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Photo: Yvonne Mundry

Figure 1. When preparing for a time series of photographs in monitoring projects, it is important to know the height of the objective lens.

Preparing Future Flashbacks – Repeat Photography as a Method in Landscape Monitoring

When ground level photography is to be used in landscape monitoring, it is important to record when, where, how and possibly even why the photographs are taken. Standardisation enables better repeat photography in the future and maximises comparability of photos over time. We used a Cultural Environment protected by law on the peninsula of Bygdøy, Oslo municipality, as a study area to document advantages and disadvantages of different approaches to the first round of landscape photography for long-term monitoring.

BENEFITS OF PHOTOGRAPHY IN LANDSCAPE MONITORING

In a landscape perspective, repeat photographs of "past-and-present" situations are very illustrative. Such photographs have therefore been used in numerous projects in many different countries. Since 2002, the Department of Landscape Monitoring at NIBIO has re-photographed around 3500 landscape photos with a wide range of time intervals. See examples at www.tilbakeblikk.no.

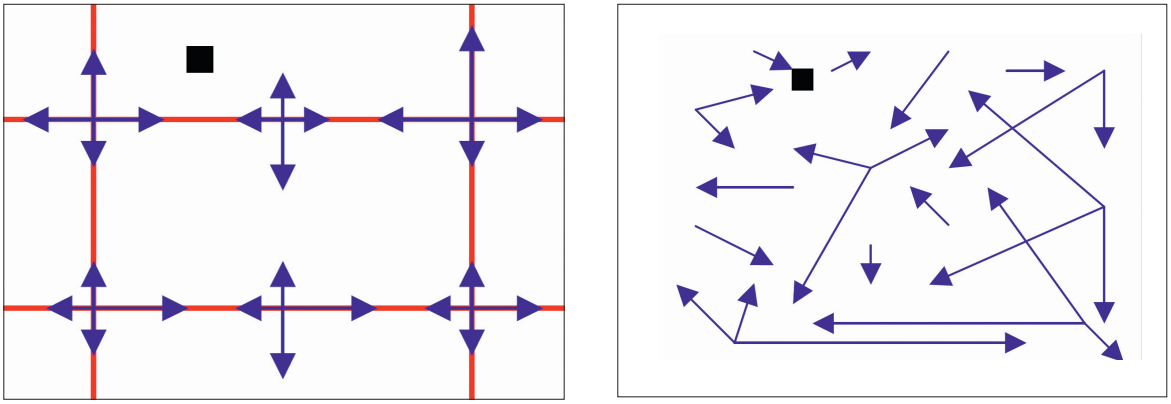

Figure 2. Different approaches for choosing viewpoints: quantitative (left) and qualitative (right) (Puschmann and Dramstad 2003).

Often, we do not know the context in which a photograph was taken in the past. Usually, a qualitative approach was followed, which means that the photographer chose the viewpoint, direction, subject and composition freely – maybe aiming to take a beautiful photograph or to illustrate a particular topic. When the aim is to monitor landscape status and change over time, we need more objective and systematic photography. Amongst other things, viewpoints and directions should be defined in advance.

Therefore, we have conducted a study to examine advantages and disadvantages of a qualitative and quantitative approach to landscape photography for long-term monitoring (Figure 2). What do the photos show? Which topics for monitoring and potential landscape changes are captured? To what extent is the result of the photography dependent on the photographer?

A STANDARDISED METHOD OF PHOTOGRAPHY

Standardisation enables more effective repeat photography in the future, and increases the comparability of photos from different time periods. This applies regardless of whether a qualitative or quantitative approach is followed. The purpose is to enable other photographers to easily re-visit viewpoints and re-photograph the same landscape segment that was shown in previous sets of photos.

Five photographers participated in the Bygdøy experiment. For all photos they registered the geographical coordinates of the viewpoint, the direction in which the picture was taken, focal length/width, date and time. The height of the objective lens was standardised using a 1.5 m long bamboo stick (Figure 1).

MONITORING PROTECTED CULTURAL ENVIRONMENTS

In 2012, the Norwegian Directorate for Cultural Heritage commissioned the Department of Landscape Monitoring at NIBIO to develop and test a method for long-term monitoring of protected Cultural Environments. As a supplement to that work, we conducted this study of methodological approaches to landscape photography. Our study area on the Bygdøy peninsula in Oslo municipality is part of a protected Cultural Environment.

Cultural Environments are protected according to § 20 of the Norwegian Act on Cultural Heritage. The Act defines a Cultural Environment as «any area where a[n architectural or historical] monument or site forms part of a larger entity or context» (§ 2). Monitoring is necessary to ensure that cultural heritage authorities are made aware of changes and can consider management measures. The Rule of Protection of the specific area, and possibly supplementing documents such as management plans or specialist information material, define what is special and subject to conservation in an area. Thereby these documents also define what should be monitored. The Rule of Protection for Bygdøy Cultural Environment, dated 2012, states that:

"The cultural heritage values in the area are historically connected to the functions of the Royal summer residence, Royal farm with agricultural areas, public park, recreation area on land and sea, and museum. Bygdøy Church and other properties and localities with landscape-related and historical affiliation to the Royal farm are also subject to protection."

Bygdøy Cultural Environment covers c.2.2 km^2, of which c.1.8 km^2 is land area. The northern part of the

Cultural Environment covering about 1 km² (Figure 3) was chosen as the study area for method development.

QUALITATIVE PHOTOGRAPHY

In the qualitative approach, all viewpoints were chosen freely by the photographers. Prior to fieldwork, all photographers were requested to read the Rule of Protection and a fact sheet by the Directorate for Cultural Heritage, to understand the characteristics of the Cultural Environment. In addition, each photographer received the following instructions:

While taking photos consider that:

- The photos are to be used in future monitoring.
- The area is a protected Cultural Environment (read attachments).
- The viewpoints shall be easily and legally accessible.
- For each photo, record GPS coordinates of the viewpoint and the view direction (360° scale, 5° accuracy).
- The height of the objective lens shall be as close to 150 cm as possible (use bamboo stick).
- Each photographer shall deliver a total of 30 pictures.
- Consider the scale of the area, dispersal, coverage and degree of detail.

The aim of the qualitative approach was to capture the landscape character of the Cultural Environment, and important qualities of the area. The photographers could take as many pictures as they wanted, but everyone should finally deliver the 30 pictures that they felt most appropriately reflected the character of the area.

Based on experiences from NIBIO's national monitoring of agricultural landscapes (the "3Q Programme"), the maximum time for fieldwork was set to 4.5 hours for the study area of 1 km². All photographers conducted fieldwork simultaneously, thereby under the same general weather and light conditions, although they moved around the area independently.

QUANTITATIVE PHOTOGRAPHY

For the quantitative approach, viewpoints were predefined. We started with the centre points of cells in a 200 m x 200 m grid. Then, to ensure accessibility, points that were on private property or in agricultural fields were relocated to the nearest road or path. Points were dropped if the distance from the original point to the nearest road or path was greater than 50 m. This procedure resulted in 30 viewpoints, relatively evenly distributed throughout the whole study area (Figure 3). The following instructions for each viewpoint were given to the photographers:

- Use GPS (uploaded waypoint) and aerial photograph to locate the viewpoint as precisely as possible.
- Take five photographs in the directions N, E, S, W and "free" – in this order.
- Choose focal length/width freely.
- The height of the objective lens shall be as close to 150 cm as possible (use bamboo stick).
- The position of the bamboo stick shall be exactly the same for all five pictures.
- Record compass direction for the "free" picture: 360° scale, 5° accuracy.
- Record clock time.

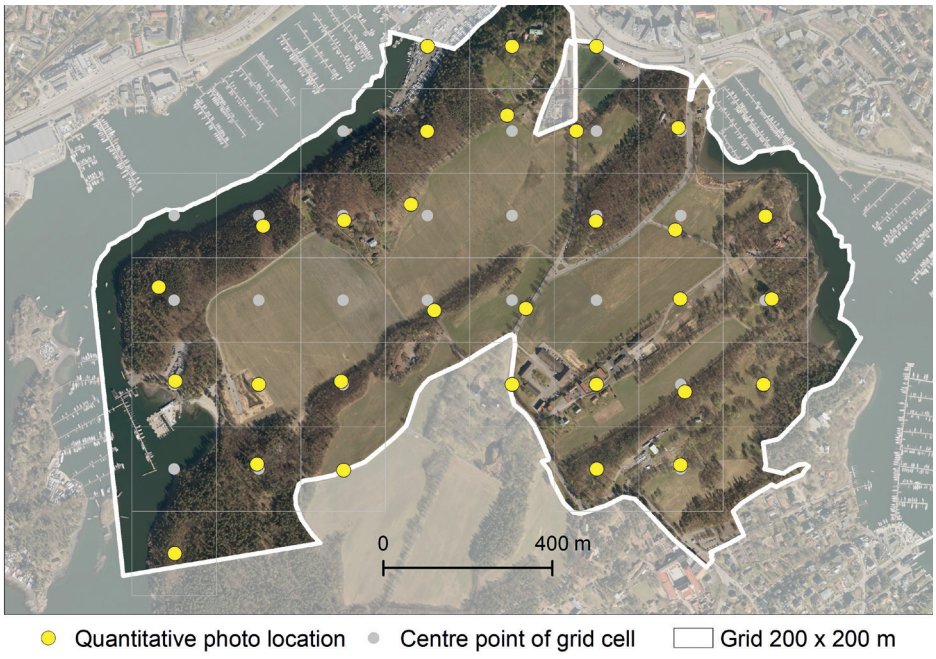

Figure 3. Predefined viewpoints for the quantitative approach.

Figure 4. Selected pictures resulting from the qualitative approach to photography: Valuable landscape elements and environments were well represented, but the area was covered unevenly.

STRENGTHS AND WEAKNESSES OF THE APPROACHES

The strength of the qualitative approach was that it resulted in a set of illustrative photographs that captured many qualities of the area (Figure 4). Many photos included several elements such as ploughed fields, grassland, livestock, single trees, and buildings. Specific landscape elements, including buildings, that are mentioned in the Rule of Protection or the fact sheet, were well represented.

Weaknesses of the qualitative approach were an uneven distribution of viewpoints in the area, and large differences in geographical coverage between different photographers (Figure 5). The distribution of viewpoints appeared to be influenced by where the photographers started their fieldwork, with a higher density of photographs at the beginning of the trip, when all impressions were new, and gradually fewer pictures as the different landscape qualities had already been documented. The photographers found it challenging to allocate their time in a way that ensured that they could cover the entire area within the given time frame. Since considerable time was spent choosing viewpoints at the start of the trip, some ended up in a hurry towards the end of the work, even resulting in failure to cover the whole area (Figure 5). There were also differences in the content of photographs from different photographers, which may be due to different opinions about which qualities were particularly important to document. For example, photographers differed in the degree to which they focused on natural elements in the area, or on the cultural landscape elements mentioned in the Rule of Protection or fact sheet. These differences could also result from different interpretations of the instructions. Was it the general landscape character of the area that should be documented, or the particularly valuable aspects of the protected Cultural Environment?

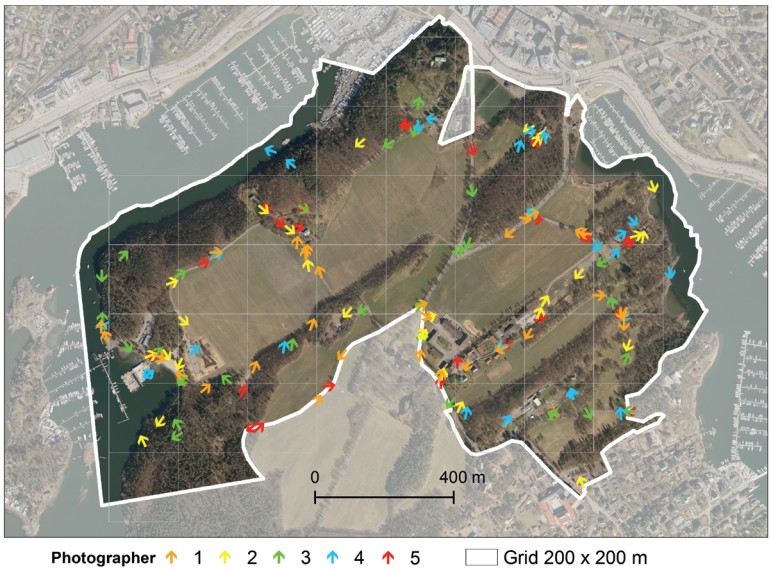

Figure 5. Viewpoints and directions (arrows) for the five photographers, resulting from the qualitative approach.

Regarding long-term landscape monitoring, the qualitative approach may provide better

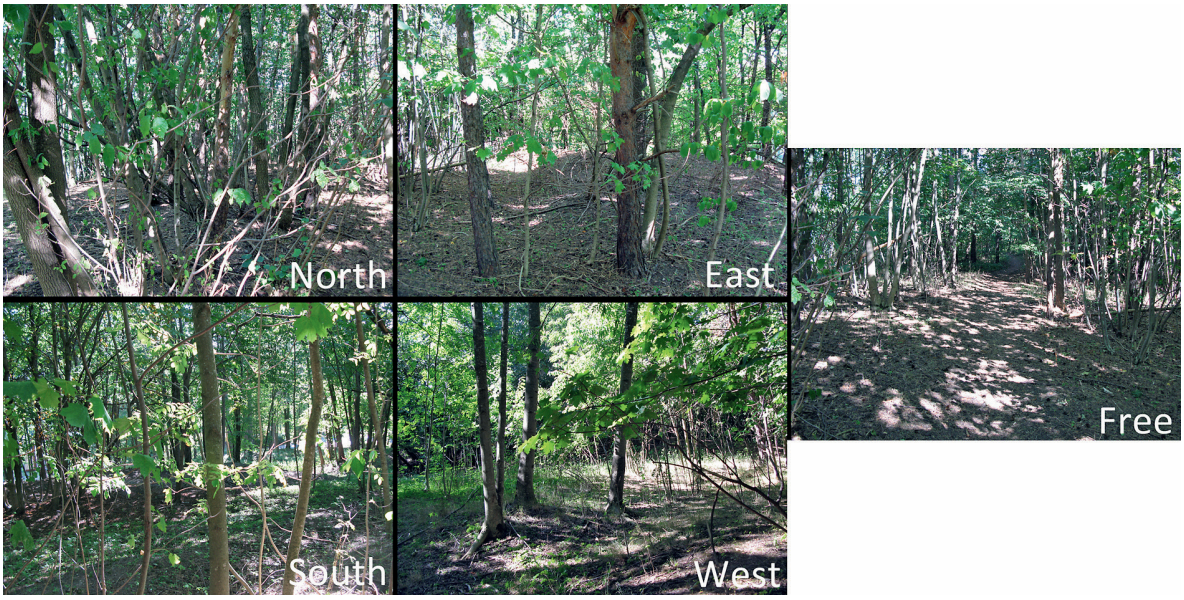

Figure 6. Examples resulting from the quantitative approach to photography: Five pictures taken from one viewpoint by one of the photographers. The quantitative approach resulted in a geographically even coverage of the area, but many pictures appear rather "uninteresting". One photograph in a freely chosen direction enabled the photographer to capture the most interesting view or specific elements visible from the predefined viewpoint.

documentation of the most valuable elements and environments, which – due to their protected status - are less likely to be subject to profoundly negative changes. Whereas the landscape in between, which may be more threatened by negative changes such as scrub encroachment or housing development, may not be captured sufficiently by a qualitative approach. The strength of the qualitative approach is that it covers specific elements and special aspects of landscape character well. However, ordinary or everyday elements that may be more prone to negative changes are less likely to be documented.

The quantitative approach results in a geographically even photographic coverage of the area. The photographers felt that this approach was more time efficient because they knew from the outset exactly where each viewpoint was located. All photographers managed to take pictures from all of the predefined viewpoints, even though they took many more photographs in total than with the qualitative approach. The photographers felt that the instructions for taking photos were clear and easy to follow, and the different photographers produced very similar results.

However, many pictures taken with the quantitative approach appear rather "uninteresting". There was less variety in landscape elements per picture, and numerous photos were dominated by dense scrub and forest in the foreground (Figure 6). Since the predefined viewpoints were generally situated along roads and paths, verges and border zones were common elements in these pictures. Several buildings mentioned specifically in the protection documents were not captured by any photo.

To monitor change over time it will often be desirable to document both landscape character in general and the status of specific elements. The photos resulting from the quantitative approach are probably more representative of the landscape's appearance within a defined area. Moreover, the geographically even distribution of viewpoints provides a good basis for capturing future landscape changes, no matter where they may happen.

However, the quantitative approach does not capture the rare, specific landscape elements that strongly contribute to an area being protected by law. Even in landscapes without protection status, there will often be views from a few select locations that create a particularly strong impression and are therefore important to capture. Therefore, landscape monitoring should aim at including both «stereotype views» and «representative» photographs.

RECOMMENDED METHOD: COMBINATION OF QUALITATIVE AND QUANTITATIVE PHOTOGRAPHY

The differences between qualitative and quantitative photography clearly illustrate that neither approach is perfect, but that they can supplement one another. Therefore, long-term monitoring of protected areas should include both approaches. To make the best of the potential of qualitative photography, the specific values of an area should first be reviewed, to ensure both a wide distribution of viewpoints and that specific qualities are captured. When older photographs are available from the area, it is worth considering whether these viewpoints can be re-visited, and included in the qualitative photographing. The

Figure 7. Predefined viewpoints ensure that the whole areas is covered. However, the flexibility to move a viewpoint a few metres can provide more useful, illustrative photographs for documenting future landscape change (large photo).

probability of capturing future landscape changes can be increased if photographs are taken in the four cardinal directions, in addition to the chosen or historical view. Quantitative photography will generate the most valuable results if the viewpoints can be moved a few metres from the predefined points. In this way «meaningless» detailed pictures of, for example, tree trunks or dense scrub can be avoided (Figure 7).

We suggest establishing a set of quantitative viewpoints, their number depending on the size of the area to be covered, with the flexibility to move points a few metres to capture more useful or interesting views. Where it seems necessary or appropriate, qualitative viewpoints should be chosen in between the quantitative ones. From all viewpoints, pictures should be taken in all four cardinal directions, in addition to a freely chosen direction. A combination of qualitative and quantitative photography is suitable for monitoring all kinds of landscapes, including neglected landscapes where the aim is to restore the qualities of bygone days.

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