CEPPS/IFES Final Report

Brazil General Elections 2022

FINAL REPORT | DECEMBER 6, 2022

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International Foundation for Electoral Systems

About IFES

IFES advances democracy for a better future. We collaborate with civil society, public institutions and the private sector to build resilient democracies that deliver for everyone. As a global leader in the promotion and protection of democracy, our technical assistance and applied research develops trusted electoral bodies capable of conducting credible elections; effective and accountable governing institutions; civic and political processes in which all people can safely and equally participate; and innovative ways in which technology and data can positively serve elections and democracy. Since 1987, IFES has worked in more than 145 countries, from developing to mature democracies. IFES is a global, nonpartisan organization based in Arlington, Virginia, USA, and registered as a non-profit organization [501(c)(3)] under the United States tax code.

IFES By The Numbers

Reached 25M+ people with civic and voter education in 2021

Supported 30 elections in 2021, training 300K+ election officials

Worked across 58 countries in 2021

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Acronyms

BU	*Boletin de urna* (electronic voting machine results protocol)
CEPPS	Consortium for Political and Political Processes Strengthening
CGU	*Controladoria Geral da União* (Comptroller General of Brazil)
COAF	*Conselho de Controle de Atividades Financeiras* (Financial Intelligence Council)
DF	*Distrito Federal* (Federal District)
DRE	Direct Record Electronic Voting Machine
EAC	United States Electoral Assistance Commission
EDR	Electoral Dispute Resolution
EMB	Electoral Management Body
EVM	Electronic Voting Machine
IFES	International Foundation for Electoral Systems
OCV	Out-of-Country Voting
PF	*Polícia Federal* (Federal Police)
PRF	*Polícia Rodoviária Federal* (Federal Highway Police)
PSDB	*Partido da Social Democracia Brasileira* (Brazilian Social Democracy Party)
PWD	Persons with Disabilities
RDV	*Registro Digital de Voto* (Digital Vote Record)
RFR	Rapid and Flexible Response Mechanism
STF	*Supremo Tribunal Federal* (Supreme Federal Court)
TCU	*Tribunal de Contas da União* (Federal Court of Accounts)
TRE	*Tribunal Regional Eleitoral* (Regional Electoral Court)
TSE	*Tribunal Superior Eleitoral* (Superior Electoral Court)
VVPAT	Voter-Verifiable Paper Audit Trail

The CEPPS/IFES Project

The International Foundation for Electoral Systems (IFES), a partner in the Consortium for Political and Political Processes Strengthening (CEPPS), was invited by the Superior Electoral Court (*Tribunal Superior Eleitoral*, TSE) to conduct a technical assessment of the Brazilian voting system with a focus on its election technology and related security features. CEPPS/IFES began its program in July 2022, with the remote analysis of relevant documentation and continuing through the first and second rounds of elections. This report encapsulates the findings of all three CEPPS/IFES missions to Brazil.

CEPPS/IFES would like to express its sincere gratitude to the TSE for welcoming CEPPS/IFES to Brazil, for its openness to provide information, and for its willingness to engage in discussions to strengthen the electoral process.

Executive Summary

On October 2 and October 30, 2022, almost 80 percent of Brazil's registered voters peacefully exercised their right to vote in both rounds of general elections. Despite some speculation of possible violence, Brazilian voters generally displayed exemplary civility, and over two million of them competently and diligently served as polling staff.

Going into the elections, a survey showed that 47 percent of Brazilians trusted Brazil's electronic voting machines (EVM), while 32 percent had little trust and 20 percent had no trust in them.[1] During the first round of elections, just over 3,000 of Brazil's 577,000 voting machines, or less than one percent, had to be replaced on election-day.[2] In the first round, results were announced within four hours of close of polling with only those from very remote regions trickling in during the following four days. In the second round, the winner emerged within three hours of close of polling. Overall, the performance of Brazil's electronic voting system has once again proven its resilience.

Brazil's 2022 presidential election was unprecedented in several ways: For the first time since 1985, an incumbent president standing for reelection was defeated; turnout between the first and second rounds increased by about half a million votes; and a total of 124,252,796 votes were cast, the highest absolute turnout in Brazil's history—the world's fourth most populous democracy in terms of electorate size. Finally, the Superior Electoral Tribunal (*Tribunal Superior Eleitoral*, TSE) piloted biometric integrity testing with voters volunteering across all 26 States and the Federal District. Between the two rounds, the TSE also notably increased its efforts to make the public aware of the accuracy of its integrity tests.

[1] Cresce confiança nas urnas eletrônicas (August 1, 2022). *Datafolha Instituto de Pesquisas*. https://datafolha.folha.uol.com.br/eleicoes/2022/08/cresce-confianca-nas-urnas-eletronicas.shtml
[2] Barbiéri, Luiz Felipe (October 2, 2022). Balanço do TSE mostra substituição de 3.222 urnas electrônicas até as 16h. *G1.* https://g1.globo.com/politica/eleicoes/2022/noticia/2022/10/02/balanco-do-tse-mostra-que-2196-urnas-foram-substituidas-ate-14h.ghtml

With a 2,139,645 (1.8 percent) vote difference, the outcome of the 2022 presidential runoff marked Brazil's closest so far, followed by Dilma Rousseff's 2014 win over Aécio Neves by 3.5 million votes. Brazil's 2022 presidential election outcome hence follows the global trend of ever-closer election results.

Internationally, ever tighter election outcomes give rise to demands for election management or court-supported *post*-results recounts, audits, or testing—which could in the future challenge Brazil's focus on pre-electoral and election-day audits and tests. The losing presidential candidate of the 2022 election has indirectly accepted defeat without raising such demand for an audit,[3] but Aécio Neves and the Brazilian Social Democracy Party (*Partido da Social Democracia Brasileira*, PSDB) already did so in 2014. Brazil's 1997 Election Law grants aggrieved candidates auditing rights but remains silent on timeframes and the role of the TSE in such scrutiny. The PSDB hence undertook the audit at its own expense, which took a year to complete, since results archives had to be accessed at over 2,600 electoral offices (*cartórios*) across Brazil.[4]

Some stakeholders call on the TSE to add voter-verifiable paper trails to its voting system, which would allow vote-by-vote paper recounts—at an initial overall cost of US $400 million. Such investment could dispel any distrust in Brazil's EVMs, but it would also slightly slow down the voting process and might entail rare violations of the secrecy of the vote in the event of paper jams. Whether or not the TSE will undertake this investment is largely in the hands of Congress, where a constitutional amendment to this effect is pending. Congress would also need to authorize funding for the voter-verifiable paper audit trails (VVPAT) devices. Short of this measure, the TSE could enable post-results integrity testing of the voting machines actually used on election day. Such post-election testing could proceed on a risk limiting basis, starting with a small sample that is expanded only if irregularities are discovered.

The Electronic Voting Machines (EVMs)

Brazil was a pioneer in the wide-scale implementation of technology to the field of elections, introducing its *urnas eletrônicas* (electronic ballot boxes) in 1996 and significantly reducing the problems it was facing with fraud in the manipulation of paper ballots. Since then, however, some countries have abandoned electronic voting machines completely or supplemented their EVMs with VVPAT that can be visually recounted, if needed.[5] Brazil currently relies on digital vote records (*registros digitais de voto,* RDV)-based forensic auditability, whose evidentiary value is difficult to illustrate to the general public. A VVPAT system was piloted in Brazil in 2002, but several challenges led to its quick dismissal and to the Brazilian Supreme Federal Court (*Supremo Tribunal Federal*, STF) declaring it as unconstitutional for potentially violating the secrecy of the vote. The incorporation of printers to the Brazilian EVMs to produce VVPAT would cost about US $400 million and require legislative change.

[3] Poder360, "Ao vivo: Bolsonaro fala pela 1ª vez após derrota para Lula." YouTube. November 1, 2022. https://www.youtube.com/watch?v=pxNmFNroJGI

[4] Partido da Social Democracia Brasileira (November 4, 2015). *Relatório de Auditoria Especial no Sistema Eleitoral 2014.* http://www.brunazo.eng.br/voto-e/arquivos/RelatorioAuditoriaEleicao2014-PSDB.pdf

[5] In the US, for instance, the EAC's voluntary guidelines for electronic voting provided already in 2005 that, in addition to the common requirements, DRE systems shall: k. Maintain a record of each ballot cast using a process and storage location that differs from the main vote detection, interpretation, processing, and reporting path l. Provide a capability to retrieve ballot images in a form readable by humans. The US has now eliminated 98 percent of its DREs.

US Election Assistance Commission (2013). *Voluntary Voting System Guidelines*. https://www.eac.gov/sites/default/files/eac_assets/1/6/VVSG.508compliant.2013.03.15.pdf

Another potential measure to increase the feasibility and accessibility of post-election audits is to conduct post-results integrity testing of selected machines actually used on election day. By analogy, when Direct Record Electronic voting machines (DREs) without paper trails were still in wide use in the United States, the Electoral Assistance Commission (EAC) instructed that, "All ballot tally program(s) and hardware must remain operative from the time of the pre-ballot processing logic test, through the processing of all voted ballots, and finally, the *post-ballot processing logic test*."[6] The post-ballot logic and accuracy test stipulated by the American EAC is equivalent to the TSE's integrity testing, with the only difference being that it is performed also *after* results announcement, when the losing candidate's demand for scrutiny generally peaks.

Which approach most sustainably preserves Brazil's unique technological heritage is a sovereign choice unconstrained by international norms. However, it is important to recognize that this sustainability is only achievable to the extent that voters and observers have reason to remain confident in the system.

Electoral Dispute Resolution (EDR)

The International Covenant on Civil and Political Rights requires party states to guarantee access to effective judicial remedies before an impartial court. The fact that the Brazilian framework tasks the TSE with announcing election outcomes in the first and last instance, as well as with hearing challenges thereto in the last instance, could be perceived as a lack of impartiality. Further, Brazil's framework allows challenging results only at the individual polling station level. This could leave aggrieved stakeholders without remedy against wider irregularities, such as the 514 public transport traffic stops by the Federal Traffic Police that occurred on October 30. Interventions of such scale could hypothetically have an impact on tight margins during Brazil's 2024 municipal election, and current dispute mechanisms are inadequate to provide meaningful remedy.

Overall, none of the above issues have detracted from the legitimacy of the 2022 elections. Looking ahead, however, the present report will discuss different potential solutions' merits and costs. Further suggestions can be made at a later date to ease voter access, voter identification, and polling, with a focus on special needs voting in the contexts of out-of-country voting (OCV), voting by polling staff, prison voting, and voting by persons with disabilities (PWDs).

Pre-Electoral Findings

Confidence-Building Measures

Prior to and during the CEPPS/IFES mission in August 2022, the TSE had been proactive in taking measures to mitigate potential disinformation regarding the voting system and its effects on voter confidence. These measures

[6] US Election Assistance Commission (August 2010). *4.5 Logic and Accuracy Testing of System and Components*. Page 479. https://www.eac.gov/sites/default/files/eac_assets/1/6/ess-3011-Logic_Accuracy-use-procedures.pdf

included extending opportunities for political parties and other government bodies to scrutinize voting machines,[7] inviting peer public institutions to review source code and other parts of the system, and welcoming international technical experts to observe the process.[8] Independent Brazilian institutions such as the Federal Court of Accounts (*Tribunal de Contas da União,* TCU),[9] the Federal Police (*Polícia Federal,* PF),[10] the Comptroller General (*Contraloría Geral da União)*, and a number of public and private universities[11] issued press releases or reports that presented an overall favorable view of the TSE's work. The TSE also received support from international organizations[12] and foreign leaders, who condemned the disinformation campaigns and malicious narratives wielded by political actors to undermine trust in the system.

Brazil's Electronic Voting Machines

Brazil's election technology presents high levels of security against external threats, internal auditability, efficiency, and voter experience, but it is still a black box to many stakeholders

The ecosystem of technology systems that supports elections in Brazil is well-developed, reflecting 26 years of careful evolution. The design principles of the EVM focused on three criteria – security, efficiency, and voter experience[9] – and these criteria have defined both the success and the limitations of the system. The layers of encryption, digital signatures, and system checks reflect a mature security model. Election results are efficiently tabulated and published within hours of the closing of polls.

In response to recommendations stemming from public security testing and extended university testing of the systems, the TSE has built in layers of security, including multiple layers of encryption and sophisticated sets of digital signatures and authentication at start-up, which makes an external attack extremely difficult. The repeated cycle of public pre-electoral and election-day tests followed by system enhancements reflects the cat-and-mouse nature of all efforts to provide secure technology. For every vulnerability detected in the public tests, the TSE has effectively implemented new security measures, which shows a clear intention to strengthen and improve the system—however,

[7] Galf, Renata. "Inspeção antecipada de urnas eletrônicas é ignorada por partidos e Ministério Público." *Folha de São Paulo,* November 12, 2012. https://www1.folha.uol.com.br/amp/poder/2021/11/inspecao-antecipada-de-urnas-eletronicas-e-ignorada-por-partidos-e-ministerio-publico.shtml?fbclid=IwAR1Z2CdddILFEEkvza5oQqb4V6n-MLT5EQXFz-4CyNPI6lHnPZlAAS2IE0I

[8] Boadle, Anthony and Ricardo Brito. "Brazil invites EU for the first time to observe its national election." *Reuters,* April 11, 2022. https://www.reuters.com/world/americas/exclusive-brazil-invites-eu-first-time-observe-its-national-election-2022-04-11/?eType=EmailBlastContent&eId=e789823b-15b8-442f-b17d-af6e41b09c52

[9] Auditoria do TCU conclui que não há riscos relevantes à realização das Eleições 2022 (July 13, 2022). *TSE.* https://www.tse.jus.br/comunicacao/noticias/2022/Julho/auditoria-do-tcu-conclui-que-nao-ha-riscos-relevantes-a-realizacao-das-eleicoes-gerais-de-2022

[10] Urna eletrônica é segura e não há evidência de fraude, diz associação de peritos da Polícia Federal (August 5, 2021). *G1.* https://g1.globo.com/politica/noticia/2021/08/05/urna-eletronica-e-segura-e-nao-ha-evidencia-de-fraude-diz-associacao-de-peritos-da-policia-federal.ghtml

[11] Diversas entidades públicas e privadas já testaram as urnas eletrônicas. *TSE.* https://www.tse.jus.br/comunicacao/noticias/2022/Setembro/diversas-entidades-publicas-e-privadas-ja-testaram-as-urnas-eletronicas

[12] Ortiz, D. Rodrigues, M. (September 13, 2022). Missão internacional diz que Brasil é 'referência' para eleições na América Latina e volta a pedir reunião com o governo. *G1.* https://g1.globo.com/google/amp/politica/eleicoes/2022/noticia/2022/09/13/missao-internacional-diz-que-brasil-e-referencia-para-eleicoes-na-america-latina-e-volta-a-pedir-reuniao-com-o-governo.ghtml

there is no guarantee that no undetected (or unpublished) vulnerabilities persist. That said, in practice, there is minimal risk of any outside attack since the system is used in a controlled environment on Election Day.

Results of the tabulation process can be verified through manual comparison of the machine-generated election results (*boletins de urna,* BUs) with the RDVs posted online. This allows for verification that results reported on the TSE website from each polling station match the data printed on the BU. Although this provides an important degree of transparency, it would be extremely cumbersome for any entity or organization to do a comprehensive audit of data from every polling station in the country. The option to audit individual EVMs also provides a strong verification of the integrity of the software and data on an individual EVM. The judicial discretion to grant post-election audits by way of appeal, however, combined with the lack of legally defined remedies in case of any discrepancies, renders this option relatively ineffective.

Finally, the processes of public testing, sealing of the systems, chain of custody (from sealing through the conduct of the elections), and opportunity for integrity audits attempt to provide an opportunity for independent monitoring. The reality, however, is that the complexities of the technology place constraints upon the ability of anyone outside the TSE technology staff to realistically conduct this monitoring. Political parties and civil society organizations lack the capacity to achieve an in-depth understanding of the technology, which is constantly changing and improving, and thus cannot be expected to fully trust the system and their place in it.

Trust in the system largely relies on trust in the TSE: The “Castle and Moat” security model

Perhaps the greatest weakness of the Brazilian voting system is that it was designed in an environment of trust. Because the public had very high levels of confidence in the judiciary and in technology (as opposed to the human-led processes that had been marred with fraud), the initial EVM design was, and continues to be, based on a “castle and moat” security model. The assumption is that everything inside the organization can be trusted, and the system only, or primarily, needs to be protected from attacks from outside the organization. Similarly, defenses against potential manipulation have focused on building layers of security inside the system, with very little attention on building close partnerships with external defenders (including voters or political parties) who can play a role in protecting against potential corruption from within. Given the exclusive prerogatives conferred to the TSE, stakeholders must have high trust in the election management body. The TSE emphasizes the fact that functions and authorities are compartmentalized in a way to ensure system pieces can only be generated, modified, and incorporated into the official system when multiple people within the TSE revise and authenticate them. While there is no indication that these procedures have enabled manipulation or wrongdoing thus far, thanks in large part to the independence of the institution, it is important for the TSE to guard itself against insider threats in the long run (e.g., in the case of biased leadership appointments and insider collusion) and against groundless allegations of manipulation. Currently, given the limited understanding of the technology by stakeholders, general trust in the system largely relies on the level of trust stakeholders have in the TSE itself.

The best way to shield the institution against these threats is through the implementation of a *zero-trust* model that assumes attacks and system corruption can come from anywhere, and that no activity should be allowed to happen without protection against accidental or intentional corruption. In zero-trust electoral models, every electoral act should be fully transparent and auditable by both internal and *external* stakeholders.

Responses to criticisms often rely on more technology, which does not necessarily address perception issues among those with a limited understanding of the technology

A zero-trust electoral model cannot succeed by developing layers and layers of technology monitoring technology, as this is analogous to simply digging a deeper moat. In the case of the EVM, the castle-and-moat model has been used to argue against measures that would allow ordinary voters to monitor or audit the counting of individual votes, insisting that the accuracy and efficiency of the technology is a more effective defense against attacks. This approach is ineffective against attacks that claim the system is hackable, or even worse, that the TSE might use the technology to commit electoral fraud. As the historical and ongoing efforts to improve the Brazilian voting system indicate, electoral authorities are committed to continuing to enhance the security of the system, but these efforts often involve more technology that is not readily understandable to the layperson.

While software security enhancements are very important, given that the current challenge is not the system's security itself but people's perception of it, solutions that better cater to the mistrusting electorate would be more effective. As mentioned above, public outreach by the TSE has been intense and inclusive in its efforts to engage diverse audiences (including political parties and civil society). Electoral authorities are also leveraging technology to identify mis- and disinformation online, analyze its reach, and address it quickly. Yet, despite all these efforts, due to the very technical nature of electronic voting machines, these communication strategies have limited impact on a large sector of society. It is very hard for ordinary citizens to be able to judge, from a technical standpoint, the security features of software, even if the TSE is making information on them available and transparent.

Potentially useful solutions to meet current challenges have been prematurely dismissed on outdated premises

A voter-verifiable paper audit trail (VVPAT) system was piloted in Brazil in 2002 and quickly dismissed by authorities as a failure. With the 2002 model, voters' electronically inputted choices were printed out for the voter to verify (through the transparent screen of a locked compartment). Once accuracy was confirmed by the voter, the print-out was directly cast into a physical, sealed ballot box. The VVPAT machines were piloted in three municipalities of each state and in the entirety of the Federal District and the state of Sergipe, totaling 150 municipalities and 7,128,233 voters (6.18% of the electorate at that time). A TSE report from 2003 concluded that the model led to higher costs,

longer queues caused by a slower voting process, higher numbers of invalid votes, and an increased percentage of technical failures (5.3% of VVPAT devices in comparison to 1.41% of traditional devices).[13]

The problems reported by the TSE in 2002 do not seem insurmountable, as several countries currently implement VVPAT systems under similar circumstances. Brazilian electoral authorities themselves also have made significant technological advances in the past decades that could help solve the technical problems encountered in 2002. The overarching reason for dismissing the VVPAT system back in 2002 is arguably that it was simply not worth it. The higher costs needed to fix the technical glitches, and efforts to train poll workers and voters on how to use the machines were likely seen as unnecessary given that the traditional machines were widely accepted by the population. In 2022, this is no longer the case.

Current politicization of the debate around election technology creates a certain resistance to change

The TSE and its regional branches have numerous research and innovation programs intended to improve the voting process, making it more modern, secure, and accessible. While authorities generally welcome innovation, the current political atmosphere is not very favorable to a neutral debate on changes to the election technology, much less changes that seem to cater to the narratives being used to sow distrust in the system, such as the VVPAT model. It is also important to note that the (re)introduction of a VVPAT model would require a constitutional amendment, as the Supreme Court has ruled the printing of the electronic vote unconstitutional for jeopardizing the secrecy of the vote.[14] This decision, however, seems to be based on the technical glitches experienced in 2002 (e.g., printer jam leaving the printed vote visible to poll workers), which can be reasonably addressed.

The post-election period could allow for more productive dialogue and cooperation to shield the Brazilian voting system from similar attacks in the future. The TSE and lawmakers would benefit from considering such options regardless of the fact that allegations against the EVMs ultimately failed to cause further turmoil after the announcement of results. Other political actors might eventually use similar narratives to once again raise suspicions about its integrity. In other words, while certain election results might make the problem seem obsolete, as long as the root cause remains– namely, the lack of more intelligible mechanisms for voters to verify how their votes are being counted – the threat will only idle.

Brazil's Results Dispute Mechanism

In addition to its election administration responsibilities, the TSE manages and announces presidential election results, and it also hears first and last instance challenges to presidential candidacies and election certification (*diplomação*). Stakeholders can contest the ineligibility or loss of eligibility of a presidential candidate at any time—even after election certification or presidential inauguration. Candidates can also be disqualified on grounds of

[13] Coimbra, R. (2022) A urna eletrônica brasileira é um equipamento de primeira ou de última geração?

[14] Westin, R. (July 6, 2021). Entenda a polêmica em torno da PEC do voto impresso. *Agência Senado.* https://www12.senado.leg.br/noticias/infomaterias/2021/06/entenda-a-polemica-em-torno-da-pec-do-voto-impresso

campaign violations, such as abuse of state resources and/or of incumbency power. The TSE has framed procedures for such eligibility disputes in a standalone resolution. The fact that the TSE reviews its own decisions, however, could lead to a perception of lack of impartiality in terms of its role as an electoral dispute resolution adjudicator. Further appeal to the STF is allowed only on narrow grounds, such as issues of unconstitutionality, writs of mandamus,[15] or *habeas corpus*.

A 2003 law allows stakeholders to challenge the voting process after *pre-electoral* testing and audit, but *not* after election results are announced—when demand for such confirmation peaks. When it comes to post-electoral disputes, the 1965 Election Code grants aggrieved parties 48 hours to seek annulment and paper ballot recount at individual polling stations with local election judges. But since the adoption of DREs in 1996, manual recounts are no longer physically feasible. Polling and counting have been moved into the voting machine, and the nature of any Election Day machine error or breach may be detected only much later through subsequent forensic audit—well beyond the statutory deadline to seek polling station annulment.

Since the introduction of electronic voting, nationwide presidential election results had been disputed only once—in 2014. The TSE granted the petitioner a *discretionary* one-year system audit, since partial or full paper ballot recounts were no longer feasible, and partial or full election annulment and rerun is not expressly available. The law, however, suggests that post-electoral petitioners must bear the cost of any audit themselves, and that they must gain access to physical evidence at over 2,600 electoral *cartórios* across the national territory. This hardship significantly increases the time needed to conduct audits, and it also makes it difficult for ordinary citizens to follow the operational logic of audit procedures.

The TSE's choice not to barcode or centralize flash drives containing results, but to leave them behind at the *cartórios* would also significantly delay contingency results aggregation, in the event the VPN results transmission on election night fails. Such failure need not necessarily be due to malicious breach, but could be caused by equipment failure, blackouts, human error, loss of flash drives, or force majeure, such as natural disasters. For such events, the legal framework does not determine whether the results of signed EVM printouts or electronic results stored on EVMs or flash drives legally prevail.

Besides the discretionary grant of audit, the Brazilian legal electoral framework lacks any other defined remedies for the event that an audit discovers irregularities likely to overturn the disputed election. The lack of a clear path for challenges to election results entails two main risks: it lends pretext for aggrieved parties to pursue disputes by extra-judicial means and, in the event that the TSE grants a *discretionary* partial or wholesale annulment and rerun of the election, the preliminarily declared winner of the election can petition the STF to challenge the grant of such remedy as beyond the TSE’s express powers, potentially leading to a constitutional crisis.

[15] Writs of mandamus are used by higher courts to compel a lower court to perform an act that the court has a clear duty to do under law.

Insufficient Personnel to Conduct Reliable Political Finance Monitoring

The pre-election program hosted by the TSE for international observers and invited guests included presentations on the TSE's efforts to combat disinformation and monitor and enforce campaign and political party finance regulations. While noting the threefold increase in public campaign funding since 2018 (now amounting to US $925 million), the TSE acknowledged its lack of staff to scrutinize such expenditure reporting. The TSE does collaborate with Brazil's Financial Intelligence Council (*Conselho de Controle de Atividades Financeiras,* COAF*)* in investigating shell companies, dummy candidacies, and fraudulent expenditures that may allow candidates to divert public funds for personal use. The TCU also informed CEPPS/IFES that it currently supports the TSE in cross-checking campaign expenditure filings with national corporate tax registries and welfare databases. However, these partnerships are not sufficient for the TSE to carry out its monitoring mandate. In 2018, the TSE estimated that it would need 136 auditors to shoulder the workload of fully auditing campaign expenditures, whereas it now only has ten.

First-Round Findings

For the day of elections, the TSE had pre-established election observation routes for larger observer groups (Organization of American States, *Unión Interamericana de Organismos Electorales*, etc.), mainly concentrated around polling centers in Asa Sul and Asa Norte of the country's capital Brasilia. CEPPS/IFES routed its own itinerary, giving priority to areas with potentially higher poverty rates, in order to be able to gauge maximum times needed by voters to complete the electronic voting process, and to cover polling centers not visited by other observers.

Opening

CEPPS/IFES observed the opening at EC-01 in *Paranoá*, a voting center with 15 polling stations. Upon arrival at 7h, a line of about 100 voters had already formed outside the school. Security was provided by one police officer out in front of the school. CEPPS/IFES was quickly granted access, and the center administrator recorded the mission's presence. The supervisor responsible for results transmission had already arrived. When CEPPS/IFES entered the indicated polling station room, polling staff had already configured and booted up the voting machines and were in the process of signing the *zerésima* printout and biometrically signing in. Voting started promptly at 8h, and lines of about 30 voters had formed in front of each polling station room at the time of opening. The atmosphere was peaceful.

Polling

After attending the opening of polls in *Paranoá,* CEPPS/IFES observed voting at *Escola Classe 203 in Itapoá*, a center with 15 polling stations. Upon arrival around 9h, the supervisor in charge of results transmission was already present. A party agent alerted CEPPS/IFES to a voting machine dysfunction, but the administrator later clarified that only one individual voter had problems using the machine, which ultimately did not need to be replaced. The center had no visible police presence, and the atmosphere was calm, with children playing in a central courtyard while voters

queued. Voters reported approximate wait times of five minutes to CEPPS/IFES, although actual wait times likely reached 20-30 minutes during the morning hours, as at least 15-20 voters stood in line at each station.

Inside the polling station, CEPPS/IFES observed a significant number of issues with identifying voters. Timing the process revealed that the average time required to identify a voter was 41 seconds, but this varied from 18 seconds to more than three minutes, with the biggest contributing factor being whether the fingerprint was recognized. CEPPS/IFES also observed measurable disparities in voter preparedness to operate the voting machine. Almost all voters observed brought hand-written slips of paper (as allowed by the voting rules) into the polling booth presumably detailing the respective voter's chosen candidate numbers across the five races. While some voters across the polling stations observed completed the process in as little as 40 seconds, one elderly voter needed more than six minutes to key in all choices. Presidents of polling stations followed each voter's progress on the screen of the voter authentication terminal and, as needed, reminded voters how to key in the digits for the race(s). CEPPS/IFES observed no attempts to influence voter choice, or to violate the secrecy of the vote. The list of candidates was posted for reference behind each voting booth, albeit in very small print and without candidate photos. CEPPS/IFES did not observe any candidates consulting the lists. The voting machine does display the name and photo of the candidate once the candidate number is entered so the voter has the opportunity to check that they have entered the correct number before confirming their vote.

Integrity Testing

At noon, CEPPS/IFES arrived at the Federal District (*Distrito Federal*, DF) Regional Electoral Tribunal's (*Tribunal Regional Eleitoral*, TRE) offsite integrity testing at the Legislative Assembly of the Federal District, where 14 voting machines that had been drawn by lottery the previous Friday were subjected to the TSE's parallel voting scrutiny. The integrity test is the TSE's most publicly visible procedure to demonstrate that its voting machines faithfully translate each voter's choices into their machine count. While CEPPS/IFES observed the process, the TSE President also made an appearance during the procedure, drawing significant media attention. The integrity test involved TSE staff keying pre-determined printed voter choices into the tested machines, to then compare the votes processed by the machines with the choices consigned on paper.

In order to complete this process, the biometric voter authentication must be waived for each test vote entry, since TSE data entry clerks are not included on the randomly drawn machines' voter registers—which significantly slows down the testing process. The TSE has informed CEPPS/IFES that integrity testing can only be conducted on Election Day itself, and not after results announcement—when it might be psychologically most needed—because the EVM's voting application is timebound. Also, because the voting application is locked for single use, EVMs actually used on Election Day cannot be tested after that day, at least not with its original operational mode.

TRE staff informed CEPPS/IFES that during the last election, integrity testing actually incurred an inconsistency, which was caused by a typographical error that was later discovered on closed-circuit video footage. This year, the entire TRE DF integrity test was livestreamed on its homepage for greater transparency. The design and panoramic

camera angles of the stream, though, as well as lack of close-up and logical step-by-step sequencing, likely does not yet allow citizens to grasp the conclusive effect of the tests.

Three days after the first round, CEPPS/IFES spoke with Giselly Siqueira, the TSE's Communications and Multimedia Secretary, and suggested that integrity testing merits more explanatory documentary publicity. Ms. Siqueira reverted to CEPPS/IFES later that same day to confirm that she started viewing closed-circuit footage to produce a streamable, logically sequenced clip of the test to make the process more accessible to the public in the days following the election.

Biometric Integrity Testing

CEPPS/IFES arrived at 13h30 at Brasilia's Canadian School to assess the DF TRE's pilot for biometric, onsite integrity testing. First-round biometric pilot testing relied on actual voters to volunteer to perform the parallel voting on randomly drawn voting machines once they had completed their actual voting. Biometric integrity testing is done onsite on machines initially slated for that center. Each volunteer voter is routed to the machine they were initially registered on before the machine was randomly selected (and replaced with a contingency EVM), which biometrically authenticates the voter. Because the on-site polling center tests do not need to go through the lengthy process of waiving biometric authentication, they are much faster than offsite integrity testing performed by TSE staff. The DF TRE selected six machines at a single location for this pilot. The pilot's turnout target of 10 percent of registered voters was reached, with final participation being 15 percent, or 160 voters. The process was recorded, but not livestreamed, and no photography was allowed. The TSE informed CEPPS/IFES that it did not plan to extend biometric onsite integrity testing during the runoff, only offsite integrity testing, a decision it later reversed.[16]

Closing

CEPPS/IFES observed the closing of polls at EC 102 in Asa Sul. Party agents of the New Party (*Partido Novo),* Brazil Unity (*União Brasil*) Party*,* and Workers' Party (*Partido dos Trabalhadores)* collected signed copies of the results BUs, and CEPPS/IFES was also offered a signed copy. The polling station had 263 registered voters of whom 221 turned out. Of those, 98 voted for the incumbent president and 79 for Lula. No voters were in line as of 17h and polling officials once again captured their biometrics at closing. Within five minutes of closing, the station supervisor collected the results flash drive from the voting machine and uploaded the results to the TSE server. By 17h08, the results of all seven polling stations of that center had successfully been uploaded from a school desktop computer through the dedicated TSE application. The seven flash drives were packed in a numbered cardboard box and delivered by the supervisor to the appropriate *cartório*.

[16] CEPPS/IFES had recommended in its First-Round report to maintain the pilot for the runoff.

Results Transmission

CEPPS/IFES followed the TSE's results transmission process from TSE headquarters after closing on Election Day. The TSE walked observers around cybersecurity workstations, but the session was not conducive to one-on-one technical expert conversations, so CEPPS/IFES was not able to assess the cyber clearance process for incoming results. This is fairly common practice in a results center; observers can ascertain that there is an active process of compiling the votes, but are not allowed to disrupt the time-intensive process by interacting with the results center staff.

CEPPS/IFES observed up to 4.5-hour lags in reporting from mostly Northeastern and Northern states, which led to a significant lead by incumbent President Bolsonaro that was only reversed at around 20h30, when Lula strongholds reported the bulk of their results. The lag of results transmission by Northeastern states merits further research. Stakeholders informed CEPPS/IFES that in some areas voting was still ongoing after 20h, which could be due to slower voting in areas with higher illiteracy (voters who are in line by 17h are given a ticket and are allowed to vote after 17h).

Another possible source of delays is the digital divide in broadband penetration between more affluent and less affluent residential neighborhoods and their schools. In these cases, physical transport of the latter's results flash drives to upload points may be required, as opposed to the schools observed by CEPPS/IFES in Brasilia, which all availed of on-site upload points.

Results Archiving Uncertainties

The TSE provided CEPPS/IFES with conflicting information on its logistical and archival planning for the signed BU results printouts and the results flash drives (*mídias de resultados*). One TSE staffer said that those sensitive results documents would remain at Brazil's 2,600 *cartórios* until their reuse or destruction, whereas another said they would be regionally centralized with the 27 TREs, and yet another mentioned that they would be centralized at the TSE within roughly one week of Election Day. While some of this discrepancy may be due to regional protocol differences, it is worth making sure that protocols are public and clear in order to avoid misconceptions. On October 4, the day it began requisitioning the sample of 4,161 BU printouts, the TCU was laboring under the assumption that it would receive the printouts directly from respective *cartórios*, as was the case for Aécio Neves' 2014 post-results audit. In addition to resolving this confusion, one of the present report's short-term recommendations suggests that the TSE label results flash drives with QR codes to facilitate tracking them along the chain of custody, as is already possible for BU printouts and voting machine cases. Flash drives for the results entry of the 29 OCV voting locations that still use paper balloting are already QR-coded.

Institutional Audits and Observers

CEPPS/IFES met with seven representatives of the TCU during its first mission to Brazil in late August, and had suggested that the TCU extend its testing and auditing involvement with the TSE into the post-results announcement period, as is standard international practice. CEPPS/IFES also raised this possibility with the Federal Police. The

TCU and the PF informed CEPPS/IFES that they could only do so upon request of the TSE. A month later, during the TSE pre-electoral briefings for international guests, CEPPS/IFES learned that the TCU, as well as the Federal Police, and possibly the military, would indeed extend their auditing into the post-results announcement phase.

CEPPS/IFES further inquired and learned that the TCU would requisition a sample of 4,161 BU results printouts from the *cartórios* through the TSE, to compare them to the results of the respective polling stations as listed among the disaggregated results on the TSE homepage. The TSE informed CEPPS/IFES that the TCU would design its sample so that it would be statistically relevant and representative, allowing even for estimating the percentage of votes received by each of the leading presidential candidates, akin to the statistical models used by Brazil's opinion polling. This raised concern with CEPPS/IFES, since all but one Brazilian polling company underestimated the incumbent President's score, as well as that of Ciro Gomes.

CEPPS/IFES therefore held a follow-up meeting with Riu Ribeiro, the TCU official in charge of the post-results audit. Mr. Ribeiro and his direct supervisor received CEPPS/IFES on October 4 and clarified that the audit exercise had not yet started, and that it would not seek to extrapolate candidates scores, but merely verify the accuracy of the results transmission of the randomly selected 4,161 polling stations. CEPPS/IFES inquired whether the TCU would take a risk-limiting audit approach and expand their sampling, in case it were to discover any results transmission inconsistencies among the 4,161 drawn polling stations, which Mr. Ribeiro suggested the TCU had at that stage not planned. As is, the TCU only requisitions the results printouts, and not the results flash drives archived at the *cartórios*.

During the runoff, CEPPS/IFES also exchanged observations with members of the Comptroller General of Brazil (*Controladoria Geral da União,* CGU), which had deployed to nine states during the first round, and 30 observers to five states during the runoff. In contrast to the TCU, the PF and the CGU, observers/auditors deployed by the Brazilian Armed Forces who CEPPS/IFES spoke with did not identify themselves through badges and remained in civilian clothes throughout both rounds of elections.

Gender

While more women were elected into the Lower House in 2022 than in 2018, the cycle increase from 2018 to 2022 was less than the increase between 2014 and 2018.[17] The two largest parties in the Lower House, the Liberal Party (*Partido Liberal,* PL) and the Workers' Party (*Partido dos Trabalhadores,* PT), each had the most women candidates elected, 18 and 17 respectively. The Socialism and Liberty Party (*Partido Socialismo e Liberdade,* PSOL) was the only party that had more women than men elected (seven versus five). The Lower House will now count 91 congresswomen or 17 percent, up from 77 in 2018 (after it jumped from 51 to 77 between 2014 to 2018), whereas the Senate will have only 12 women, or 15.4 percent.[18] Minority representation slightly edged up in both houses, including a historic two transgender women being elected to the Lower House and an increase in the number of Indigenous women in the legislature from one to three. At the time of writing, the TSE had not yet updated its gender

[17] Boldrini, Angela and Cristiano Martins (October 3, 2022). Mais mulheres são eleitas para o Congresso, mas bancada feminina cresce menos que em 2018. *Folha de São Paulo*. https://www1.folha.uol.com.br/poder/2022/10/mais-mulheres-sao-eleitas-para-o-congresso-mas-bancada-feminina-cresce-menos-que-em-2018.shtml?utm_source=newsletter&utm_medium=email&utm_campaign=newsfolha
[18] Ibid.

statistics page from 2020.[19] Worth noting too, political parties enjoy unfettered discretion in assigning favorable candidate numbers, often hindering women or less favored candidates with numbers that are more difficult to memorize.

Accessibility for Persons with Disabilities

At EC 203 in *Itapoá*, voting was held on two floors, and the upper floor had a wheelchair ramp. CEPPS/IFES spoke with one wheelchair-using voter, who was satisfied with the ease of his access. CEPPS/IFES observed at least two other voters arriving with impaired mobility; while CEPPS/IFES did not speak to them and cannot report their feedback on accessibility, it appeared that they were able to vote with ease, although might have benefited from a shorter walk to the station, and more places to sit while waiting and voting. Voting machines were placed on low enough desks for wheelchair-using voters to access the keyboard, although for older voters or those using canes or walking supports, the low height actually seemed to make it more difficult for them to retain their balance while leaning over to see the screen.

The TSE's latest generation EVM displays instructions in Brazilian Sign language on its voting screen (and instructions are available online as well), and all EVM keyboards have always had braille numbering. The TSE website also shows video tutorials on how the EVM can be operated by those with severely impaired mobility. Persons with disabilities, as well as elderly and pregnant voters are given legal queueing priority, which CEPPS/IFES observed as respected in all three polling centers. Queue controllers also provided chairs to elderly voters standing in line in at least one polling station observed. Observed illiterate or innumerate voters, however, had to be verbally assisted by the head of the polling station, since the EVM itself does not have an audio cue function to help struggling voters complete the process. In 2022, only 1,271,381 voters noted their disability on the voter register,[20] even though 17.3 million Brazilians live with disabilities. Over half of those 17.3 million are of advanced age.[21] Worth highlighting again is the *e-título,* which can spare voters with disabilities the need to physically travel to a *cartório* to receive a paper voter card.

Brazil does not offer vote from home, either by mail or online for immobile voters, but the TSE and *Itamaraty* have studied both options for out-of-country voters in 2021.

Second-Round Findings

For the runoff, CEPPS/IFES decided to vary its observation sites from the first round in order to glean a more diverse perspective of the election administration in the Distrito Federal. CEPPS/IFES also focused on election operations and logistics by visiting one of Brazil's 2,600 *cartórios*, which are tasked to store, stage, deploy, redeploy, and sometimes archive sensitive and non-sensitive polling material. CEPPS/IFES further decided to observe voting in the

[19] TSE Women (n.d.). *TSE*. https://www.justicaeleitoral.jus.br/tse-mulheres/
[20] Estatísticas do eleitorado (2022). *Tribunal Superior Eleitoral.* https://sig.tse.jus.br/ords/dwapr/seai/r/sig-eleicao-eleitorado/painel-eleitorado-com-defici%C3%AAncia?session=15339385558205
[21] Censo Agro (2017). Instituto Brasileiro de Geografia e Estatísticas. https://censoagro2017.ibge.gov.br/en/2185-news-agency/releases-en/31465-pns-2019-brazil-has-17-3-million-persons-with-some-type-of-disability.html

district jail of *Papuda*, which falls under the jurisdiction of the Zone 18 *cartório* visited by CEPPS/IFES. The building that houses the Zone 18 *cartório* also accommodates Zone ZZ/ZE, which is tasked with overseeing OCV. CEPPS/IFES thus had the opportunity to obtain information on operational and logistical arrangements and challenges of OCV.

Voter Identification and Polling Times

The TSE has recently launched electronic voter cards (*e-título*), a convenient tool that over 30 percent of Brazil's registered voters have already downloaded onto their smartphones, including some of the two million eligible 16 and 17-year-olds—a 400 percent increase of that demographic when compared to 2020. The TSE also introduced the possibility of short-term voting address changes to accommodate voters who would be travelling within Brazil on Election Day. 667,565 voters utilized this option in advance of the 2022 elections in order to be able to vote.[22]

During the first round, CEPPS/IFES visited the opening of polling in one of DF's socio-economically most underprivileged areas in *Paranoá*, so the second mission chose to contrast that with observing the opening of the runoff in *Lago Sul-Qi15-CEP06*. At the time of arrival at 6h55, polling staff had set up all 10 polling stations, but no voters were waiting in line. A waiting room with seats was arranged for elderly voters. Parking lots had already filled up, so that voters had to park curbside and walk some distance to the polling center. Even though the *e-título* contains a QR code that could be easily scanned, polling staff had to read aloud and key each voter's ID number into the identification terminal. In the alternative, voters could also be identified only with their fingerprint, so that the president of the polling station could simply confirm their identity without having to dial in their ID number.

The time required to identify voters was relatively consistent with the first round, although CEPPS/IFES noted a significant number of persons whose fingerprints were not recognized. One polling officer estimated that the failure rate in his polling station during the first round was between 30% to 40% and was more prevalent among the elderly. This observation is consistent with recent studies that demonstrate a negative impact of dry skin on fingerprint scanner and that associate conditions leading to dry skin with aging. The problem can be exacerbated by the use of cleaning solutions that have been adopted to prevent the spread of COVID-19. CEPPS/IFES shared with the officer a suggestion from another biometric company to ask the voter to rub their fingers on their hair, as oil from the hair may make the fingerprint more readable by the scanner. The polling officer shared this tip with other poll workers and shared that they experienced a marked improvement in fingerprint recognition.

CEPPS/IFES also noted an inefficiency in the use of the EVM for voter identification and voting. After a voter is identified, they proceed to vote while the next voter in the queue waits. The voter identification process can only begin once the previous voter has completed voting. It should be a simple modification to allow these processes to occur simultaneously so that a voter can begin the identification process as soon as the previous voter moves into the polling booth. This could provide a steady queue of voters who have already been identified, reducing the lag time between voters.

[22] Estatísticas do eleitorado (2022). *Tribunal Superior Eleitoral.* https://sig.tse.jus.br/ords/dwapr/seai/r/sig-eleicao-eleitorado/painel-eleitorado-tte?session=10808535656458

Poll Workers

Contrary to many other countries, which have incurred poll worker attrition since the pandemic, Brazil suffers no shortage of poll workers, since they are compensated for their service with additional vacation days at their regular employment. Some poll workers perform additional days of service at *cartórios*, during deployment and redeployment of election material, which brings them additional days off. Because of the voting machines' results processing and transmission, most Brazilian poll workers finish their service early in the evening of election day. One downside to note, however, is that some poll workers were not all able to temporarily transfer their voting address to their polling station of service since they received their assignments only four days before the first-round Election Day.

Voting in Jail

CEPPS/IFES visited the *Papuda* district jail to observe voting procedures. *Papuda*'s population counts 1,300 inmates, of whom 511 have not been convicted and are hence eligible to vote. Of those, only 47 decided to vote. Sixty prison guards also temporarily transferred their polling location so they were able to vote at *Papuda*. Poll workers there were public servants selected by the Zone 18 election judge. The average time detained individuals wait for sentences in Brasília is three months—a shorter average pretrial detention than in other regions, especially the Northeast. Detainees were required to vote in handcuffs. CEPPS/IFES was informed that inmates had access to political campaign information mainly through television. Two polling stations opened in *Papuda* and two others opened for juvenile and women inmates (in Gama). Detention centers and prisons must open polling stations as long as at least 20 eligible individuals indicate that they plan to vote.

Out-of-Country Voting

The number of out-of-country voters doubled over recent years to 697,000. This increase led to longer wait times at some Brazilian diplomatic missions on Election Day, especially in Europe. Voters abroad are only allowed to cast votes for the presidential election. CEPPS/IFES was informed that, during the first round, only two of six voting machines set up at the Brazilian embassy in Vienna were operational. CEPPS/IFES visited the 18th Electoral Zone *cartório,* whose ZZ/ZE department oversees OCV. Officials were receiving the results from 160 countries, of which 29 were still using paper ballots, as they registered fewer than 100 voters. The process was unfolding smoothly, although three locations had to adopt paper ballots because the machines malfunctioned and there was no contingency equipment (one in New Zealand, one in Russia, and one in Canada). CEPPS/IFES was informed that the Brazilian diaspora counts over four million citizens, many of whom reside at great distance to Brazilian diplomatic missions. The TSE does not yet publish disaggregated data on what justifications the over three million abstentionist Brazilians living overseas provided for not voting. In 2021, the TSE and *Itamaraty* studied OCV distance voting options.

Runoff Integrity Testing

CEPPS/IFES returned to the Legislative Chamber to observe non-biometric integrity testing. Across Brazil, 641 voting machines were randomly drawn for integrity testing, of which 14 were in the Distrito Federal. At the time of observation, representatives of the Organization of American States (OAS) and International IDEA were also present, as well as the Federal Police, and members of the armed forces. The Test Commission expected 60 heads of diplomatic missions between 14h and 16:30h on Election Day.

Runoff Biometric Integrity Testing

CEPPS/IFES also returned to the Canadian School, where the biometric integrity test pilot was taking place. The TRE maintained the same test scope of six randomly drawn machines from the first round, but was confident to improve on the first-round participation of 160 voters. Nationwide, 58 voting machines were again drawn for biometric integrity testing. Cameras were recording keystrokes for potential investigation of discrepancies. The test closed at 17h, and machine printouts were compared to manual votes. Members of the Federal Comptroller's Office (CGU) were present and identifiable. Biometric validation presented some difficulties even during the integrity tests, so poll workers had to override the machine. CEPPS/IFES also spoke with civilian-clothed observers deployed by the Armed Forces who had not recorded any irregularities. It is worth noting that the first voter who CEPPS/IFES observed at the biometric integrity test was unable to be verified by fingerprint

Runoff Results Management

For the runoff, results were transmitted with much less delay than during the first round, even though turnout increased by half a million votes. This could be due to shorter voting times, because voters had to dial numbers for only one or two races into the voting machine, as opposed to five races during the first round. Shorter vote intervals might have reduced the number of voters still standing in line at the time of closing, and therefore allowed more polling stations to close and transmit results on time. The faster results transmission and more balanced timing of the score reporting between the two candidates may have contributed to results acceptance. If that were the case, it would illustrate the importance of taking further measures to ensure that delays and disparities in first round results reporting do not recur in 2026, especially in the event that a candidate has a reasonable chance of winning the election in the first round.

Audits by Public Institutions

The TCU has conducted different audits of the electronic voting system throughout different stages of the electoral process, including analyzing the software and, after the elections, with the manual verification of BUs and comparison with the numbers published by the TSE on its online platform. The TCU documents reported no discrepancies in the BUs or other indications of fraud or manipulation.[23] The Order of Attorneys of Brazil (*Ordem dos Advogados do Brasil,*

[23] TCU não encontra irregularidades em urnas no segundo turno (November 8, 2022). *Agência Brasil. https://agenciabrasil.ebc.com.br/politica/noticia/2022-11/tcu-nao-encontra-irregularidades-em-urnas-no-segundo-*

OAB) also concluded that there were no irregularities in the voting process and commended the transparency with which the TSE administered the elections.[24]

The Ministry of Defense published its report on November 9. The report does not make any claims or provide evidence of fraud but concludes that the analysis of the armed forces auditors "does not exclude the possibility of fraud or inconsistency" in the EVMs[25] and advocates for further investigation.

Biometric Voter Registration

CEPPS/IFES notes that despite the pandemic, all regions of the country have reached nearly 90 percent biometric registration, with the only exception of the Southeast lagging at 60 percent biometric capture. Within the Southeast, Minas Gerais has the lowest biometric capture rate at 55 percent.[26] At the Zone 18 *cartório*, biometric capture was still suspended when CEPPS/IFES visited.

Presidents of polling stations can override the biometric voter validation with no limits on the number of overrides, as long as the voter can correctly state biographic information, such as their date of birth. Other countries impose software caps on the number or percentage of voters registered within a given voting machine to waive biometric authentication. Doing so would limit the number of votes that can be cast at non-biometric offsite integrity tests, so that the TSE would need to migrate its integrity testing entirely onsite and thereby rely on biometrically validated voter volunteers.

Turnout

Of 156,454,011 total eligible voters, 123,682,372, or 79.05 percent voted during the first round. Of those, 118,229,719 cast valid votes for candidates, 3,487,874 (2.82 percent) annulled their votes, and 1,964,779, or 1.59 percent cast blank votes.[27] The proportion of annulled and blank votes (both considered invalid) represents a 50% decrease from the 2018 election. [28]

Despite Brazil's compulsory vote, the convenience of the *e-título*, and the ability to temporarily change one's voting address, 32,770,982 voters (or 20.95 percent of eligible voters) abstained from voting altogether.[29] CEPPS/IFES has

*turno*https://agenciabrasil.ebc.com.br/politica/noticia/2022-11/tcu-nao-encontra-irregularidades-em-urnas-no-segundo-turno

[24] Carmargo, Gilson (November 9, 2022). Relatórios do TCU e da OAB reafirmam lisura das eleições. *Extra Classe*. https://www.extraclasse.org.br/politica/2022/11/relatorios-do-tcu-e-da-oab-reafirmam-lisura-das-eleicoes/

[25] Relatório das Forças Armadas não excluiu a possibilidade de fraude ou inconsistência nas urnas eletrônicas (November 10, 2022). *Ministério da Defesa*.https://www.gov.br/defesa/pt-br/centrais-de-conteudo/relatorio-das-forcas-armadas-nao-excluiu-a-possibilidade-de-fraude-ou-inconsistencia-nas-urnas-eletronicas

[26] Estatísticas do eleitorado (2022). *Tribunal Superior Eleitoral.* https://sig.tse.jus.br/ords/dwapr/f?p=1004:2:10808535656458::::P0_ABRANGENCIA,P0_PAIS,P0_REGIAO,P0_UF,P0_MUNICIPIO:UF,Brasil,SUDESTE

[27] Leia os resultados da apuração em todo o Brasil (October 4, 2022). *Poder360.* https://www.poder360.com.br/eleicoes2022/resultados/1turno/abstencao/?cargo=0001&turno=544&uf=BR&mun=0&zona=0&pag=1&partido=null

[28] Alves, Shirlei (October 3, 2022). Brancos e nulos têm menor percentual de votos para presidente desde 2002. *A Folha de São Paulo.* https://www1.folha.uol.com.br/poder/2022/10/brancos-e-nulos-tem-menor-percentual-de-votos-para-presidente-desde-2002.shtml

[29] Leia os resultados da apuração em todo o Brasil (October 4, 2022). *Poder360.* https://www.poder360.com.br/eleicoes2022/resultados/1turno/abstencao/?cargo=0001&turno=544&uf=BR&mun=0&zona=0&pag=1&partido=null

been unable to locate statistical disaggregation of this abstention by gender, age, ethnicity, education, disability or socio-economic status among the TSE's otherwise rich electoral statistics. Two days after the election, CEPPS/IFES received a geographic breakdown of abstention, showing the highest abstention rates in the Southeast.

Of the 667,565 voters who temporarily transferred their voting address, only about half ultimately voted in the first round.[30] TSE statistics make out 16-20-year-olds as the most under-registered age group eligible to vote. The fact that voting becomes compulsory at 18 does not measurably increase the registration rate of 18- and 19-year-olds, perhaps partially because Brazil holds elections every two years. It is also possible that the registration rate may have been negatively impacted by COVID-19. Nevertheless, a precipitous registration lag persists for first-time voters in that age bracket.[31] In 2020, abstention also rose with advanced age, as voting becomes optional for those older than 70.[32]

During the runoff, Brazil achieved its first ever turnout increase between the two rounds by about half a million votes. The abstention rate still remained high, considering that voting in Brazil is compulsory, and despite the fact that the TSE for the first time allowed temporary voting address changes. CEPPS/IFES hence encourages the TSE to explore additional ways to accommodate voters with special needs, including the elderly, hospital-bound voters, persons with disabilities, and overseas voters residing at large distances from diplomatic missions. Because voters are captured through electronic poll books, the TSE has the statistical capability to, and does disaggregate and publish breakdowns of registered voters who abstain from voting.[33] CEPPS/IFES commends the TSE's publication of select data, but also acknowledges that several datasets merit more granular analysis, for instance in terms of correlation of poll worker service and abstention.

Recommendations

On Auditability of Brazil's Electronic Voting Machines

Conduct opinion polling on the evolving degree of public trust in the voting machines – This polling can be conducted both with Congress and with the Brazilian public, in order to explore most favored options for further modernizing Brazil's electronic voting machines.

Implement transparency solutions that are intelligible to the average voter – In addition to providing a system that efficiently and securely counts the votes and provides a satisfying user experience, the TSE should also design systems to enhance transparency and promote greater civic participation in verifying the legitimacy of the voting and counting. Observers without sophisticated technology expertise should be able to verify that the output of the black

[30] Estatísticas do eleitorado (2022). *Tribunal Superior Eleitoral.* https://sig.tse.jus.br/ords/dwapr/f?p=1004:2:10808535656458::::P0_ABRANGENCIA,P0_PAIS,P0_REGIAO,P0_UF,P0_MUNICIPIO:UF,Brasil,SUDESTE
[31] Ibid.
[32] Estatísticas de comparecimento/abstenção (2022). *Tribunal Supremo Eleitoral*. https://sig.tse.jus.br/ords/dwapr/seai/r/sig-eleicao-comp-abst/home?session=15339385558205
[33] Ibid.

box corresponds to the input of the voters. The TSE has made extensive efforts in the lead-up to the 2022 elections to engage and educate stakeholders on the technology and on the many safeguards built into the system. These efforts are worthwhile in helping to promote confidence, but no amount of effort could completely bridge the gulf between a technology layperson and the level of knowledge required to achieve an in-depth understanding of how and why the system can be trusted. A more effective approach would be to provide mechanisms so that anyone can understand and verify for themselves that the process is credible and accurate. Where complexity is the enemy of broad stakeholder engagement, simplicity might be a better strategy. In developing such a transparent system, it is important to not be limited to "paper or no paper," but to focus on the electoral principles of transparency and auditability. The current EVM is clearly more efficient than paper-only systems and is arguably more secure; it is also more accurate and provides a better user experience. However, it fails to provide a mechanism for transparency and publicly visible recounting procedures. While there may be other solutions, whatever mechanism the TSE decides to implement should be equivalent to a VVPAT in ensuring transparency and auditability. It is important to emphasize that the (re)introduction of a VVPAT would not at all imply a return to the pre-1996 paper ballots. It would just be one more option for strengthening an effective electronic system.

Enabling post-results announcement biometric and non-biometric integrity testing – Testing of machines that actually served on Election Day could offer a non-paper-based post-results confidence and acceptance building measure, as was the standard in the United States when DREs were still in use there. Airing the TSE's videos on integrity testing in *cartório* waiting room TVs could also broaden understanding of the probatory value of the mechanism.[34,35,36] Although the EVMs are currently locked in a way that prohibits using them outside of Election Day, this could be addressed by adding a configuration mode for post-election testing, similar to the made used for training. While post-electoral integrity testing may not entirely substitute paper-based recounts, it might suffice to dispel any stakeholder apprehension about the integrity of the voting machines that were actually used on election-day.

Develop mechanisms to facilitate voters' understanding of RDVs – The EVM is capable of printing out a complete Digital Record of the Vote (RDV), a randomized collection of records representing the ballots cast in the form of binary strings recording the keystrokes each individual voter has dialed into the EVM. This RDV would allow interested parties to recapitulate a count of individual ballots to ensure that these correspond to the summary of votes printed by the BU. The TSE has agreed to publish the RDVs of every EVM online, which would allow for a Parallel Vote Tabulation-like exercise (PVT). In a PVT, a random sample of polling stations is selected, and votes are counted and tallied from this sample, allowing the organization conducting the PVT to project total vote counts within a defined degree of certainty. While announcement and publication of the results remains the exclusive legal prerogative of the TSE, any exercise that can allow independent verification of the accuracy of the vote tally can help to build greater public confidence in the results announced by the TSE. Consideration could be given to expanding post-results integrity tests on contingency EVMs, as well as creating duplicates of flash-drive-hosted voting application copies, to integrity tests on EVMs actually used on election-day, once results are announced.

[34] justicaeleitoral. "React: projeto-piloto com biometria no teste de integridade da urna eletrônica." YouTube. September 23, 2022. https://youtu.be/WidgNWgks0A

[35] Justiça Eleitoral TO. "Teste de Integridade com Biometria." YouTube. October 3, 2022. https://youtu.be/7zq4YAfEcsg?list=PLdNdie2j-5WKye5Ei2OLt3K0lSO8SmxKJ

[36] TRE-MG. "Teste de Integridade das urnas eletrônicas." YouTube. September 24, 2022. https://www.youtube.com/watch?v=7E2WQLRSYAs

One caveat is that allowing a complete comparison of the RDV with the BU still falls short of the level of transparency provided by most voting systems globally, since the RDV is generated from within the same black box that produced the BU. Consequently, a comparison of the two only confirms that the EVM produced results that are consistent with its own internal logic, and still fails to provide a mechanism for independent verification that the EVM accurately recorded the choices expressed by each voter.

On Results Disputes

Research and remedy the reasons for the lag in results transmission from Northeastern states – The TSE could consider publicizing explanations (and remedies) to reassure voters that delays are expected or at least not indicative of manipulation. Mapping the lack of polling center internet connectivity could help bridge the digital divide between the Northeast and the rest of the country.

Pre-define remedies, paths, and procedures that contesters can pursue to review results – In the absence of actionable results appeals avenues defined by statute, the TSE could adopt a resolution defining the grounds on which post-electoral audits can be challenged by petition. Such a resolution could outline an approach whereby auditors analyze a small but statistically significant random sample of polling stations and expand the exercise only if the initial sample reveals inconsistencies. This sampling approach is similar to that used in a risk-limiting audit. Such a TSE results appeals resolution could also define the available remedies in case audits unearth irregularities prone to impact the outcome of a given election. The TSE resolution could also address other legislative gaps – for instance, which results (countersigned BUs or electronic results stored on EVMs or on flash drives) legally prevail in case of inconsistencies. Placing QR-codes on the results flash drives could help auditors correlate BUs with respective DREs and flash drives at *cartório* warehouses.

Allowing challenges against election results with the STF – This measure could dispel the suspicion that the TSE lacks impartiality when acting as judge and party and allow for the review of its own administrative acts and decisions.

Ensuring that all flash drives include a QR code and storing them centrally – This logistical centralization would provide a useful service to any entity that files a petition demanding an extensive post-election audit similar to the one in 2014.

On Turnout and Voting Access

Ensuring that poll workers are notified in advance of the polling station where they will be working, so they can change their registered voting station to the polling station of service. This would potentially reduce abstentionism.

Supplementing the 2021 TSE study on distance OCV voting with international comparative costs of postal and online voting, as well as comparative approaches to ensure the secrecy of the vote, could ease adoption of greater access of expats who live far away from Brazilian diplomatic missions.

Studying comparative legal frameworks and practices for prison voting could raise international awareness of Brazil's advances in the field, as well as help harmonize Brazil's framework with its international human rights commitments, for instance the UN Human Rights Committee's standard that deprivation of political rights must be individually pronounced by each sentence and cannot be generalized by legislation.[37]

Capitalize on the TSE's wealth of data collection to address current turnout gaps – The TSE could unpack abstention statistics according to justifications given and explore ways of addressing these obstacles that prevent voters from casting their ballots.

On Ease of Polling

Allow validation of voters through QR code readers for *e-título*, or straight by fingerprint recognition, to obviate reading aloud and dialing each voter's ID number into the identification terminal.

Conduct a study on how to improve fingerprint recognition, for example through the use of different cleaning solutions that add oil to the fingers to lessen the negative impact of dry skin on fingerprint scanners.

Allow for poll workers to conduct the voter identity verification while another voter is at the polling booth, instead of waiting for each voter to finalize the voting process before doing so. This could speed up the process and reduce wait time in the queue.

Provide DRE audio cues to voters who are struggling with keying in different candidate choices, informing them of which race they are currently required to mark or informing them by voice how many digits they must enter.

On Voter Registration and Identification

Encourage persons with disabilities to specify their situation in the voter register online when they download their *e-título* (and without having to physically appear at the *cartório)*, so that the TSE can better study and accommodate their needs.

Consider capturing missing voter biometrics during 2024 elections at polling sites, rather than just at *cartórios*.

Limit the number of times the polling officer can override a failed biometric match. This closes a loophole that could be abused to allow casting votes for voters who are not physically present in the polling station.

[37] CCPR/C/GBR/CO/6, United Kingdom of Great Britain and Northern Ireland (2008), p. 28: The Committee remains concerned at the State party's maintenance of section 3(1) of the Representation of the People Act 1983 prohibiting convicted prisoners from exercising their right to vote, especially in the light of the judgment of the European Court of Human Rights in *Hirst v. United Kingdom* (2005). The Committee is of the view that general deprivation of the right to vote for convicted prisoners may not meet the requirements of article 10, paragraph 3, read in conjunction with article 25 of the Covenant. (art. 25). The State party should review its legislation denying all convicted prisoners the right to vote in light of the Covenant.

Final Considerations

CEPPS/IFES reiterates its gratitude to the TSE, other Brazilian public institutions, regional electoral offices, and poll workers who shared information with CEPPS/IFES team members and enabled the development of this report. CEPPS/IFES remains committed to collaborating with the TSE in the areas highlighted throughout this report and in other areas of interest according to the memorandum of understanding in effect between the two institutions.

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