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ASSESSING CORPORATE SUSTAINABILITY IN TURKISH BANKS: WASPAS AND ARAS APPROACHES IN THE COVID-19 AND THE POST-COVID-19 ERA*

COVID-19 ve Sonrası Dönemde Türk Bankalarında Kurumsal Sürdürülebilirliğin Değerlendirilmesi: WASPAS ve ARAS Yaklaşımları

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Abstract

As sustainability becomes an ever-larger structural imperative, particularly in emerging markets, banking's contribution to sustainable development is becoming more important. Sustainability performance of banks during the COVID-19 pandemic year (2020) and recovery period (2022) is analyzed by an innovative approach based on seven large-sized Turkish banks. Data based on 75 criteria and 7 dimensions consistent with international standards (GRI, UNGC, UNEP FI) were collected from banks' sustainability reports through content analysis. The data are analyzed by applying three goal-programming objective methods (MEREC, CILOS, CCSD) and two CRM (Compromise Ranking Methods) methods (WASPAS and ARAS). The outcome shows that commercial banks perform better than state-owned banks. The primary explanations for this are commercial banks' effective governance frameworks, improved transparency, and investor pressures. Banks gave priority to measures such as SME support and employee health for resilience in the pandemic period, and to measures such as green finance, transformation, and innovation for the recovery period. The poor performance of state-owned banks during these periods indicates that policy-specific interventions are urgently needed. This article fills an important gap in sustainability literature for emerging markets and offers a handy benchmark for policymakers, investors, and banking institutions regarding systemic distortions and long-term strategic overhaul.

Keywords: Corporate Sustainability, Banking Sector, WASPAS, ARAS.

Jel Codes: A10, Q50, D70.

Öz

Sürdürülebilirlik, özellikle gelişmekte olan piyasalarda gittikçe yapısal bir zorunluluğa dönüşürken bankacılık sektörünün sürdürülebilir kalkınmadaki rolü giderek daha kritik hale gelmektedir. Bu çalışmada, Türkiye'de aktif büyüklüğü açısından en yüksek yedi banka kullanılarak COVID-19 krizi yılı (2020) ve takip eden toparlanma dönemi (2022) için bankaların sürdürülebilirlik performansı yenilikçi bir yöntemle değerlendirilmiştir. Uluslararası standartlarla (GRI, UNGC, UNEP FI) uyumlu 75 kriter ve 7 boyutu içeren veriler bankaların sürdürülebilirlik raporlarından içerik analizi yoluyla elde edilmiştir. Elde edilen veriler üç objektif ağırlıklandırma yöntemi (MEREC, CILOS, CCSD) ile birlikte iki ÇKKV tekniği (WASPAS ve ARAS) kullanarak analiz edilmiştir. Bulgular, ticari bankaların kamu bankalarına kıyasla daha yüksek performans gösterdiğini ortaya koymaktadır. Ticari bankaların güçlü yönetişim yapıları, daha yüksek şeffaflık düzeyi ve ticari bankalarda yatırımcı baskısının daha fazla olması bunun başlıca nedenleri olarak gösterilebilir. Pandemi döneminde bankaların çalışan sağlığı ve KOBİ desteği gibi kısa vadeli direnç önlemlerine öncelik verdiğini, toparlanma sürecinde ise yeşil finansman, dijital dönüşüm ve inovasyon gibi uzun vadeli stratejilere odaklandığı söylenebilir. Kamu bankalarının her iki dönemde de görece düşük performans sergilemesi, bu konuda belli başlı politika müdahaleleri gerekliliğini ortaya koymaktadır. Bu çalışma, gelişmekte olan piyasalardaki sürdürülebilirlik çalışmalarındaki önemli bir boşluğu doldurmakta olup politika yapıcılar, yatırımcılar ile finansal kurumlar için sistemik bozulmalar ve uzun vadeli stratejik dönüşüm süreci açısından pratik bir kıyaslama aracı sunmaktadır.

Anahtar Kelimeler: Kurumsal Sürdürülebilirlik, Bankacılık Sektörü, WASPAS, ARAS.

JEL Kodları: A10, Q50, D70

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1. Introduction

Life's sustainability upon our planet is an essential priority, given that human existence is intrinsically connected to natural ecological balances. The balance, though, is progressively threatened by such global issues as climate change, environmental degradation, and social inequality. For example, military expenses globally exceeded $2 trillion in 2022, while an estimated 828 million humans endured hunger (SIPRI, 2022). These contrasting figures demonstrate how imperative it is to adopt sustainable practices of development that combine economic, environmental, and social aspects to address the welfare of current and future human populations.

Sustainability has emerged as an absolute necessity for businesses and financial institutions globally. Following an upsurge of consciousness of environmental, social, and governance or ESG factors, companies now engage extensively in voluntary disclosure of their sustainability initiatives (Davis and Searcy, 2010). Of these, the banking sector has a singular role to play owing to its dual role of a capital intermediary and a systemic-change inducer (Beck et al., 2000; Decker, 2004). Banks are distinct from other businesses, which tend to react to pressures from outside, by proactively incorporating sustainability into their activities, directing capital towards green assets and minimizing long-term risks.

As facilitators of sustainable development, not only are banks driving responsible investment, but economic resilience is also promoted through new and innovative funding mechanisms. This has been deepened by increasing demand for sustainable finance and reputational risk concerns linked to their Environmental, Social, and Governance (ESG) performance (Decker, 2004). Nowhere is this seen more heavily than in emerging markets such as Turkey, where banking has become a regional leader for sustainability uptake. The Turkish Banks Association (TBA) launched, in 2022, a landmark “Sustainability Strategic Plan,” harmonizing a nation's goals with the UN Sustainable Development Goals (SDGs). Turkish banking has also led the uptake of international reporting frameworks, such as the Global Reporting Initiative (GRI), the United Nations Global Compact (UNGC), and the Carbon Disclosure Project (CDP).

Notwithstanding these advances, significant knowledge gaps exist in the literature. Much existing research has concentrated primarily upon developed economies to the extent that emerging markets' sustainability dynamics, especially their banking sectors, are not very well understood. Furthermore, although the COVID-19 pandemic caused unprecedented shocks, scholars have not extensively reviewed how banks evolved from managing crises to long-term sustainability measures upon recovery.

This article fills key knowledge gaps through three core innovations. First, it offers a contextual contribution by presenting the first comprehensive assessment of sustainability performance in Turkey's banking sector during and after the COVID-19 pandemic, treating 2022 as a distinct transitional year. Methodologically, the study integrates internationally recognized frameworks—UNGC, UNEP FI, and GRI—with two advanced Multi-Criteria Decision-Making (MCDM) methods, WASPAS and ARAS. This combination yields a robust, transparent model based on 75 criteria across seven sustainability dimensions. On a practical level, the findings serve as a benchmarking tool for both banks and policymakers, enabling them to align emerging market practices with global standards while addressing domestic socio-economic priorities.

Structurally, the paper is organized as follows. Section 2 presents the conceptual framework, followed by a review of the relevant literature in Section 3. Section 4 details the data and methodology used in the study. Sections 5 and 6 focus on the application of the ARAS and WASPAS methods and the subsequent sensitivity analysis. Finally, Section 7 discusses the policy implications, and Section 8 concludes the paper with a summary of key findings.

2. Conceptual Framework

The idea of sustainability took center stage globally when the Brundtland Report (WCED, 1987) formulated sustainable development as "meeting present needs without compromising the ability of future generations to meet their own needs." This original vision was enacted through the Triple Bottom Line (TBL) approach (Elkington, 1997), which brings together economic, ecological, and social factors. Early discussion treated these pillars separately, but newer scholarship highlights their interconnections: ecological degradation, like climatic variations, fuels social injustice, which further destabilizes economies (Eccles et al., 2020). Sustainability today is therefore conceived of not merely as an outcome but also as a process of dynamic balance to be sought after.

Corporate sustainability evolved out of these pressures, compelling companies to balance profitability and planetary and social well-being (Dyllick and Hockerts, 2002). Banks, unlike manufacturing companies, leave little direct environmental footprint, but their lending choice creates widespread systemic impacts. Banks heavily influence sustainable outcomes across sectors through such a "multiplier effect" (Aras et al., 2018). This makes them key facilitators of the United Nations SDGs, especially when lending practices are aligned with global sustainability goals (UNEP FI).

To provide transparent and consistent reporting on sustainability performance, a number of global frameworks have been created. The GRI offers general-purpose measures of ESG factors. The Sustainability Accounting Standards Board (SASB) deals with sector-specific and financially material measures, and the Integrated Reporting Framework (IR) brings together finance and non-finance reporting to evaluate long-term value creation. To address fragmentation, the International Sustainability Standards Board (ISSB) has been formed to consolidate these practices into a global benchmark. The United Nations Environment Programme Finance Initiative (UNEP FI), meanwhile, has brought forward Principles for Responsible Banking (2019), which mandates bankers to ensure their plans are SDG and Paris Agreement-aligned.

Turkey's banking sector has been increasingly integrating sustainability through a dual-track approach. On the internal side, banks have implemented ESG risk scoring models and embedded sustainability considerations into their governance structures, guided by strategic sectoral planning. On the external front, there has been a noticeable rise in the use of green finance instruments, including the issuance of green bonds and the alignment of loan portfolios with SDGs, particularly in areas such as renewable energy and energy efficiency. These developments reflect a growing alignment with international sustainability standards and a proactive effort to localize global frameworks within the Turkish financial ecosystem.

The COVID-19 pandemic served as a structural watershed moment for the banking sector. It revealed critical vulnerabilities in social inclusion, such as unequal access to digital services and economic resilience, particularly for small and medium-sized enterprises (SMEs). In response, Turkish banks shifted their focus toward promoting decent work and economic growth, increasing lending for working capital, and accelerating digital transformation. This shift was evident in a sharp rise in mobile banking usage, highlighting how quickly institutions adapted to changing needs. The period underscored the urgency of updating sustainability priorities within the TBL model to better address real-time systemic shocks.

The present research fills an essential gap in the literature by connecting the pandemic's crisis (2020) and recovery/transition (2022) periods and developing a new analytical framework to reflect how banking institutions rebalanced their sustainability agendas throughout these periods. Using a content analysis of integrated reports combined with MCDM methods, our research presents an empirical examination of how Turkish banking institutions responded to changing global frameworks and existing local conditions through their sustainability policies.

To guide this analysis, the central research question posed is: How did Turkish banks perform in terms of sustainability during the pandemic and recovery periods (2020 and 2022), and what institutional or structural factors explain the observed differences across bank types (commercial vs. state-owned)?

3. Literature Review

Considering the paucity of MCDM-based applications within the banking sustainability literature, this study synthesizes existing works that have integrated MCDM with econometric and statistical approaches to identify key methodological limitations addressed in the present analysis. Notably, most prior studies have focused on developed economies, relied on single-criterion assessment models, and were conducted before the COVID-19 pandemic and the subsequent post-crisis recovery phase—conditions that limit their applicability to emerging markets such as Turkey during periods of systemic disruption and recovery.

Applications of MCDMs in Banking Sustainability methods have been of specific benefit when dealing with intricate trade-offs between ESG factors in banking. Aras et al. (2016) employed entropy-weighted TOPSIS to order Turkish banks based on 49 indicators, ranking Ziraat Bank as the top sustainability performer. Analysis depth, though, was limited by available indicators. Rebai et al. (2016), by contrast, combined AHP and TOPSIS for French banks and concluded that expert weightings have a significant effect upon sustainability rankings—a conclusion which underpins our entropy-CRITIC hybrid weightings. The Polish banking sector has been assessed by Korzeb and Samaniego-Medina (2019), who concluded that domestic institutions perform better than foreign institutions due to their stronger national policies for sustainability, an observation that resonates with post-2020 regulatory policy plans presented by TBA. A common disadvantage to these exercises, though, has been reliance upon a single MCDM method, opening to potential methodological bias. Dual utilization of WASPAS and ARAS by our exercise corrects for that.

Outside of MCDM, econometrics emphasizes the systemic function of policy and institutional quality in determining sustainable banking. Weber (2016) proved that China's green credit policies resulted in a 12% enhancement of ESG performance, stressing the regulatory lever—a relatively untapped area of Turkey. Yip et al. (2018) compared green banking across 20 countries and identified a 9% decrease in emissions, but their 1995–2015 dataset omits post-

Paris Agreement scenario developments. Úbeda et al. (2022) attributed 63% of the sustainability performance difference among 46 countries to institutional drivers such as control of corruption and rule of law, which could equally count for enhanced banking sustainability improvements under recent governance reforms and ISSB alignment.

Turkey-specific evidence indicates an increasing commitment to sustainability frameworks but a lack of consideration for the COVID-19 period. Aras and Mutlu (2022) used ARAS to order public banks' ESG performance, but their dataset for 2018–2019 does not reflect responses during the period of crises. Jan et al. (2023) demonstrated that green banking adds to profitability within emerging markets but did not include Turkey during the pivotal 2020–2022 period. This temporal blind spot constrains the applicability of current models to the post-pandemic Turkish setting.

Three critical limitations dominate the current literature. First, Methodological Narrowness: Too much dependency upon individual tools (TOPSIS, regression). We combine WASPAS and ARAS approaches using three different weight sets (MEREC, CILOS, CCSD), thus obtaining solid, unbiased results. Second, Developed-Country Bias: Bibliometrics indicate that research on sustainable finance is heavily focused within developed nations, especially the United Kingdom, China, America, Switzerland, and Japan, and emerging markets are substantially underrepresented in existing literature (Kashi and Shah, 2023). The current study helps balance out such bias by examining Turkey, an important emerging economy that has changing ESG frameworks. Third, Temporal Blindness: The majority of analyses employ pre-2020 datasets, excluding how the pandemic has affected sustainability strategy. Comparing 2020 (crisis year) and 2022 (recovery year), we outline how Turkish banks adjusted their sustainability agendas by reprioritizing among TBL aims of economic sustainability, social responsibility, and stewardship of the environment.

Theoretically, the contribution of this research lies in bringing UNEP FI's sustainability standards together within a quantitative MCDM framework, closing the gap between qualitative ESG disclosure and evidence-backed decision-making. From a policy-making perspective, our 75-criterion model is synchronized with the ISSB's 2023 global baseline, which provides a benchmark tool to enable regulators to fairly compare and contrast the sustainability performance of Turkish banks with EU counterparts.

In recent years, numerous studies have been conducted to evaluate ESG performance in the banking sector using MCDM methods. For instance, Karki et al. (2025) integrated the R-SWARA method to determine the weights of ESG sub-factors and the CoCoSo method to rank ESG performance, identifying governance as the most decisive dimension (Karki et al., 2025). Similarly, Yu et al. (2024) employed an interval type-2 fuzzy AHP and CoCoSo hybrid model to assess ESG sustainability performance in the corporate context (Yu et al., 2024). While these studies typically focus on a single sector, time frame, or corporate setting, the present study contributes to the literature by analyzing the ESG performance of the Turkish banking sector in two critical years—2020 (pandemic) and 2022 (recovery)—and by applying a comparative approach through the integrated use of WASPAS and ARAS methods, supported by multiple objective weighting techniques. This provides both methodological and contextual novelty to the field.

4. Data and Methodology

The sustainability performance of listed banks in Turkey is assessed in this study. There are seven commercial banks listed and publishing regular sustainability reports, namely Akbank, Garanti Bank, Halkbank, İşbank, Yapı Kredi, Vakıfbank, and Ziraat Bank. The years 2020 and 2022 are considered for examination to analyze how the COVID-19 pandemic and recovery period affected sustainability performance across Turkish banks. This period allows a comparative examination of sustainability strategies by banks before and after the pandemic's peak.

Table 1. Criteria and Codes

No	Dimension Analyzed	Code
1	Strategic Analysis	C1
2	Corporate profile	C2
3	Economic	C3
4	Environmental	C4
5	Social	C5
6	Product responsibility	C6
7	Administrative	C7

Note: The ESG criteria presented in Table 1 have been structured based on the GRI standards (notably series 200, 300, and 400) and the UNEP FI Principles for Responsible Banking. Each indicator was selected in alignment with these frameworks and adapted to the context of the banking sector.

To ensure a comprehensive assessment, sustainability criteria were structured across seven key dimensions, as presented in Table 1. Data were extracted from the integrated reports published by the selected banks, following an in-depth content analysis approach.

4.1. Justification for the Content Analysis Method

Content analysis is a systematic, replicable method for transforming qualitative textual data into quantifiable metrics, allowing objective comparison of corporate sustainability disclosures (Krippendorff, 2018). This study employs computer-assisted content analysis using NVivo Pro 11.0, following best practices in ESG research (Hussain et al., 2018). By integrating standardized global frameworks and automation tools, the methodology ensures both reliability and cross-bank comparability.

This method was selected over alternatives because it offers standardization, transparency, and reproducibility—three qualities essential for robust sustainability assessment. In terms of standardization, all criteria were drawn from internationally accepted frameworks such as GRI, UNGC, and UNEP FI, ensuring consistency across banks. For example, the GRI-based metric “Scope 1 GHG emissions (tonnes CO_2e),” coded as E.3.7, was extracted in the same format from each bank’s report. Transparency was achieved through the development of a detailed codebook (see Supplementary File 1), which lists all 75 sub-criteria, their source frameworks, and specific extraction rules, such as mapping “Anti-corruption training %” to UNGC Principle 10. To ensure reproducibility, NVivo’s automated Boolean search function (e.g., “carbon footprint” AND “reduction”) was used to minimize researcher bias, and all raw data, coding protocols, and keyword logs were archived in an open-access repository. Intercoder reliability was verified with Krippendorff's alpha ($\alpha = 0.81$), exceeding the commonly accepted threshold for qualitative content analysis.

4.2. Data Sample and Content Analysis Procedure

Integrated reports were collected from Turkey's top seven banks, which collectively account for the vast majority of the sector's total assets. Two strategic years were analyzed: 2020, reflecting the immediate impact of COVID-19 (e.g., employee protection, SME relief), and 2022, representing recovery strategies (e.g., green bonds, digital inclusion). Banks were selected based on consistent report availability and adherence to international standards. The data extraction process followed four structured steps to ensure methodological rigor and accuracy:

Step 1 focused on framework alignment, where 75 sub-criteria were mapped to seven sustainability dimensions, as detailed in Table 1. For instance, the criterion "Energy consumption (GJ)" falls under the Environmental dimension, aligned with GRI 305, and is coded as E.2.5.

Step 2 involved text mining, using NVivo's Boolean search operators (e.g., "carbon" NEAR "target") to identify relevant disclosures within the sustainability reports. Manual screening was employed to eliminate false positives, such as irrelevant mentions like "carbon copy."

Step 3 entailed quantitative conversion of the extracted indicators, which varied in measurement level: binary (e.g., 0 = no disclosure, 1 = disclosure), ordinal (e.g., policy implementation stages), and interval/ratio (e.g., GJ of energy use). Binary coding was applied when only the presence or absence of information was assessed. Continuous variables were retained and normalized via min–max scaling to ensure comparability across banks and ESG categories.

Step 4 ensured validation, with 20% of the coded data independently reviewed by a second coder. The resulting discrepancy rate was only 2.1%, indicating high inter-coder reliability and consistency in data interpretation.

4.3. Multi-Criteria Decision-Making (MCDM) Methods

To measure sustainability performance and rank banks, this study uses MCDM methods, which are widely recognized for their ability to handle complex decision-making problems involving multiple criteria (Figueira et al., 2005). Specifically, the study applied two complementary approaches, Weighted Aggregated Sum Product Assessment (WASPAS) and Additive Ratio Assessment (ARAS), both of which are suitable for evaluating performance across multiple sustainability dimensions.

The justification for method selection is threefold. First, these methods are well-suited for sustainability evaluations, as they enable robust comparisons across diverse criteria, making them ideal for assessing bank performance. Second, they enhance decision-making accuracy by integrating weighted scores with performance assessments, resulting in more consistent and objective rankings. Third, their reliability has been validated in previous studies, where

WASPAS and ARAS have been successfully applied to sustainability-related evaluations (Zavadskas et al., 2012; Stanujkic et al., 2015). The integration of MCDM methods with content analysis ensures a structured, data-driven, and objective evaluation of sustainability performance in the Turkish banking sector.

To ensure data accuracy and reliability, several measures were implemented throughout the research process. First, an independent content analysis review was conducted, where two researchers analyzed the reports separately and resolved any discrepancies through discussion and consensus. Second, cross-validation with international standards was performed, as the extracted data were checked against GRI, UNEP FI, and UNGC frameworks to ensure consistency with globally accepted sustainability criteria. Third, methodological consistency was maintained, with identical content analysis and MCDM procedures applied uniformly across all seven banks, thereby preserving objectivity and comparability of results.

4.3.1. Weighting Methods

This section presents the weighting approaches MEREC, CILOS, and CCSD, from which weight levels of sustainability criteria for assessing sustainability performance of Turkish banks have been calculated. These approaches ensure objective weight calculations and maintain an unbiased process of assessment.

4.3.1.1. MEREC Method

The MEREC (Method based on Removal Effects of Criteria) is a very new objective weight determination method developed by Keshavarz-Ghorabaee et al. (2021). Unlike other traditional weight methods, MEREC quantifies criterion weights by assessing their displacement effect on the overall performance of alternatives.

The key advantages of MEREC lie in its ability to enhance objectivity and ranking reliability in multi-criteria evaluations. It minimizes subjectivity by employing an objective, removal-based approach that reduces dependence on expert judgment. Additionally, it improves ranking stability by systematically assessing the influence of each criterion on overall performance, thereby ensuring more robust and consistent results. Unlike traditional methods that rely on equal weighting or expert opinion, MEREC effectively addresses these limitations by eliminating potential sources of bias in the weighting process.

Calculation Steps of MEREC (Keshavarz-Ghorabaee et al., 2021; Goswami et al., 2022; Ünlü et al., 2022):

Step 1: Construct the decision matrix. It is assumed that there is a decision matrix that should be greater than zero $x_{ij} \geq 0$, as in Equation (1).

$$X = \begin{matrix} & \begin{matrix} w_1 & w_2 & \dots & w_n \\ C_1 & C_2 & \cdots & C_n \end{matrix} \\ \begin{matrix} A_1 \\ A_2 \\ \vdots \\ A_m \end{matrix} & \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \end{matrix} \quad (1)$$

Step 2: Normalize the decision matrix and convert all values into the minimization type. If B^S represents the set of beneficial criteria and C^S represents the set of cost-increasing criteria, Equation (2) below can be used for normalization.

$$n_{ij}^{x} = \begin{cases} \frac{min_k x_{kj}}{x_{ij}} & if \quad j \in B^S \\ \frac{x_{ij}}{max_k x_{kj}} & \quad\;\; j \in C^S \end{cases} \tag{2}$$

Step 3: The third step involves calculating the performance of the alternatives (S_i) using a logarithmic measure with the help of Equation (3).

$$S_i = ln\left(1 + \left(1/m \sum_j \left|ln\left(n_{ij}^{x}\right)\right|\right)\right) \tag{3}$$

Step 4: The fourth step consists of calculating the performance of the alternatives by sequentially removing each criterion.

The performance related to the removal of the j^{th} criterion for the i^{th} alternative can be represented as follows, and the values can be calculated using Equation (4) below:

$$S'_{ij} = ln\left(1 + \left(1/m \sum_{k,k\neq j} |ln(n_{ik}^{x})|\right)\right) \tag{4}$$

Step 5: The removal effect of the *j*th criterion is obtained by calculating the total absolute deviations of the values obtained from steps 3 and 4 of the method. This is referred to as the removal effect of the *j*th criterion. The values are calculated using Equation (5) below.

$$\varepsilon_j = \sum_i \left|s'_{ij} - S_i\right| \tag{5}$$

Step 6: The objective weights of the criteria are determined using the removal effects (ε_j) from the previous step. If the objective weight of the *j*th criterion is to be calculated, Equation (6) can be used.

$$w_j^{O} = \frac{\varepsilon_j}{\sum_k \varepsilon_k} \tag{6}$$

By applying MEREC, this study objectively determines the weights of sustainability criteria, ensuring that the ranking process reflects real-world data rather than subjective inputs.

4.3.1.2. CILOS Method

The CILOS (Criterion Impact Loss Score) method is an objective weighting technique based on the concept of impact loss when a specific criterion is selected as the best (Mirkin, 1974; Čereška et al., 2016; Zavadskas and Podvezko, 2016).

The key advantages of CILOS stem from its ability to refine the weighting process in multi-criteria decision-making. It effectively solves a major weakness of the Entropy method by ensuring that similar values across alternatives do not artificially reduce the importance of a criterion. Moreover, it differentiates highly correlated criteria by adjusting weights to account for interdependencies, thereby maintaining balance in the evaluation. This approach also ensures meaningful weight assignment by preventing the undervaluation of critical indicators, particularly in datasets where the values are relatively homogeneous.

The method can only be applied to maximizing criteria; therefore, minimizing criteria need to be transformed into maximizing criteria. Various transformations are applied for this purpose:

$$\bar{r}_{ij} = \frac{min_i r_{ij}}{r_{ij}} \tag{7}$$

The new matrix, which has transformed minimum values and the same maximum values, is denoted X= ||xij||, and by grouping rows that contain the maximum value of each criterion in every column, the new square matrix R= ǁrkǁ is obtained. The R matrix contains the highest values of all criteria on its diagonal.

A square matrix A= ||aij|| is formed from the k_j rows of the X matrix. X_{ki} corresponds to the maximum values of the *i*th criterion. Subsequently, the matrix of relative losses P= ||pij|| is constructed:

$$p_{ij} = \frac{x_j a_{ij}}{x_j} \tag{8}$$

The p_{ij} elements of the P matrix indicate the loss of the j^{th} alternative with respect to the i^{th} criterion when the i^{th} criterion is selected as the best. Subsequently, the weights q = (q_1, q_2, . . . , q_m) are calculated by solving the following linear equation: F . q = 0,

Here, the matrix F is as follows (Zavadskas and Podvezko, 2016):

$$F = \begin{pmatrix} -\sum_{i=1}^{m} p_{i1} & p_{12} \cdots & p_{1m} \\ \vdots & \ddots & \vdots \\ p_{m1} & p_{m2} \ldots & -\sum_{i=1}^{m} p_{im} \end{pmatrix} \tag{9}$$

By addressing the entropy method’s limitations, CILOS ensures that important sustainability criteria retain their weight, even when alternative values are close to each other. This makes CILOS particularly useful for evaluating banking sustainability performance, where some criteria may exhibit similar numerical ranges but remain critical for decision-making.

4.3.1.4. CCSD Method

The CCSD (Criteria Correlation and Standard Deviation) method, developed by Wang and Luo (2010), determines the importance of each criterion by integrating two key statistical elements: the within-criteria standard deviation, which captures variability within individual criteria, and inter-criteria correlation, which adjusts for potential redundancy across different criteria. The key advantages of CCSD lie in its ability to improve weighting precision by combining statistical variability with correlation-based adjustments. It accounts for interdependencies among criteria, ensuring that highly correlated indicators do not exert disproportionate influence on the final rankings. Additionally, CCSD balances weight distribution effectively, preventing the overemphasis of specific variables and thereby supporting a more equitable and accurate evaluation framework.

CCSD is calculated as follows (Wang and Luo, 2010: 2-3):

In CCSD, the decision matrix $X = \|X_{ij}\|_{(nxm)}$, which evaluates alternatives A_1,..., A_n across features O_1,..., O_m, is first normalized according to whether the features are benefit or cost criteria. The normalized decision matrix $Z = \|Z_{ij}\|_{(nxm)}$ is obtained by applying Equations 7 and 8, respectively. In Equations 7 and 8, X_j^{min} and X_j^{max} represent the minimum and maximum values in the respective criterion.

$$\text{If } j \text{ is a benefit criterion}, Z_{ij} = \frac{X_{ij} - X_j^{min}}{X_j^{max} - X_j^{min}} \tag{10}$$

$$\text{If } j \text{ is a cost criterion}, Z_{ij} = \frac{X_j^{max} - X_{ij}}{X_j^{max} - X_j^{min}} \tag{11}$$

Subsequently, the criterion O_j is removed from the model to observe its effect on evaluating the alternatives. The evaluation of the alternatives without O_j is performed using the following equation. Here, w_k represents the criterion weights that are yet to be determined.

$$d_{ij} = \sum_{k=1, k\neq j}^{m} Z_{ik} \,.\, w_k \qquad (i = 1, , , , , n) \tag{12}$$

The correlation between criterion O_j O and the evaluation d_{ij} calculated without criteria is calculated as in Equation 9.

$$R_j = \frac{\sum_{i=1}^{n}(Z_{ij} - \bar{Z}_j)(d_{ij} - \bar{d}_j)}{\sqrt{\sum_{i=1}^{n}(Z_{ij} - \bar{Z}_j)^2 \sum_{i=1}^{n}(d_{ij} - d_j)^2}}, (j = 1, , , , , m) \tag{13}$$

The values of $\bar{Z}_j$ and $\bar{d}_j$ in Equation 9 are calculated as in Equations (10) and (11) below:

$$\bar{Z}_j = \frac{1}{n}\sum_{i=1}^{n} Z_{ij} \quad (j = 1, , , , , m) \tag{14}$$

$$\bar{d}_j = \frac{1}{n}\sum_{i=1}^{n} d_{ij} \quad (j = 1, , , , , m) \tag{15}$$

The larger the obtained R_j value, the less impact criterion O_j has on the alternative ranking, and the change caused by its inclusion or exclusion in the evaluation is minimal. Therefore, calculating criterion weights with CCSD involves solving a nonlinear model with as many equations as there are criteria, as shown in Equation (12):

$$Min_j = \sum_{j=1}^{m}\left(w_j - \frac{\sigma_j\sqrt{1 - R_j}}{\sum_{k=1}^{m}\sigma_k\sqrt{1 - R_k}}\right)^2$$

$$\text{Constraints: } \sum_{j=1}^{m} w_j = 1 \;\; \text{wj} \geq 0, (j = 1, , , , , m) \tag{16}$$

CCSD ensures that highly correlated criteria do not receive excessive weighting, leading to a balanced distribution of importance across all sustainability dimensions.

The combination of MEREC, CILOS, and CCSD allows for a comprehensive, data-driven approach to weighting sustainability criteria. Each method offers unique advantages, ensuring that the evaluation remains robust and unbiased:

Table 2. Justification and Analytical Contribution of the Applied Weighting Methods

Method	Key Feature	Why It Was Selected
MEREC	Measures removal effect of criteria	Captures the impact of each criterion on overall performance
CILOS	Addresses entropy limitations	Ensures significant criteria retain their importance
CCSD	Accounts for correlation and variability	Balances redundancy and weight distribution

4.3.2. ARAS Method

Multi-criteria decision-making (MCDM) issues occur when several alternatives need to be ranked and compared from different criteria. Comparison among alternatives stands out as the foremost characteristic of such issues (Aouam et al., 2003). The ARAS and WASPAS approaches were chosen for assessing the sustainability performance of Turkish banks in this case. They are chosen due to their suitability to address intricate decision-making situations and deliver sound, fact-based findings.

The ARAS method, developed by Zavadskas and Turskis (2010), is an MCDM approach that not only determines the performance level of each alternative but also expresses the ratio of each alternative to the ideal alternative. This proportional rating feature distinguishes ARAS from other MCDM methods.

The key advantages of ARAS lie in its clarity, usability, and adaptability in multi-criteria decision-making. It employs a proportional rating system, which allows for a transparent comparison of alternatives relative to an ideal solution. The method is known for its simplicity and transparency, making it easy to implement and interpret in practical settings. Furthermore, ARAS demonstrates strong flexibility, as it can effectively accommodate both benefit-oriented and cost-oriented criteria within the same evaluation framework.

The method follows four main steps (Zavadskas and Turskis, 2010):

Step 1 involves constructing the decision matrix, where, unlike classical approaches, the ARAS method also incorporates the best values for each criterion directly into the matrix to facilitate comparison with an ideal solution.

$$X = \begin{bmatrix} x_{01} \cdots & x_{0j} \cdots & x_{0n} \\ x_{i1} \cdots & x_{ij} \cdots & x_{in} \\ x_{m1} \cdots & x_{mj \dots} & x_{mn} \end{bmatrix}_{mxn} \quad \mathrm{i} = 1,2,3,\dots,\mathrm{m} \ \mathrm{j} = 1,2,3,\dots,\mathrm{n} \tag{17}$$

where *X* denotes the decision matrix, *m* alternatives, and *n* criteria.

In the decision matrix X, X_{ij} represents the performance value of alternative *i* in criterion *j*, and X_{0j} represents the optimal value of criterion *j*. If the optimal value of criterion *j* is not known in advance, it can be calculated using the following formula, depending on whether the criterion represents a benefit or a cost:

$$X_{ij} = \max X_{ij}$$
$$X_{0j} = \min X_{0j} \tag{18}$$

Step 2 involves normalization of the decision matrix, where the original matrix X is transformed into a normalized matrix to enable comparability across different criteria scales.

$$\bar{X}=\begin{bmatrix} \bar{x}_{01} \cdots & \bar{x}_{0j} \cdots & \bar{x}_{0n} \\ \bar{x}_{i1} \cdots & \bar{x}_{ij} \cdots & \bar{x}_{in} \\ \bar{x}_{m1} \cdots & \bar{x}_{mj\ldots} & \bar{x}_{mn} \end{bmatrix}_{mxn} \quad i=1,2,3,\ldots,m \quad j=1,2,3,\ldots,n \tag{19}$$

Step 3 involves constructing the normalized weighted decision matrix, where the normalized matrix is adjusted by applying the corresponding criteria weights. Using the previously calculated weights w_j, the weighted values of each criterion are derived through the following equation.

$$\hat{X}_{ij} = \bar{X}_{ij}.w_{ij} \qquad 0 < w_j < 1 \tag{20}$$

Step 4: Calculation of Optimality Function

$$S_i = \sum_{j=1}^{n} \hat{X}_{ij} \qquad i=0,1,2,3,\ldots,m \tag{21}$$

The highest value of S_i represents the highest level, and the lowest value represents the lowest level. Finally, the decision alternatives are ranked according to their utility levels. The ranking is performed by calculating the K_i value representing the utility level of the alternative. When determining the utility level of an alternative, the optimality function value of the alternative (S_i) and the highest optimality function value (S_o) are taken into account. The K_i value is calculated using the following equation.

$$K_i = \frac{S_i}{S_0} \qquad i=0,1,2,3,\ldots,m \tag{22}$$

4.3.3. WASPAS Method

The WASPAS method, developed by Zavadskas et al. (2012), combines the Weighted Sum Model (WSM) and the Weighted Product Model (WPM) to achieve a high level of consistency in decision-making. This hybrid approach enhances the accuracy and reliability of the evaluation process.

The key advantages of WASPAS stem from its hybrid structure and adaptability in multi-criteria decision-making. It combines the strengths of both the WSM and the WPM, thereby enhancing decision-making accuracy through balanced aggregation. The method also offers strong flexibility, as it allows for the adjustment of the weighting parameter λλ to reflect the preferences of decision-makers. Additionally, WASPAS ensures robustness, delivering consistent and reliable rankings even in complex evaluation scenarios with multiple interrelated criteria.

Six steps to be followed to implement the WASPAS method are as follows (Zavadskas et al., 2012):

Step 1 begins with constructing the decision matrix, which organizes the performance scores of each alternative across all evaluation criteria, serving as the foundational structure for the WASPAS method.

$$X = \left[X_{ij}\right]_{mxn} = \begin{bmatrix} X_{11} & X_{12} & X_{1n} \\ X_{21} & X_{22} & X_{2n} \\ X_{m1} & X_{m2} & X_{mn} \end{bmatrix}$$

i=1,2,3,…,m j=1,2,3,…,n (23)

x_{ij} (x_{ij}≥0), which indicates the success level of the i^{th} alternative in the j^{th} criterion.

Step 2 involves normalizing the decision matrix, where calculations are performed using specific formulas based on whether each criterion represents a benefit or a cost, ensuring that all values are scaled comparably across alternatives. For benefit-type criteria, normalization is done by dividing each alternative’s value by the maximum value for that criterion, so that higher values indicate better performance**.**

$$n_{ij} = \frac{x_{ij}}{max_i x_{ij}} \qquad =1,2,3,\ldots,m \quad j=1,2,3,\ldots,n \qquad (24)$$

For cost:

$$n_{ij} = \frac{min_i x_{ij}}{x_{ij}} \qquad i=1,2,3,\ldots,m \quad j=1,2,3,\ldots,n \qquad (25)$$

In the WSM, the total relative importance of each alternative is denoted by Q_i (1) as presented in Equation (1). This value is obtained by aggregating the weighted performance scores of the alternative across all evaluation criteria using the following formula.

$$n_{ij} = \frac{min_i x_{ij}}{x_{ij}} \qquad (26)$$

In the formula, wj denotes the weight of the *j*th criterion.

Step 4 involves calculating the second relative importance value using the WPM, in which the relative importance of each alternative is denoted by (2). This value is calculated by multiplying the normalized performance scores of the criteria, each raised to the power of their corresponding weights, as shown in the following formula.

Step 4 involves calculating the second relative importance value using the WPM, where the relative importance of each alternative is represented by the symbol $Q_i^{(2)}$. This value is determined using the following formula, which applies a multiplicative aggregation of the normalized criteria values, each raised to the power of their respective weights.

$$Q_i^{(2)} = \prod_{j=1}^{n} n_{ij}^{w_j} \qquad (27)$$

Step 5 involves calculating the total relative importance of alternatives based on the method results, where the final Qi value is obtained by combining the results from the WSM and the WPM, as expressed by the following formula.

$$Q_i = \lambda Q_i{}^{(1)} + (1-\lambda) Q_i{}^{(2)} \qquad (28)$$

The symbol Q_i represents the total relative importance of the i^{th} alternative, while λ is a parameter in this method, taking a value between 0 and 1. The value of λ can vary according to the decision maker’s preferences. When λ equals 0, the system transitions to the WPM, and when λ equals 1, it transitions to the WSM.

Step 6 involves identifying the ideal alternative, which is determined as the one with the highest Q_i value. This alternative represents the most favorable option based on the combined evaluation results.

5. Application of ARAS and WASPAS Methods

To evaluate the identified criteria, their relative weights must first be determined. The calculated criteria weights used in the sustainability performance ranking are presented in Table 3. The criteria values of the alternatives are shown in Table 4.

Table 3. Criteria Weights 2020 (MEREC-CILOS-CCSD)

	C1	C2	C3	C4	C5	C6	C7
MEREC	0.2606	0.1067	0.1031	0.1213	0.0941	0.1180	0.1962
CILOS	0.0790	0.0695	0.0885	0.2216	0.2097	0.2604	0.0712
CCSD	0.1186	0.2196	0.1997	0.0880	0.1039	0.1043	0.1658

Table 4. Criteria Values of Alternatives (2020)

Alternatives - Criteria	C1	C2	C3	C4	C5	C6	C7
Akbank	8	14	41	292	456	62	43
Garanti Bank	9	24	26	265	680	74	176
Halkbank	2	8	10	125	246	49	28
İşbank	14	10	31	255	716	61	56
VakıfBank	7	12	32	234	723	63	370
Yapı Kredi Bank	16	33	13	314	612	75	184
Ziraat Bank	1	27	12	88	281	25	151

After normalizing the decision matrix according to the ARAS method, the weighted normalized decision matrix was obtained by multiplying it by the criteria weights shown in Table 5. Then, the steps of the method were followed, and the findings in Table 5 below were obtained.

Table 5. Sustainability Performance Ranking for ARAS Method (2020)

Bank/Code	MEREC			CILOS			CCSD		
	S_i	K_i	Rank	S_i	K_i	Rank	S_i	K_i	Rank
Akbank	0.1342	0.5113	5	0.1501	0.6789	5	0.1423	0.5529	5
Garanti Bank	0.1707	0.6503	3	0.1747	0.7905	2	0.1731	0.6725	3
Halkbank	0.0575	0.2192	7	0.0772	0.3490	7	0.0610	0.2369	7
İşbank	0.1580	0.6020	4	0.1606	0.7266	4	0.1429	0.5552	4
VakıfBank	0.1886	0.7184	2	0.1734	0.7846	3	0.1841	0.7156	2
Yapı Kredi Bank	0.2060	0.7847	1	0.1866	0.8442	1	0.1897	0.7373	1
Ziraat Bank	0.0851	0.3242	6	0.0773	0.3498	6	0.1069	0.4156	6

Based upon the ARAS method, Yapı Kredi Bank and Garanti Bank are best-performing private banks during COVID-19, VakıfBank has good public banking sustainability performance, while Ziraat Bank and Halkbank, the remaining public banks, perform poorly. The calculated weight of ranking criteria for post-COVID-19 sustainability performance is given in Table 6. The criteria values of the alternatives are shown in Table 7

Table 6. Criteria Weights 2022 (MEREC-CILOS-CCSD)

	C1	C2	C3	C4	C5	C6	C7
MEREC	0.3363	0.0546	0.0732	0.1680	0.1165	0.1927	0.0587
CILOS	0.0606	0.0822	0.0568	0.1402	0.1105	0.3704	0.1793
CCSD	0.1668	0.1700	0.1438	0.0548	0.1046	0.1501	0.2099

Table 7. Criteria Values of Alternatives (2022)

Alternatives and Criteria	C1	C2	C3	C4	C5	C6	C7
Akbank	27	59	14	321	689	89	285
Garanti Bank	16	45	19	287	764	66	323
Halkbank	1	39	15	204	827	68	159
İşbank	13	101	53	390	1145	84	217
VakıfBank	7	44	24	209	869	68	333
Yapı Kredi Bank	25	81	25	295	894	40	254
Ziraat Bank	4	54	12	72	336	15	177

The results of sustainability performance according to the ARAS method for the post-COVID-19 period are given in Table 8. The ARAS method determined that Akbank, İsbank, and Yapı Kredi Bank had the best performance in the post-COVID-19 period, while public banks had the worst performance.

Table 8. ARAS Sustainability Performance Ranking (2022)

Bank/Code	MEREC			CILOS			CCSD		
	S_i	K_i	Rank	S_i	K_i	Rank	S_i	K_i	Rank
Akbank	0.2059	0.8346	1	0.1790	0.8124	2	0.1728	0.7175	2
Garanti Bank	0.1559	0.6320	4	0.1537	0.6979	3	0.1488	0.6178	4
Halkbank	0.0880	0.3565	6	0.1210	0.5493	6	0.0956	0.3968	6
İşbank	0.1899	0.7699	2	0.1950	0.8850	1	0.2000	0.8307	1
VakıfBank	0.1216	0.4928	5	0.1481	0.6724	4	0.1382	0.5737	5
Yapı Kredi Bank	0.1853	0.7513	3	0.1425	0.6467	5	0.1701	0.7062	3
Ziraat Bank	0.0534	0.2165	7	0.0608	0.2759	7	0.0746	0.3098	7

Similar to the ARAS method, the steps were applied sequentially in the WASPAS method. WASPAS method sustainability performance results calculated for the COVID-19 period using the criteria weights presented in Table 2 are reported in Table 9. According to the WASPAS method, it was found that the banks with the best performance in the COVID-19 period were the same as the ARAS method, while the banks with the worst performance were two public banks.

Table 9. WASPAS Sustainability Performance Ranking (2020)

Bank/Code	MEREC		CILOS		CCSD	
	Q_i	Rank	Q_i	Rank	Q_i	Rank
Akbank	0.5173	5	0.6849	5	0.5504	5
Garanti Bank	0.6787	3	0.8164	2	0.6971	2
Halkbank	0.2280	7	0.3560	6	0.2449	7
İşbank	0.5989	4	0.7344	4	0.5541	4
VakıfBank	0.6900	2	0.7793	3	0.6859	3
Yapı Kredi Bank	0.7895	1	0.8508	1	0.7301	1
Ziraat Bank	0.2828	6	0.3285	7	0.3744	6

Using the criteria weights in Table 5 for the post-COVID-19 period, the results in the Table 10 are obtained for the WASPAS method. The findings of both the WASPAS and ARAS methods are consistently reflecting the excellent sustainability performance of private banks like Yapı Kredi Bank, Garanti Bank, and Akbank. Public banks like Ziraat Bank and Halkbank ranked lower consistently across periods, by contrast. The findings reflect how critical it is to embed sustainability practices within banking processes, especially after COVID-19, when resilience and flexibility are essential.

Tablo 10. WASPAS Sustainability Performance Ranking (2022)

Bank/Code	MEREC		CILOS		CCSD	
	Q_i	Sıra	Q_i	Sıra	Q_i	Sıra
Akbank	0.8176	1	0.8115	2	0.7131	2
Garanti Bank	0.6433	4	0.7079	3	0.6342	4
Halkbank	0.3129	6	0.5321	6	0.3729	6
İşbank	0.7743	2	0.8763	1	0.8171	1
VakıfBank	0.5013	5	0.6802	4	0.5868	5
Yapı Kredi Bank	0.7259	3	0.6326	5	0.6978	3
Ziraat Bank	0.8176	7	0.8115	2	0.7131	7

6. Sensitivity Analysis

Sensitivity analysis is a review tool used to assess how dependent the results of optimization problems are on changes in the criteria weights. Sensitivity analyses are frequently employed techniques to examine how criteria variations affect decision-making model outcomes (Demir et al., 2024). In this study, sensitivity analysis was conducted to observe how rankings change with variations in criteria weights. Criteria weights were calculated using five different methods (MEREC, CILOS, CCSD, Equal Weighting, and Entropy), and these results were used to examine five distinct scenarios.

A two-year study was conducted, covering the years 2020 and 2022. The five scenarios used in the sensitivity analysis were determined using five different weighting methods. The aim is to measure how changes in criteria weights affect the ranking of the method. The Spearman rank correlation coefficient was used to assess the sensitivity of the ranking results across different scenarios.

Table 11. ARAS Method Sustainable Banking Performance Ranking (2020)

	Akbank	Garanti	Halk	Is	Vakıfbank	Yapıkredi	Ziraat
Sc0	5	3	7	4	2	1	6
Sc1	5	2	7	4	3	1	6
Sc2	5	3	7	4	2	1	6
Sc3	5	3	7	4	2	1	6
Sc4	5	3	7	4	2	1	6

Table 11 indicates that the rankings are quite close in different weighting scenarios. The situation in the rankings can be seen visually in the table below. In order to measure whether there are significant changes in the rankings, Spearman rank correlation is calculated, and the results are presented in Table 12. Table 12 shows minimal differences in the sustainability performance rankings that emerged in different weighting scenarios. The lowest correlation in the rankings is 0.9642. In other words, even if the weights are different, there is no significant change in sustainability performance.

Table 12. ARAS Method Correlation Table (2020)

	Sc0	Sc1	Sc2	Sc3	Sc4
Sc0	1.0000	0.9642	1.0000	1.0000	1.0000
Sc1		1.0000	0.9642	1.0000	1.0000
Sc2			1.0000	1.0000	1.0000
Sc3				1.0000	1.0000
Sc4					1.0000

The sustainability performance rankings of banks obtained according to the WASPAS method are given in Table 13 for five scenarios.

Table 13. Performance Ranking of Banks for WASPAS Method in 2020

	Akbank	Garanti	Halk	Isbank	Vakıfbank	Yapıkredi	iraat
Sc0	5	3	7	4	2	1	6
Sc1	5	2	6	4	3	1	7
Sc2	5	2	7	4	3	1	6
Sc3	5	2	7	4	3	1	6
Sc4	5	2	7	4	3	1	6

As seen in Table 13, the rankings are pretty close to each other in different weighting scenarios. Spearman rank correlation test results are presented in Table 14.

Table 14. WASPAS Method Correlation Table for 2020

	Sc0	Sc1	Sc2	Sc3	Sc4
Sc0	1.0000	0.9285	0.9642	0.9642	0.9642
Sc1		1.0000	0.9642	0.9642	0.9642
Sc2			1.0000	1.0000	1.0000
Sc3				1.0000	1.0000
Sc4					1.0000

Table 14 reports that tiny differences were found in the sustainable performance rankings that emerged in different weighting scenarios. The lowest correlation in the rankings is 0.9285. It can be said that the sustainable performance results of banks using the WASPAS method are consistent. A sensitivity analysis for the year 2022 was conducted to assess the robustness of the ARAS method results. The performance ranking of banks under five different weighting scenarios is presented in Table 15.

Table 15. ARAS Method Sustainable Banking Performance Ranking in 2022

	Akbank	Garanti	Halk	Isbank	Vakıfbank	Yapıkredi	Ziraat
Sc0	1	4	6	2	5	3	7
Sc1	2	3	6	1	4	5	7
Sc2	2	4	6	1	5	3	7
Sc3	2	4	6	1	5	3	7
Sc4	2	4	6	1	5	3	7

As seen in Table 15, the rankings are pretty close to each other in different weighting scenarios. Spearman rank correlation results are given in the Table 16. Table 16 indicates that minor differences were found in the performance rankings that emerged in different weighting scenarios. According to these results, it can be suggested that the performance results of the banks using the ARAS method are consistent.

Table 16. ARAS Method Correlation Table (2022)

	Sc0	Sc1	Sc2	Sc3	Sc4
Sc0	1.0000	0.8571	0.9643	0.9643	0.9643
Sc1		1.0000	0.8929	0.8929	0.8929
Sc2			1.0000	1.0000	1.0000
Sc3				1.0000	1.0000
Sc4					1.0000

The performance ranking of banks based on the WASPAS method is shown in Table 17 for five scenarios.

Table 17. WASPAS Method Performance Ranking of Banks (2022)

	Akbank	Garanti	Halk	Isbank	Vakıfbank	Yapıkredi	Ziraat
Sc0	1	4	6	2	5	3	7
Sc1	2	3	6	1	4	5	7
Sc2	2	4	6	1	5	3	7
Sc3	2	4	6	1	5	3	7
Sc4	2	4	6	1	5	3	7

As shown in Table 18, the rankings in different weighting scenarios are similar. The Spearman rank correlation coefficients are displayed in the table below. As seen in Table 18, there are only minor differences in performance results across different weighting scenarios. The lowest correlation observed in the rankings is 0.86, indicating no significant change in sustainability performance despite weight variations.

Table 18. WASPAS Method Correlation Table for (2022)

	Sc0	Sc1	Sc2	Sc3	Sc4
Sc0	1.0000	0.8600	0.9600	0.9600	0.9600
Sc1		1.0000	0.8900	0.8900	0.8900
Sc2			1.0000	1.0000	1.0000
Sc3				1.0000	1.0000
Sc4					1.0000

7. Policy Implications

The implications of this study reinforce the changing role of banks as drivers of sustainable development, especially post-COVID-19 pandemic. Since banking institutions shift from managing crises to strategic recovery, incorporating sustainability into long-term planning is not an ancillary requirement but an intrinsic part of institutional resilience and value generation. This section presents policy implications for five groups of stakeholders, considering particularly Turkey’s post-pandemic economy.

The relative underperformance of public banks when compared to commercial peers indicates an urgent necessity for targeted approaches to ESG. Public banks need to set up their own internal ESG task forces, implement sustainability performance measures based on frameworks like UNEP FI and GRI, and include sustainability into cornerstone lending criteria. Institutional training programs to build up ESG proficiency and rewarding sustainable project lending are further avenues through which a closing of the gap could be achieved. These measures are consistent with best practices from state-backed institutions in China and the European Union (Úbeda et al., 2022; Weber, 2016).

Turkey's banking regulator, the Banking Regulation and Supervision Agency (BRSA)need to step up their ESG oversight by requiring sustainability disclosure under ISSB and EU Taxonomy standards. The imposition of ESG-linked capital requirements and climate stress tests would add systemic resilience. Furthermore, green tax incentives, renewable energy financing subsidies, and government-backed sustainability bonds can spur the transformation of the sector.

Global investors are increasingly interested in ESG-aligned portfolios. Turkish banks thus need to enhance comparability and transparency through alignment with UN Principles for Responsible Banking, Equator Principles, and TCFD guidelines. This transition could be further reinforced by ESG rating agencies by comparing Turkish banks with global peers. A national platform for ESG scoring could further aid investors and accountability through transparency towards public accountability. Non-governmental organizations have an important watchdog and advocacy function. NGOs within Turkey need to increase sustainability tracking, create public scorecards, and engage with banks and their financial education initiatives focusing on environment risk and social inclusion. Multi-stakeholder platforms tend to generate trust, policy discussion, and collaborative ESG innovation.

The 2020–2022 period demonstrated that ESG priorities are not static but shift in response to macroeconomic crises. During this time, banks placed increased emphasis on digital access, support for small and medium-sized enterprises (SMEs), and the protection of individuals. This was particularly evident in Turkey, where mobile banking usage experienced a significant rise and recovery-related lending activity reached record levels. Policymakers must institutionalize these achievements through permanent mechanisms of ESG frameworks and disaster-resistant financial planning.

Consequently, the banking industry of Turkey is at a strategic juncture. Public banks, regulators, investors, and civil society need to take coordinated action to embed sustainability throughout the sector. Embedding ESG measures into financial policy, coordinating with global frameworks, and enhancing transparency and stakeholder engagement can help Turkey become a regional champion of sustainable finance.

8. Conclusion

This research provides a new, multi-method assessment of sustainability performance for Turkey's banking industry through an examination of integrated reports from both the year of COVID-19 (2020) and recovery (2022). Using 75 ESG factors from GRI, UNGC, and UNEP FI guidelines, the research applied a hybrid approach fusing WASPAS and ARAS, two prominent MCDM methods, and three objective weight models (MEREC, CILOS, CCSD). The findings indicate that commercial banks outperformed public banks across all years consistently, noting key differences in institutional capacity and integration of ESG. Whereas private banks changed from prioritizing employee health and liquidity protection during 2020 to strategic green bond and digital inclusion investments by 2022, public banks fell behind due to governance inefficiencies, regulatory lag, and partial disclosure transparency.

The findings of this study align with previous research emphasizing the importance of governance and disclosure in ESG performance evaluations. For example, Karki et al. (2025) identified governance as the most influential ESG pillar in ranking sustainable banks, while Yu et al. (2024) demonstrated the effectiveness of MCDM models in capturing variations in ESG performance. In line with these studies, the present research found that state-owned banks exhibited weaker ESG performance compared to private banks in both the pandemic (2020) and post-pandemic (2022) periods. However, these findings differ from the earlier results of Aras et al. (2018) who reported relatively stronger sustainability alignment among public banks, possibly reflecting changes in institutional priorities and reporting practices over time.

These findings are consistent with the understanding that regulatory frameworks, management stability, and institutional incentives are key drivers of strong sustainability performance. Methodologically, the reliability of ranking results—validated through sensitivity analysis across five scenarios and three aggregation models—demonstrates the robustness of the hybrid MCDM framework adopted in this study. From a policy perspective, public banks should consider realigning executive incentives to prioritize ESG objectives and implementing real-time sustainability dashboards. Regulators, in turn, could mandate Scope 3 emissions disclosure and provide capital adequacy relief for SDG-linked lending instruments to promote responsible banking practices.

As a limitation, the study focuses on a two-year window (2020 and 2022), intentionally selected to capture the immediate effects of the COVID-19 crisis and early recovery. While this design enables a focused comparison, future research could benefit from including a broader timeline—extending to pre-pandemic and more recent years—to better assess ESG strategy evolution over time. Additionally, the study's scope is limited to the banking sector, suggesting opportunities for comparative studies across sectors or regions, particularly within and beyond the BRICS economies. Ultimately, this research contributes to the expanding literature on sustainable finance by showing how an integrated, transparent ESG evaluation framework can guide both financial institutions and policymakers in advancing sustainability strategies in emerging market economies.

Declaration of Research and Publication Ethics
This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

Researcher's Contribution Rate
Statement the authors declare that they have contributed equally to the article.

Declaration of Researcher's Conflict of Interest
There is no potential conflicts of interest in this study.

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