Acorn Validation and Verification Cycle – Sampling Approach and Program Certification

Version 1.0 - 2024

Acorn

Contents

1. Introduction

The Acorn program consists of multiple projects around the globe which all apply the same carbon removal interventions and measurement technologies. Unlike other carbon removal standards, certified Acorn projects can issue Carbon Removal Units (CRUs) before they are audited by an independent third-party expert. This proactive certification approach enables projects to scale up faster, keeping their operational costs down, and in turn increasing accessibility to the Voluntary Carbon Market for the smallholder farmers we work with.

Our selected Certifier, Plan Vivo, assesses all projects for eligibility criteria on the basis of the so-called Eligibility Document. Once deemed eligible, and after the project's Acorn Design Document is complete, a project can start issuing CRUs for the Acorn program.

To confirm the veracity of our projects and the Acorn program as a whole, Acorn continuously undergoes what we call the Validation and Verification Cycle (VV Cycle). In this process, a sample of projects is taken according to Acorn's Certifier-approved sampling approach. Sampled projects are then submitted to the Certifier for desk review. An independent Validation and Verification Bodies (VVBs), selected according to the criteria in the Acorn Framework, then conduct field audits on the sampled projects. Their findings identify measures, if any, that need to be taken to ensure the Acorn program and our projects are issuing valid and verifiable CRUs.

This document details Acorn's Validation and Verification Cycle from the sampling approach to the outcomes that can be issued by the Certifier, and the steps taken to resolve any issues found.

2. Overview of the cycle

The Acorn program is continuously assessed by independent third-party experts to ensure our projects are issuing valid and verifiable CRUs. In this process, which we refer to as the Validation and Verification Cycle, or VV Cycle, we take a sample of Acorn projects from our portfolio on a yearly basis. These projects are then assessed by the Certifier and Validation and Verification Bodies (VVBs) to determine the veracity of not only the projects themselves but of Acorn as a whole.

A VV Cycle begins with project sampling and ends when all the sampled projects are issued a final opinion by the VVB and, in consultation with the Certifier, the reports are closed. Activities in the cycle include desk reviews by the Certifier and VVBs, field audits, reassessments, and the publication of the final reports.

At the start of a cycle, projects in the Acorn program are sampled according to our certified sampling approach (see chapter 4). The sampled projects are then submitted to the Certifier for a desk review of the project's documentation (see chapter 3), which are reviewed against the Acorn Framework and the Acorn Methodology. The sampled projects are then sent to VVBs for auditing (see chapter 5).

After their own desk reviews and site visits, the VVBs report their findings using the Certifier-approved Validation Report and/or Verification Report templates. These reports describe whether a project has met the requirements in the Acorn Framework and Acorn Methodology, and whether project documentation accurately represents the project's intervention on the ground. Disparities, or what we call non-conformities, can be found on a project level (see chapter 6) but can also be determined to be systemic and therefore program-level concerns (see chapter 7).

The VVB's report is first discussed with the Certifier before being forwarded to Acorn. In the case that one or more non-conformities are found, Acorn and the Local Partner(s) take corrective measures until resolved.

A cycle closes once all the sampled projects have been issued a final opinion. See Figure 1 for a simplified depiction of a single VV Cycle.

Figure 1. Simplified depiction of a single VV Cycle.

3. Project documentation requirements

For the VV Cycle, all certified projects must possess the following documents:

- **Acorn Design Document (ADD):** A project-specific report that details the project design (e.g. agroforestry design and business case), implementation plans and processes (e.g. benefit-sharing mechanism and project council governance structure), potential risks and negative impacts, and other assessments (e.g. additionality and adjustment factors) to demonstrate conformance with the Acorn Framework and Acorn Methodology;

- **Appendix to the ADD:** project area and ecoregion map,, sub-contractor assessment (if applicable), land tenure documentation, evidence of engagement with Local Stakeholders, organizational structure, evidence of government communication, Participant and Partnership agreements, Agroforestry Design(s), Business Case(s), Benefit Sharing Mechanism, CRU calculations and rationale for the adjustment factors, among others[1];

- **Annual Report (AR):** Yearly-submitted report detailing project implementation, progress, scaling, finances and payments, monitoring (e.g. carbon, risks and indicators), grievances, project council meetings, and any changes made to the project design during the corresponding reporting period.

- **Appendix to the AR**: CRU calculation sheets and rationale for the adjustment factors, Project Council reports, sample of signed Participant Agreements, updated/new Agroforestry Design(s), updated/new Business Case(s), updated/new Benefit Sharing Mechanism, updated project area and ecoregion map, among others.

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[1] This list is not exhaustive. The Certifier can request additional evidence and documentation that is relevant to the project's ADD and AR.

4. Sampling approach

Each year, projects are selected for the VV Cycle according to Acorn's Certifier-approved sampling approach. Sampling is overseen by the Certifier to safeguard its accuracy, and, at least once every five years, the sampling approach is reviewed by Acorn and the Certifier.

First, clusters of similar projects are formed using a hierarchical-based clustering method. Second, a random sample of projects is selected from each cluster. The number of total projects sampled depends on the total number of projects in each cluster. The methodologies for clustering and random sampling are described in detail in sections 4.1 and 4.2 respectively. Examples of sample sizes are provided in section 4.3.

4.1. Agglomerative hierarchical-based clustering method

An agglomerative hierarchical-based clustering method (Sneath 1973) is applied to construct a hierarchy of clusters. The method starts by treating each data point as a distinct cluster. At each step of the algorithm, pairs of clusters which are most similar to each other are merged into a new cluster. This procedure is repeated until all projects are one single cluster.

Similarity between projects is calculated using Gower's distance (Gower 1971). This algorithm was chosen because it can handle mixed data (quantitative, ordinal, and nominal data). The minimum project characteristics used to calculate the Gower's distance between projects are land size (ha), geographical location (by continent), and Local Partner entities. Other characteristics might be added at a later stage.

In order to calculate the distance between clusters, a linkage method needs to be chosen. Three non-Euclidean linkage methods are considered (see Figure 2). The silhouette score (Rousseeuw 1987) is then used to decide which linkage method produces the best clusters.
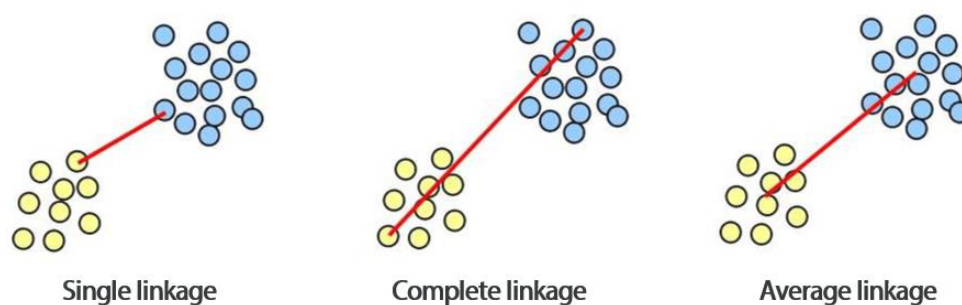
Figure 2. Linkage method

The result of the hierarchical clustering procedure can be represented by a dendrogram (see Figure 3). A dendrogram visualizes the steps of the hierarchical clustering by showing the distance between clusters in graph form. The projects are shown on the x-axis and the Gower's distance between them on the y-axis. This implies that the further apart the vertical lines in the dendrogram, the greater the distance between the clusters.

The dendrogram is also used to calculate the final number of clusters. This is done by setting a threshold distance (e.g. the red horizontal line in Figure 3) at a height where the line can traverse the maximum distance up and down without intersecting a merging point. The final number of clusters for use in the sampling is the number of vertical lines intersected by the threshold line. In the example provided here, there are two resulting clusters (the orange cluster and the green cluster).
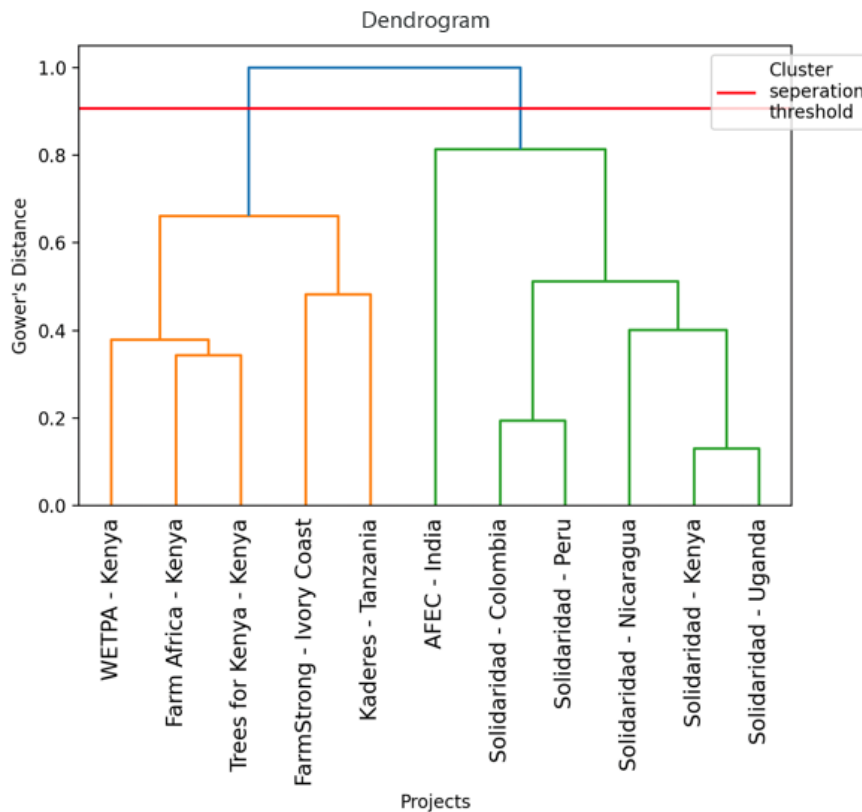

Figure 3. Example dendrogram.

4.2.   Weighted random sampling

The number of projects sampled from each of the selected clusters (*c*) is determined as follows:

$$y_c = \left\lceil \sqrt{x_c - x_{c0}} \right\rceil$$

where:

y_c	= Sample size, i.e. total number of projects sampled from cluster *c*
$\lceil \ \rceil$	= Ceiling. Rounds up a number to the nearest integer
x_c	= Total number of projects in cluster *c*
x_{c0}	= Total number of projects in cluster *c* that have weight zero (see below)

Once the sample size is determined, specific projects in a cluster (*c*) are selected based on a weighted random draw (Vitter 1984). This entails the following steps:

1. Assign weights $\{w_1, w_2, \ldots, w_n\}$ for a set of n projects $\{project\ 1, project\ 2, \ldots, project\ n\}$ in cluster c at time t

   The weight is a number that increases ($w_i > 1$) or decreases ($w_i < 1$) the chance of being selected. There are two situations that affect weight:

   - When a project is included in the current year's sample, it should have a zero probability of being chosen again in the following year, or $(t + 1)$.
   - The weight is also affected by the outcome of the Risk Assessment for environmental, social, and carbon reversal risks, in a project's ADD. A project with a higher risk should have a higher chance of being selected (i.e. a higher weight) than a project with lower risk. In the Risk Assessment, there are three levels of risk: low, medium, and high. The overall risk score (rs_i) for the risks $\{r = 1, \ldots, R\}$ for project i is determined as follows:

$$rs_i = \sum_{r=1}^{R} 0 * I_{r,i,low} + 1 * I_{r,i,medium} + 2 * I_{r,i,high}$$

where:

rs_i	= Overall risk score for project i
$I_{r,i,low}$	= Indicator equal to one if risk r for project i is assigned as low, and zero otherwise
$I_{r,i,medium}$	= Indicator equal to one if risk r for project i is assigned as medium, and zero otherwise
$I_{r,i,high}$	= Indicator equal to one if risk r for project i is assigned as high, and zero otherwise

2. Calculate the total weight in cluster c (W_c) for project $i = 1, \ldots n$

$$W_c = \sum_{i=1}^{n} w_i$$

3. Determine the selection probability of project i ($P_c(i)$), based on its weight relative to the total weight in cluster c:

$$P_c(i) = \frac{w_i}{W_c}$$

4. Compute the cumulative probabilities in cluster c for project i ($CP_c(i)$):

$$CP_c(i) = \sum_{j=1}^{i} P_c(j)$$

   Note that $CP_c(1) = P_c(1)$ and $CP_c(n) = 1$

5. Select the projects from cluster c:

- Generate a random number r between 0 and 1 (including zero, excluding one)
- Determine the selected projects based on which interval r falls into:
    i. If $0 \leq r < CP_c(1)$, select project 1
    ii. If $CP_c(1) \leq r < CP_c(2)$, select project 2
    iii. …
    iv. If $CP_c(n-1) \leq r < CP_c(n)$, select project n

6. Repeat step 5 until all y_c projects are selected.

As the Certifier's expertise is vital to guaranteeing independent audits, at any time the Certifier can request the inclusion of a project that was not sampled. When such a request is made, a clear reason must be given, and consideration of costs must be included in the request.

4.3. Example sample sizes

Table 1 provides an example of the number of projects that would be sampled given a certain number of clusters in the dendrogram. Note that if only ten projects are in the Acorn program's portfolio, a minimum of five projects must be sampled.

Table 1. Example of the number of projects sampled, where x_c includes the total number of projects in cluster c, and y_c includes the total number of projects selected from cluster c

Number of clusters in dendogram		$10\ projects$		$30\ projects$		$100\ projects$		$120\ projects$	
		x_c	y_c	x_c	y_c	x_c	y_c	x_c	y_c
2 clusters	Cluster 1	6	3	10	4	40	7	80	9
	Cluster 2	4	2	20	5	60	8	40	7
	Total		5		9		15		16
4 clusters	Cluster 1	2	2	7	3	17	5	23	5
	Cluster 2	1	1	12	4	30	5	56	8
	Cluster 3	3	2	6	3	16	4	12	4
	Cluster 4	4	2	5	3	37	7	29	6
	Total		7		13		21		23
7 clusters	Cluster 1	1	1	3	2	8	3	15	4
	Cluster 2	2	2	4	2	12	4	23	5
	Cluster 3	1	1	2	2	24	5	29	6
	Cluster 4	2	2	6	3	19	5	13	4
	Cluster 5	2	2	3	2	12	4	8	3
	Cluster 6	1	1	8	3	9	3	11	4
	Cluster 7	1	1	4	2	16	4	21	5
	Total		10		16		28		31

5. *Validation and verification*

If chosen in a sample, a project is subject to one of the following in the VV Cycle:

- If a project has **not** been validated yet and **is** issuing CRUs, both validation and verification are conducted
- If a project has **not** been validated yet and **is not** issuing CRUs, only validation is conducted
- If a project **is** validated and **is** issuing or **has** issued CRUs, only verification is conducted
- If a project **is** validated and is **not** or **has not** issued CRUs, no verification or validation are conducted
- If a project **is** validated but has expanded outside of the initial ecoregion listed in the ADD at the time of validation, validation is conducted on only the new ecoregion area. Verification is also conducted if the new ecoregion area **is** issuing CRUs

The sampled projects are first sent to the Certifier for an initial desk review. The Certifier then sends the projects to the applicable VVBs with its request for validation and/or verification, including recommendations for any specific inquiries to be conducted in the audit.

In a validation, the accuracy, completeness, quality, and veracity of information reported in the project's ADD, and the knowledge, capacity and functionality of the project coordinator and project participants, are assessed by a VVB. The VVB conducts both a desk review and a field audit. Validation is executed only once per project, unless the project expands to a new ecoregion, different from the one initially listed in its ADD.

In a verification, the accuracy, completeness, quality, and veracity of information provided in the AR, quality assurance of the CRU calculations, and any revisions to the ADD made since the last verification are assessed by a VVB. This includes verifying the number of CRUs issued by the project since the previous verification. The VVB conducts both a desk review and a field audit. Verification can be executed more than once per project.

A VVB's Validation and/or Verification Report on a project determines the project's compliance or non-compliance with the requirements in the Acorn Framework and Acorn Methodology. Non-compliance is reported as a so-called non-conformity (see chapter 6). The report states whether the project's documentation accurately represents the project and its activities, and provides the VVB's preliminary opinion on a project's compliance with the Acorn requirements.

The VVB submits the report(s) to the Certifier. Upon consultation with the Certifier, Acorn and the Local Partner of the project address any non-conformities found by the VVB. After measures have been taken and conformance demonstrated, the project is issued a final opinion. Once all the sample of a VV Cycle has been issued a final opinion, the VV Cycle is closed.

During a VV Cycle, Acorn and the Certifier consult the incoming reports to determine the presence of program-level non-conformities, in other words systemic or procedural issues that are affecting the veracity of the program as a whole.

6. *Non-conformities on a project level*

The VVB's Validation and/or Verification Report details any non-conformities, its preliminary opinion on the project's compliance with the Acorn program, and recommendations for resolving any non-conformities, if found.

6.1. *Types of project non-conformities*

6.1.1. Corrective Action Request (CAR)

Non-conformity which could have negative impact or reduce benefits in the project area or project region, requiring immediate action. The project coordinator needs to resolve a CAR within a timeframe set by the VVB. No CRUs can be issued if a project has an open CAR.

6.1.2. Procedural Corrective Action Request (PCAR)

Non-conformity likely to arise due to one or more processes in place, or lack thereof, at Acorn. A PCAR is determined by the VVB and confirmed in consultation with the Certifier and Acorn, and is considered a SCAR that must to be addressed on both the project and program levels (see chapters 6 and 7).

6.1.3. Forward Action Request (FAR)

Non-conformity that does not require immediate action but may require time and effort to resolve. Although not likely, if left unresolved, a FAR could affect a project's delivery of the intended benefits. The project can continue to issue CRUs. The VVB proposes the action required and the timeframe within which it must be implemented. Any open FAR is reviewed by the Certifier within one year. A project can have no more than three open FARs to close the validation and/or verification. If more than three FARs are found, then additional non-conformities will be categorized as CARs by the VVB.

6.1.4. New Information Request (NIR)

Lack of clarity to determine compliance, and additional information is needed. No CRUs can be issued if a project has an open NIR.

6.1.5. Observation

Also called recommendation, an observation is advice given when the VVB identifies one or more areas where procedures, data, or documentation could be clarified or improved, but which is not deemed material enough to impose a CAR, PCAR, FAR, or NIR. Acorn is responsible for following up on an observation at its own discretion.

6.2. *Preliminary opinion*

Following its audit, the VVB must provide a concrete and preliminary opinion as to the status of the validation and/or verification of a project. This opinion takes the form of positive, or pending:

- **Positive opinion:** When a sampled project passes the validation and/or verification assessment because it exhibits no non-conformity.

- **Pending opinion:** When a sampled project has not yet passed the validation and/or verification assessment due to the presence of one or more non-conformities. The VVB specifies a timeframe to resolve the open non-conformities.

The preliminary opinion also includes a summary of whether a project's documentation accurately and clearly represents the project and its activities.

6.3. Process to resolve project non-conformities

Project non-conformities are handled as follows (see Figure 4):

Step 1: Measures taken

Acorn together with the Local Partner work together to resolve any non-conformities identified by the VVB, and must do so within the timeframe specified in the VVB's report. The VVB then reviews the action(s) taken; this may include a site visit.

Step 2: First reassessment

The VVB assesses the measures taken. If resolved, the non-conformity is closed, and the project is issued a final positive opinion. If unresolved, but ongoing, the VVB provides an extension; appropriate mitigation actions are then defined to resolve the non-conformity within the extended timeframe. Any open FAR will be reviewed by the Certifier within one year.

Step 3: Second reassessment

If the non-conformity continues after the second reassessment, the project is issued a final negative opinion. Acorn, in consultation with the Certifier, defines appropriate rectification measures (e.g. placing the project on hold, suspension of CRU issuance, and offboarding of the project), depending on severity of the non-conformity.
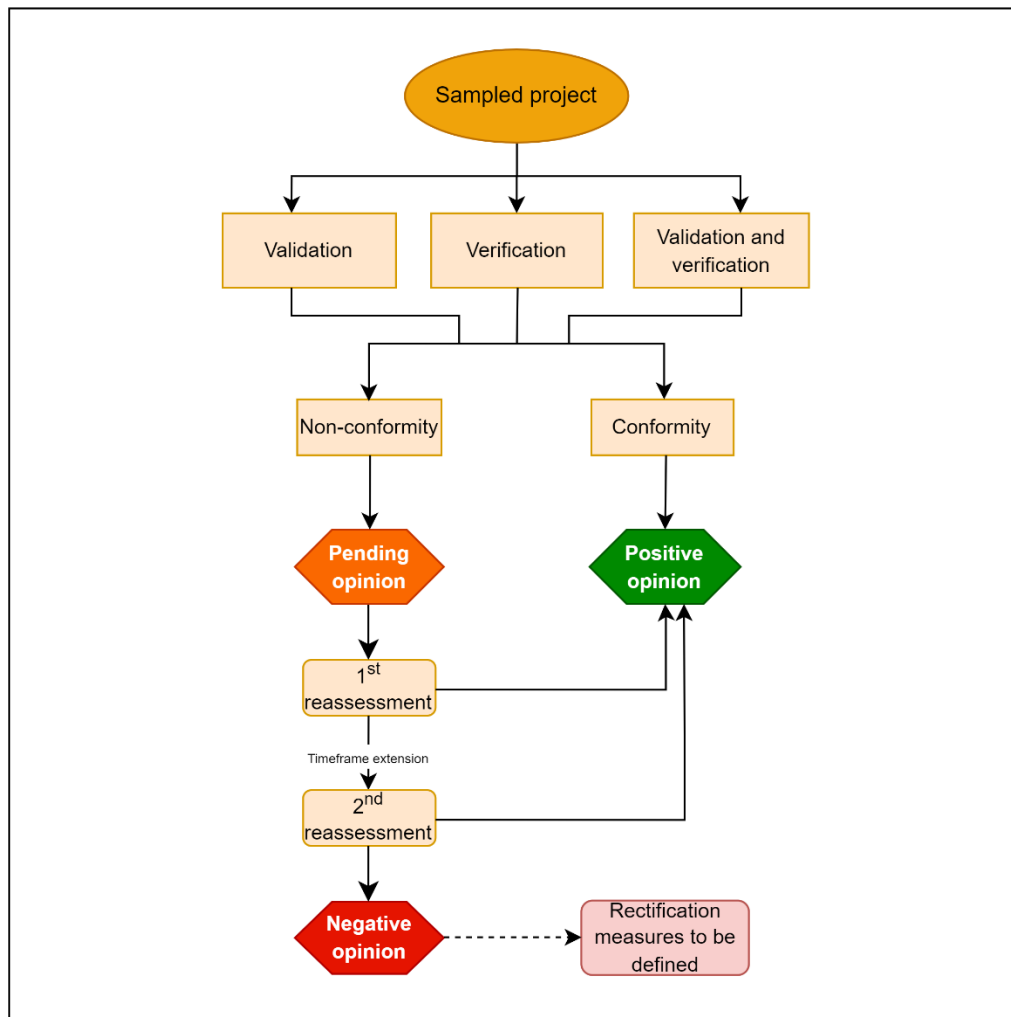
Figure 4. Process to address a project non-conformity.

6.4. Final opinion

After Acorn and the Local Partner have addressed the non-conformities, and the VVB in consultation with the Certifier assess the evidence, the VVB issues a final opinion on the project's validation and/or verification. This updated and final opinion takes the form of positive or negative:

- **Positive opinion:** When a sampled project passes the validation and/or verification assessment because it has successfully resolved any non-conformities within the given timeframe
- **Negative opinion:** When a sampled project has not passed the validation and/or verification assessment due to the presence of one or more non-conformities that have not been resolved within the given timeframe

The opinion also includes a summary that describes whether a project's documentation, after the corrective actions have taken place, accurately and clearly represents the project and its activities.

7. Non-conformities on a program level

In addition to identifying non-conformities on the project level, it is essential that these are also identified on a program level (i.e. across the Acorn portfolio) to ensure projects are not undertaking activities or lacking activities that result in non-compliance in the same areas. As reports are submitted over the course of a VV Cycle, Acorn and the Certifier review those reports for any non-conformities which indicate systemic or procedural issues within the program itself.

7.1. Types of program non-conformities

7.1.1. Systemic Corrective Action Request (SCAR)

Non-conformity assumed to arise in other projects that have not been selected for validation and/or verification due to the sample-based approach. When a CAR or NIR is repeated in three or more projects, the non-conformity is considered a SCAR.

7.1.2. Procedural Corrective Action Request (PCAR)

Non-conformity of a project that is likely due to processes in place, or lack thereof, at Acorn. As stated in section 6.1.2, a PCAR is considered a SCAR and, therefore, needs to be addressed on both the program and project levels.

7.2. Program review

The Acorn program is continuously reviewed through the annually-initiated sampled VV Cycles. Project-level findings can indicate areas for improvement, but can also testify to systemic issues in the program. The veracity of the program is confirmed through a SCAR as follows:

I. t – SCAR is identified. Acorn, in consultation with the Certifier, defines mitigation measures at the program level.

II. $t+1$ – The presence of the SCAR is assessed in the following VV Cycle. Depending on the sample size[2], a SCAR remains open if it appears again in > 5% of sampled projects, and closed if it appears in $\leq$ 5% of sampled projects. If closed, the program's veracity is confirmed.

III. $t+2$ – If in the third VV Cycle since the SCAR was found, the same SCAR is still present in > 5% of sampled projects, the program's is not confirmed. Acorn, in consultation with the Certifier, must define measures to return the program to Validated/Verified status. If the same SCAR is no longer present, the program's veracity is confirmed.

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[2] If the number of projects in the sample size is < 50, 1 CAR needs to occur in 3 projects to be considered systemic. If the sample size is $\geq$ 50 projects, 1 CAR needs to occur in > 5% of the sample to be considered systemic.

7.3. Process to resolve program non-conformities

Program non-conformities are handled as follows (see Figure 5):

Step 1: Confirmation of SCAR(s)

Acorn and the Certifier confirm the SCAR(s) identified in a VV Cycle. The Certifier can suspend CRU issuance for a selection of projects or for all projects.

Step 2: Project-level and program-level measures

The SCAR is addressed at the sample level (i.e., the project must resolve the CAR or NIR that led to the determination of a SCAR, see section 6.3) and at the program level. For the latter, Acorn develops a mitigation and monitoring plan, agreed upon with the Certifier, to close the SCAR.

Step 3: Reassessment

The SCAR is reassessed in subsequent VV Cycles until closed by $t+2$. At any time, but especially after identifying a SCAR, the Certifier can instruct the VVB to collect certain information or evidence, or pay special attention to specific areas in its field audit. If the SCAR does not appear in the subsequent cycle, the SCAR is closed. If the same SCAR does appear, then Acorn, in consultation with the Certifier, revises the mitigation and monitoring plan and develops a roadmap for resolving the SCAR.
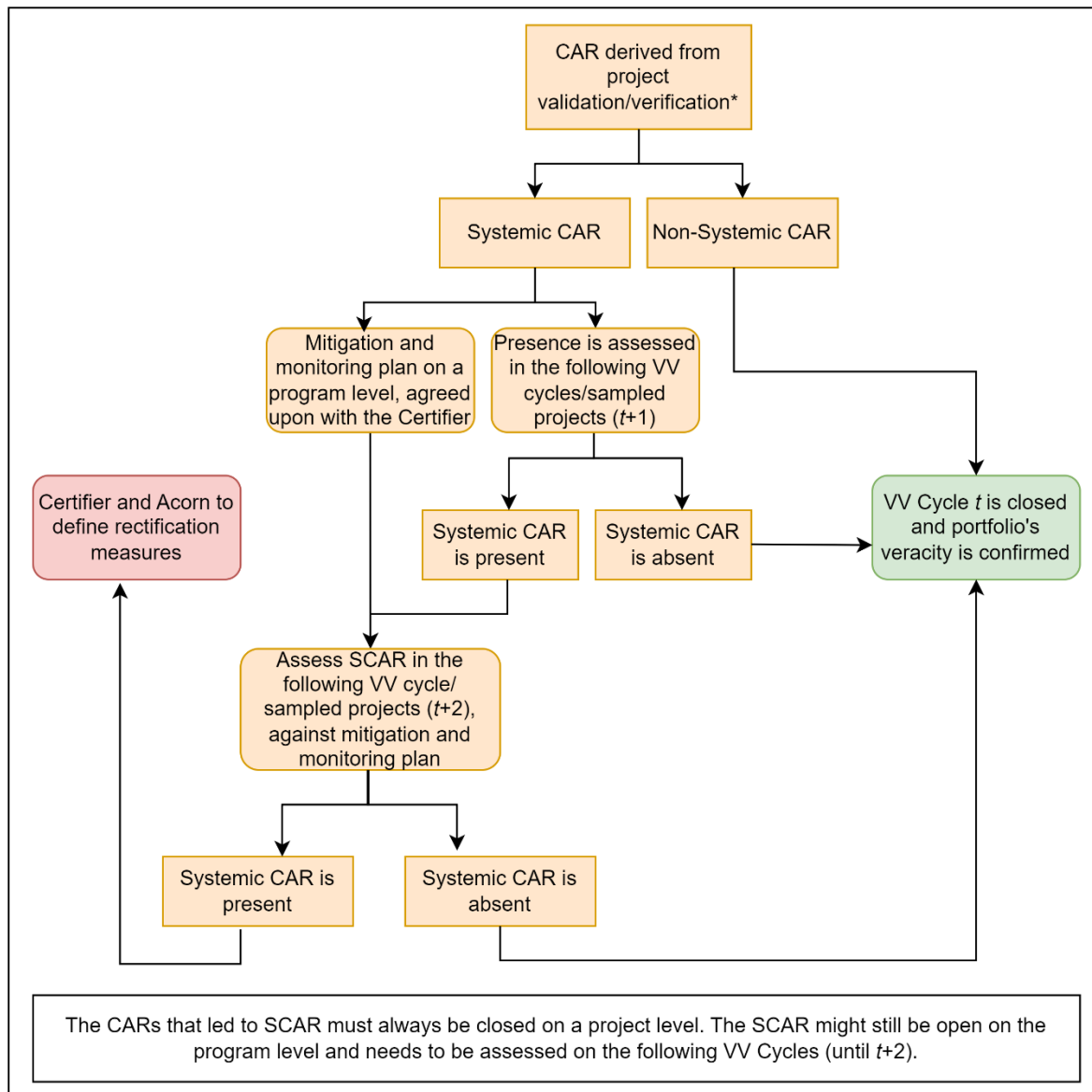
Figure 5. Process to address a program non-conformity

8.   References

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