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| ***DISCLAIMER:*** *This is a document prepared by the Commission services. It provides technical guidance on the sampling methods for audit bodies under the Recovery and Resilience Facility (RRF). This guidance has not been endorsed by the European Commission.* |

**Guidance on sampling methods for audit bodies under the Recovery and Resilience Facility for audits to ensure the effective functioning of Member State systems in terms of collecting, storing, verifying and certifying reliable and accurate data on the achievement of milestones and targets**

**PREAMBLE**

As per Article 22 of the RRF Regulation the primary responsibility of the Member States is the protection of the financial interests of the Union. Member States are therefore expected to carry out **audits** to ensure that appropriate measures are in place to ensure the protection of the financial interests of the Union.

The Commission’s decision authorising the disbursement of the instalment will be exclusively based on whether the milestones and targets have been met. The Commission will therefore as part of its ex-ante **control** thoroughly assess the justification and evidences provided by the Member States to ensure that this is the case, including as the case may be by relying on sampling for targets with large number of beneficiaries. Such a sampling method does however not allow to draw any conclusion regarding the error rate. It is therefore not suitable for an audit context.

Furthermore, as part of the control system put in place by the Commission, the Commission will carry out its own **audits**. These audits will mainly focus on the achievement of milestones and targets, given that the regularity and legality of the payment under RRF is solely based on the achievement of milestones and targets. There will be two types of audits: (i) system audits on the systems in place to store, collect, aggregate and report milestones and targets; and (ii) substantive audits on the reliability of the reported data related to the achieved milestones and targets declared by Member States in the requests for payment.

In addition to the audits that the Member States will need to carry out to ensure the protection of the financial interests of the Union (as per Article 22 of the RRF Regulation), in order to support the declaration in the Management Declaration “*that the information submitted with the request for payment is complete, accurate and reliable*” and more generally to provide assurance on sound financial management, Member States are encouraged to undertake **audits** to ensure the effective functioning of Member State systems in terms of collecting, storing, verifying and certifying reliable and accurate data on the achievement of milestones and targets. Such audits can be carried (i) ex-ante (i.e. before the request for payment is submitted to the Commission), or (ii) ex-post (i.e. after the submission of the payment request to the Commission). In this respect, the audit body should highlight in the Summary of audits the audit work, in terms of substantive testing, that it may have conducted on the reliability and accuracy of the data on the achievement of milestones and targets for the underlying request for payment as well as the level of assurance (low/average/high) obtained following the system audit on the effective functioning of Member State’s control systems in terms of collecting, storing, verifying and certifying reliable and accurate data on the achievement of milestones and targets.

The scope and extent of the audit work by the national audit body will be taken into account for the risk assessment and planning of the Commission audits in the Member States.

When carrying out substantive audits on milestones and targets, both the Commission and the Member States will need to use sampling methods. The objective of this document is to provide guidance of the most commonly used and suitable sampling methods for the audit bodies under the Recovery and Resilience Facility when undertaking audits to ensure the effective functioning of Member State’s systems in terms of collecting, storing, verifying and certifying reliable and accurate data on the achievement of milestones and targets. The sampling guidance does not contain any recommendations in terms of sampling for audits to ensure the protection of the financial interests of the Union. This is because the extent of the audit work carried out in the context of the protection of the financial interests will very much depend on the set up and quality of the national systems and the quality of anti-fraud measures. As a consequence, sampling for control purposes or for substantive testing in the context of the protection of the financial interests will depend heavily on auditor’s judgment. Moreover, this guidance is not targeting control testing in the framework of the system audits carried out by the audit bodies, where we recommend to rather use the attribute sampling.

This guidance builds on the (upcoming) Delegated Act on the off-the-shelf sampling methodologies and on specific Guidance on sampling methods for audit authorities[[1]](#footnote-1), both used for ESI Funds, hence it can include several references to the sampling concepts and methods, which are further described in this guidance. Therefore, complementary reading of this additional guidance is advised in order to get a complete understanding on the most commonly used and suitable sampling methods to be used for the Recovery and Resilience Facility. However, the Recovery and Resilience Facility is a performance-based instrument, hence the understanding of legality and regularity is solely linked to the fulfilment of the agreed milestones and targets. The Commission will not compensate actual incurred costs and there will be no certification of actual costs. Consequently, not all sampling methods in the above-mentioned guidance are suitable for the Recovery and Resilience Facility.

International auditing standards and updated sampling theory provide guidance on the use of audit sampling and other means of selecting items for testing when designing audit procedures.

1. **INTRODUCTION**

In the context of audits to ensure the effective functioning of Member State’s systems in terms of collecting, storing, verifying and certifying reliable and accurate data on the achievement of milestones and targets, in general, it is not possible for auditors to cover 100% of the milestones and targets. As such, audit sampling[[2]](#footnote-2) should be applied. The Commission recommends applying two levels of sampling:

1. Considering the low number of sampling items, it is estimated that the **first level sampling,** for example at the level of a payment request or during a certain period for the selection of the milestones and targets, will generally be **based on auditor’s judgment and/or non-statistical risk-based sampling combined with a random element** (see part III of this guidance); and
2. **The second level sampling** at the level of the selected milestone or target that involves the selection of a number of final recipients or projects **based on a statistical sampling method** (see part IV of this guidance).

The audit strategy of each audit body in the Member State, which defines the overall approach that national auditors take to perform the audit work under the Recovery and Resilience Facility, should outline a description of the audit sampling (i.e. risk assessment methodology to be used for the first level samplings and statistical methods to be used for the second level samplings) that led to establishing the audit plan.

1. **ASSURANCE AND CONFIDENCE LEVEL FOR THE SUBSTANTIVE TESTINGS**

Substantive testing is based on the assurance obtained from inherent[[3]](#footnote-3) and control risk[[4]](#footnote-4). The level of assurance will then influence the extent of the substantive testing : the lower the level of assurance on the control system(s) provided from the system audit, the higher the required confidence level that will be required and hence the higher the sample size. One could consider three levels of assurance on system: high, medium and low:

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| --- | --- |
| **Level of assurance from the system audits** | **Confidence level** |
| High | Not less than 60% |
| Medium | 80% |
| Low | Not below 90% |

1. **FIRST LEVEL SAMPLING: NON-STATISTICAL RISK-BASED CONCEPTS WITH A RANDOM ELEMENT**

In principle, due to the low number of sampling items, the Commission estimates that a non-statistical risk-based sampling method combined with a random element will generally be used for the first level sampling of milestones and targets, for example at the level of a payment request or during a certain period (semester, calendar year, etc.). As a reminder and as indicated in section II, the lower the level of assurance on the control system(s) provided from the system audit, the higher the required confidence level that will be required and hence the higher the sample size.

A non-statistical sampling method may be used based on the professional judgement of the audit body in accordance with internationally accepted audit standards. The audit body should use its professional judgement and shall consider the following risk criteria for its risk assessment:

1. The type of awarding of grants/contracts;
2. The type of implementing authority(ies);
3. The number of implementing authority(ies),
4. The number of measures implemented by the implementing bodies;
5. The type of final recipient(s) (public/private);
6. The number of final recipients, contractors, sub-contractors involved;
7. The complexity of the verification mechanism;
8. The risk of double use of outputs/results, and
9. The results of the audits previously carried out.

The risk assessment should additionally take into account that the milestones and targets linked to the investments may be of a higher risk as regards their confirming their fulfilment than some milestones and targets linked to reforms (for example, publication of a law in the Official Journal may be easier to confirm than whether an investment with a large number of units has taken place).

The above-mentioned criteria are not exhaustive and the audit body may use other risk criteria, which better tackle the potential risk for the implementation of the Recovery and Resilience Plan in the specific Member State.

The population for the first level sampling includes all milestones and targets submitted to the Commission in the respective payment request or during a certain period (semester, calendar year, etc.).

There are no fixed rules on the sample size based on this non-statistical approach. The Commission recommends stratifying the population into two strata: (i) high risk stratum; and (ii) medium and low risk stratum. The milestones and targets with the highest risk (i.e. based on the highest risk score or based on the fact that for example 4 out of 9 risk criteria are applicable to the reform or investment) should be audited 100%. The milestones and targets from the medium and low risk stratum should be selected randomly. The Member States should ensure adequate coverage of measures related to milestones and targets in the audit sample, including their coverage in the medium and low stratum.

**Example 1:**

During the calendar year 2021, the Member State implemented 44 milestones and targets. Based on the risk-based assessment carried out by the audit body 6 milestones and targets are in the high-risk stratum hence will be audited 100%. The remaining 38 milestones and targets have either low or medium risk score.

High-risk stratum: 6 (5 investments and 1 reform)

Medium and low-risk stratum: 38 (17 investments and 21 reforms)

Taking into account that the high-risk stratum already includes 6 milestones and targets and in order to ensure an adequate coverage, the audit body decided to cover additional 8 milestones and targets from the medium and low-risk stratum. The audit body decided to audit at least 5 reforms in total hence the medium and low-risk stratum is sub-stratified (M). The audit body selects randomly 4 out of 21 reforms and 4 out of 17 investments.

As a conclusion, the audit body will cover 9 milestones/targets related to investments and 5 milestones related to reforms from the total population of 44 milestones and targets.

The audit body should then combine the audit results of the 100% audit of the high-risk items and the audit results of the audit of the randomly selected medium and low risk items in order to come to a general audit conclusion for underpinning the Management Declaration.

The use of a risk-based non-statistical method does not allow the projection of the errors identified in the sample to the whole population (for example in the respective payment request[[5]](#footnote-5) or during a certain period). Therefore, in case the significant deficiencies are identified by the audit body in the sample, the audit body should increase the sample for the substantive testing.

1. **SECOND LEVEL SAMPLING: STATISTICAL SAMPLING**
2. **Sampling methods**

For the sampling design, methods can be selected using the equal probability selection (e.g. simple random sampling) or the probability proportional to size (e.g. monetary unit sampling). Such methods allow the selection of a sample that is “representing” the population. Given the performance based nature of the Recovery and Resilience Plan, the Commission recommends to use the simple random sampling method. However, also the standard monetary unit sampling (MUS Standard) may be used by the audit bodies[[6]](#footnote-6).

As defined in the existing Commission guidances[[7]](#footnote-7), a basic rule of thumb is to never use sample sizes smaller than 30 items. Therefore, in the case that a population for the second level sampling does not exceed 30 items, the audit body is recommended to cover 100% of the items (e.g. final recipients or projects). When the audit population is higher than 30 items, the audit body is recommended either to apply statistical sampling methods or to audit 100% of the items.

* 1. Simple random sampling (SRS)

This method ensures that every final recipient or project in the population has equal probability to be selected to the sample (based on a random selection).

The calculation spreadsheet is presented in the templates in Annex 2 to this Guidance Note.

An example of the sampling process for the SRS method is in Annex 3 of this Guidance Note.

Refer to the [Guidance on sampling](https://ec.europa.eu/regional_policy/sources/docgener/informat/2014/guidance_sampling_method_en.pdf) or the Delegated Act, where all the details are explained.

* 1. MUS Standard

MUS Standard is the statistical sampling method that uses a monetary unit as the auxiliary variable for sampling. As explained above, the Recovery and Resilience Facility is a performance based instrument and there is no detailed information available on the expenditure behind the particular milestones and targets included in the payment claims. Therefore, a “monetary unit” cannot be based on cost but can be another quantitative variable such as the number of final recipients (see the example below). This approach is based on a systematic sampling with the probability of selection proportional to size (based on random selection).

**Example 2:**

The investment consists of the installation of 10,000 solar panels. The grants for this investment have been provided in total to 685 final recipients. The number of solar panels installed by these final recipients differs from 1 solar panel up to 663 solar panels.

The audit body decided to use the MUS standard statistical method with the final recipient as the sampling unit. The sample size calculated by the audit body is 30 sampling units (i.e. final recipients). The number of solar panels will represent the “monetary unit or hit” to be used in this case. The audit body calculated the cut-off value of 333.3 (= 10,000 / 30) to determine the high value stratum. In the high value stratum, there are 2 final recipients, one installed 663 solar panels and another 500 solar panels (i.e. in total 1,163 solar panels)[[8]](#footnote-8). The remaining 683 final recipients with 8,837 solar panels remain in the low-value stratum. The audit body selected randomly from this low-value population a sample of 28 final recipients based on sampling interval of 315.6 which will be later used for the extrapolation of the errors identified in the low-value stratum.

The calculation spreadsheet is presented in the templates in Annex 4 to this Guidance Note.

An example of the sampling process for the MUS Standard method is in Annex 5 of this Guidance Note.

Refer to the [Guidance on sampling](https://ec.europa.eu/regional_policy/sources/docgener/informat/2014/guidance_sampling_method_en.pdf) or the Delegated Act, where all the details are explained.

1. **Projection**

As presented in part III of this guidance, the use of a risk-based non-statistical method does not allow projecting the errors identified in the sample to the whole population. However, when using the statistical sampling method for the second level sampling the level of error (misstatement) identified should be projected (extrapolated) to the whole population of the particular investment.

1. **Precision**

Precision represents the sampling error, i.e. difference between the sample projection error (estimate) and the true (unknown) error in the population. It depends mainly on the sample size, the population variability and in a smaller degree on the population size.

1. **Population**

The population for the second level sampling includes all final recipients, projects, etc. for the selected milestone or target under the first level sampling. Whenever the selected milestone or target include a large number of final recipients, projects, etc., the audit body may apply second level statistical sampling.

1. **Stratification**

The population can be sub-divided (based on region, type of final recipient, type of the investment) in sub-populations called strata and independent samples can then be drawn from each stratum.

1. **Sampling unit**

The determination of the sampling unit should take into account the performance based character of the Recovery and Resilience Facility. For the second level sampling, the sampling unit will be usually the final recipient or the project (investment).

1. **Materiality (tolerable error)**

A materiality level represents the maximum level of error that is considered to be tolerable by the Commission. In principle, the formulas for the calculation of the sample size cannot be used when tolerable error is 0%. In this case and for the purposes of the sample size calculation, it is recommended to use the tolerable error of equal or lower than 2%.

1. **Evaluation of the audit results**

Once the level of error (misstatement) is projected (extrapolated) to the whole population of the particular investment, the audit body needs to evaluate the audit results in order to determine whether the milestone/target has been satisfactorily achieved. Over-declarations of the target goals will absorb any errors identified by the audits before the conclusion on the achievement of a target.

**Example 3:**

The target relates to the training of at least 20,000 persons and the Member State declares in the payment request 21,000 persons trained.

For the evaluation of the audit results the audit body will compare the declared outputs minus the extrapolated errors against the minimum target in the CID. In case that the audit body concludes, after the projection of the audit results, that the population is affected by the error of 4%, i.e. 840 trainings (= 21,000 \* 4%), it can still be concluded that the target has been satisfactorily fulfilled.

On the other hand, when the Member State declares to the Commission exactly 20,000 persons trained and the audit body concludes, after the projection of the audit results, that the population is affected by the error of 10%, i.e. 2000 trainings (= 20,000 \* 10%), it will have to be concluded that the target has not been satisfactorily fulfilled.

1. **SPECIFIC RRF CONSIDERATIONS**
2. Recommendations on how to organise the audit work in situations where the fulfilment of the target/milestone will be reached shortly before the payment request is submitted to the Commission

Audit bodies may be confronted with a situation whereby the fulfilment of the target for an investment would only be achieved very shortly before the planned date of presentation of the payment request to the Commission and the audit bodies has decided that it would like to assess the fulfilment of this target before the payment request is submitted. However, the activity underlying the investment is usually spread over a period of time and not fully concentrated in a short period before the submission of the payment request to the Commission. In order to allow the audit body to include conclusive audit results on these targets in the audit summary accompanying the payment request, the Commission proposes using either

* multi period sampling; or
* roll forward testing.

The guidance note on sampling methods for the audit authorities[[9]](#footnote-9) presents the specific formulas and detailed guidance for implementing the sampling in multiple observation periods. This approach can be followed with any sampling method that has been chosen by the auditor, including possible stratification. The formulas are presented in the templates in Annexes 2 and 3 to this Guidance Note.

Audit bodies could also opt for applying a generally accepted audit technique called “Roll forward testing”. [[10]](#footnote-10)A roll forward bridges the timing gap between the prior testing phase(s), but before the conclusion of the audit, whereby a risk-based approach could be used to determine what types of procedures need to be performed.

The amount of evidence needed for the roll-forward testing procedures depends on the following factors:

* The risk, nature and results during the interim testing;
* The sufficiency of the evidence obtained during the interim testing;
* The length of the roll-forward period; and
* The possibility that there may have been any significant changes in internal control over the reporting on the indicator data after the interim testing took place.

**Example 4:**

For the target relating to the training of the 220 persons, the training consisted of 15 modules spread over two years. The last module consisted of a final module of 1 month, scheduled to take place at a time close to the date of the submission of the payment request. Therefore, the audit body could audit first the 14 modules for the 220 persons based on a statistical sampling method and subsequently cover the final 1 month module and combine the audit results in order to conclude on the total investment. This technique allows to frontload the bulk of the audit work and to limit the audit work to be carried out in the period right before the date of the planned submission of the payment request.

1. Regional clustering

In some cases, the investment financed by the RRF is located in a large number of areas, far from each other. In order to avoid the excessive geographical spread of the audit work, while still allowing statistical representativeness, a special technique named regional clustering is proposed. The technique is developed both for MUS Standard and simple random sampling (SRS) frameworks.

The application of the technique is motivated by the opportunity to reduce audit burden by reducing geographical dispersion.

Regional clustering is based on the selection of a limited number of regions, thus geographically concentrating the audit work, whereby regions are selected randomly using either MUS Standard or SRS selection. The selection of the projects/final recipients is confined to the regions selected to the sample and the items to be audited within the region are also selected randomly using MUS Standard or SRS approaches.

Principles:

* The minimum number of regions in a sample is 3;
* The minimum sample size of items (projects/final recipients) inside an investment is 30 as usual;
* The minimum number of items (projects/final recipients) to be selected in one region is 3;
* The method is based on selecting a constant number of items (projects/final recipients) in each region, which is expected to facilitate the organization of audit activities.

Sample size:

* The calculation of sample size is based on two steps:
	+ Firstly the audit body chooses the number of regions that it wants to audit (min. 3, depending on the characteristics of the population, a higher number could be required in case any of the regions would constitute a cluster with a high number of items);
	+ Secondly, after the number of regions is chosen, the audit body uses the below formula to calculate the number of items to be audited in each region;
* Typically, the larger the number of regions the audit body accepts to select, the smaller the sample size of items will be the needed;
* It is recommended that the audit body tries different number of regions in order to fine tune the “best” balance between number of regions and sample size of items.

Projection:

Projection is to be made in 2 steps:

* Items in each region are used to project the error rates for each selected region and thus to obtain error rate for region;
* Once these error rates are obtained, they are used to project the errors at investment level in the sample;

Precision:

At operation level: new formulas are available to calculate precision at investment level.

1. **AUDIT TRAIL ON SAMPLING IN THE SUMMARY OF AUDITS**

For each audit contained in the Summary of audits where the sampling has been carried out, the Member State should provide, as part of its summary, an indication of the sampling parameters and other information for statistical or non-statistical sampling used, as well as an explanation of the underlying calculations and professional judgement applied. The information should include where relevant: population size, sample size, materiality level, confidence level, sampling unit, expected error rate, and information on stratification. Where relevant, the underlying calculations for the sample size calculation and the sample selection, in a format permitting an understanding of the basic steps taken, and in accordance with the specific sampling method used, should be attached.

1. **ANNEXES**

Annex 1 – Parameter z from the normal distribution

Annex 2 – Calculation spreadsheets for the SRS method

Annex 3 – Example of the sampling process for the SRS method

Annex 4 – Calculation spreadsheets for the MUS Standard

Annex 5 – Example of the sampling method for the MUS Standard method

Annex 6 – Sampling technique and example for the regional clustering

**Annex 1 – Parameter z from the normal distribution**

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| **Confidence level** | 60% | 80% | 90% |
| **System assurance level** | High | Medium | Low |
| z | 0.842 | 1.282 | 1.645 |

**Annex 2 – Calculation spreadsheet for the SRS method**



**Annex 3 – Example of the sampling process for the SRS method**

The target selected by the audit body consists of entry into service of at least 7,500 rapid re-charging stations for electric vehicles. The Member State declared to the Commission installation of 7,700 rapid re-charging stations.

The sample size is computed as follows:

Population size: 7,700 charging stations

*z* is parameter from the normal distribution related to the confidence level determined from system audits. Based on the system audits carried out, the level of assurance on internal control system is medium, it means that the confidence level is 80% → z = 1.282

To obtain an approximation of the standard deviation (), the audit body decided to use standard deviation from either a pilot sample, previous years or from the result of the audit of a similar type of investment under the cohesion policy. The standard deviation is 0.094.

Tolerable error: The target relates to the entry into service of at least 7,500 charging stations and the Member State declares in the payment request 7,700 charging stations. For the purposes of the sample size calculation the audit body used a tolerable error of 2% (i.e. 154).

Anticipated error: Based on the professional judgement of the audit body, the anticipated error is 0.25%.

The sample size calculated by the audit body is 48 sampling units (i.e. charging stations).

Projection of identified errors:

After auditing the 48 charging stations, the audit body is able to project the error. The audit body identified errors with 1 charging station. In this case it is recommended to use mean-per-unit estimation method for the projection of errors.

Using mean-per-unit estimation, the projection of the errors to the population is calculated by multiplying this average error by the population size (7,700 in our example). This is the projected error at the level of the investment:

The projected error rate is computed as the ratio between the projected error and the total size of the population.

The projected error rate allows to consider the milestone as satisfactorily achieved as the over declaration of 200 charging stations will fully absorb this error. However final conclusions can only be drawn after taking into account the precision (sampling error):

To draw a conclusion about the materiality of the error the upper limit of error (ULE) should be calculated. This upper limit is equal to the summation of the projected error and the precision.

Precision (sampling risk) is approximately 2.67%. Since the maximum tolerable error is larger than the projected error, but smaller than the upper limit of error, additional work is needed.

According to the INTOSAI guideline No 23, the additional work can include (i) requesting the audited entity to investigate the errors/exceptions found and the potential for further errors/exceptions. This may lead to agreed adjustments in the financial statements; (ii) carrying out further testing with a view to reducing the sampling risk and thus the allowance that has to be built into the evaluation of results; and (iii) using alternative audit procedures to obtain additional assurance (e.g. re-calculation of the confidence level)

**Annex 4 – Calculation spreadsheet for the MUS Standard**



**Annex 5 – Example of the sampling method for the MUS Standard method**

The target consists of the installation of 10,000 solar panels. The grants for this investment have been provided in total to 685 final recipients. The number of solar panels installed by these final recipients differs from 1 solar panel up to 663 solar panels. The Member State declared to the Commission installation of 10,200 solar panels.

Population size: 685 final recipients

Book value (BV): 10,200 solar panels

The sample size is computed as follows:

*z* is parameter from the normal distribution related to the confidence level determined from system audits. Based on the system audits carried out, the level of assurance on internal control system is medium, it means that the confidence level is 80% → z = 1.282

To obtain an approximation of the standard deviation (), the audit body decided to use standard deviation from previous years of the similar grant scheme under the cohesion policy. The standard deviation is 0.022[[11]](#footnote-11).

Tolerable error (TE): The target relates to the installation of 10,000 solar panels and the Member State declares in the payment request 10,200 solar panels. The audit body will use the tolerable error of 2% for the purposes of the sample size calculation.

Anticipated error (AE): Based on the professional judgement of the audit body, the anticipated error is 1.5%.

The sample size calculated by the audit body is 32 sampling units (i.e. final recipients).

The audit body calculated the cut-off value of 318.75 (= 10,200 / 32) to determine the high value stratum (100% audit stratum). All items whose book value is higher than this cut-off will be placed in the 100% audit stratum. In the high value stratum there are 2 final recipients, one installed 663 solar panels and another 500 solar panels (i.e. in total 1,163 solar panels)[[12]](#footnote-12).

The remaining 683 final recipients with 9,037 solar panels remain in the low-value stratum. The audit body selected randomly from this low-value population a sample of 30 final recipients based on sampling interval of 301.23 which will be later used for the extrapolation of the errors identified in the low-value stratum.

Projection of identified errors:

After auditing the 32 final recipients, the audit body is able to project the error. Out of the 2 high-value final recipients, the audit body identified an error with 29 solar panels.

For the remaining sample of 30 final recipients (low-value stratum), the identified error has a different treatment. For each final recipient the error rate (E/R), i.e. the ratio between the solar panels with error and the total number of audited solar panels is calculated.

Final recipient 001 – 8 solar panels, no error, E/R = 0.00

Final recipient 002 – 10 solar panels, 2 solar panels with error, E/R = 0.20

(…)

Final recipient 030 – 19 solar panels, 1 solar panel with error, E/R = 0.05

Sum of error rates (E/R) = 0.37

Then, the error rates should be summed over all units in the sample and multiplied by the sampling interval.

The projected error at the level of the total population (high-value stratum and low-value stratum) is just the sum of these two components.

The projected error rate (TPER) is the ratio between the projected error and the total population:

The standard deviation of error rates in the sampling stratum (low-value stratum) is 0.025. The precision (SE) is calculated in the following way:

Note that the precision (sampling error) is computed for the non-exhaustive stratum only, since there is no sampling error to account for in the exhaustive stratum.

To draw a conclusion about the materiality of the error the upper limit of error (ULE) should be calculated. This upper limit is equal to the summation of the projected error and the precision.

In this case, both the projected error rate and the upper limit are smaller than maximum tolerable error. It means that the audit body can conclude that the target has been satisfactorily fulfilled as the overdeclaration of 200 solar panels will fully absorb identified error.

**Annex 6 – Sampling technique and example for the regional clustering**

Sampling technique[[13]](#footnote-13):

The sample size of projects/final recipients within each region of one target is computed as follows:

where:

* + *BV, TE, AE* are the book value, tolerable error and anticipated error at investment level;
	+ *m* is the number of regions that the audit body decides to select for its sample (min. 3);
	+ is the standard-deviation of error rates calculated at region level;
	+ is the average of the variances of the error rates calculated at project/final recipient level within each region;
	+ unknown parameters are obtained with the usual methods (historical data, professional judgement, etc.).

The average of the variances of the error rates at project/final recipient level can be approximated using sample data through

where is the variance of error rates of the project/final recipient in region *l*.

The variance of the error rates at region level can be approximated using sample data through

where is the error rate of region *l*

In each region/location sample selection is performed as usual.

In each region , there will be two strata:

* + the high-value stratum containing the sampling units with book value larger or equal than the cut-off value, ;
	+ the low-value stratum containing the sampling units with book value smaller than the cut-off value, )

As usual in each region the sampling interval is

Note that several independent samples will be selected, one for each region.

In what follows below on the projection a standard MUS approach is assumed. The methodology can be easily adapted to other sampling methods, in particular SRS.

*Projection at region level:*

The errors of the high-value stratum are just summed as usual:

For the low-value (sampling) stratum errors are also projected using the formula

The projected error at the level of region is just the sum of these two components:

And the projected error rate is as usual:

*Projection at investment level:*

Once the error rates of the regions are projected, they are used to project the errors for the overall target

Where

* + is the projected error at the level of the overall target *i*.
	+ is the book value of the overall target *i*
	+ is the number of regions selected in investment *i*
	+ the errors have been obtained by projecting the respective sample of projects/final beneficiaries

The precision at overall target level is calculated by:

of low value stratum in region *l*

*BV* is the book value of the overall target

 is the book value of projects/final recipients in audited region *l*

 is the book value of projects/final recipients in low value stratum of region *l*

*Sample size calculation for one specific target, using the regional clustering technique:*

BV: 102,000 solar panels, installed by 5,100 final recipients, spread over 15 regions

Tolerable error: 2%.

Confidence level: 80%, thus z factor is 1.282

AE: 1%, based on professional judgment of the audit body

Standard deviation of error rates at region level: 0.01

Average standard deviation of error rates at final recipient level within each region: 0.08

The standard deviation approximation is based on standard deviations from previous years of a similar grant scheme under the cohesion policy.

Audit body decides to concentrate the audit work in 5 regions

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 =5

If the audit body had decided to select the sample of final recipients directly from the whole population without restricting it to 5 regions, the sample size would have been:

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Notes:

There is an increase of 52 projects/final recipients in the sample size when comparing with the sample size calculation without regional clustering, resulting from restricting the sample to a limited number of regions.

But there is a significant advantage from restricting the audit work to a limited number of locations.

*Projection:*



1. EGESIF\_16-0014-01 20/01/2017 [↑](#footnote-ref-1)
2. The application of audit procedures to less than 100% of items within a population of audit relevance such that all sampling units have a chance of selection in order to provide auditor with a reasonable basis on which to draw conclusions about the entire population [↑](#footnote-ref-2)
3. Inherent risk is the perceived level of risk that a material error may occur in the requests for payments submitted to the Commission, or underlying levels of aggregation, in the absence of internal control procedures. The inherent risk is linked to the kind of activities of the audited entity and will depend on external factors (cultural, political, economic, business activities, clients and suppliers, etc.) and internal factors (type of organisation, procedures, competence of staff, recent changes to processes or management positions, etc.) [↑](#footnote-ref-3)
4. Control risk is the perceived level of risk that a material error in the requests for payments submitted to the Commission, or underlying levels of aggregation, will not be prevented, detected and corrected by the management's internal control procedures. As such the control risks are related to how well inherent risks are managed (controlled). Control risks can be evaluated by means of system audits – detailed control testing, which are intended to provide evidence about the effectiveness of the design and operation of an internal control system in preventing or detecting material errors. [↑](#footnote-ref-4)
5. However, the results from the substantive testing will to underpin the management declaration and as such provide assurance to the authority signing off on the management declaration that the applicable rules have been complied with [↑](#footnote-ref-5)
6. “Monetary unit” should be interpreted in the broader sense and should be read as “item”, “invoice” or “solar panel” as explained in the example 2. [↑](#footnote-ref-6)
7. Guidance on sampling methods for audit authorities (EGESIF\_16-0014-01 20/01/2017) and the (upcoming) Delegated Act on the off-the-shelf sampling methodologies [↑](#footnote-ref-7)
8. In this case the audit body can apply sub-sampling, selecting the solar panels by using the same principles and methods used to select the final recipients [↑](#footnote-ref-8)
9. EGESIF\_16-0014-01 20/01//2017 [↑](#footnote-ref-9)
10. As described in ISA Number 330 point A33 and Auditing Standard number 5 of the PCAOB point 55 [↑](#footnote-ref-10)
11. Alternatively, the audit body can audit a preliminary/pilot sample of low sample size in order to determine standard deviation [↑](#footnote-ref-11)
12. In this case the audit body can apply sub-sampling, selecting the solar panels by using the same principles and methods used to select the final recipients [↑](#footnote-ref-12)
13. As presented by prof Pedro Simões Coelho at the May 2019 Technical Meeting between the EC and the audit authorities in the area of Cohesion [↑](#footnote-ref-13)