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An Adaptive Resource-Oriented Mechanism for Enhancing Economic Efficiency of Industrial Enterprises: Evidence from the Potash Industry of Uzbekistan

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Abstract. This paper investigates the organisational and economic mechanisms governing industrial efficiency in the mining-chemical sector of Uzbekistan. Drawing on a ten-year longitudinal dataset (2016–2025) from JSC «Dekhkanabad Kaliy Zavodi» (DKZ) — the sole producer of potash fertilisers in Uzbekistan and Central Asia — the study reveals a fundamental structural paradox: revenue expanded 9.6-fold while physical output grew by only 1.6 times, with 93.0% of the revenue increment attributable to world potash price dynamics rather than internal efficiency improvements. To address this vulnerability, an adaptive resource-oriented organisational and economic mechanism with a closed-loop cycle of continuous reserve identification and realisation is proposed. The mechanism integrates three previously fragmented management contours — economic efficiency, resource efficiency, and product quality — into a unified digital platform. A composite performance index $I(t)$ is constructed on the basis of six normalised indicators, yielding a 2025 value of 0.559 against a conjunctural peak of 0.901 in 2022. A verified three-factor econometric profit model ($R^2 = 0.980$) provides the foundation for scenario forecasting through 2028. The guaranteed annual economic effect from mechanism deployment is estimated at UZS 498.2 million, with a payback period of 1.18 years. The aggregate medium-term profit growth reserve is quantified at UZS 66.8 billion per annum, equivalent to 53.2% of 2025 net profit.

Keywords: economic efficiency, organisational and economic mechanism, mining-chemical industry, potash fertilisers, Uzbekistan, resource-oriented approach, composite performance index, digitalisation, profit reserves

1. INTRODUCTION

The global potash fertiliser market is a tightly concentrated industry shaped by high capital intensity, long technology cycles, and pronounced price volatility. According to the United States Geological Survey, world potash production reached approximately 56 million tonnes K_2O in 2024, with Canada, Russia, and Belarus collectively accounting for over 60% of supply. Sanctions imposed in 2022 against Belarusian and Russian exporters triggered an unprecedented price spike — spot prices approaching USD 1,200 per tonne

in April 2022 — followed by a sharp correction to around USD 408 per tonne by April 2023. This cycle exposed the structural fragility of enterprises whose financial performance is tightly coupled to external price conditions rather than grounded in robust internal operational efficiency.

Within this global context, JSC «Dekhkanabad Kaliy Zavodi» (DKZ) occupies a strategically singular position. Established on the basis of the Tyubegatan potash salt deposit in the Kashkadarya region of Uzbekistan, DKZ produced its first output in July 2010 and has since expanded its licensed capacity to 600,000 tonnes per year, with a full-complex design capacity of 2.1 million tonnes per year. The enterprise operates a vertically integrated, closed-loop production chain — from extraction through beneficiation, processing, and marketing — and supplies potassium chloride to more than 30 countries. With a workforce of approximately 2,000 persons, it is also a significant regional employer and a strategically important enterprise for Uzbekistan's agrochemical security.

Two developments in 2025 substantially altered the enterprise's operating environment. First, the privatisation of DKZ — transfer of 100% of shares to Asian Chemical Group in August 2025 — marked a transition to private ownership and created new imperatives for efficiency-driven governance. Second, despite a partial recovery in world potash prices, the plant's capacity utilisation rate remained at 61.3%, leaving more than one-third of productive potential idle and underscoring the urgency of systematic internal efficiency improvements.

The diagnosis of DKZ's performance over 2016–2025 reveals a pattern that is common to commodity-dependent industrial enterprises in transitional economies: financial results track price cycles rather than operational improvements. Revenue grew from UZS 104.6 billion to UZS 1,003.0 billion (9.6-fold), yet physical output increased from 230,100 to 367,700 tonnes (1.6-fold). Index decomposition confirms that 93.0% of the cumulative revenue increment is attributable to the price factor, with only 7.0% stemming from volume growth. This structural dependence on commodity price windfalls — rather than endogenous efficiency gains — constitutes the central problem addressed in this paper.

The objective of this study is to develop, formalise, and empirically validate an adaptive resource-oriented organisational and economic mechanism for enhancing the economic efficiency of DKZ, with a view to shifting the enterprise's performance trajectory from conjuncture-driven to internally sustained growth. The study contributes to three intersecting literatures: the theory of organisational and economic mechanisms in industrial management; quantitative methods for efficiency assessment in mining-chemical enterprises; and the empirics of enterprise modernisation in transitional economies.

2. LITERATURE REVIEW

The concept of productive efficiency was formalised by Farrell (1957), who decomposed overall efficiency into technical and allocative components using a production frontier approach. This framework remains the methodological cornerstone of efficiency measurement in industrial economics and informs the resource-oriented perspective adopted in the present study.

Kaplan and Norton (1996) extended the efficiency concept beyond financial metrics through the balanced scorecard, arguing that sustainable performance requires the simultaneous management of financial, customer, internal process, and learning dimensions. Their insight that financial outcomes are lagging indicators — reflecting past decisions rather than current capabilities — directly motivates the multi-dimensional composite index developed in this paper.

The resource-based view of the firm, articulated by Barney (1991) and Peteraf (1993), posits that durable competitive advantage stems from the efficient deployment of idiosyncratic, inimitable resources. For capital-intensive extractive enterprises, the efficiency with which energy, materials, and fixed assets are utilised constitutes a primary source of competitive differentiation when product prices are exogenously determined.

In the Russian and Central Asian academic tradition, Savitskaya (2021) developed a comprehensive system of factor analysis for enterprise activity assessment, incorporating the chain substitution method and Dupont decomposition. Kleiner (2013) advanced the systemic economics perspective, arguing for the integration of efficiency, resource, and quality management into coherent organisational mechanisms — a position that underpins the architecture proposed in the present study.

Uzbekistan-specific contributions include Vakhobov (2015), who examined financial-economic mechanisms for enhancing enterprise efficiency in the real sector under transitional conditions, and Alimov (2019), who analysed efficiency improvement strategies in the country's mining-chemical sector under globalisation. Both authors identify resource productivity and capacity utilisation as primary levers — findings consistent with the empirical evidence presented here.

The international benchmarking literature on potash producers is largely contained in industry analytical sources (CRU Group, 2024; Argus Media, 2024) and corporate sustainability reports. Nutrien, K+S, ICL, Uralkali, and Belaruskali collectively account for over 75% of global potash output and have

documented operational improvement programmes spanning capacity optimisation, energy management (ISO 50001 certification), predictive maintenance, and product diversification into specialty fertilisers. The comparative gap between DKZ and these benchmarks — capacity utilisation lower by 10–31 percentage points, energy consumption higher by 30–40%, and labour productivity lower by 40–50% — defines the improvement space addressed by the proposed mechanism.

A review of the literature reveals a persistent gap: existing work either diagnoses inefficiency drivers or proposes individual tools (energy management, KPI dashboards, digitalisation) without integrating them into a closed-loop management mechanism calibrated for price-volatile, resource-intensive enterprises in transitional economies. The present paper addresses this gap.

3. METHODS

The empirical foundation of this study comprises managerial and financial accounting data from JSC DKZ for the period 2016–2025, supplemented by data from the State Committee of the Republic of Uzbekistan on Statistics, JSC Uzkimyosanoat, the United States Geological Survey, and open financial reporting of major international potash producers.

A multi-method analytical strategy was adopted. Horizontal, vertical, and ratio analysis provided a baseline characterisation of performance dynamics and structural shifts. Factor analysis using the chain substitution method and the Dupont model decomposed output and profit increments into intensive (efficiency-driven) and extensive (volume-driven) components. The index method was applied to formally decompose cumulative revenue change into price and physical volume constituents, enabling a quantified separation of conjunctural and internal drivers — a methodological contribution not routinely applied in Uzbek industrial research.

The composite performance index $I(t)$ was constructed through linear min–max normalisation of six indicators, with differentiated weights assigned on the basis of their sensitivity to internal management decisions (as distinct from external price effects): sales profitability (0.20), capacity utilisation rate (0.20), asset turnover (0.15), material productivity (0.15), natural labour productivity (0.15), and energy intensity (0.15, treated as a destimulant). An internal resource index $I_m(t)$ was derived from the four least price-sensitive indicators to isolate genuine operational progress from conjunctural distortion.

Economic effect quantification followed an additive model with conservatively calibrated parameters: energy saving coefficient $\alpha_e = 0.6\%$, material saving coefficient $\alpha_m = 0.15\%$, and managerial process optimisation coefficient $k = 0.75$. These parameters are consistent with documented outcomes from ISO 50001 energy management implementations and McKinsey industrial efficiency benchmarks.

Econometric modelling employed ordinary least squares regression on annual data for 2016–2025, with net profit as the dependent variable. Model selection followed a stepwise elimination procedure guided by the variance inflation factor ($VIF < 10$ threshold for multicollinearity), the Durbin–Watson statistic (no autocorrelation), and the Shapiro–Wilk test (normality of residuals). The final three-factor model was validated by all three criteria. Comparative benchmarking against Nutrien, K+S, ICL, Uralkali, and Belaruskali was conducted using publicly available annual reports and CRU Group data.

4. RESULTS

4.1. Performance Dynamics: The Price–Volume Divergence

Table 1 presents the trajectory of key performance indicators over the study period. The most striking feature is the systematic divergence between value-based and physical-volume indicators. Revenue expanded 9.6-fold, from UZS 104.6 billion to UZS 1,003.0 billion, while output grew from 230,100 to 367,700 tonnes — a ratio of 1.6. Average annual revenue growth was 28.6%, against 5.3% for physical output.

Table 1.

Key Economic Efficiency Indicators of JSC DKZ, 2016–2025

Year	Revenue, UZS bn	Production cost, UZS bn	Output, 000 t	Net profit, UZS bn	ROS, %
2016	104.6	96.1	230.1	0.013	0.01
2018	336.1	346.2	304.0	3.5	1.04
2020	449.8	478.6	350.0	1.3	0.29
2022	1,076.0	1,239.5	329.7	345.5	32.11
2023	696.5	751.3	330.1	17.7	2.55
2025	1,003.0	819.4	367.7	125.5	12.51

ROS = return on sales. Source: compiled by the author from DKZ managerial accounts.

Index decomposition of the UZS 898.4 billion cumulative revenue increment (2016–2025) confirms that UZS 835.9 billion (93.0%) is attributable to price appreciation, while only UZS 62.5 billion (7.0%) reflects physical volume growth. The cumulative price index stood at 6.0x against a physical volume index of 1.6x. Even in the relatively favourable year 2025, 98.4% of the revenue increment was price-driven. This quantitative finding has a direct strategic implication: the enterprise's historical financial success does not constitute evidence of organisational and economic efficiency; it constitutes evidence of favourable commodity market positioning.

Profitability indicators mirror the price cycle with near-perfect fidelity. Return on sales moved from 0.01% in 2016 to a peak of 32.11% in 2022, collapsed to 2.55% in 2023, and recovered to 12.51% in 2025 — tracking world potash spot prices with a correlation that leaves little explanatory residual for internal management. Factor decomposition of the 2024–2025 net profit increment (UZS 80.6 billion) confirms that UZS 61.9 billion (76.8%) was driven by improved return on sales (a price-sensitive metric) and only UZS 18.7 billion (23.2%) by revenue growth.

Resource analysis reveals heterogeneous trends. Material intensity declined from 0.156 to 0.133 UZS/UZS — one of the few robust internal improvements over the decade. By contrast, unit energy expenditure rose 5.5-fold, and energy intensity reached a ten-year high of 5.15% in 2025. Capacity utilisation increased from 38.3% to 61.3%, yet more than one-third of productive capacity remains idle. Natural labour productivity grew from 121.2 to 181.8 tonnes per person-year — a 50% gain, but far below the 1,100–1,300 t/person-year benchmark of Nutrien's best-performing assets.

4.2. Benchmarking Against International Best Practice

Table 2 presents a comparative efficiency profile of DKZ against global best practices. The data reveal systemic underperformance across all six dimensions. The widest gap — capacity utilisation — is primarily a consequence of output volume constraints rather than low asset productivity per se, which has important implications for improvement prioritisation: closing the capacity gap does not require capital investment in new assets but rather volume mobilisation within the existing production system.

Table 2.

Comparative Efficiency Profile: JSC DKZ versus International Best Practice

Indicator	DKZ (actual)	Best practice / benchmark	Gap
Capacity utilisation rate	61–85%	92–96% (Nutrien)	–10...31 p.p.
Unit energy consumption, kWh/t	~210–230	165–175 (Uralkali)	+30–40%
Fixed asset depreciation rate	>40%	<20% (K+S Bethune)	+20 p.p.
Share of high-value-added products	<5%	21% (ICL)	–16 p.p.
Labour productivity, t/person-year	~180–700	1,100–1,300 (Nutrien)	–40–86%
Return on sales	~12–16%	22–28%	–8...14 p.p.

Source: compiled by the author from public annual reports, CRU Group (2024), and DKZ managerial accounts.

4.3. Deficiencies of the Incumbent Mechanism

Diagnostic assessment of the incumbent organisational and economic management mechanism — which integrates target, organisational, economic, motivational, information-analytical, and control blocks — identified six systemic deficiencies. First, management is predominantly reactive: control occurs ex post, without anticipatory feedback loops. Second, the motivation system is weakly linked to resource efficiency metrics, providing limited incentives for energy and material saving. Third, digitalisation of accounting and analytical processes is insufficient for real-time cost management. Fourth, the management contours for efficiency, resources, and quality are fragmented, generating information gaps and functional duplication. Fifth, the financial outcome's tight coupling to price conditions masks the true state of operational efficiency, enabling complacency during boom phases. Sixth, there is no formalised system for identifying, quantifying, and ranking internal performance reserves.

5. DISCUSSION

5.1. The Adaptive Resource-Oriented Mechanism: Architecture and Logic

The proposed adaptive resource-oriented organisational and economic mechanism responds directly to the six systemic deficiencies identified above. Its defining architectural feature is the integration of three previously fragmented management contours — economic efficiency, resource efficiency, and product quality — into a unified digitally enabled platform governed by a closed-loop management cycle: real-time digital diagnostics of resource consumption → formalised identification and prioritisation of reserves →

management decision-making under scenario planning → KPI-based motivation for resource conservation → anticipatory control with continuous feedback → renewed diagnostic cycle.

The mechanism is structured around eight interlinked subsystems: (1) goal-setting and strategy alignment; (2) input parameter monitoring; (3) diagnostic and benchmarking; (4) analytical processing; (5) decision-making under uncertainty; (6) motivation and incentive alignment; (7) anticipatory control; and (8) results assessment and loop closure. The mechanism's adaptivity is secured through embedded scenario planning and commodity price hedging instruments, reducing the sensitivity of financial outcomes to world potash market volatility — the primary vulnerability identified in the historical analysis.

The guaranteed annual economic effect from deploying the mechanism was quantified using a conservative additive model across three saving contours, calibrated to 2025 cost data (Table 3). At estimated one-off digitalisation costs of UZS 500 million, the payback period is 1.18 years and the three-year net present value at a 20% discount rate is UZS 392.1 million. Under full deployment of the mechanism, the effect range extends to UZS 1,807.4 million per year.

Table 3.

Guaranteed Annual Economic Effect from Mechanism Deployment (2025 base)

Saving contour	Cost base, UZS mn/yr	Parameter	Saving, UZS mn/yr
Energy saving (ΔE_1)	42,200	$\alpha_e = 0.6\%$	253.2
Material saving (ΔE_2)	109,340	$\alpha_m = 0.15\%$	164.0
Managerial process optimisation (ΔE_3)	108.1 units	$k = 0.75$	81.0
Total guaranteed annual effect	—	—	498.2

Source: author's calculations based on DKZ 2025 cost accounts.

5.2. Composite Performance Index and Upgraded Assessment Methodology

The composite performance index $I(t)$ provides a single quantitative summary of the mechanism's state and tracks genuine internal progress independently of price cycles. Calculated across 2016–2025, $I(t)$ rose from 0.031 to 0.559, with a conjunctural peak of 0.901 in 2022 that was not sustained following the price correction (0.403 in 2023). The 2025 value of 0.559 implies an untapped improvement potential of 0.441 index points relative to the historically best-achieved state. The constituent analysis reveals energy intensity as the dominant drag component, registering a normalised value of zero in 2025 — a clear signal of improvement priority.

The internal resource index $I_m(t)$, computed from the four least price-sensitive indicators, displays a more stable trajectory: following the 2023 trough (0.482), it recovered to 0.578 in 2024 and 0.631 in 2025, confirming that genuine operational progress — record capacity utilisation at 61.3% and record natural labour productivity at 181.8 t/person-year — was indeed occurring beneath the conjunctural noise. The difference $I(t) - I_m(t)$ serves as a real-time indicator of the sign and magnitude of the price effect on aggregate measured performance.

The upgraded assessment methodology addresses five limitations of conventional approaches: dominance of price-sensitive monetary metrics, absence of a formal price–volume decomposition, fragmentation of evaluation, the gap between assessment and reserve quantification, and retrospective orientation. It is implemented as a six-stage repeating cycle, with the formal index decomposition providing the methodological bridge between historical diagnosis and forward-looking reserve identification.

5.3. Performance Reserves: Quantification and Prioritisation

The closing stages of the assessment methodology translate diagnosis into a quantified, non-overlapping reserve system. Each reserve class carries a calculation formula, a target parameter, and a realisation timeline, ensuring that the aggregate reserve estimate is free of double-counting. As shown in Table 4, the total medium-term profit growth reserve is UZS 66.8 billion per year — equivalent to 53.2% of 2025 net profit and approximately 5.7 percentage points of return on sales.

Table 4.

Quantified Performance Reserve Structure of JSC DKZ (2025 base)

Reserve class	Target parameter	UZS bn/yr	Share, %
Financial cost structure optimisation	Target share $d = 12\%$ (vs. 15.7%)	31.3	46.9

Capacity utilisation uplift	Target CUR = 75% (vs. 61.3%)	28.0	41.9
Energy saving	$\beta_e = 10\%$	4.2	6.3
Material intensity reduction	Target ME = 0.129 (vs. 0.133)	3.3	4.9
Total medium-term reserve	—	66.8	100.0

Source: author's calculations.

The concentration of 88.8% of the aggregate reserve in two categories — cost structure optimisation and capacity utilisation uplift — is consistent with the enterprise's cost architecture. A large share of total costs is fixed or quasi-fixed; consequently, each additional percentage point of capacity utilisation delivers a disproportionately large marginal contribution. This finding is independently confirmed by the econometric model: a UZS 1 million reduction in material costs delivers a UZS 2.648 million net profit increment, against UZS 0.647 million from a UZS 1 million revenue increase — a ratio that underscores the primacy of cost-side levers over volume growth as a profit improvement strategy.

5.4. Econometric Validation and Scenario Forecasting

The three-factor econometric model of net profit formation — incorporating production volume (X_1), material costs (X_5), and depreciation (X_4) — was selected from an initial four-factor specification through stepwise elimination of a labour cost variable that exhibited VIF = 89.6, indicating severe multicollinearity. The retained model, $\hat{Y} = 28,912.4 + 0.6471 \cdot X_1 - 2.6484 \cdot X_5 - 1.8045 \cdot X_4$, passed all diagnostic checks: $R^2 = 0.980$ (adjusted $R^2 = 0.970$), F-statistic = 97.83 (significant at 0.1%), all coefficients significant at 1%, VIF < 10, Durbin-Watson within acceptable bounds, and Shapiro-Wilk confirming residual normality.

Three scenarios were constructed for 2026–2028. The baseline inertial scenario assumes no policy intervention, projecting net profit to decline to UZS 117.6 billion in 2026 before recovering to UZS 150.4 billion by 2028. The base improvement scenario — implementing the proposed mechanism at baseline intensity — projects growth to UZS 211.2 billion by 2028. The optimistic scenario, under more aggressive capacity loading and full digital mechanism deployment, reaches UZS 277.7 billion. Cumulative three-year effects relative to the inertial trajectory amount to UZS 112.8 billion (base) and UZS 232.8 billion (optimistic). Critically, the average annual base scenario effect (UZS 37.6 billion) corresponds to approximately 56% of the independently estimated reserve potential (UZS 66.8 billion), providing cross-validation between two methodologically distinct approaches — factor reserve decomposition and econometric forecasting.

6. CONCLUSION

This study set out to develop and validate an adaptive resource-oriented organisational and economic mechanism for enhancing the efficiency of a price-volatile, resource-intensive industrial enterprise in a transitional economy. Three principal conclusions emerge.

First, the sustained growth in DKZ's financial indicators over 2016–2025 was conjunctural in origin rather than the product of organisational efficiency gains: index decomposition attributed 93.0% of the cumulative revenue increment to commodity price appreciation. This finding has general applicability to commodity-dependent enterprises in transitional economies, where price windfalls can mask and defer necessary internal improvements. The privatisation of 2025 and the associated shift in governance imperatives make this finding particularly timely for DKZ.

Second, the proposed adaptive resource-oriented mechanism — with its closed-loop diagnostic cycle, integrated triple contour architecture, and digitally enabled real-time feedback — directly addresses the six systemic deficiencies of the incumbent management system. The mechanism's guaranteed annual economic effect of UZS 498.2 million is conservatively parameterised and generates a payback period below 1.2 years, establishing a strong implementation case. The composite performance index $I(t)$ and its conjuncture-purged companion $I_m(t)$ provide management with a transparent, continuous measure of genuine operational progress.

Third, the aggregate medium-term profit growth reserve of UZS 66.8 billion per annum — validated by independent cross-referencing with econometric scenario projections — is concentrated overwhelmingly in two levers: financial cost structure optimisation and capacity utilisation uplift. The econometric model's coefficient estimates confirm that cost-side improvements deliver a 4:1 multiplier advantage over equivalent revenue-side gains, establishing a clear priority ordering for management action.

The proposed mechanism is not enterprise-specific in its architecture. Its modular structure — adaptable to different weighting schemes for $I(t)$, different cost bases for effect quantification, and different capacity configurations — makes it transferable to other resource-intensive industrial enterprises with high

shares of material and energy costs in their cost of production. Future research should focus on the digital integration architecture connecting real-time production accounting to KPI dashboards, and on the adaptation of the framework to post-privatisation governance structures.

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REFERENCES

1. Farrell, M.J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society, Series A*, 120, 253–290.
2. Kaplan, R.S., & Norton, D.P. (1996). *The balanced scorecard: Translating strategy into action*. Harvard Business School Press.
3. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
4. Peteraf, M.A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, 14(3), 179–191.
5. Kleiner, G.B. (2013). Systemic economics as a platform for modern economic theory. *Voprosy Ekonomiki*, 6, 4–28.
6. Savitskaya, G.V. (2021). Analysis of enterprise economic activity (textbook). INFRA-M.
7. Vakhobov, A.V. (2015). Financial-economic mechanisms for enhancing enterprise efficiency in the real sector of the Uzbekistan economy. Moliya.
8. Alimov, R.A. (2019). Enhancing enterprise efficiency in the mining and chemical industry of Uzbekistan under globalisation. Fan.
9. Porter, M.E. (1985). *Competitive advantage: Creating and sustaining superior performance*. Free Press.
10. Acemoglu, D., & Robinson, J.A. (2012). *Why nations fail*. Crown Publishers.
11. CRU Group. (2024). *Global potash market outlook 2024*. CRU.
12. Argus Media. (2024). *Argus fertilizer: Annual review 2024*. Argus Media.
13. U.S. Geological Survey. (2025). *Mineral commodity summaries 2025: Potash*. USGS.
14. State Committee of the Republic of Uzbekistan on Statistics. (2023). *Statistical yearbook of Uzbekistan 2023*. Goskomstat.
15. JSC «Dekhkanabad Kaliy Zavodi» privatised. (2025, August 8). *Gazeta.uz*.