Secretariat for Strengthening of Democracy (SSD)
Department of Electoral Cooperation and Observation (DECO)

Electoral integrity analysis
General Elections in the Plurinational State of Bolivia
October 20, 2019

PRELIMINARY FINDINGS
REPORT TO THE GENERAL SECRETARIAT

BACKGROUND

On October 30, the OAS General Secretariat and the Government of the Plurinational State of Bolivia signed the agreements relating to the analysis of the electoral integrity of the elections held on October 20. Those documents established that the Government would provide every facility needed to perform a proper audit of the official vote count in the elections of October 20, along with verification of the tally sheets, statistical aspects, the electoral process, and the chain of custody. It was likewise agreed that the authorities would provide the OAS experts with full access to their installations, as well as any information regarding the elections that the team considered relevant.

At the same time, it was established that the audit would focus on Election Day (October 20) and on subsequent stages and that, upon completing its analysis, the group of specialists would deliver a report to the Secretary General, who would remit it to the Government of Bolivia. In addition, in order to ensure both maximum seriousness and rigor, it was established that the conclusions would be binding upon the parties to the process.

On instructions from the Secretary General, a team was formed consisting of 36 specialists of 18 different nationalities, including electoral attorneys, statisticians, I.T. experts, document specialists, handwriting experts, experts in chain of custody and experts in electoral organization. The group of experts and auditors arrived in Bolivia on October 31 and began their activities on November 1.

The purpose of the electoral integrity analysis was to acquire detailed insight into the processes involved in the vote count, the transmission of preliminary results, the official tally, and the chain of custody of electoral materials, so as to verify, on the basis of that information, the integrity and reliability of the electoral results of October 20, 2019.

To achieve that objective, the technical team proceeded to audit the following:

A. **The authenticity and reliability of the vote count records (tally sheets) and of the data input into the electoral results transmission system and the official count system.**

B. **The Plan for comprehensive custody of all electoral materials (tally sheets, ballots, voters register).**

C. **Infrastructure and operation of the I.T. systems used to transmit preliminary results and the official count.**

D. **Uploading flows of the data on preliminary electoral results and the official count.**

The team worked continuously, compiling, systematizing, and analyzing information through to November 9. In addition, more than 250 complaints regarding the electoral process were received, both physically and via an e-mail address established for that purpose. Based on the work of the various audit teams, preliminary findings are as follows:

PRELIMINARY FINDINGS

Finding: Flawed transmission systems for both preliminary election results and the final count.

Electoral Results Transmission System

1) The BO1 server had not been contemplated as part of the technological infrastructure for the Preliminary Election Results Transmission System (TREP). It was used despite the absence of the corresponding monitoring agent. According to reports by the audit company, it was provided at the request of the Supreme Electoral Tribunal (TSE) in order to facilitate consultations.

   Based on the analysis conducted by our experts, this equipment was not used for the purpose conveyed to the team. It was used, from the beginning of the day's work on October 20, 2019 until 7:40 p.m. on the same day (when the interruption occurred) for the flow of information related to the Preliminary Election Results Transmission (TREP) System workstations.

2) The OAS audit detected that the flow of transcription information following the interruption was re-directed to a server (BO20) that was not included among those contemplated for the TREP in the cloud nor to the physical equipment of the National Information Technology Directorate (DNTIC). Furthermore, it was not overseen by the audit company, by Civic Registry Service (SERECI) officials, or by technical personnel of the DNTIC, but, rather, by an external person. No mention of this server was made in the reports given to us by the Tribunal and everyone involved omitted to mention its existence until it was detected by the OAS auditors.

   When he was interviewed (after the discovery), the technical head of the DNTIC acknowledged knowing about this server (BO20) and denied that it was he who had ordered the change of flow, adding that it had not been he who controlled or oversaw it either.

   It is strange that the dataflow should be re-directed to an extraneous network that had neither been contemplated nor documented. There is also no valid technical explanation for the non-usage of the perimeter servers controlled by the audit company. This is extremely serious and impacts the transparency of the process.

3) To re-direct the flow of information generated in SERECI to the (BO20) server, the Internet Protocol (IP) address to which the 350 machines used in SERECI were directed was altered. This occurred even though there were servers in the TREP network that were ready and overseen by the audit company inside the network.

4) Contrary to the technological arrangements that had been made, the tally sheet flow reached the main server in the TREP via two separate routes that were not monitored by the audit company. After the information flow had been interrupted and traffic re-directed to the BO20 server, the information went directly to the public IP of the TREP's primary server, which constitutes very poor practice. There is no reason why the flow should elude audit company oversight.

5) From a breakdown of the data in the reports given to OAS technical experts by the TSE, it transpires that there was an established infrastructure of principal perimeter servers and their respective contingency equipment. During the interviews conducted with technical personnel in the electoral tribunal and the contractor, no explanation was forthcoming about why, when the BO1 server stopped functioning, and perimeter servers were available in excellent working condition (according to the audit company's reports), the decision was taken to change the IP for

350 computers instead of using the servers provided for that purpose. This is a highly serious matter, in addition to it occurring right in the middle of an electoral process.

6) According to the information provided by the electoral authority, there was one principal BO2 server, one for publishing (BO3) and the corresponding contingency. Curiously enough, the BO3 server was not used for publication as had been planned. The OAS Audit managed to ascertain that the BO3 contingency server does not have the same number of logs as the principal BO2 server. In other words, they do not have the same information in their databases as one would expect.

7) There is no document with the life cycle of the incident relating to the interruption of the TREP, which might explain what happened and the root cause of it. Nor is there a detailed record of the persons who acted at that moment and the role they played. The OAS audit team asked for documentation of the log and all those interviewed denied the existence of such documentation.

8) What were found were leftovers from out-of-date databases and other versions of the app in perimeter servers, which is contrary to best practice.

9) META DATA (data of images received from cellphones) were not kept, even though they are vital for transparency in a process of this nature.

10) The app did not restrict the transmission of tally sheets to equipment with the correct date. Furthermore, it is impossible to secure computers belonging to the user (volunteer) who registered to send the tally sheet. For that reason, tally sheets were received with dates that do not fall within the TREP life cycle.

11) According to OAS audit findings, no record was kept of the hash value in the software freeze log. That is bad practice.

12) Based on the OAS auditors' observations:
   - Not all (100%) of the data flows of the TREP were monitored;
   - Infrastructure was not overseen by or familiar to the SERECI technician in charge;
   - Key infrastructure components were not specified;
   - A server was used that was not part of the TRP "BO1" or "BO" infrastructure;
   - Traffic was re-directed to a network of servers extraneous to the TREP and the Official "BO20" Count;
   - TREP perimeter servers were not properly used, because they were side-stepped.

Conclusion:
It is not possible to certify the accuracy of the TREP.

Official count:

1) Best practices were not followed.

2) The following software tests were not carried out:
   - Unit testing;
   - Integration testing;
   - Regression testing.

3) The tests lacked a formal software acceptance process:
   - Cases in which the software is used
   - Cases in which formal testing of the software is performed.

4) Authentication was weak, allowing someone to take control and perform administrator functions, due to:
   - Deficient implementation of the multiple authentication function (several sessions can be opened using the same code)
   - A new tab could be opened in the navigator before closing the previous one (without authentication).
   - When the previous person working withdrew, even though he or she had closed the application, it was possible to gain access with her or his user name without authentication (even to roles permitting validation of tally sheets).

5) The database reset to zero value procedure did not follow basic security requirements:
   - A formal deletion procedure was conducted;
   - Later on the head of the company gained unrestricted access to the databases;
   - When the single database was already in zero, a new deletion was performed from Departmental Electoral Tribunals (TEDs).

6) Software integrity was ignored:
   - Software was frozen without keeping a record of the hash values
   - The software was recompiled in the middle of the process, causing integrity to be lost
   - The change violated core security principles by going directly into the production enviroment

7) The test data contaminating the production environment were not removed:
   - No arrangements were made to ensure a sterile environment at the start of the process. Test data (tally sheets, for instance) were found in the computers of the Departmental Electoral Tribunal of La Paz mixed up with Election Day tally sheets.

8) TREP tally sheets found their way Into the OFFICAL COUNT:

   - TREP tally sheets (in a setting in which the network was damaged and manipulated) were included in the Official Count.
   - From a server in a damaged network (the TREP BO2 server), contact was made with the Official Count network in order to transfer data.
   - The number of TREP tally sheets directly included in the official count is 1,575.

9) The provider of the app gained direct remote access to the server:

   - Virtual Private Networks (VPN) were allowed access to Official Count servers.

10) Evidence of the election was not kept:

   - To this day, the provider and principal actor involved in an investigation into incidents in a disputed election are in absolute possession of the data and nobody else can access them without their authorization. This is contrary to best practices in the handling of incidents and violates the chain of custody.
   - There is no official preservation of election data that could later be the subject of judicial proceedings.

- The apps used to access databases by persons operating from Bolivia suffer from the authentication shortcomings described earlier (assumption of an administrator function without having to perform authentication procedures).

11) A flaw in the calculation algorithm known as "*flat computado*":

- There was a flaw in the "*flat computado*" algorithm, revealing a lack of testing. Apart from that, the flaw could cause an incomplete tally sheet. That flaw could not be corrected using the app. The head of the company had to be given unrestricted (maximum privileges) access (through SQL commands) to solve the problem. That poses a high risk for data integrity.

12) Direct access to the database was provided without going through the app:

- During the process, direct access was given to modify data in the database via SQL commands (which allow data to be changed without using the app). That is unacceptable in an electoral process and jeopardizes data integrity.
- One of the reasons why that form of access was granted was to (as officials put it) reverse the annulment of tally sheets.

13) A single person (the person in charge of the software provider) performed the following functions:

- Designing, developing, testing, and implementing the software.
- During the election the same person:
  o Recompiled the software,
  o Applied no change management, testing, or security procedure;
  o Accessed the database with maximum data-changing privileges;
  o Retained exclusive control over the servers, databases, and the app.
  o As a result of the above, broke the chain of custody since the incident.

14) The audit company did not monitor data integrity:

- It was not assigned that task.

Conclusions

As a result of the above, the process was contrary to best practices and failed to abide by security standards.

The audit company publicly acknowledged the weaknesses and irregularities. Nevertheless, it failed to describe the redirecting of the server in the cloud (BO20).

Given all the irregularities observed, it is impossible to guarantee the integrity of the data and certify the accuracy of the results.

Finding: forged signatures and alteration of tally sheets.

The OAS technical team performed handwriting analyses of 333 qustionable tally sheets. To obtain that sample, the team selected the voting tables in which the MAS obtained 99% of the votes, as well as the successive tables, that is, those in the same voting center.

Expert analysis showed irregularities in 78 tally sheets (23% of the sample). In some cases, it was confirmed that all the tally sheets in a center had been completed by the same person. Sometimes, that person turned out to be the MAS representative accredited as the party's delegate in the voting center concerned. Likewise, several tally sheets were found in which the government party obtained 100% of the votes. In some of those documents, the fields for opposition parties had not even been filled in with a "0". In some of those voting tables, moreover, attendance was 100%, which is practically impossible.

The OAS experts asked the Plurinational Electoral Body (OEP) for the original tally sheets and materials used at voting tables to perform more in-depth expert analysis. Tables were found for which the signatures on the original tally sheet did not match those of the copies. The signatures of the panel members (*jurados*) shown on the tally sheets were also cross-checked against those on the worksheets, as a result of which cases emerged in which the signatures of the six panel members on the worksheet document had been forged.

Conclusions

It should be borne in mind that the irregularities we have pointed out are those we observed in a short period of time. It is also important to point out that it was not possible to analyze the original tally sheets for the departments of Potosí, Chuquisaca, and Santa Cruz as part of the documentation had been burned. In all likelihood, given more time to process documentation, even more irregularities would surface.

Finding: Deficient chain of custody

A team of 18 experts of 13 different nationalities was deployed in 5 departments in Bolivia: Cochabamba, Pando, Beni, Tarija, and La Paz, with a view to verifying conditions relating to Departmental Tribunals and the chain of custody of electoral material. Part of the team in La Paz was assigned to the same tasks relating to voting abroad.[1] The OAS was unable to deploy specialists to the departments of Chuquisaca, Oruro, Potosí, and Santa Cruz because of road blocks and lack of security.

At a meeting with nine Departmental Electoral Tribunals (TED), the OAS team heard of a number of post-election incidents caused by unrest, such as the burning down of electoral facilities (TEDs and SERECI), pillaging in political party offices, and demonstrations. In particular, some sensitive and non-sensitive material was burned in Chuquisaca, Beni, Pando, Potosí, and Santa Cruz.

The OAS experts compiled information from 894 original tally sheets, selected on the basis of a statistical sample. The experts verified the contents of the tally sheets and compared them with the final count and voter registry lists. From that analysis it emerged that 176 of the tally sheets in the sample had been counted in Argentina and 38.07% were inconsistent with the number of citizens casting a vote. That is to say, the tally sheets showed a higher number of votes than voters on the voter registration lists.

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[1] Overseas voting took place in 33 countries, for 341,001 Bolivians resident abroad.

In the departments of Chuquisaca and Potosí, the tally sheet counts were conducted in places other than those established by each TED plenary. In Chuquisaca, they were conducted in the municipality of Zudañez (an hour and a half's drive from the TED); in Potosí, they were conducted in the municipality of Llallagua (three hours away from the TED). In both cases, the OAS was told that this change had come about at the initiative of the TED, which argued that the original sites were ill-suited to continue the process, given the conditions at the time. While those conditions might have justified the change of locality, according to party delegates, they were not informed in time of the changes and so were unable to witness the official vote count in the new premises.

Under the Interagency Cooperation Agreement signed by the Supreme Electoral Tribunal (TSE) and the Security Forces (Bolivian Police and Armed Forces), the latter had an obligation to provide protection for the transfer of the envelopes taken by electoral notaries to the Departmental Electoral Tribunals (TEDs). However, OAS experts ascertained that in none of the five departments are there signed records or other evidence certifying any actions relating to the transfer of electoral material (Envelope A) either on Election Day or in the post-electoral stage, not even for the material transferred from the headquarters.

Information compiled in the departments showed, moreover, that there is no specific protocol for custody of the Official Tally (Envelope A) after it is received in the Departmental Electoral Tribunals. The experts ascertained that there are no standardized organizational procedures for tally sheets in the various TEDs.

Conclusions

Currently, the controls needed in respect of the chain of custody of sensitive electoral material do not exist. The fact that some electoral records were burned illustrates the lack of protection, the absence of appropriate precautions, and poor coordination between the TEDs and the security forces.

Given that there is no possibility of recounting votes in Bolivia, protection of tally sheets is vital for providing guarantees for the electoral process. Monitoring of whoever handles the tally sheets and of the place they are kept at any one time is crucial.

When handling sensitive documentation, it is essential to note everything irregular and out of the ordinary. The electoral authority needs to keep records so that documents can be traced, particularly when unforeseen events take place. That did not happen in these elections.
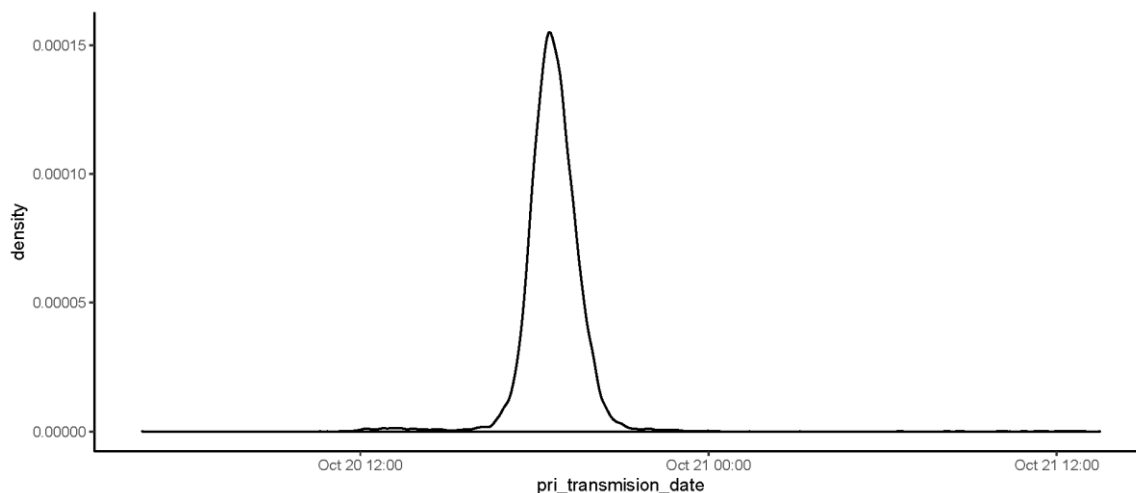
**Finding: Highly unlikely trend shown in the last 5% of the vote count.**

For the following exercise, both TREP and Official Count data were analyzed.

Analysis of Trend in the TREP

The first figure shows a distribution of 33,000+ voting tables at the time when the tally sheets were transmitted to the TSE. The distribution is normal.


The next figure plots a similar distribution but this time by the time stamp for when the tally sheets were 'verified' by the TSE. The second chart is "bimodal" with a second spike late at night. That second spike is also visible if we use the approval (aprobador_date) time-stamp instead. See below
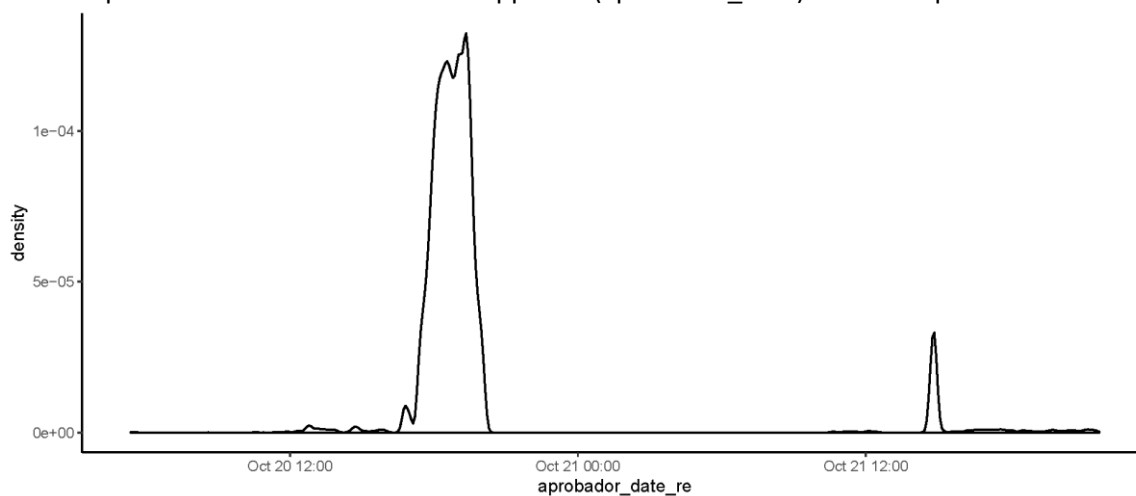

Here the second spike has moved further to the right, and the accompanying time stamp reveals a threshold that represents about the last 5% of the cumulative vote count.

Consequently, there are two especially interesting moments in this election. First, the moment when processing of the tallies reaches 81%, just before the TSE stops reporting progress with the vote count. That is the moment when an abnormal number of tally sheets are uploaded in the TREP system, coming from a server that was unknown at the time. The second moment is when the processing of tally sheets in the TREP system reaches 95%, as shown in the following charts.
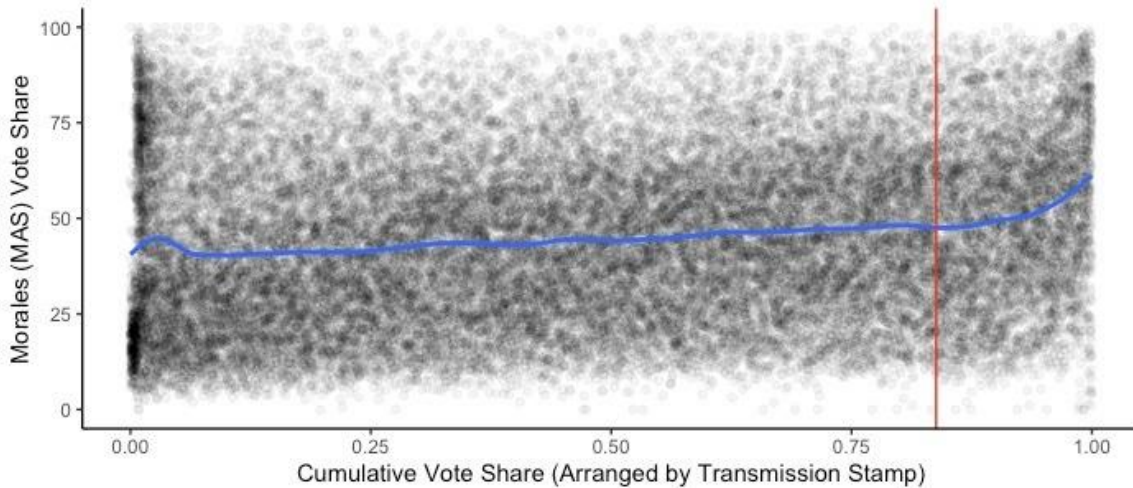
Each point in the graph above is a voting table plotted against its MAS vote share and the time at which its acta was transmitted to the TSE. The red vertical line is the 81% cumulative vote count. The blue smoothed average vote trend line is right along 46% for most of the night until a the line curves upwards starting at the 81% mark and the trends even more sharply up at the end of the distribution.
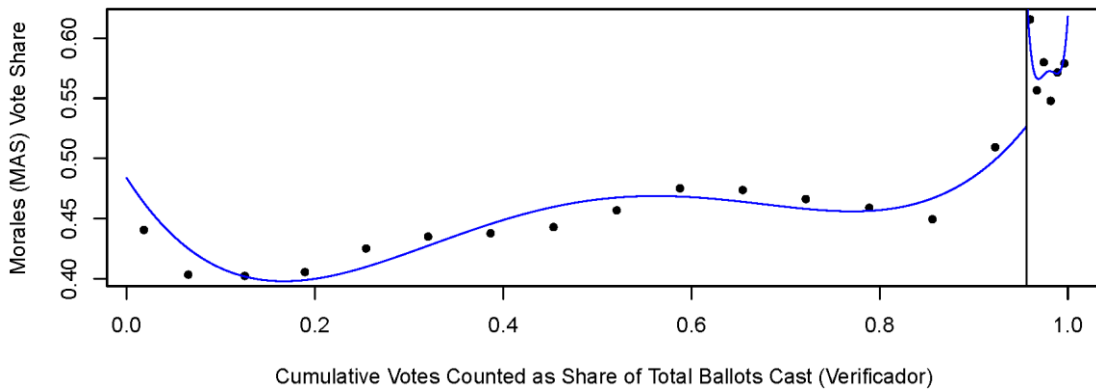
The next figure removes the individual voting table from the graph so that the trend is more clearly visible.
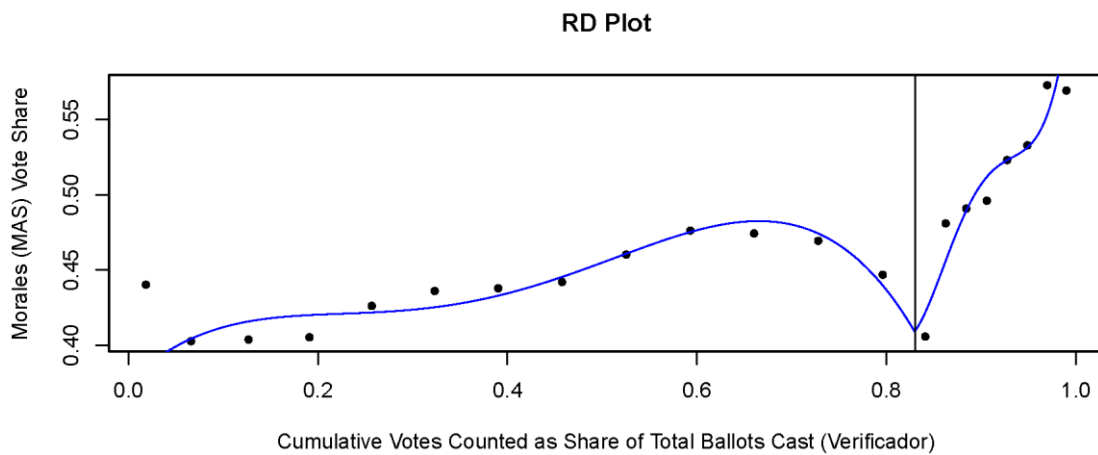
RD Plot

The jump is marked and this is again the case if one consider a 95% threshold (see below).
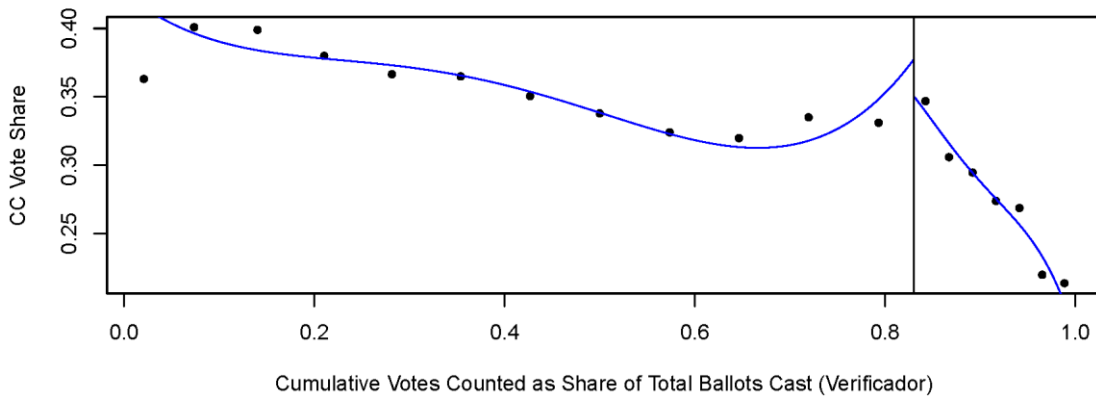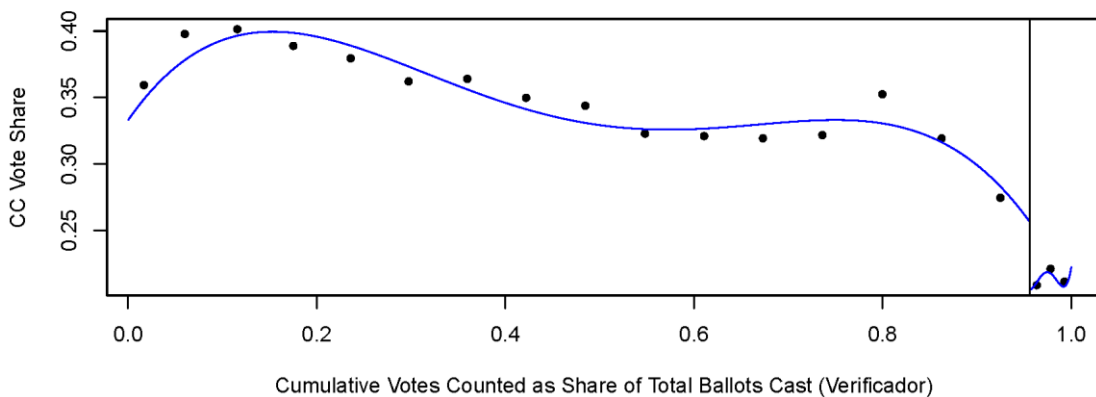
RD Plot

Clearly the MAS did very well in the final 5% of the cumulative vote. By contrast, the next two graphs show the Comunidad Ciudadana (CC) vote share using the 81% and 95% thresholds respectively..

RD Plot

RD Plot

In the last 5% of the count, 290,402 votes were counted. Of those, Morales won 175,670, that is to say 60.5% of the votes, while Mesa obtained only 69, 199 votes, that is to say, 23.8%. In other words,

Morales average vote share increased by over 15% compared to the previous 95%, while Mesa's average vote share plunged by about the same percentage. This pattern is highly unusual.

Analysis of Trends in the Official Count System.

The charts shown below reflect the decline of the candidate for Comunidad Ciudadana and the rise of the candidate of the MAS.
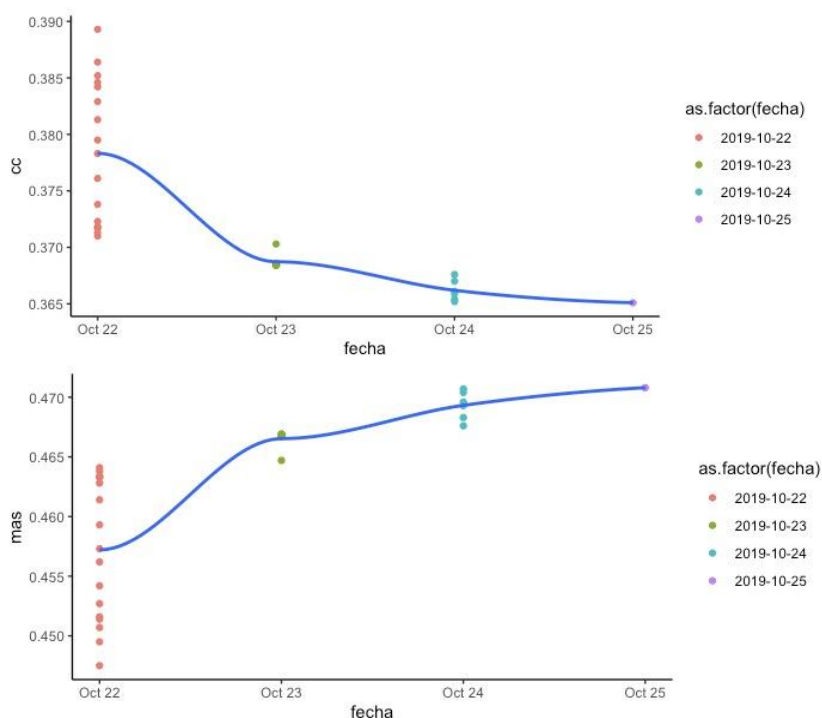
The final 5% of the data entered into the final count came from six departments (La Paz, Cocachamba, Oruro, Potosí, Chuquisaca, and Beni). While La Paz and Cochabamba are overrepresented because of the number of voting table they have, the curve should not be so marked.

Taking statistical projections into account, it is possible that candidate Morales came in first and candidate Mesa second. However, it is statistically unlikely that Morales obtained the 10% difference needed to avoid a second round.

Conclusions of the preliminary findings

In the four factors reviewed (technology, chain of custody, integrity of the tally sheets, and statistical projections), irregularities were detected, ranging from very serious to indicative of something wrong. This leads the technical audit team to question the integrity of the results of the election on October 20, 2019.

As regards I.T. aspects, serious security flaws were discovered in both the TREP (Preliminary Election Results Transmission) and final count systems. In addition, a clear manipulation of the TREP system was discovered, which affected the results of both that system and the final count.

The existence of 1,575 TREP tally sheets in the final count corresponds to approximately 350,000 votes. The first round margin of victory is fewer than 40,000 votes. Therefore, an irregularity on that scale is a determining factor in the outcome. For those reasons, the audit team is unable to confirm a first round victory.

The manipulations of the I.T. system are of such magnitude that they should be investigated in depth by the Bolivian State in order to get to the bottom of them and determine who is responsible for such a serious situation.

The existence of physically altered tally sheets and forged signatures also undermines the integrity of the official count.

Of the 176 tally sheets in the sample that had been counted in Argentina, 38.07% were inconsistent with the number of citizens casting a vote. That is to say, the tally sheets showed a higher number of votes than voters on the voter registration lists.

Taking statistical projections into account, it is possible that candidate Morales came in first and candidate Mesa second. However, it is statistically unlikely that Morales obtained the 10% difference needed to avoid a second round.

The OAS technical personnel were given the information and access needed to do their job.

The audit team cannot validate the results of this election and therefore recommends another electoral process. Any future process should be overseen by new electoral authorities to ensure the conduct of credible elections.

Finally, the audit team will continue to process information and the more than 250 complaints received regarding the electoral process, with a view to producing the final report, which will contain a series of recommendations. Nevertheless, the preliminary findings are conclusive.