the property, as these areas proved to be particularly relevant regarding potential damage to the property's OUV.

Table 17: Overview of views based on their significance

Level of significance	Meaning of level of significance	Viewpoint (POI)	Name of POI
A+	Preservation of this view contributes significantly to the overall legibility of OUV	1	Eastern river bank opposite confluence of Alekšupīte and Venta
		2	Kuldīga Regional Museum
		4	Brick bridge
		11	Lookout future Nature Trail north
A	Preservation of this view contributes to a large extent to the overall legibility of OUV	6	St. Catherine's Lutheran Church
		13	Observation tower
B	Preservation of this view somewhat contributes to the overall legibility of OUV	15	Needle tower

The viewpoints at St. Catherine's Lutheran Church and the Observation tower were graded as significance level A. The visibility from these points informed the creation of the HIA zone within the radius of 15 kilometres as well as the case-by-case zone within a radius of 16 to 25 kilometres. In this second area, case-specific photo simulations should be conducted before authorising wind farm developments, and full HIAs should be conducted if the photo simulations show conflict potential. Wind farms with a height of 260 metres close to Aizpute, in the far west of the property, remained invisible even from these points, and therefore could be located here without further assessment.

Examples of photo simulations were presented in chapter 3.8, where the computer-based analysis showed potential visibility of already planned wind farms. The simulations allowed for a more precise understanding of the concrete impact of these future developments. After carefully placing the planned wind farms within pictures of the current views, taking into account distance, location, viewing angles and tree coverage, it could be noted that the impact expected from Ventspils 2 / EKO Ziemeļi is to be considered minor.

Finally, the viewpoint on the Needle Tower was graded as a level B view. Developments visible from here would normally need to undergo a case-by-case assessment which identifies whether a planned wind farm affects parts of the panoramic view that are still intact (for example, if they further cut through the town silhouette) or if they would affect the view more marginally. Given that the relevant sight relationships are already covered under the zones developed from the higher rated viewpoints, no additional zone was created in the context of this view. It is fully covered under the previous zoning concept.

5. Recommendations

Zoning concept

1. A No-Go zone for wind farm developments of 260 metres and higher is recommended to be established within a radius of 15 kilometres from the Old Town of Kuldīga towards the north-west as well as the east and south-east (according to the presented map).
2. A No-Go zone for wind farm developments of 350 metres and higher is recommended to be established surrounding the No-Go zone for 260 metres. This zone should follow the suggested map or extend 3 kilometres beyond the boundaries of the first zone.
3. No wind farms should be developed without a previous HIA within the entire radius of 15 kilometres surrounding the UNESCO World Heritage property.
4. Due to the remaining visibility of wind farms constructed within a radius of 25 kilometres, it is recommended to limit the development of wind farms within the territory of Kuldīga municipality to a minimum and to carefully assess them regarding their impact on the OUV by means of photo simulations.
5. It showed that the areas west of Kuldīga are least vulnerable towards wind farm development in the context of the property's OUV. This result should be reflected in the choice of future wind farm territories.
6. It is important for the wind farms north-west of Kuldīga to maintain the current distance to the property and to not extend the Ventspils wind farms in south-eastern direction.
7. It is recommended not to build or repower any wind turbines of 350 metres height in the south-eastern most area of the Ventspils 2 / EKO Ziemeļi wind farm, but to maintain lower maximum heights in this area. If possible, repowering of the wind turbines to higher structures should be limited to the north-western areas of the wind farm, as there is no visual interconnection between those areas and the UNESCO property.



Figure 43: View towards the brick bridge from the confluence of the two rivers

8. It might be necessary to reconfirm whether there are separate heritage or environmental areas in the north-west of the planned wind farm that might be impacted by recommendation (7). An assessment in this regard has not been included in this report.
9. It is recommended to establish a mechanism within Kuldīga Municipality to carry out the case-by-case assessments necessary within the relevant zone.
10. Should the Municipality of Kuldīga be informed about specific wind farm development proposals that present heights not considered in this report, for example a wind farm with towers of 300 metres' height, it is highly recommended to conduct an additional computer-based viewshed analysis as well as photo simulations from the potentially impacted viewpoints to guarantee an adequate base for decision-making.

Awareness-raising & communication of decision-making

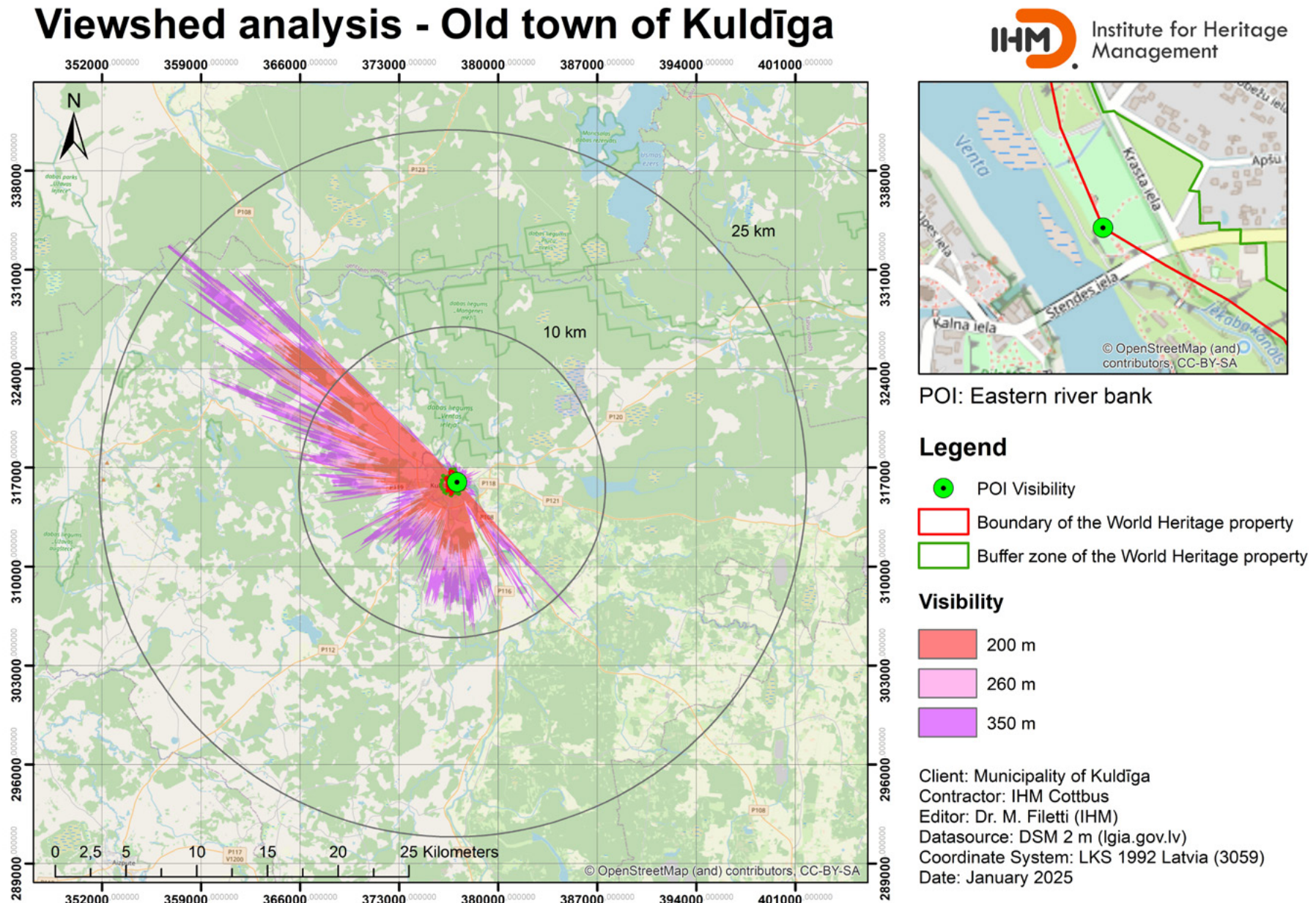
11. It is strongly recommended to raise awareness for the property's attributes of OUV and their potential vulnerability towards wind farm developments. Developers and authorizing entities for wind farm developments should be made aware that all future developments situated within the sightline of one or more attributes of the property's landscape setting need to be carefully assessed, as they may potentially damage the property's OUV. This is also true for wind farm developments that would prolong a sightline onto the clay roofscape of Kuldīga, as well as of the town silhouette.
12. It is furthermore recommended to make the map material of the suggested zoning concept accessible to all relevant stakeholders, and especially to wind farm developers.
13. To facilitate faster decision-making in the future, viewpoints of the property's OUV should be assessed according to the presented methodology to have a complete overview of the status quo of all relevant viewpoints.
14. Independent from new wind farm developments, existing disturbances, such as radio towers that are being situated within important view corridors, should ideally be relocated to recreate the historical silhouette of the town.



Figure 44: Kuldīga's town silhouette as seen from Mārtiņšala

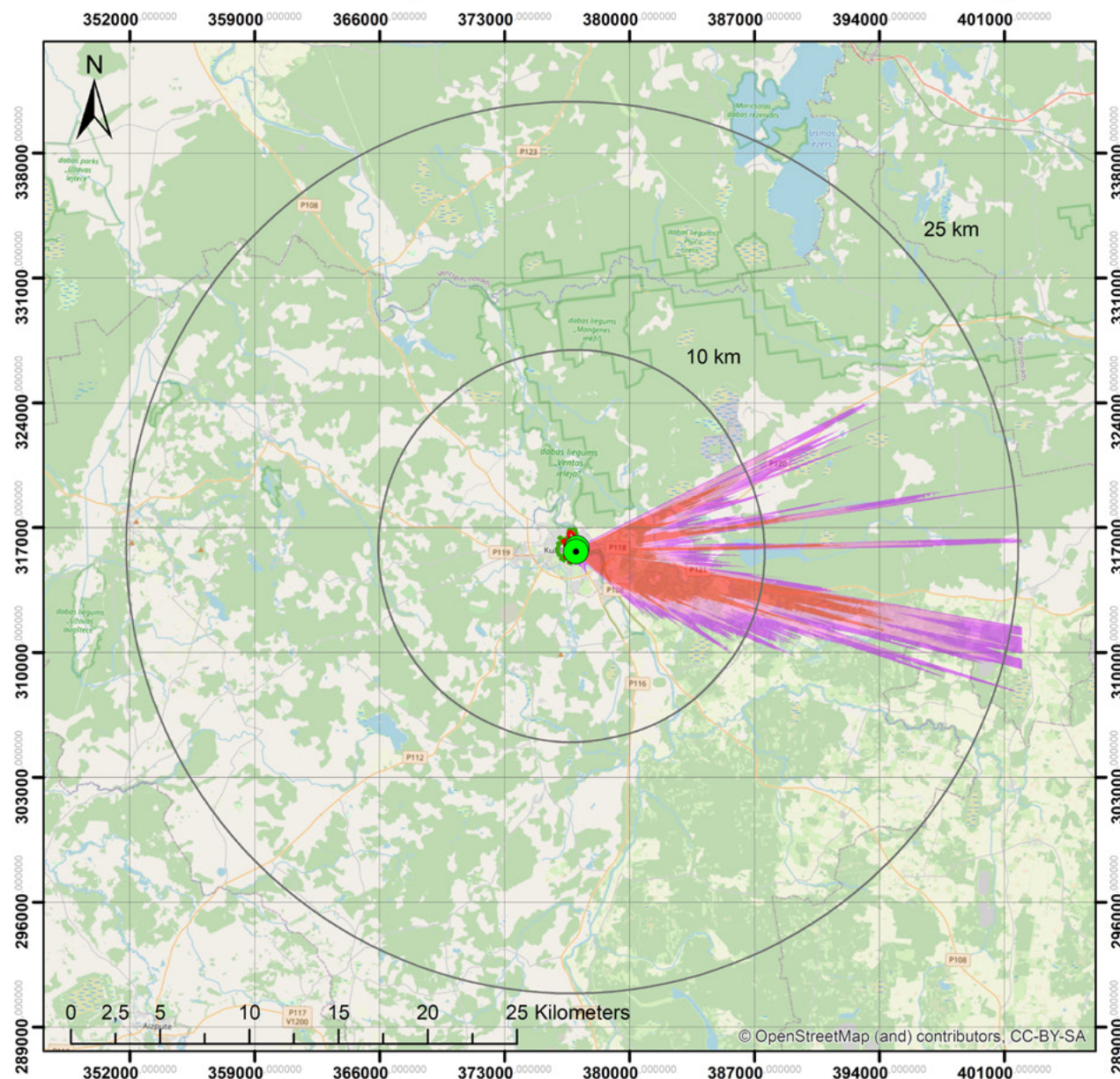
6. Annex: Visibility from A+ and A- level viewpoints

Map 8: Visibility of wind farms from the Eastern river bank opposite the confluence of Alekšupīte and Venta rivers (Level of significance A+)



Map 9: Visibility of wind farms from the Kuldīga Regional Museum (Level of significance A+)

Viewshed analysis - Old town of Kuldīga



POI: Kuldīga Regional Museum

Legend

- POI Visibility
- Boundary of the World Heritage property
- Buffer zone of the World Heritage property

Visibility

- 200 m
- 260 m
- 350 m

Client: Municipality of Kuldīga

Contractor: IHM Cottbus

Editor: Dr. M. Filetti (IHM)

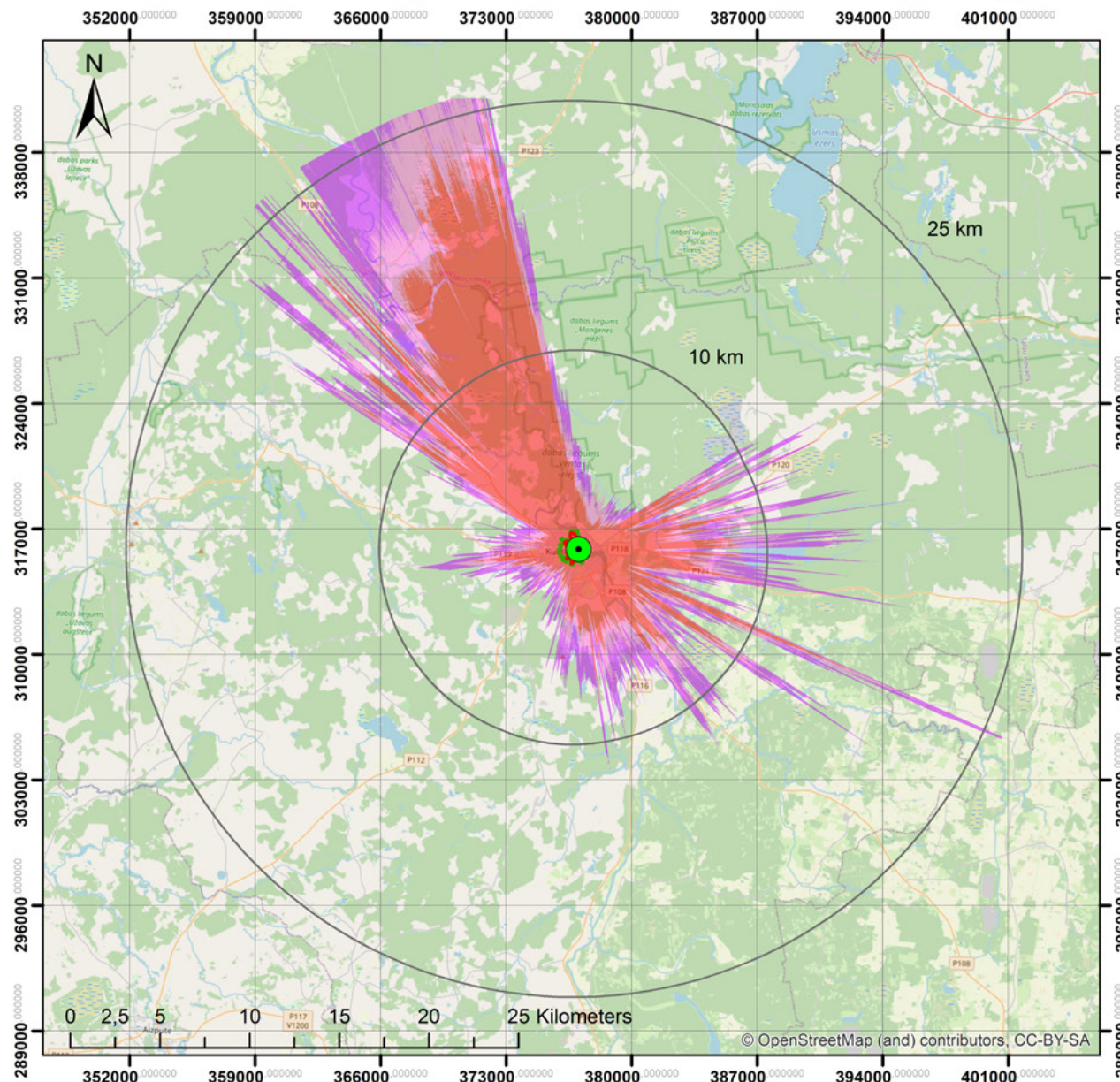
Datasource: DSM 2 m (Igia.gov.lv)

Coordinate System: LKS 1992 Latvia (3059)

Date: January 2025

Map 10: Visibility of wind farms from the brick bridge (Level of significance A+)

Viewshed analysis - Old town of Kuldīga



POI: Brick bridge

Legend

- POI Visibility
- Boundary of the World Heritage property
- Buffer zone of the World Heritage property

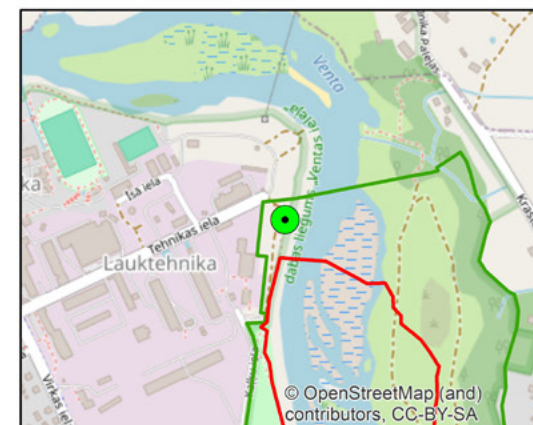
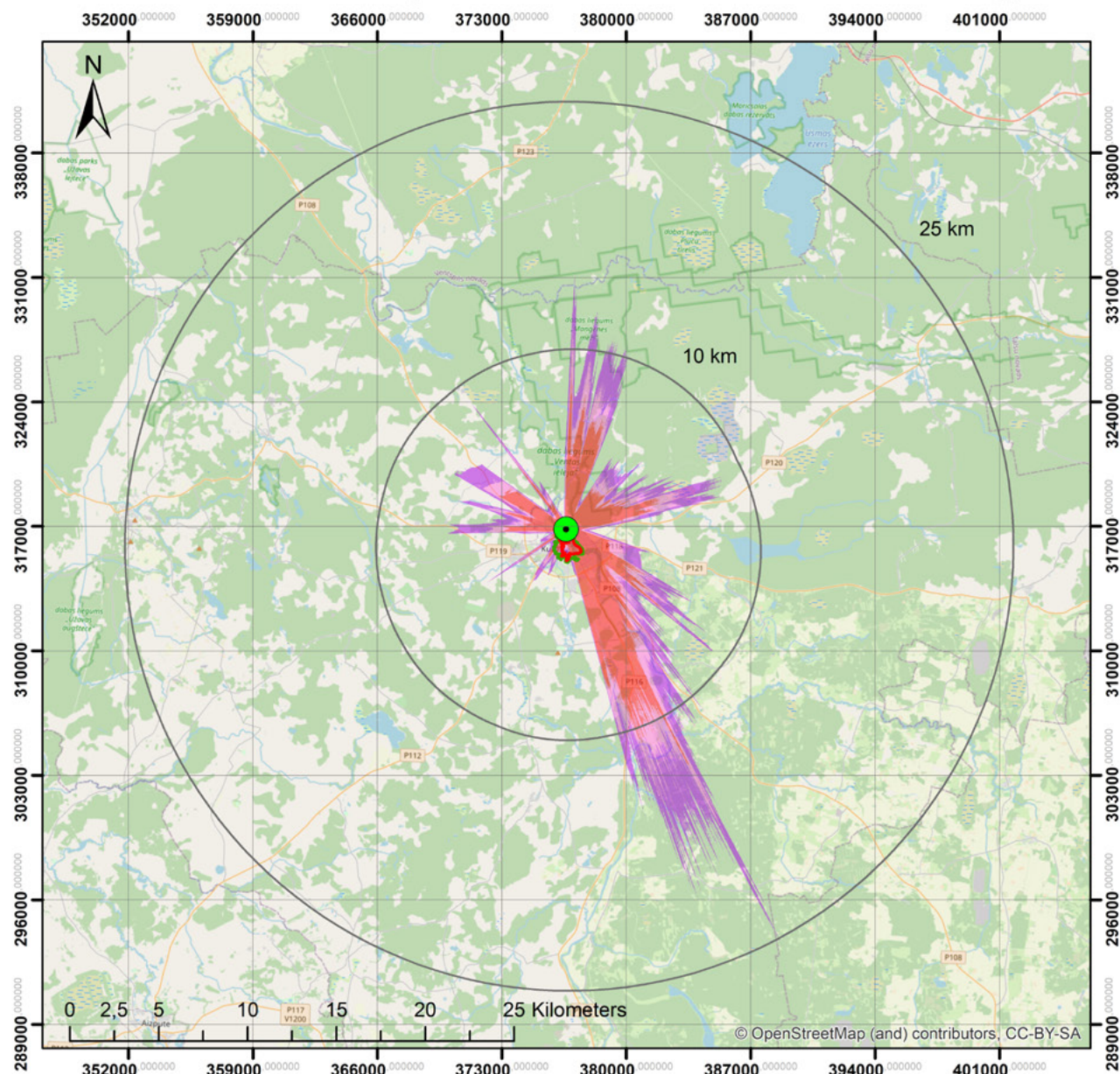
Visibility

- 200 m
- 260 m
- 350 m

Client: Municipality of Kuldīga
 Contractor: IHM Cottbus
 Editor: Dr. M. Filetti (IHM)
 Datasource: DSM 2 m (Igia.gov.lv)
 Coordinate System: LKS 1992 Latvia (3059)
 Date: January 2025




Map 11: Visibility of wind farms from the planned lookout at the future nature trail north of the property (Level of significance A+)

Viewshed analysis - Old town of Kuldīga



POI: Future lookout nature trail north

Legend

-  POI Visibility
-  Boundary of the World Heritage property
-  Buffer zone of the World Heritage property

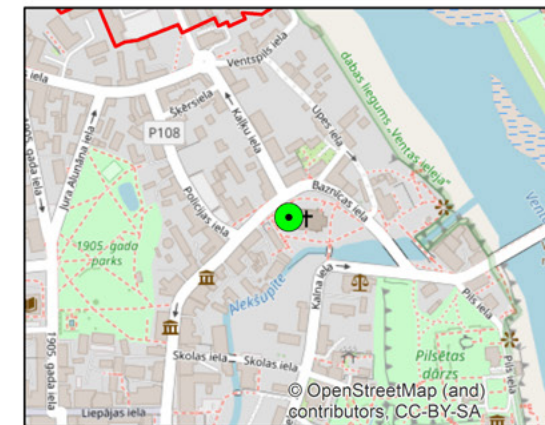
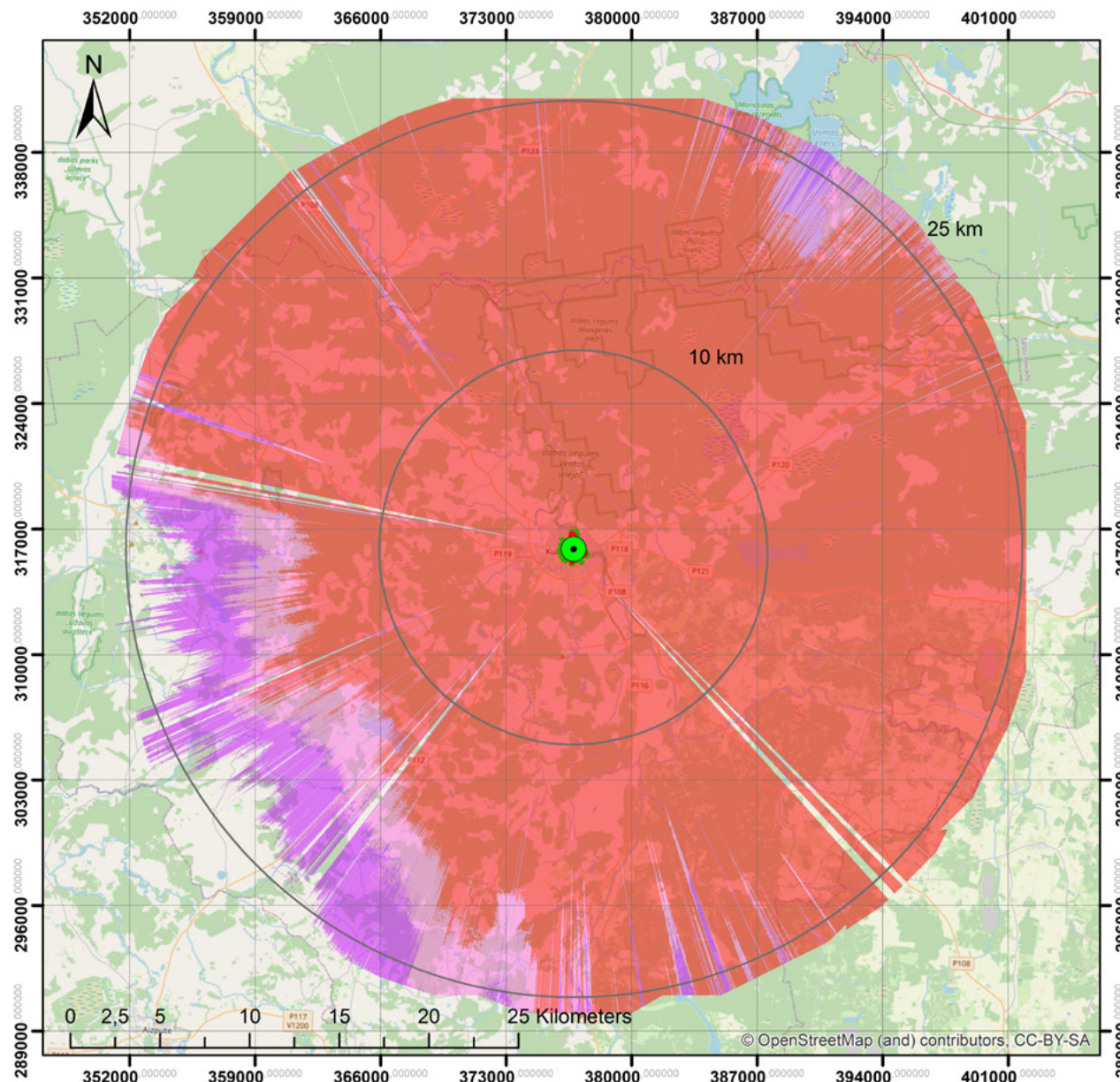
Visibility

-  200 m
-  260 m
-  350 m

Client: Municipality of Kuldīga
 Contractor: IHM Cottbus
 Editor: Dr. M. Filetti (IHM)
 Datasource: DSM 2 m (Igia.gov.lv)
 Coordinate System: LKS 1992 Latvia (3059)
 Date: January 2025

Map 12: Visibility of wind farms from St. Catherine's Lutheran Church (Level of significance A)

Viewshed analysis - Old town of Kuldīga



POI: St. Catherine's Lutheran Church

Legend

- POI Visibility
- Boundary of the World Heritage property
- Buffer zone of the World Heritage property

Visibility

- 200 m
- 260 m
- 350 m




Client: Municipality of Kuldīga
 Contractor: IHM Cottbus
 Editor: Dr. M. Filetti (IHM)
 Datasource: DSM 2 m (Igia.gov.lv)
 Coordinate System: LKS 1992 Latvia (3059)
 Date: January 2025

Viewshed analysis - Old town of Kuldīga



POI: Observation tower

Legend

-  POI Visibility
-  Boundary of the World Heritage property
-  Buffer zone of the World Heritage property

Visibility

- | | |
|---|-------|
|  | 200 m |
|  | 260 m |
|  | 350 m |

Client: Municipality of Kuldīga
Contractor: IHM Cottbus
Editor: Dr. M. Filetti (IHM)
Datasource: DSM 2 m (Igia.gov.lv)
Coordinate System: LKS 1992 Latvia (3059)
Date: January 2025

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