Methodology for defining the result indicator and target value for the Interreg EST-LAT programme project “Harmonization of geodetic reference system in the Estonian-Latvian border area”
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INTRODUCTION

Within the framework of the Interreg Estonia-Latvia programme, it is planned to carry out the cooperation project “Harmonization of geodetic reference system in the Estonian-Latvian border area”. The main goal of this project is to harmonize the geodetic reference systems of the countries, which would facilitate the planning and implementation of various Estonian-Latvian cross-border projects and activities. As a result of the project, a harmonized geodetic reference system will be completed. This includes the creation of transition models between Estonia and Latvia for both planar coordinates and the altitude system, and the creation of a uniform geoid (sea level 0 level) model. The project activities will also develop a common methodology and principles for the collection, evaluation and implementation of (spatial) data and the creation of spatial models. The created databases and transition models will be made publicly available on the websites of the Estonian Land Board and the Latvian Geospatial Information Agency.

The synchronization of geodetic reference systems carried out in the project is necessary and rather the principle of how to ensure the synchronization of different systems in the future. When managed separately, the differences between geodetic systems tend to increase over time. The significance of the project in practical terms is primarily related to the implementation of Estonian-Latvian cross-border infrastructure projects. For other cross-border projects, the synchronization solution helps streamline operations. A solution for the operation of the urban infrastructure related to Valga-Valka, for example, could also be potentially important, if the coordinates and heights of the flat system (e.g. water mains, cables, roads, etc.) could be seamlessly connected on both sides of the border.

The output indicator assigned to the project is “geodetic reference systems are harmonized”. To measure / check the achievement of the target level of the project output indicator, for example, precession point measurements can be made based on the Estonian system in Estonia and the same independent measurements based on the Latvian system in Latvia. If the created transitional model allows to calculate the results in total within the allowable geodetic errors, then the model can be considered to be of good quality. The criterion for the technical quality of the project results is therefore that the control measurements or closure errors or total deviations fall within the permissible accuracy requirements, which can be objectively verified. The rate of further use of the project result, the diversity of use and the extent of benefits will depend to a large extent on the quality of achieving the target value of the project output indicator.

The aim of this work is to propose a result indicator of the proposed joint project together with the baseline and target values and the methodology that allows their measurement. The result indicator is used to assess the level of project performance against the project performance target. The indicator is determined on the basis of several key principles, depending on the specifics of the project.

• The indicator reflects the achievement of the project activity goal.

1 The level of achievement means how much was actually achieved. It can be less than, above or equal to the target value.
The goal of the project is achieved when the output of the project is realized in the expected result of the project.

- The indicator reflects as closely as possible the causal link between project output and performance. In essence, this principle is the most important in determining the indicator. The variable value of the indicator depends on the existence of the project output (harmonized geodetic system) and the use of the output. Therefore, when determining an indicator, it is important to ensure that the system to be created and its implementation would cause a (positive) change in the value of the indicator. The more it does, the better the defined performance indicator. Ideally, in this case, the effect of other factors (so-called noise) on the change in the value of the indicator is small or rather indirect.

- The indicator is (quantitatively) measurable. It is rather more reasonable to quantify the level of achievement of the indicator for the output of a given project, as data collection / interpretation / transmission involves two different countries. The fewer different interpretations there are when dealing with data, the better the quality of the assessment of the indicator's level of achievement.

- The indicator is unambiguously measurable both in Estonia and Latvia. It must be possible to measure the level of achievement of the indicator through similar data and common data collection procedures.

- The time and resource required to measure the indicator is reasonable. The time- and cost-effective availability of the necessary data is important in assessing the level of achievement of the indicator.

- To measure the indicator, the project output is clearly defined and unambiguous. The delimitation of the project output, i.e. the distinction covered by the harmonized geodetic reference system, is important for defining and measuring the content of the baseline and target values of the indicator.

The basic level of the project result indicator is determined as of 2020, i.e. the situation before the start of the project. The target value of the indicator will be set for 2023, i.e. one year after the end of the project. The benchmark is thus defined in terms of performance over a one-year period. This may include, for example, new activities initiated through the project result, the use of the project results, the benefits of using the system, etc. When setting the target value of the indicator, the wider socio-economic benefits for Estonia and Latvia are also taken into account.

1. **RESULT INDICATOR**

As part of the terms of reference, the Client (SSSC) presented two possible project result indicators to illustrate:

1) the number of institutions that have benefited from the harmonized system and,
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2) the share of institutions that have benefited from the harmonized system.

In the framework of the work, the possible suitability of these indicators was first considered. The analysis identified the following factors as key bottlenecks.

The main weakness of both indicators is the lack of a direct link to the project objective. The result of the project must support not so much the interested institutions as such, but above all the implementation of Estonian-Latvian cross-border activities. In other words, the aim is not simply to use a harmonized system, but (and above all) to use the system in a targeted way.

In the case of both indicators, it would be methodologically relatively difficult to ensure high-quality measurement of the level of achievement. In terms of the result, it would not matter how many institutions use the system. Rather, the contribution counts. Thus, it is not correct to assume that it is better to have more (or less) beneficiary institutions or a higher proportion of institutions.

In case of the number of institutions that have benefited from the harmonized system, one of the critical bottlenecks would also be taking into account the institutions in case of multi-partner projects.

The share of institutions that have benefited from the harmonized system is similar in content to the previous one, but even less appropriate, as it is not possible to define the range of beneficiaries in advance. Thus, there is no set number against which to measure the proportion. The result of the project is freely available for use by all institutions (including unspecified companies) and the system can be used by anyone interested. It is known that no rights / licenses are allocated for use and it is not specified which institutions download the system.

Taking into account the assumptions described above and the bottlenecks of the illustrated indicators, the result indicator is defined in this work as follows.

1.1. Option A

The result indicator is the use of a harmonized geodetic reference system in Estonian-Latvian cross-border projects.

The selected indicator reflects a direct link to the project objective. In the case of the indicator, it is not differentiated whether the projects must be Estonian-Latvian co-operation projects or not, because in terms of the objective (support for cross-border activities) it is secondary. However, when setting the target value of the indicator, it is set a condition that the project partners (Estonian and Latvian land offices) do not contribute to the fulfillment of the target value (at least in the case of 2023).

- Indicator baseline: Harmonized system not in use / not available.
- Target value of the indicator: a harmonized system has been used (in Estonian-Latvian cross-border projects not related to project partners) – value 1.

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2 The beneficiaries have mentioned 9 state agencies, 4 local governments, agricultural enterprises, electricity and gas supply companies, research companies and institutions and companies related to Rail Baltic and other cross-border infrastructure projects as potential beneficiaries.
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When determining the baseline value of the indicator, the logical connection with the target level to be determined is taken into account. The baseline value is not defined as a numerical value. This reflects the situation of the use of the harmonized surveying system before the start of the project.

The basis for determining the target value of the indicator is not the quantity of projects, but the possible positive impact on the development and support of Estonian-Latvian cross-border activities. The output of the project supports the implementation of Estonian-Latvian cross-border projects. Change is understood as improvement of the performance of activities. The harmonized geodetic system does not create activities, but helps to carry them out.

When assessing the target value of the indicator, it is necessary to clarify whether the harmonized geodetic system has been used in some projects within one year after the completion of the system. This first requires a delineation:

- What is covered by the harmonized geodetic system created (i.e. what does it consist of) that is used in cross-border projects?
- How to decide that the harmonized system created has been used in the projects?

Based on the description of the proposed project activities and expert assessment, we can assume that the harmonized model is a sufficiently dense set of geodetic points on both sides of the Estonian-Latvian border with coordinates and parameters in different systems that can be used in applications described in the proposed harmonization project.

In a simplified form, it is conceivable that the result is an Excel spreadsheet with formulas - the coordinates are entered in a system and what those coordinates are in the corrected form in the harmonized model will be found out.

Such a result can be used primarily in those Estonian-Latvian cross-border projects where older existing data are combined between the two countries. This requires these tools in the form of models.

The use of a harmonized geodetic system can be more easily assessed on the basis of information provided in the relevant projects. We assume that the (future) methodology of geodetic works of Estonian-Latvian cross-border projects declares that the data / coordinates have been recalculated with the help of/according to this harmonized model. The coordinates are marked as “corrected by this model”.

3 In particular, the plane orthogonal coordinates of Estonia and Latvia (but possibly other orthogonal coordinate systems such as UTM, etc.) and the WGS84 geodetic coordinates and global spatial orthogonal coordinates XYZ. For heights, geoid heights and GRS80 ellipsoid heights are expected. The project description also mentions that there are currently relatively few geodetic transmission network points in the border area. In the course of the work, it can be assumed that measurements will be made in the border area and that this point network will be compacted in order to create reliable data and a number of support points to bring the coordinate space of both countries together. As a result of the project, model surfaces (interpolated on the basis of points), measurement documentation, accuracy estimates / deviations and (data collection) methodology may also be used.

4 See, for example, the EE Land Board’s geodetic calculators: https://geoportaal.maaamet.ee/est/Teenused/Geodeesia-kalkulaatorid-p142.html

5 Just as coordinate systems have their own symbols, markings – e.g. L-EST92, L-EST97 give slightly different coordinate values to points, and by this definition you can understand which system it is. Geodetic systems are
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In general, we assume that this should be enough. However, for the sake of correctness, it may be necessary to re-verify what is claimed in the projects.

In what follows, it is explained **how to find projects that have used a harmonized geodetic system.**

First, the project outcome, i.e. the harmonized geodetic system, can in principle only be used in Estonian-Latvian cross-border projects / activities. Elsewhere, this has little practical significance. Therefore, we assume that the system is used only in Estonian-Latvian cross-border projects / activities.

Second, the methodology for collecting data to measure the benchmark (knowing in which projects the harmonized system has been used) depends on whether the use of a harmonized system is mandatory, recommended or otherwise specified as a methodological precondition for cross-border projects.

Thus, the methodological precondition for data collection is also that the implementation of cross-border projects / activities requires at least coordination with the institutions responsible for the project area in both countries. This may include Estonian and Latvian state agencies (e.g. most probably in the fields of national defense, police and border guard, economic and communication (incl. energy), transport, environment, tourism, forestry), regional institutions as well as Estonian-Latvian border municipalities.

Based on the above assumptions, the methodological procedures for data collection on the target value of the result indicator are as follows:

**First, a list of such institutions** (state agencies, border local governments and regional development or administrative institutions related to the development and organization of areas in, inter alia, the Estonian-Latvian border areas) **is compiled,** as well as a list of e-mail addresses of officials potentially involved in Estonian-Latvian cross-border projects in these institutions.

These officials will then be asked about possible Estonian-Latvian cross-border projects / activities that started in 2023 and that may have used a harmonized geodetic system. As one year controllable - you can check the coordinate values of the point from the catalog of points in the main network, e.g. in the Estonian national system L-EST97, as well as in the case of a harmonized model.

6 If (future) cross-border projects also carry out measurements on both sides of the border, it is in some cases (if necessary) a little more difficult to check whether the model has actually been used or only claimed to be used. The criterion here is the rules and norms for conducting geodetic works - surveying works must indicate closure errors. In other words, the same fixed points of the national transmission network, the coordinates of which are now being specified, are for reference - starting the survey, for example from Estonia, the survey is closed at the Latvian point, and on the basis of this it can be said whether and how accurate the survey (measurement) was. As the gaps between the systems may be small (3-6 cm is mentioned), in some cases this may be unnoticed and within the limits of the error allowed for simpler technical measurements. There is no doubt that there are significant differences between national systems in precision surveys.

7 From the point of view of both countries, this provides certainty that the data will be valid until the state border, and if to start compiling the data of different countries on a European scale, then the Estonian-Latvian border will be smooth. Where harmonization has not taken place, inconsistencies are likely to occur. So indirectly, this work also has a more global meaning too.
Methodology for defining the result indicator and target value for the Interreg EST-LAT programme project “Harmonization of geodetic reference system in the Estonian-Latvian border area” (benchmarking period) is a relatively short time, both completed and ongoing projects could be taken into account.

The appropriate time to send the request would be the period November 2023 to January 2024. By that time, potential projects could already be underway. Subsequent data collection is also possible, but in this case it should be noted that the collection would not include information on projects started in 2024. Based on the feedback received, as they cannot be taken into account when assessing the achievement of the 2023 target.

To summarize, the request provides information from national and regional organizations and local governments in the border area on Estonian-Latvian cross-border projects where geodetic works may be carried out (use of databases, models or terrain work, including data collection or verification) and thus harmonized geodetic system may be used.

The first query will therefore help to map possible cross-border projects where a harmonized geodetic system is used in 2023.

Next, based on the information received from the officials, the project implementers will be contacted and it will be examined whether a harmonized geodetic system has been used in the project. In essence, one positive answer is now enough to consider the target value of the project result indicator fulfilled met (since the target value is 1). At the same time, it would be correct to find out the level of achievement of the project that reflects reality as close as possible, i.e. how many there are in total such cross-border projects/activities started in 2023 where harmonized Estonian-Latvian geodetic system has been used.

In addition, as described above, however, in the event of a positive answer, it would be correct to then verify that the harmonized system has in fact been used. In principle, it may also be sufficient to ask by e-mail for a description of the methodology of the project’s geodetic works. But it can also be realistically checked (e.g. see footnotes 5 and 6).

The timing of a query for project implementers depends in part on how quickly the first query is answered. The second query could be made 2-3 weeks after the first one.

The methodology for assessing the target value described above is primarily suitable for evaluating the results of 2023 (which is also the task of this work). If, for example, it would be necessary to monitor the use of a harmonized geodetic system in Estonian-Latvian cross-border projects later (e.g. 2025, etc.), the application of the project value weighting methodology in assessing the fulfillment of target value could be considered. Such an approach would be reasonable, as it would avoid the incorrect assumption that the benefits of using a harmonized surveying system will be greater the more projects use it. The value-weighting methodology assumes that the benefits depend on the (projected) impact of specific projects on cross-border activities and developments.

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8 It can be likely that the contacted (national) authorities and local authorities in the border areas may themselves carry out projects using a harmonized system.

9 If the correct approach is not used (this is not desirable), a less systematic approach to data collection could suffice (e.g. if there is prior knowledge that a harmonized system has been used somewhere in an Estonian-Latvian cross-border project, it could simply be asked and this way confirmation on the achievement of the target value is received.
In the case of the value-weighting methodology, the target values would be the (average) impact values of the projects, not the number of projects. Briefly, this methodological approach can be described as follows. Each project in which the harmonized system is used contributes to the objectives of Estonian-Latvian cross-border activities and developments on an evaluation scale of 1-5. This contribution will be assessed on the basis of pre-defined conditions / scales for each project where the system has been used. For example, 4-5 categories can be distinguished (one of them can be related to financial output) and each project receives a score of 1-5 in each category. The results of the projects are then aggregated and the average score of all projects is calculated, on the basis of which the achievement of the target value can be measured. The target value of the performance indicator could be defined, for example, as: the contribution of projects using a harmonized geodetic system to the cross-border objectives of cross-border activities and developments. The target level is the average impact rating of the projects (e.g. 4.2). In the following years, the comparison with the previous evaluation year (+/-) will be reviewed.

1.2. Option B

In addition to the main result indicator, we also provide a brief description of a possible alternative solution.

In principle, it is possible to consider the use of a cost-based result indicator for a given project, as this would also have a direct link to the project’s objective. The cost-based indicator is based on the assumption that the use of a harmonized geodetic system will lead to savings in labor costs, as the necessary (labor-intensive) recalculations of geodetic systems will be eliminated\textsuperscript{10}. The indicator in such a case could be, for example, the average cost related to geodetic data per working hour in Estonian-Latvian cross-border projects. When defining an indicator, work done with data in the field can be excluded from the cost calculation.

To determine the baseline value, the average cost per hour of such work as of 2020 will be clarified. When setting the target value, the average costs per hour of such work as of 2023 are estimated. The baseline is determined on the basis of the cost of this work without compatibility models. The use of a harmonized system is the basis for forecasting the target value. The level of achievement is measured by the average cost. As there are no (yet) institutions / companies using the harmonized system as sources of relevant information, a couple of surveying institutions / companies should be queried for appropriate assessments. Calculations of the average cost could be based on the data of at least three institutions, two of which could also be partners in the proposed project (Estonian and Latvian land offices). When calculating the average cost, due to the different wage levels in the countries, the results can also be viewed separately, i.e. separately for both Estonia and Latvia. In this case, the calculation could be based on at least two institutions / companies in both countries.

\textsuperscript{10} It should be mentioned that a similar methodology could also be used to measure a result indicator, which would measure the time spent on work instead of the price of working hours. As the volumes of work can vary widely, the measurement should then be limited to a specific operating phase, which could take less working hours if a harmonized system were used. Thus, activities that do not depend on volume, but on the way they are done. Due to the difference in activities or projects, such an indicator cannot be measured, for example, as a share of average time spent and its change (in projects).