International Journal of Innovative Research and Scientific Studies, 8(9) 2025, pages: 51-71

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Optimizing borderland port governance and trade efficiency in central Asian regional economic cooperation: A multidisciplinary approach to prioritizing service level agreement components

Omar Khalid Bhatti[1*], Muhammad Irfan[2], Ali Raza Hanjra[3]

[1,2]*Project Management Unit, Integrated Transit Trade-Management System (ITTMS): Central Asian Regional Economic Corporation, Reginal Improving Border Services (CAREC-RIBS), Pakistan.*
[3]*Directorate General of Intelligence & Investigation, Pakistan Customs- Pakistan / Project Director CAREC-RIBS, (Integrated Transit Trade Management System) FBR- Pakistan.*

Corresponding author: Omar Khalid Bhatti (*Email: omar.k.bhatti@gmail.com*)

Abstract

Borderland Ports (BLPs) serve as the most critical nodes in global and regional trade connectivity, particularly within the Central Asian Regional Economic Cooperation (CAREC) corridor. With its growing significance, BLPs across all the 11 member countries of CAREC, consistently face governance and operational inadequacies due to high bureaucratic fragmentation, lack of inter-agency coordination and inconsistent delivery of services. Service Level Agreements (SLAs) have become an important tool for ensuring superior governance for standardizing process, procedures, accountability and operational performance at the BLPs. However, their real implementation often lacks empirical rigor, as it fails to prioritize the SLAs components based on their operational impact. The present study aims to identify the key components of Service Level Agreements at borderland ports to enhance trade, governance, port efficiency and security. Employing a four-phase hybrid methodology comprising Delphi technique, Exploratory Factor Analysis (EFA), Confirmatory Factor Analyses (CFA), and Artificial Neural Networks (ANN). The current study analyzed the responses from 704 diverse participants from 11 CAREC member states. The respondents included customs officials, logistics professionals, port authority staff, and trade experts. The findings validated the 10 key SLA components for instance confidentiality, dispute resolution, service levels and monitoring mechanism significantly affecting borderland port efficiency, inter agency coordination and infrastructure sustainability. The Study also presents a validated SLA measurement scale and a predicative model for guiding SLA formulation under complex governance conditions. By aligning SLA prioritization with the CAREC 2030 strategy for seamless trade and regional integration, the present research offers both theoretical and practical contribution for all the 11 member states. It also presents decision makers, policy experts and port authority management with empirically grounded tool for evidence-based decision making while cautioning against context-free, politically influenced SLA adoption.

Keywords: Artificial Neural Networks (ANN), Borderland Port (BLP), CAREC Region, Factor Analyses (EFA/CFA), Service Level Agreements (SLAs), Trade Facilitation.

DOI: 10.53894/ijirss.v8i9.10614
Funding: This study received no specific financial support.
History: Received: 6 August 2025 / **Revised:** 22 September 2025 / **Accepted:** 26 September 2025 / **Published:** 10 October 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

Border land ports (BLPs) have conventionally functioned as hubs of cross-border trade and commerce, enabling efficient transportation of goods, services, and movement of people while adhering to national and international regulatory standards/frameworks [1, 2]. These ports serve as essential nodes in regional and global supply chains, and are vital in trade facilitation, economic integration, and logistical efficiency [3, 4]. Nonetheless, despite their indispensable economic and social functions, BLPs have been persistently facing operational constraints that impede their efficiency [5]. With the increase in global trade and the growing prominence of regional connectivity, the governance and operational efficiency of BLPs have emerged as major concerns for traders, regulators, academicians, and practitioners [1, 6]. Notably, the absence of an all-encompassing and structured BLP governance framework has resulted in an ongoing inefficiency rooted in weak infrastructure, bureaucratic hindrances, poor inter-agency cooperation, and security issues [1]. Together, the BLP-related issues, the operational inefficiencies have increased business costs, operational hurdles, extended dwell-time at BLPs, corruption and exploitation, and interruptions in trade flows [7, 8]. An all-inclusive operational framework focusing on logical, methodical, and data-driven decision making is essentially needed to enhance efficiency and effectiveness at BLPs [2, 5].

In order to overcome these borderland port inefficiencies, Service level agreements (SLAs) have been generally embraced as contractual instruments that define performance standards, stakeholder obligations, and accountability protocols among main stakeholders like; Port Authorities, Customs, terminal operators, and logistics companies [5, 9, 10]. Indeed, SLAs serve as a structured governance tool for streamlining procedures of cargo clearance, improving stakeholders' coordination for trade and commerce, and increasing service quality in operations and logistics [11, 12]. Notwithstanding their intended advantages, SLAs face a number of challenges when it comes to their implementation, because they lack empirical bases for determining and prioritizing key components. Similarly, implementation of SLAs is missing a formal methodology to evaluate their impact on individual port efficiency and effectiveness [5, 9, 12]. SLA formulation in general is based on past practices, political reflections, or ad hoc consultations, rather than strategic prioritization and empirical data-driven decision-making [5, 9, 13]. Unfortunately, the absence of methodical and data-driven approach leads to misaligned resource allocations, distorted objectives, and poor operational governance ultimately lowering the overall efficiency of BLPs [9, 11-13].

Despite availability of few studies examining the application, performance, assessment, compliance, and contractual enforcement of SLAs, the existing literature lacks studies identifying and empirically prioritizing the key components of an SLA [4]. The lack of a structured SLA framework poses a challenge for practitioners, policy makers, and trade experts to strategically utilize capital-intensive resources and take informed decisions at BLPs [11, 12]. In the extant literature, mostly studies have used either focus group discussion or in-depth interviews to ascertain the main components of an SLA, however these techniques are prone to biases, inconsistencies and lack validity [8]. Importantly, no valid and consistent framework at present is available that can systemically rank the components based on their direct impact on BLP efficiency, security or trade facilitation [9, 11-13]. It is highlighted that the Central Asian Regional Economic Cooperation (CAREC) Program 2030 strategy intends to improve and transform the BLP operations into efficient and effective conduits of trade in which the role and significance of SLAs have become increasingly critical.

The present study aims to identify the key components of Service Level Agreements at borderland ports to enhance trade, governance, port efficiency and security. As limitations persist in the existing conventional method, this study employs a hybrid methodology which integrates Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Artificial Neural Network (ANN) to methodically analyze and rank the components of the Service level Agreements. The EFA is applied to identify the underlaying dimensions of the SLA components, confirming its structural validity. CFA is used to test and validate the proposed factor structure, establishing construct reliability and model fit. In addition, ANN will establish their predictive significance that could aid in improving operations, governance and interagency coordination. This empirical approach will enable Port Authorities, terminal operators and senior leadership across the CAREC landscape to make more informed decisions, allocate resources efficiently, implement SLAs in a manner that improves border governance and trade.

2. Literature Review

BLPs have gained immense significance as critical nodes in trade networks and the regional and global supply chains. These ports help facilitate seamless and effective cross-border movement of passengers, goods, and services [1, 5]. By bringing the roads, railways, and maritime transportation means together, these ports substantially improve the regional economic integration, especially for countries that are landlocked and heavily rely on transit corridors like in Central Asia and Sub-Saharan Africa [14]. With increasing implications of BLPs for emerging economic corridors, a number of gaps continue to plague trade competitiveness of BLPs like weak governance, corruption, depleted infrastructure and bureaucratic hurdles [8, 15]. In view to these existing challenges, Service level agreements (SLAs) have been recognized as institutional mechanisms that ensure accountability, standardization of operations, and effective governance as per international best practices [16].

2.1. Roles and Functions of Border Land Ports (BLPs)

BLPs perform four key interrelated functions: streamlining cross border process, regulatory compliance, intermodal connectivity, and security and risk management (See Figure 1 and Table 1 for clarity). These key functions are extremely critical for enhancing port efficiency and trade facilitation. González and Trujillo [10] affirm that by streamlining cross border trade procedures using digital clearance systems and systematically harmonizing inspections a significant reduction in clearance and swell time can be achieved. Likewise, McLinden, et al. [16] stress that regulatory compliance signifies conformity with the established international standards like Trade Facilitation Agreement (TFA) of the World Trade Organizations (WTO) via instruments like AEO (Authorized Economic Operator) Programs. In addition, intermodal connectivity amalgamates transportation modalities to improve cargo efficiency which have considerably reduced costs of logistics for land locked countries [8]. Finally, enhanced security and risk management through advanced technologies and joint task forces have cut illicit cargo traffic incidents [17]. Collectively, these functions influence operational efficiency of BLPs by reducing dwell times, minimizing disputes, and enhancing supply chain predictability.

Figure 1.
Border Land Ports Key Interrelated Functions.

Table 1.
Core Functions and Operational Impacts of BLPs.

Function	Key Mechanisms	Impact	Case Example
Trade Facilitation	Digital clearance, pre-arrival processing	Faster clearance times	Single Window Systems
Regulatory Compliance	AEO programs, risk-based inspections	Fewer SPS disputes	EU's AEO Program
Intermodal Connectivity	Dry ports, synchronized schedules	Lower logistics costs	China-Europe Railway Network
Security & Risk Management	Biometrics, joint task forces	Reduction in illicit cargo incidents	U.S.-Mexico Pre-Inspection Program

BLPs, regardless of their growing strategic role and significance, are encountering a number of systematic challenges. The recent World Bank [18] avows that poor infrastructure, inadequate import and export yards, non-availability of bonded warehouses and cold storage areas, less throughput capacity, manual process coupled with unaccounted informal payments

are some of the major challenges of the BLPs [1, 9]. Indeed, feeble and disjointed governance mechanisms further complicate operations as they generate lack of interagency coordination amongst the borders agencies like; Customs, Border Security, animal and plant quarantine and so forth, resulting in delays, extra bureaucratic hurdles and higher cost of doing business Tambulasi [19]. Liu and Garg [20] argue that decentralized operations of border agencies at a number of BLPs result in overlapping inspections and extra paperwork which in turn increases the overall cargo dwell time. These impediments at the BLPs underscore the need for major institutional remedies like Service level Agreements (SLAs) that are efficient and effective to align the requirements of all stakeholders as well as the best international practices to improve cross border trade and passenger movement [5, 21].

2.2. Service Level Agreements

Service Level Agreements (SLAs) are formal legal contracts that define and outline the procedures for enforcement, service expectations, and performance measurement standards amongst the key management stakeholders at BLPs. These agreements outline the operational standards and criteria for port authority, terminal operators, Customs, security agencies, freight, and logistics services in a manner that the key objective of trade facilitation is attained through efficiency, transparency and accountability [22]. By defining the performance standards and criterions, SLAs play a critical role in improving inadequacies stemming from bureaucratic fragmentation and redundant regulatory compliance [21]. A key characteristic of SLAs is their ability to enforce checks and balances through the implementation of a comprehensive assessment and monitoring framework. In general, these agreements include provisions for key performance audits, automated data evaluation and monitoring, and charges or fines for noncompliance; hence, it not only works as a source of motivation but also as a basis of incentive for all stakeholders to adhere to the specified and agreed service levels [9].

The literature advocates that SLAs in general encompass essential elements that are; scope of services designating the operational responsibilities, transfer of assets specifying the handover of resources, rights and responsibilities elucidating stakeholder responsibilities and tasks, service levels and quality standards establishing measurable key performance standards, monitoring and reporting explaining compliance tracking, charges and payments confirming the overall percentage of payment, insurance and indemnity for the assets to be managed by the user, termination and renewal highlighting contractual suppleness, dispute resolution and lastly confidentiality and compliance [1, 9, 10, 20, 22, 23]. Avow that over the years, the digitalization of SLAs compliance mechanisms has gained momentum. It has been observed that a large number of port authorities and border management agencies have implemented real time trace-and-track systems and automated reporting structures to augment operational efficiency and trade certainty [1, 20]. Despite all the advantages of SLAs in enhancing inter-agency coordination, port efficiency, dwell time, and service trustworthiness, their efficacy mostly depends on the collaboration of stakeholders, continuous enforcement, and adaptability to changing trade requirements [1, 5].

2.3. Service Level Agreements and their Outcomes

Service level Agreements (SLAs) ought to be well structured as they contribute significantly to reducing delays in cargo and passenger clearance at borders, improving port operations, resource efficiency, and rationalizing trade procedures [9, 20]. Research advocates that the impact of SLAs is different in various governance settings as the impact is contingent upon factors like; technological integration, institutional frameworks and enforcement regulations. Liu and Garg [20] argue that the implementation of SLA by local governments has resulted in significant improvement in service delivery, quicker response time, and lower service backlogs. Notably, SLAs have also shown promising outcomes in public private partnership (PPP) for border management where port efficiency, dwell time, Customs clearance and cargo throughput capacity depends upon organized collaboration amongst border agencies and terminal operators Penning [9].

Tambulasi [19] emphasized that governments in the healthcare sector frequently apply and utilize SLAs with private companies. These SLAs set performance targets and financial rewards for meeting service goals and play a critical role in improving the overall service quality. Nonetheless, these agreements encounter challenges related to accountability, particularly in instances where service providers function under minimal oversight and regulatory control mechanisms [9]. In the domain of IT outsourcing for Customs operations, the implementation of SLA-driven automation has led to improved data-sharing capabilities. Yet, there are serious concerns with regards to the long-term financial viability and sustainability of the wide-ranging IT investments, as well as the readiness of the port authorities and government agencies to fully adopt digital solutions [21].

Despite variations across sectors, research shows that SLAs can achieve optimal effectiveness when supported by sound monitoring and compliance frameworks [16]. In case of BLPs, the true success of SLAs depends on the commitment of all stakeholders towards accountability, the accessibility of Information and Communication Technologies for real time progress tracking, and adaptability of the agreements to local and regional trade requirements [8].

2.4. The Influence of Institutional and Political Factors on Service Level Agreements (SLAs)

As discussed earlier, past studies support the successful implementation of SLAs in managing BLPs subject to the conditions like; Organizational framework, political willingness and priorities, and the power structure among the agencies operating at BLPs [1, 5, 9]. Interestingly, the resistance to the implementation of SLAs in general is associated with the fear and anxiety of accountability and transparency among the land port agencies, as they have enjoyed limited oversight in the past. In many cases it has been observed that the terminal operators, border security agencies, Customs and logistics firms have opposed the implementation of SLAs, dreading that key performance measures and online trace and track systems would expose their operational inefficiencies and corruption [5, 8].

Political factors do influence the implementation of the SLAs. According to research, certain governments give more importance to the investments in infrastructure development rather than the reforms aimed at trade and passenger facilitations based on SLAs [19]. This prioritization is generally due to the fact that physical infrastructure development is more politically visible to the general public, offering immediate political mileage to the governments along with the economic benefits for the country [5]. Moreover, the overlying jurisdiction and inconsistent interagency directives create additional challenges for the adoption of SLAs. The lack of harmonized processes and procedures among BLP agencies results in fragmented implementation of SLAs [19]. These intricacies related to SLAs highlight the need for improved coordination among BLP agencies, greater and clearer coherence in policy framework, and the establishment of an independent regulatory authority to oversee the correct implementation and compliance of the SLAs [1, 5, 16].

2.5. Role of Technological advancements and Online Platform in SLAs

The adoption of blockchains and digital risk and tracking systems has substantially altered the implementation of service level agreements at BLPs [24-26]. Single Window Application have also showcased their effectiveness in ensuring smooth transfer of information and data among the key stakeholders like; Customs, trade regulators, and logistics operators, improving transparency and minimizing cargo clearance time O'Neil [27]. Goo, et al. [21] supports that the integration of IoT (Internet of Things) sensors and real time trace and tracking systems has enhanced the compliance for SLAs, allowing port authorities to monitor real time cargo movements more accurately detect bottlenecks in advance.

Artificial Intelligence (AI)-based risk evaluation models have transformed the process of border inspection by automating the identification of high-risk consignments. These advance AI models support Customs authorities to conduct and prioritize Customs inspections with greater efficiency [28]. Interestingly, the models employ machine learning algorithms to examine past and current data and detect trends that could signify potential risks [25, 29]. In context to the same, blockchain technology has aided the development of automatic smart contracts that independently impose penalties for noncompliance and activate incentives to performance for attaining the required service benchmarks as set in the SLAs [24]. It is argued that with all these major developments and advancements a number of BLPs still rely on execution of key protocols manually, hence, limiting the border agencies to wholly to advantage of the digitalization options available. Hamdi, et al. [26] affirm that the shift to digital systems encounters barriers such as higher infrastructure cost, the necessity for technological proficiency, and the demand for common frameworks across various jurisdiction.

2.6. The Environmental and Sustainability Consideration in SLAs

Over the last few years, Sustainability measures have been incorporated in SLAs showcasing a greater dedication to environmental goals. Bhatti [5] argues that these agreements have lately included objectives aiming at reducing energy consumption of reefer containers, lowering carbon emissions from BLP operations and minimizing truck idle time. European border crossings, for example, have implemented SLA clauses that mandate the use of eco-friendly transport corridors and energy-efficient Customs inspection facilities, thereby lowering the environmental footprint of trade activities [16]. SLAs are also being used to promote sustainable supply chain practices, such as integrating low-emission vehicles into port logistics fleets and implementing smart traffic management systems to reduce congestion-related fuel wastage [14]. Nevertheless, these SLAs with environmental sustainability embedded in their structures are frequently compromised due to their inadequate enforcement process and a lack of regulatory framework [5]. Port Authorities along with environmental establishments must harmonize their strategies and policies for stronger enforcement and may also provide incentives for key BLP stakeholders to invest in sustainable border management solutions.

Indeed, BLP management relies on SLAs in order to improve efficiency, accountability and services. The effectiveness of service level agreements greatly depends on institutional dynamics, updated technology adaptation and enforcement mechanism. Innovative SLAs and digital technologies surely offer promising solutions, but then again fragmented inter agency collaboration/ co-ordination, political resistance and weak regulatory and monitoring hinders their true implementation and outcomes [8, 18]. To maximize the influence of SLAs on global border trade governance, it is critical to improve enforcement process, strengthen policy uniformity and extend the digital infrastructure compliance.

2.7. A CAREC Perspective on SLAs in BLP Governance

The Central Asian Regional Economic Cooperation (CAREC) program comprises eleven member countries and has realized the significance of the governance of the BLPs as a key factor for improving economic suitability and regional trade integration. The CAREC 2030 strategy has expanded its focus from infrastructure development towards the establishing of institutional mechanism that can improve and enhance accountability, transparency and coordination at the border crossing points amongst all the member states. In the revised and updated framework, service level agreements (SLAs) have gained immense significance as structured apparatus for formalizing the quality and expectation of the services being offered and also enhancing operational coherence among the border agencies like; immigration, Customs, plant and animal quarantine and logistics providers.

Though SLAs have been quite predominantly utilized in private sector, their application in public sector infrastructure especially at BLPs is underexplored not only theocratically but also empirically. Hanjra, et al. [1] argues that in view of contract theory and institutional economics, SLAs can alleviate principal agent problems and can also improve accountability among organizations [30]. In the CAREC settings institutional capacity and enforcement diverge widely. The practical evidence from CAREC Regional Improvement of Border Services (CAREC- RIBS) initiative clarifies that SLAs can help in reducing dwell time, increase reporting transparency and improve stakeholder satisfaction if aligned with international best practices and benchmarks [31].

Building on the work of North [32] institution theory, contemporary research avows that the effectiveness of formal instruments like SLAs relies not just on their written provisions but also in the incentive framework, foundational norms and the level of administrative maturity. Technology innovations like blockchains, artificial intelligence (AI) based real time dashboards display great potential for SLA performance management [1]. Nevertheless, CAREC member states still lack digital infrastructure and are hindered by fragmented data structures and systems. Hence, where literature affirms the significance and the potential of SLAs in improving BLP governance, their actual effectiveness depends on the right contextual adjustments, enforceability, institutional compatibility and preparedness among the eleven CAREC member countries.

To sum up, the existing literature advocates that the effectiveness of SLAs at BLP governance heavily relies on the strategic articulation of their key components. The key elements of the SLAs include the "*scope of services, transfer of assets, and the division of responsibilities and rights*" among the stakeholders [9, 21]. Similarly, "*operational effectiveness*" is influenced by service levels and quality standards, underpinned by a strong reporting and monitoring framework [28, 33]. Further, "*payment and charges", "insurance and indemnity", and "termination and renewal provision*" presents a solid framework for ensuring financial and legal clarity [22]. Furthermore, the framework for "*dispute resolution" along with "confidentiality and compliance*" clauses upholds "*regulatory integrity and enhances coordination*" amongst the BLP agencies [13]. The key components outlined collectively established the foundation for the empirical prioritization model of this present study, which aims to improve the performance and implementation of SLAs at BLPs.

3. Research Method

3.1. Phase I: Delphi Method for Identifying SLA Components

This study was organized into three sequential phases. The Delphi method was applied in the first phase to ensure that expert consensus is achieved on the principal components of SLAs aimed at improving BLP governance in the CAREC states. A panel consisting of experts from public administration, Customs, trade facilitation, logistics, security, and infrastructure development participated in the three iterative rounds of extensive feedback. Each round extracted and refined the list of SLA components based on consensus threshold of agreement of 80% participant experts resulting in identification and validation of 10 key components of SLAs at the culmination stage. The finally recognized and extracted components were as follows: Scope of Services; Transfer of Assets; Rights and Responsibilities; Service Levels and Quality Standards; Monitoring and Reporting; Charges and Payments; Insurance and Indemnity; Termination and Renewal; Dispute Resolution; and Confidentiality and Compliance. Figure 2 presents the ten components of SLAs reached through Delphi technique of expert feedback/consensus.

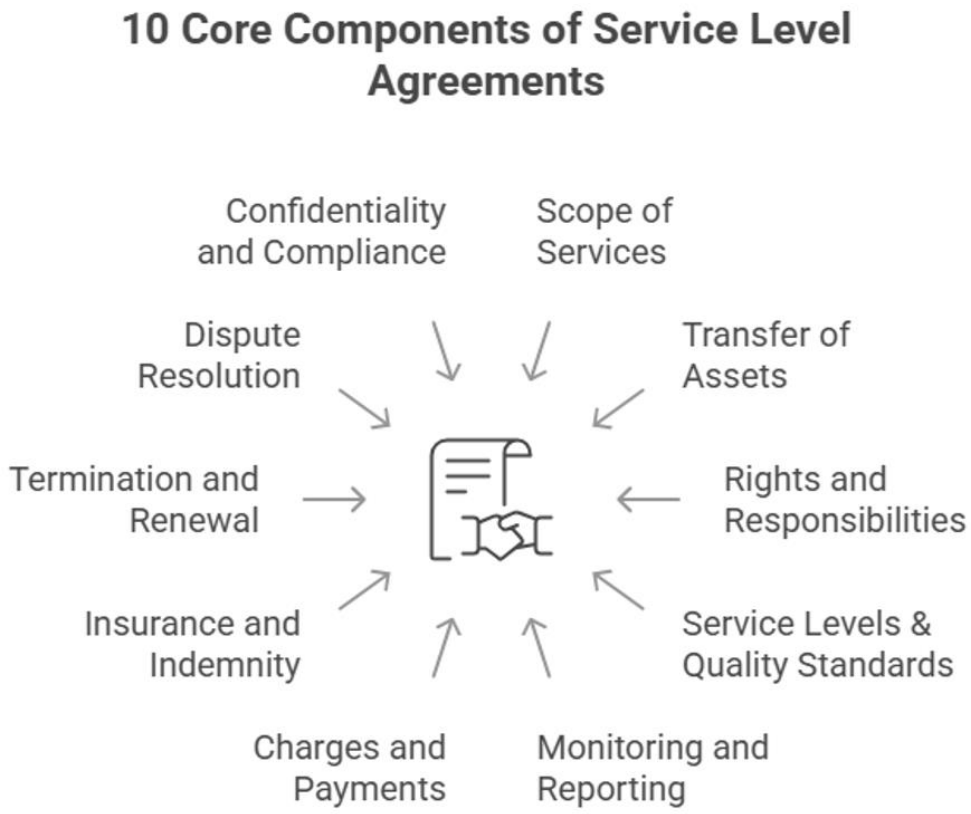

Figure 2.
SLAs Components.

3.2. Phase II: SLA Components-based Evaluation Instrument - Pilot testing

In the second phase, for SLA effectiveness assessment, the instrument based on the ten identified components of SLAs, each having 8 items (a total of 80 items) was developed for pilot testing. The items were extracted through comprehensive literature review of globally recognized/acknowledged SLAs and service frameworks, which include: ITIL v4 (Information Technology Infrastructure Library version 4), COBIT 5.0 (Control Objectives for Information and Related Technologies), ISO/IEC 20000 (Service Management System Requirements), and ISO/IEC 27001 (Information Security Management). The pilot testing included following expert inputs to enhance the content and face validity of the instrument.

Expert Validation and Cognitive Reviews. The initial pool of items was reviewed by a panel of eight experts having sound experience in the implementation of SLAs, trade procedures, logistics, and governance of public and private entities at BLPS. Content validity along with linguistic clarity was thoroughly accessed by obtaining feedback from stakeholders involved in land trade at the BLPs. Minor changes and adjustments were incorporated to ensure consistencies in regional terminologies.

Pilot testing. A pilot study was conducted by selecting 30 professionals across three CAREC member countries. These professionals were from Customs administration, trade facilitation offices, traders, logistics providers and port operators. The scale comprising 80 items was presented to 30 respondents in the form of questionnaires for completion. Based on the pilot testing, all components of the SLA scale surpassed the overall reliability threshold of 0.70 for Cronbach's Alpha (Table 2) exhibiting good internal consistency [34]. However, for further refinement, the overlapping and redundant items from all components were dropped based on total correlations. Finally, five highest performing and robust items for each component were retained. The updated and revised Cronbach's Alpha values for the final 50 item scale are also shown in Table 2.

Table 2.
Pilot Testing and Internal Consistency of Initial and finalized SLA Scale (80 Items).

S. No.	SLA Components	Initial 80 Items Scale		Final 50 Items Scale	
		No of Items	Cronbach's Alpha Value	No of Items	Cronbach's Alpha Value
1	Scope of Services	8	0.86	5	0.87
2	Transfer of Assets	8	0.80	5	0.83
3	Rights and Responsibilities	8	0.83	5	0.84
4	Service Levels and Quality Standards	8	0.88	5	0.89
5	Monitoring and Reporting	8	0.87	5	0.88
6	Charges and Payments	8	0.85	5	0.86
7	Insurance and Indemnity	8	0.78	5	0.81
8	Termination and Renewal	8	0.79	5	0.82
9	Dispute Resolution	8	0.82	5	0.85
10	Confidentiality and Compliance	8	0.81	5	0.84
	80 Items	**80**	**0.94**	**50**	**0.93**

Note: Based on the item reduction in each Component as attained by the pilot testing, the scale was optimized and refined to include only the five most robust items for each component of the SLA. The updated and revised Cronbach's Alpha values for the final 50 item scale are shown in above table.

3.3. Phase III: Data Collection, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Artificial Neural Network (ANN)

Subsequent to the pilot testing, the third phase entailed data collection across eleven CAREC member countries. A total of 1200 questionnaire were distributed, of which 736 were received after completion by respondents (response rate 61.3%). The number of questionnaires completely filled and deemed suitable for further analysis were 704. It is worth mentioning that the final respondents' pool had extensive geographic and functional diversity, appropriate for conducting EFA to evaluate the underlying structure of the scale. The profiles of the respondents along with country-wise distribution and other demographic characteristics have been presented in Table 3 and 4 respectively.

Table 3.
Professional Background of Respondents - Country Wise Distribution.

S. No.	Country	Total Respondents	Professional Background
1	Pakistan	85	Customs, Port Authorities, Traders, Logistics Experts
2	China	65	Trade Experts, Customs Officials, Logistics Providers
3	Georgia	59	Port Managers, Logistics Experts, Trade Consultants
4	Afghanistan	60	Customs Staff, Traders, Support Personnel
5	Azerbaijan	62	Logistics Professionals, Trade Experts
6	Kazakhstan	64	Border Agency Staff, Customs, Trade Specialists
7	Kyrgyz Republic	61	Customs Brokers, Logistics Teams, Trade Advisors
8	Mongolia	61	Trade Consultants, Freight Forwarders, Customs
9	Tajikistan	63	Port Authority Staff, Customs Inspectors
10	Turkmenistan	59	Logistics and Transport Professionals, Customs Agents
11	Uzbekistan	65	Trade Experts, Port Staff, Logistics Managers
	Total	704	

Table 4.
Respondents Demographic Profile.

Characteristic	Category	N	%
Gender	Male	510	72.4%
	Female	194	27.6%
Age	20–24	61	8.7%
	25–29	309	43.9%
	30–34	182	25.9%
	35–39	88	12.5%
	40 and above	64	9.1%
Marital Status	Married	359	51.0%
	Unmarried	345	49.0%
Qualification	Intermediate	10	1.4%
	Bachelor’s	160	22.7%
	Master’s	410	58.2%
	Professional Certification	124	17.6%
Functional Role	Customs Officials	182	25.9%
	Logistics Professionals	154	21.9%
	Port Authority Representatives	98	13.9%
	Traders	91	12.9%
	Trade Experts / Consultants	84	11.9%
	Support/Admin Staff	56	8.0%
	Top/Policy-Level Managers	39	5.5%
Sectoral Affiliation	Public Sector	343	48.7%
	Private Sector	322	45.7%
	Development / Consultant Sector	39	5.5%
SLA Familiarity	High (Direct involvement)	154	21.9%
	Moderate (Basic understanding)	336	47.7%
	Low (Minimal or no exposure)	214	30.4%
Experience in Current Role	Less than 1 year	213	30.3%
	1–5 years	420	59.7%
	6–9 years	55	7.8%
	10 years or more	16	2.3%
Work Experience	Less than 1 year	100	14.2%
	2–5 years	321	45.6%
	6 years or more	283	40.2%

Table 4 particularly elucidates the demographic characteristics of 704 participants showing distribution of the sample across the 11 CAREC region countries. Among the respondents, 72.4% were male and mostly between the age of 25 and 34 years (69.8%), representing that the bulk was from fairly young and engaged individuals. The educational level of 58.2% of the participants was master’s degree and 22.7% bachelor’s degree, whereas 17.6% had a professional certification. The highest proportions of individuals belonged to the Customs department (25.9%), logistics (21.9%) and port authorities (13.9%). Further, 48.7% of the research participants were from the public sector, 45.7% from the private sector, and 5.5% from the consulting / development sector. With reference to the familiarity with SLAs, 47.7% reported having limited knowledge, while 21.9% indicated hands on experience. Likewise, majority (59.7%) of the participants had

been in their current position for 1-5 years, while 40.2% had accumulated more than 5 years of work experience. The demographics indicated the expertise and knowledge of the participants in land port operations, governance, and SLAs formulation and implementation.

3.4. Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) is a statistical technique applied to examine the relationships between observable variables and their ability to jointly predict one or more latent variables [35]. The exploratory factor analysis (EFA) is followed by the confirmatory factor analysis (CFA), particularly when employing the same instrument in a diverse cultural context or setting [36]. EFA is a valuable statistical method for identifying variables that deviate from the norm, thereby facilitating the organization of data for applying CFA through SEM (structural equation modelling) [37, 38]. In this study, EFA was conducted using the principal component extraction method with varimax rotation which is a data reduction technique in SPSS. Prior to the EFA, the Kaiser-Meyer-Olkin (KMO) statistic were examined, which indicated the adequacy of the sample for all variables for factor analysis as the statistic exceeded the threshold of 0.812 (Table 5). Likewise, Bartlett's Test of Sphericity also indicted significant results confirming that the correlation matrix was not an identity matrix and that it contained adequate relationships among the variables for factor extraction [5, 39].

Table 5.
KMO and Bartlett's Test Results.

Test/Measure		**Values**
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.812
Bartlett's Test of Sphericity	Approx. Chi-Square	734.56
	Df	45
	Significance	000

Table 6.
Commonalities (Extraction Method: Principal Axis Factoring).

S. No.	**SLA Component**	**Extraction**
1	Scope of Services	0.712
2	Transfer of Assets	0.702
3	Rights and Responsibilities	0.691
4	Service Levels and Quality Standards	0.774
5	Monitoring and Reporting	0.738
6	Charges and Payments	0.687
7	Insurance and Indemnity	0.527
8	Termination and Renewal	0.695
9	Dispute Resolution	0.689
10	Confidentiality and Compliance	0.682

Table 6 explains the commonality values, indicating the proportion of variance in each component explained by the extracted factors. The extracted factors ranged from 0.527 (i.e., insurance and indemnity) to 0.774 (i.e., service levels and quality standards). Importantly all of the 10 SLA components exceeded the minimum acceptable threshold of 0.50 [40]. The rotated component matrix presented a two-factor solution with all the ten SLA components loading against one of the two distinct factors. Particularly, all loadings less than 0.40 were suppressed to enhance interpretability [40]. These key factors were categorized / labeled based on the theoretical coherence and empirical clustering as under:

Factor 1 - Operational Effectiveness. The factor 1 comprised SLA components that were directly related to service implementation and performance. The strong factor loadings on a single factor affirm a coherent latent construct – the loadings were: Scope of Services (0.774), Service Levels and Quality Standards (0.812), Monitoring and Reporting (0.792), Charges and Payments (0.765), and Rights and Responsibilities (0.728). These indicators reflected process centric and operational dimensions of the SLA operational effectiveness.

Factor 2 - Legal and Compliance Structure. The factor 2 included components of the SLA related to formal governance, legal risk, and institutional regulation. The loadings were: Transfer of Assets (0.702), Insurance and Indemnity (0.739), Termination and Renewal (0.781), Dispute Resolution (0.815), and Confidentiality and Compliance (0.797). These key factors capture the contractual and institutional infrastructure underpinnings of the SLAs and avows a latent domain related to legal and compliance structure (Table 7).

Table 7.
EFA - Rotated Component Matrix.

Components	Factor 1: Operational Effectiveness	Factor 2: Legal & Compliance Structure
Scope of Services	0.774	
Service Levels and Quality Standards	0.812	
Monitoring and Reporting	0.792	
Charges and Payments	0.765	
Rights and Responsibilities	0.728	
Transfer of Assets		0.702
Insurance and Indemnity		0.739
Termination and Renewal		0.781
Dispute Resolution		0.815
Confidentiality and Compliance		0.797

The emergence of the two distinct factors supports the view that the effectiveness of the SLA in context to BLPs in not unidimensional. In fact, it includes both regulatory governance and operational dynamics. Hence, presenting a key finding that resonates with the exiting literature on BLP SLAs, particularly involving multifaceted inter-agency coordination and multi jurisdiction compliance [1].

3.5. Confirmatory Factor Analysis and Model Validation

A Confirmatory Factor Analysis (CFA) was performed following the EFA. The purpose of CFA was to validate the two-factor structure of the SLA measurement model. The decision to retain the key two factors was guided by the Eigenvalue criterion (i.e., >1.0) and considerations of theoretical interpretability. The eigenvalues reduced below 1.0 after the second factor, suggesting the appropriateness of a two-dimensional solution [37, 40]. The two identified factors that is; Operational Effectiveness and Legal & Compliance Structure, comprised of 64.17% of the total variance. Importantly, all items displayed significant loadings on their respective latent factors. The standardized factor loadings were above the recommended threshold of 0.60. Hence, confirming the strong convergent validity of the SLA model. In addition, Table 8 and 9 of the CFA results validate that conceptual strength and clarity of the SLA structure developed through the Delphi method and empirically measured by EFA.

Table 8.
Eigenvalues and Variance Explained.

Component	Eigenvalue	Variance Explained (%)	Cumulative Variance (%)
1 (Operational Effectiveness)	4.124	41.24	41.24
2 (Legal & Compliance Structure)	2.193	21.93	63.17

Table 9.
Confirmatory Factor Analysis – Standardized Factor Loadings.

Dimension/Construct	SLA Component ~~Item~~	Standardized Loading
Operational Effectiveness	Scope of Services	0.774
	Service Levels & Quality Standards	0.812
	Monitoring and Reporting	0.792
	Charges and Payments	0.765
	Rights and Responsibilities	0.728
Legal & Compliance Structure	Transfer of Assets	0.702
	Insurance and Indemnity	0.739
	Termination and Renewal	0.781
	Dispute Resolution	0.815
	Confidentiality and Compliance	0.797

Note: All items show significant loadings ($p < .001$), validating the hypothesized model structure.

Based on the analysis of the correlation (see Table 10) between operational effectiveness and the legal compliance was 0.618 ($p < 0.01$), indicating a significant relationship between the two constructs. Hence confirming that although conceptually different, yet the two factors were interconnected facets of the SLA governance.

Table 10.
Correlation Matrix of SLA Factors.

Variables	Operational Effectiveness	Legal & Compliance Structure
Operational Effectiveness	1.00	0.618***
Legal & Compliance Structure	0.618***	1.00

Note: *** Correlation is significant at the 0.01 level (2-tailed).

In order to evaluate the overall adequacy of the two factor SLA measurement model, a set of model fit indices were examined using SEM. As per the general rule avowed by Kline [41]; Hair, et al. [40] and Hu and Bentler [42] following indices that are; Chi-Square (χ^2) statistic and degrees of freedom (df), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Standardized Root Mean Residual (SRMR) were applied in the present study. The results of the current research elucidated that the model fits the data well. The RMSEA value was found to be lower than the threshold of 0.08. The CFI and TLI values attained were greater than the value of 0.09. Whereas, the SRMR results were found to be less than 0.08, hence, supporting the model's acceptability. Table 11 clarifies the CFA model fit.

Table 11.
CFA Model Fit Indices – Two Factor SLA Measurement Model.

Fit Index	Value	Acceptable Threshold	Reference
Chi-Square (χ^2)	71.236	Non-significant desirable but sensitive to N	Kline [41]
Degrees of Freedom (df)	34	–	
χ^2/df (Normed Chi-Square)	2.09	< 3.00	Hair, et al. [40]
RMSEA (Root Mean Square Error of Approximation)	0.052	< 0.08 (acceptable), < 0.05 (good)	Hu and Bentler [42]
CFI (Comparative Fit Index)	0.964	> 0.90	Hu and Bentler [42]
TLI (Tucker-Lewis Index)	0.948	> 0.90	Hair, et al. [40]
SRMR (Standardized Root Mean Residual)	0.039	< 0.08	Hu and Bentler [42]

The CFA results validated the structural integrity of the two factor SLA measurement model. Notably, all the standardized factor loading were statistically significant and exceeded the overall established thresholds. The inter factor correlation was maintained within an acceptable (moderate) range. The model revealed a robust fit thereby reinforcing the validity of the scale factor structure. The findings of the study offer empirical support and evidence for the adaptation of the SLA framework as a valid instrument for assessing the BLP governance performance in the CAREC region. The subsequent deployment of the two-component structure presents an inclusive framework that can guide performance evaluation, institutional capacity building and SLA formulation/design efforts among the CAREC member countries. With the validated factors the model provides analytical basis for the subsequent predicative modeling via application of Artificial Neural Network (ANN).

3.6. Phase IV: Artificial Neural Network (ANN) Application

In the final phase, ANN was calculated/designed using multi-layer perceptron (MLP) architecture. ANN was mainly applied due to its ability to model complex, non-linear relationships among the input and output variables. The input variables for the ANN were the 10 validated SLA components, which were standardized to ensure that each of the components contributed equally to the model and to minimize bias due to scale variances. The ANN model included one hidden layer with four neurons via the hyperbolic tangent activation function to acquire nonlinear patterns in the data (Table 12 and Figure 3). SLA effectiveness (output) was calculated as the standardized main score across the full SLA scale, serving as the single output/dependent variable. The data was segregated into 70% training and 30% testing subsets by applying random selection. The output layer utilized the identity function, which is mostly applicable for continuous prediction. The input and outputs were rescaled using standard normalization (Table 13).

Table 12.
Neural Network Input Information.

Input Layer	**Covariates**	**1**	**Scope of Services**
		2	Service Level
		3	Monitoring and Reporting
		4	Charges and Payments
		5	Rights and Responsibilities
		6	Transfer of Assets
		7	Insurance and Indemnity
		8	Termination and Renewal
		9	Dispute Resolution
		10	Confidentiality and Compliance
	Number of Units[a]		10
	Rescaling Method for Covariates		Standardized
Hidden Layer(s)	Number of Hidden Layers		1
	Number of Units in Hidden Layer 1[a]		4
	Activation Function		Hyperbolic tangent
Output Layer	Dependent Variables	1	SLA Effectiveness
	Number of Units		1
	Rescaling Method for Scale Dependents		Standardized
	Activation Function		Identity
	Error Function		Sum of Squares

Note: a. Excluding the bias unit.

Table 13.
ANN Network Configuration.

Case Processing Summary			
		N	**Percent**
Sample	Training	476	67.6%
	Testing	228	32.5%
Valid		704	100.0%
Excluded		0	
Total		704	
Model Summary			
Training	Sum of Squares		0.276
	Relative Error		0.001
	Stopping Rule Used		1 Consecutive Step(s) with no decrease in error[a]
	Training Time		0:00:00.07
Testing	Sum of Squares Error		0.231
	Relative Error		0.002

Note: Dependent Variable: SLA Effectiveness
'a' Error Computation are based on the testing sample.

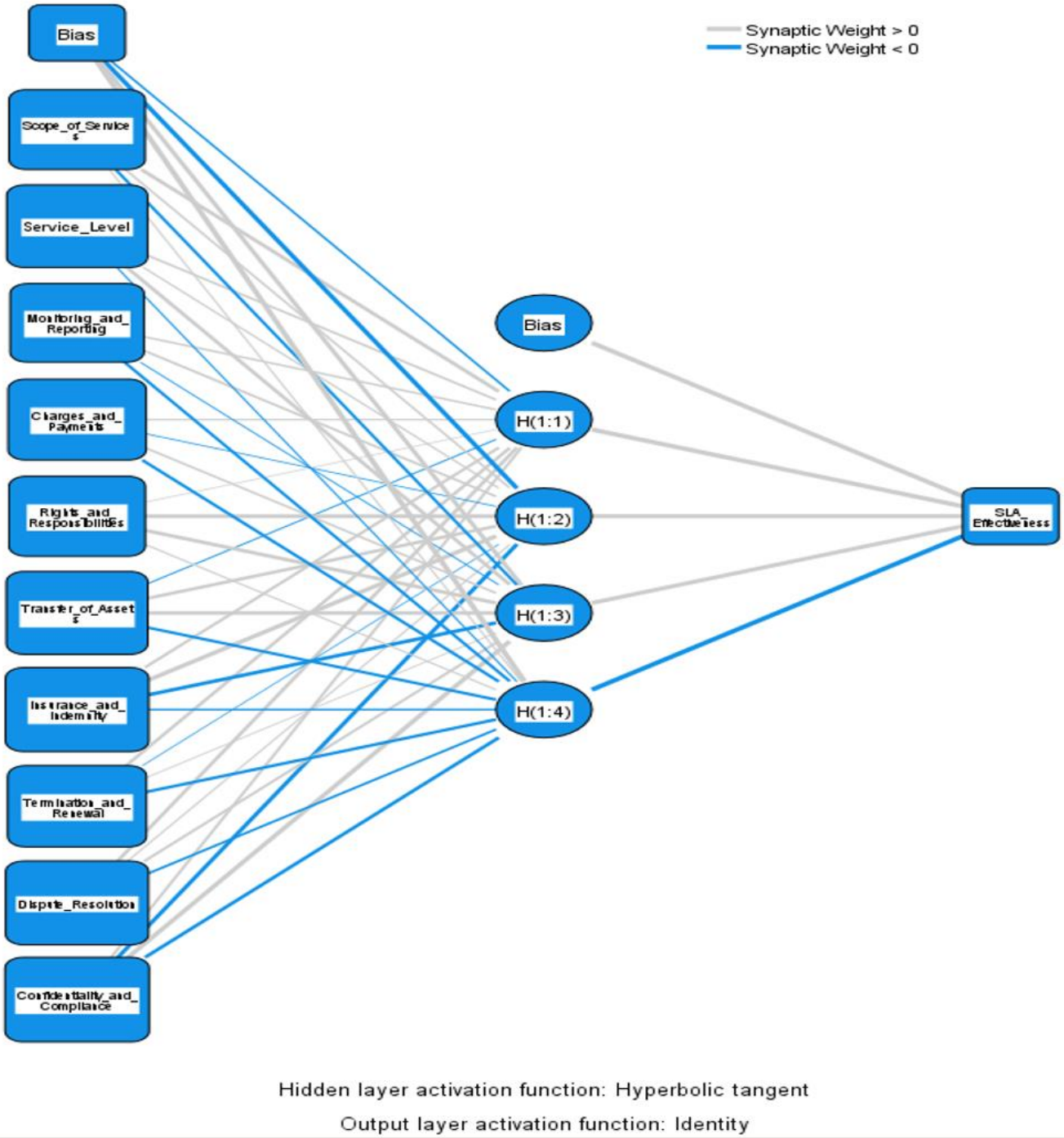

Figure 3.
Neural Network Diagram.

The ANN showcased strong predicative capability of the components of SLA for the effectiveness of SLA in this case. The value for came to $R^2 = 0.81$ which indicates that approximately 81% of the variance in the overall SLA effectiveness can be explained by the 10 SLA components. In context to the relative importance of SLA components, variable significance/importance analysis was performed to rank the SLA components based on their contribution to the prediction of SLA effectiveness. The importance of all components ranged between 89.3% to 100%. The most important component in SLA effectiveness was 'confidentiality and compliance' followed by 'insurance and indemnity' and then 'dispute resolution', 'transfer of assets', and 'service level'. For the remaining components the importance was slightly lesser which can be considered negligible as shown in Table (Table 14 and Figure 4).

Table 14.
Importance of SLA Components.

Independent Variable – SLA Components	Importance	Normalized Importance
Confidentiality and Compliance	0.105	100.0%
Insurance and Indemnity	0.104	99.0%
Dispute Resolution	0.104	98.7%
Transfer of Assets	0.102	97.2%
Service Level and Quality Standards	0.101	96.5%
Termination and Renewal	0.099	94.2%
Charges and Payments	0.098	93.6%
Rights and Responsibilities	0.097	91.9%
Scope of Services	0.096	91.7%
Monitoring and Reporting	0.094	89.3%

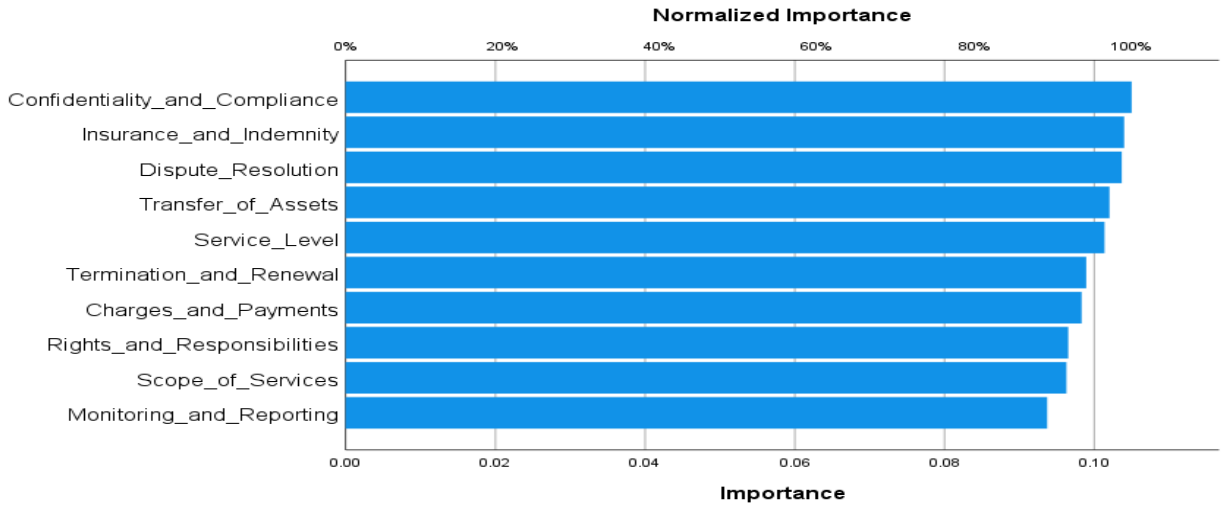

Figure 4.
Neural Network Diagram.

4. Discussion on Findings

This study has extracted and prioritized the components of SLA which are essential to specify roles and responsibilities of different stakeholders at BLPs for effective serviceability of the equipment, infrastructure and the overall facility. By merging Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Artificial Neural Network (ANN), the components of SLA have been comprehensively extracted. Past studies in this area have not employed this hybrid approach [43]. The components of SLA were extracted using Delphi technique and then tested on a large sample (704 individuals employed at BLPs). The results of EFA and CFA confirm that the components of SLA can be explained by a two-factor model. These two factors, operational effectiveness and legal and compliance structure comprise five components each: The first factor, operational effectiveness, consists of scope of services, service levels & quality standards, monitoring and reporting, charges and payments, and rights and responsibilities. The second factor, legal and compliance structure, consists of transfer of assets, insurance and indemnity, termination and renewal, dispute resolution, and confidentiality and compliance. An ANN model was formed using the ten determined components of SLA as covariates of the model with output variable SLA effectiveness.

This study empirically manifests that an SLA is a formal contractual instrument between a service provider and the owner/customer which defines the level of service expected in terms of confidentiality, quality, availability, responsibilities, and performance metrics. Though SLAs are commonly used in IT services, cloud computing, telecommunications, and other industries where service delivery is critical [44]. However, in case of BLPs, SLA can be effectively used as collaboration instrument between the facility/equipment/infrastructure owner (government or any other public or private entity) and the terminal operator responsible to run the land port operations using the assets. Experience has indicated that SLAs are formulated and implemented to ensure optimal maintenance and serviceability of the equipment and infrastructure while giving liberty of resource utilization to the terminal operator [45]. Findings of past research demonstrate that well-designed SLAs can reduce BLP operational delays by 30-40%, lower dispute rates by 27%, and significantly enhance compliance with regulations [43].

The first component of SLA, identified by this study is the Scope of Services, which has adequate support from the extant literature and is declared an essential part of SLA in ‘Port Concession Agreements in Developing Economies’ by World Bank [46]. ‘Best Practices for Border Infrastructure SLAs’ by International Trade Centre and, ‘Guidelines for Cross-Border Infrastructure Management’ by European Commission [47]. The Scope of Services is the basis for defining modular tasks separating terminal operators’ responsibilities from owner/governments’ sovereign functions [48]. This component

also includes technology adaptation clauses to accommodate infrastructure upgrades with the passage of time without the need for renegotiation between the terminal operator and the owner of the facilities [49].

The Scope of Services for CAREC-RIBS BLPs has to account for the region's unique multimodal transit corridors and varying national Customs protocols. Recent CAREC Institute studies demonstrated that 42% of delays at Central Asian borders stemmed from ambiguous service demarcation between terminal operators and agencies operating at the BLPs. SLAs should explicitly assign equipment maintenance (e.g., weighbridges, scanners) to operators while reserving regulatory inspections for state bodies [50]. This aspect has been implemented in Kazakhstan's successful "single window" pilot project under RIBS. The Asian Development Bank's CAREC Customs Modernization Strategy further advises inclusion of climate resilience clauses in SLAs in view of the region's extreme climatic variations [51].

The second component of SLA extracted by this study, Service Levels and Quality Standards, defines measurable key performance indicators (KPIs) (e.g., uptime, response time, fault rectification time). It sets minimum acceptable performance levels (e.g., 99.9% availability) and also includes service credits/penalties for failures. Extant literature affirms that quantifiable KPIs are critical for BLP efficiency, numerous studies have supported direct correlations between stringent SLA performance metrics and trade facilitation. For example, Notteboom, et al. [52] found that SLAs mandating ≤30-minute truck processing times (complying with World Trade Organization, Trade Facilitation Agreement, Article 6.1) reduce border congestion by 33%. The OECD [6] cross-border performance database also supports this claim, showing that 98% scanner uptime-clauses decrease smuggling incidents by 22% through consistent operational availability of critical cargo scanning equipment [53]. The Quality Standards must also integrate security protocols as advocated by Felsen [54] affirming that SLAs necessitating ISO/PAS 28000 compliance for cargo screening were observed to reduce illegal trade risks. Performance metrics in CAREC-RIBS SLAs are advised to prioritize the region's emphasis on transit time reduction.

The 'Monitoring and Reporting' is the third component of SLA which specifies how performance is tracked and reported, and transparency in data collection is ensured. Digital monitoring systems are now indispensable for BLP SLA enforcement. UNCTAD [55] analysis of 120 ports revealed that IoT-enabled cargo tracking (e.g., RFID/blockchain) has the potential to reduce reporting errors by 40%. Another study by Yusof, et al. [56] found that real-time API integrations between terminal operators' dashboards and Customs single windows improved data accuracy. It is important to extend transparency mechanisms beyond technology as argued by Wang, et al. [57] claiming that the SLAs which were audited by third-party minimized performance disputes. Real-time data integration is particularly crucial for CAREC's multi-country transit corridors.

This study has identified 'Charges and Payments' as fourth component of SLA which clearly outlines pricing structures, billing cycles, late fees, and payment terms. The pricing models of modern BLP SLAs must balance cost recovery with trade facilitation. The tariff case studies by World Bank [7] demonstrate that volume-tiered pricing is pivotal in terminal operators' compliance with regulations. This finding is further complemented by Cullinane, et al. [58] who found that congestion-based surcharges optimized traffic flows through the BLPs. However, force majeure exemptions must be included in SLA in view of the experience of COVID-19 pandemic when a large number of BLP disputes stemmed from unaddressed disruption clauses. The CAREC region's reliance on transit fees necessitates innovative pricing models in SLAs like the throughput-volume discounts [59].

The 5th component of SLA covering 'Rights and Responsibilities' is highly emphasized in the previous studies which declare that effective SLAs at BLPs must delineate rights and responsibilities with precision to avoid operational conflicts among stakeholders. Research by Oladeinde [60] has found that SLAs with matrix-based role definitions reduce interagency disputes. The PPP toolkit of the EBRD [59] emphasizes allocating risks proportionately like assigning cybersecurity responsibilities to terminal operators while Governments retain sovereign data protection duties. Similarly, the intellectual property (IP) management is equally critical as shown in WIPO (World Intellectual Property Organization) [61] global study which found 62% of port technology disputes arise from unclear IP ownership in SLAs. For the BLPs related to CAREC-RIBS, SLAs must address the region's complex cross-border labor dynamics.

The 'Transfer of Assets' has been identified by this study as 6th component of SLA designed to define handover of equipment, data, or licenses upon completion/termination of a particular tenure. The SLAs must address socio-economic peculiarities likely to affect smooth transfer of assets from government/developer to the terminal operator and vice versa Aryal, et al. [43]. The World Bank [18] study of the Kazakhstan-Uzbekistan border shows that standardized asset tagging systems were observed to reduce transfer disputes during transfer of assets. This is in consonance with the asset transfer protocol mentioned in CAREC (Central Asia Regional Economic Cooperation) Program [62] of ADB mandates bi-lingual inventory lists and 30-day testing periods for critical infrastructure before final handover. The SLA must carry provisions requiring terminal operators to train successor staff on specialized equipment [50].

The literature scantily mentions the 7th component of SLA, 'Insurance and Indemnity' which necessitate robust risk mitigation frameworks. The studies by Lloyd's [63] and Park, et al. [64] on risk analysis at BLPs indicate that "joint-and-several" indemnity clauses are required to be included in SLAs where terminal operators cover negligence-related claims while Governments assume systemic risks (e.g., pandemic closures). A study on emerging threats and adaptive clauses by Notteboom, et al. [52] demonstrates that SLAs embedding parametric insurance triggers cut claim processing time from 18 months to 15 days. The CAREC region's exposure to both natural disasters and geopolitical risks necessitates specialized insurance frameworks. The analysis of BLPs on the Kyrgyz-Tajik border by EBRD [59] manifests that SLAs requiring "all-risk" coverage including civil unrest considerably lower government fiscal exposures.

The 'Termination and Renewal' is the 8th component which was found highly supported by extant literature. This component specifies notice periods, auto-renewal terms, and exit obligations. Termination clauses in SLAs must balance stability with flexibility. OECD [6] lays down a requirement of 180-day operator exit notices for reducing cargo backlog

risks. The study by Monios [65] proposes "performance-triggered renewal" mechanisms in which contracts auto-extend only if operators meet more than 80% KPIs for 3 consecutive years. Similarly, the transition planning is equally vital as indicated by Wilmsmeier, et al. [66] that SLAs mandating 6-month parallel operations during handovers prevent abrupt throughput drops. The Port Transition Handbook by World Bank [18] recommends escrow accounts for unfunded maintenance liabilities during terminations. With particular reference to CAREC regions, termination clauses must balance regional stability imperatives with performance accountability.

The 'Dispute Resolution' is the 9th component which defines escalation process (mediation to arbitration to litigation), governing laws and jurisdictions, and good-faith negotiations before legal action. Expedited dispute mechanisms are essential for BLPs. An analysis of 200 trade contracts by UNCTAD [55] exhibits that 60-day mediated negotiation clauses reduce arbitration costs to a great extent. Innovative approaches to conflict management are gaining popularity, for example a study by Mnookin [67] advocates "dispute prevention boards" with quarterly SLA reviews. Likewise, embedding real-time KPI dashboards with automated penalty calculations can minimize interpretive disagreements. For technical disputes (e.g., scanner calibration), the CAREC Institute [50] recommends mandatory referral to the Almaty-based Regional Reference Laboratory, whose equipment certifications are recognized by all member states.

The last component of SLA 'Confidentiality and Compliance' musters high level of support from past research. This component requires Non-Disclosure Agreement compliance, adherence to regulations, and data security measures [68]. The EU GDPR European Commission [69] mandates biometric data encryption at borders, with studies showing that non-compliant BLPs face higher cyberattack rates [70]. Similarly, Horton, et al. [71] declare that SLAs which are ISO/IEC 27001:2022 compliant have lesser data breaches. It is also essential that compliance must extend beyond cybersecurity. The UNCTAD [55] Port Integrity Toolkit further recommends independent anti-corruption audits every 6 months which improves Customs clearance transparency.

5. Contributions and Direction for Future Research

This study contributes to the existing body of knowledge in three different ways. First, the extraction of the ten components of SLAs through Delphi method of expert consensus which provides a comprehensive set of considerations for formulating good SLAs. Second contribution is the formulation of evaluation instrument for SLA effectiveness, configured and validated using EFA and CFA, and finalizing the Internal Consistency by reducing the initial SLA Scale from 80 items to 50 items through *Pilot Testing*. Finally, the use of novel approach of ANN for determining the relative importance of each of the components of SLA in its overall effectiveness. This study is vital in assessing SLA effectiveness and advising significant suggestions for formulation, implementation, and monitoring of comprehensive SLAs at BLPs. The role of SLAs in defining the relationship between the Government and the terminal operator has been specifically highlighted by this study for ensuring optimal service delivery as well as high level of maintenance and serviceability of equipment and infrastructure. Using ANN, the current study has found all components of SLA are equally important leading to a conclusion that no component is to be relegated to a lower priority and each one needs to be given due consideration.

The study connects theoretical understandings from new institutional economics with real-world operational management by integrating theories of public service delivery, contract governance, institutional accountability, and inter-agency coordination. To validate the multifaceted nature of SLAs and emphasize their importance as both legal and dynamic governance tools, the study uses rigorous exploratory and confirmatory factor analysis. The identification of "Overall SLA Effectiveness" as a unified, measurable construct represents a theoretical advancement. The theory of SLA governance is advanced by operationalization of each component in the intricate framework of cross-border trade, especially in light of multilateral agreements such as the CAREC Corridor strategies and the WTO-TFA.

6. Limitations and Future Direction of Research

This study was confined to the 11 countries which are members of the CAREC project and respondents were selected from trade-related individuals who were involved in land port operations. On average, a sample of 60-70 individuals was selected from each CAREC member states which could have been slightly bigger. The smaller representation in sample size by each country was overcome by selecting diverse and highly experienced individuals from different government and private entities dealing with land trade. Future studies are advised to replicate this research using bigger sample representations from CAREC states. Similarly, future studies may use respondents separately from public and private organizations and thereafter carryout comparative analysis of the results. An important aspect of cultural differences has been deliberately left out because of the time constraint which can be added to the model as a moderating variable.

This research opens several new avenues for further investigation. First, future studies could explore the longitudinal impact of SLA effectiveness on critical metrics such as cargo dwell time, cost of doing business, and user satisfaction. Second, integrating SLA assessment data with Customs automation performance, digital infrastructure scores, and CAREC corridor monitoring dashboards could offer a more holistic performance model. Additionally, comparative studies across different economic corridors—such as BCPs along CAREC vs. CPEC vs. TRACECA—could provide richer insights into how contextual governance factors mediate SLA success. Finally, the ANN model could be extended into a decision-support system for real-time performance alerts and SLA renegotiation triggers.

7. Conclusion

This study represents one of the initial efforts to gather and analyze SLA-related data at a regional level across all eleven CAREC member countries, resulting in a validated dataset comprising 704 responses from professionals such as

Customs officials, terminal operators, and logistics providers. The creation of a 50-item SLA evaluation instrument, enhanced through pilot testing and validated by EFA and CFA, provides a statistically robust tool for evaluating service-level governance in intricate institutional contexts. The application of Artificial Neural Network (ANN) modeling offers a non-linear analytical framework to evaluate the predictive power of each SLA component. The ability of the model to explain 81% of the variance in overall SLA effectiveness highlights the importance of operational clarity and performance transparency as essential factors in fostering stakeholder trust and satisfaction in SLA implementation. The findings of this study empirically contest conventional beliefs that legalistic clauses are fundamental to the effectiveness of SLA in high-throughput contexts, such as BLPs [43].

This study's findings are directly relevant to policymakers, border management authorities, terminal operators, and regional coordination entities, including the CAREC Secretariat and national trade facilitation committees (NTFCs). The validated SLA framework functions as a diagnostic and planning instrument for evaluating SLA maturity and effectiveness at BLPs, proposing the shift from transactional service contracting to strategic performance governance. The ranking of SLA components derived from the ANN offers a clear roadmap for equitable reforms indicating a requirement of enhancing real-time monitoring and reporting systems. The findings support the institutionalization of Master SLAs between Border Land Port Authorities (BLPAs) and Terminal Operators, with clearly delineated sub-SLAs covering infrastructure, equipment, and operational standards. These SLAs must evolve from legal compliance checklists into living governance instruments which are monitored through performance dashboards and perpetually revised through adaptive review processes.

References

[1] A. R. Hanjra, O. K. Bhatti, and M. Irfan, "Understanding leadership and managerial challenges at border crossing points of Pakistan: A CAREC and CPEC perspective," *Bahria University Journal of Management & Technology*, vol. 8, no. 1, p. Article 125, 2025.

[2] A. Goodchild and C. Albrecht, "Cross border transportation patterns at the Western Cascade Gateway: Implications for regional planning," Working Paper. Border Policy Research Institute, 2011.

[3] T. Notteboom, A. Pallis, and J.-P. Rodrigue, *Port economics, management and policy*. New York: Routledge, 2022.

[4] J.-P. Rodrigue and B. Slack, "The geography of transport systems (6th ed.). Routledge.Sung, C., Hwang, H., & Yoo, I. K. (2018). Perspective: A review on memristive hardware for neuromorphic computation," *Journal of Applied Physics*, vol. 124, p. 151903, 2023.

[5] O. K. Bhatti, "Assessing environmental sustainability in dry ports within the central asia regional economic cooperation (CAREC) framework: A case study of Pakistan," *PONTE International Journal of Science and Research*, vol. 80, no. 3, pp. 61-95, 2024.

[6] OECD, *International trade and balance of payments statistics*. Paris, France: Organisation for Economic Co-operation and Development, 2023.

[7] World Bank, *Trade and climate change: Synergies and challenges*. Washington, DC: World Bank Group, 2023.

[8] G. Wilmsmeier and J. Monios, *Geographies of maritime transport: Transition from transport to mobilities*. Cham, Switzerland: Springer, 2022.

[9] F. Penning, "Service level agreements in business relationships," Rotterdam, Netherlands Erasmus University Repository, 2013.

[10] M. M. González and L. Trujillo, "Efficiency measurement in port operations: The case of Spanish container ports," *International Journal of Shipping and Transport Logistics*, vol. 14, no. 1, pp. 1–23, 2022.

[11] O. K. Bhatti, M. Irfan, A. O. Öztürk, and R. Maham, "Organizational inclusion through interaction of work meaningfulness and servant leadership: An artificial neural network approach," *Cogent Business & Management*, vol. 9, no. 1, p. 2059828, 2022. https://doi.org/10.1080/23311975.2022.2059828

[12] C. Peoples, F. Mtenzi, and G. Parr, "Service level agreement (SLA) chains supported by cloud in a complex port ecosystem with competing stakeholder goals," *EAI Endorsed Transactions on Cloud Systems*, vol. 8, no. 28, p. e3, 2022.

[13] World Customs Organization, *WCO single window compendium*. Brussels, Belgium: World Customs Organization, 2023.

[14] H. T. Abdoulkarim, S. H. Fatouma, and E. M. Munyao, "Dry ports in China and West Africa: A comparative study," *American Journal of Industrial and Business Management*, vol. 9, no. 03, p. 448, 2019.

[15] World Bank, *Connecting to compete: Trade logistics in the global economy*. Washington, DC: World Bank Group, 2023.

[16] G. McLinden, E. Fanta, D. Widdowson, and T. Doyle, *Border management modernization*. Washington, DC: World Bank Publications, 2010.

[17] World Bank, *Border management handbook*. Washington, DC: World Bank, 2020.

[18] World Bank, *Regional cooperation reduces poverty and builds resilience in central Asia*. Washington, DC: World Bank, 2023.

[19] R. Tambulasi, "When public services contracts are poorly managed: An analysis of Malawi's service level agreements," *International Public Management Review*, vol. 15, no. 1, pp. 83-99, 2014.

[20] H. Liu and S. Garg, "2′-Fucosyllactose attenuates aging-related metabolic disorders by modulating the adaptive immune system and gut microbiota," *Aging Cell*, vol. 23, no. 1, p. e14085, 2024.

[21] Y. J. Goo, J. H. Kim, and J. H. Park, "IoT-based intelligent logistics system for port container terminal," *IEEE Transactions on Industrial Informatics*, vol. 5, no. 2, pp. 185–192, 2009.

[22] C. M. Ford, "A theory of individual creative action in multiple social domains," *Academy of Management review*, vol. 21, no. 4, pp. 1112-1142, 1996.

[23] P. Garg *et al.*, "Advances in non-small cell lung cancer: Current insights and future directions," *Journal of Clinical Medicine*, vol. 13, no. 14, p. 4189, 2024.

[24] A. Alzubaidi, K. Mitra, and E. Solaiman, "A blockchain-based SLA monitoring and compliance assessment for IoT ecosystems," *Journal of Cloud Computing*, vol. 12, no. 1, p. 50, 2023. https://doi.org/10.1186/s13677-023-00409-7

[25] J. Manyika, M. Chui, P. Bisson, J. Woetzel, and J. Bughin, *A future that works: Automation, employment, and productivity*. San Francisco, CA: McKinsey Global, 2016.

[26] N. Hamdi, C. El Hog, R. Ben Djemaa, and L. Sliman, "A survey on SLA management using blockchain based smart contracts. In A. Abraham et al. (Eds.), Intelligent systems design and applications," presented at the 21st international conference on intelligent systems design and applications (ISDA 2021), 2022.
[27] D. O'Neil, "Digital transformation in customs administration," *World Customs Journal,* vol. 18, no. 1, pp. 1–12, 2018.
[28] Q. Jin, R. Machiraju, and A. Sahai, "Data mining for suspicious patterns in Customs data," *IEEE Intelligent Systems,* vol. 17, no. 3, pp. 20–27, 2002.
[29] R. Unsworth, "Smart contract this! an assessment of the contractual landscape and the herculean challenges it currently presents for "self-executing" contracts." Singapore: Springer Singapore, 2019, pp. 17-61. https://doi.org/10.1007/978-981-13-6086-2_2
[30] T. L. Brown, M. Potoski, and D. M. Van Slyke, "Managing public service contracts: Aligning values, institutions, and markets," *Public Administration Review,* vol. 66, no. 3, pp. 323-331, 2006.
[31] CAREC Program, *CAREC 2030: Connecting the region for shared and sustainable development*. Mandaluyong City, Metro Manila, Philippines: CAREC Secretariat / Asian Development Bank, 2017.
[32] D. C. North, *Institutions, institutional change and economic performance*. Cambridge, UK: Cambridge University Press, 1990.
[33] M. O'Donnell *et al.*, "Urinary sodium and potassium excretion, mortality, and cardiovascular events," *New England Journal of Medicine,* vol. 371, no. 7, pp. 612-623, 2014.
[34] R. Green, *Pilot testing: Why and how we trial. In The Routledge handbook of second language acquisition and language testing*. New York: Routledge, 2020.
[35] D. Goretzko, T. T. H. Pham, and M. Bühner, "Exploratory factor analysis: Current use, methodological developments and recommendations for good practice," *Current Psychology,* vol. 40, no. 7, pp. 3510-3521, 2021.
[36] F. Orçan, "Exploratory and confirmatory factor analysis: Which one to use first?," *Journal of Measurement and Evaluation in Education and Psychology,* vol. 9, no. 4, pp. 414-421, 2018.
[37] H. M. Byrne, "Dissecting cancer through mathematics: From the cell to the animal model," *Nature Reviews Cancer,* vol. 10, no. 3, pp. 221-230, 2010.
[38] R. Bougie and U. Sekaran, *Research methods for business: A skill building approach*. Hoboken, NJ: John Wiley & Sons, 2019.
[39] Pallant, *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. London, UK: Routledge, 2020.
[40] J. F. Hair, M. Sarstedt, C. M. Ringle, and J. A. Mena, "An assessment of the use of partial least squares structural equation modeling in marketing research," *Journal of the Academy of Marketing Science,* vol. 40, no. 3, pp. 414-433, 2012.
[41] R. B. Kline, "Assumptions in structural equation modeling," *Handbook of Structural Equation Modeling,* vol. 111, p. 125, 2012.
[42] L. t. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives," *Structural Equation Modeling: A Multidisciplinary Journal,* vol. 6, no. 1, pp. 1-55, 1999.
[43] N. Aryal, F. Ghaffari, E. Bertin, and N. Crespi, "A blockchain-based approach for service level agreement management in cellular network," In 2024 15th International Conference on Network of the Future (NoF) (pp. 186-194), 2024.
[44] P. Nehra and N. Kesswani, "A workload prediction model for reducing service level agreement violations in cloud data centers," *Decision Analytics Journal,* vol. 11, p. 100463, 2024. https://doi.org/10.1016/j.dajour.2024.100463
[45] H. Jahani, B. Abbasi, Z. Hosseinifard, M. Fadaki, and J. P. Minas, "Disruption risk management in service-level agreements," *International Journal of Production Research,* vol. 59, no. 1, pp. 226-244, 2021. https://doi.org/10.1080/00207543.2020.1748248
[46] M. H. Juhel, "Container terminal concession guidelines," Sub-Saharan Africa Transport Policy Working Paper;No. 107. © World Bank, 2017.
[47] K. S. J. S. Al Mehairbi, T. Evans, A. Nassereddine, R. P. Nolasco, and M. Kononov, *Bridging borders: Trade promotion and foreign direct investmenta*. Washington, D.C., USA:: International Trade Council, 2025.
[48] S. Ng, S. Shao, and N. Ling, "Food safety risk-assessment systems utilized by China, Australia/New Zealand, Canada, and the United States," *Journal of Food Science,* vol. 87, no. 11, pp. 4780-4795, 2022. https://doi.org/10.1111/1750-3841.16334
[49] K. Zhang, Q. Cui, and P. DeCorla-Souza, "Performance and efficiency diffusion of us surface transportation public–private partnerships," *Journal of Construction Engineering and Management,* vol. 151, no. 1, p. 04024192, 2025. https://doi.org/10.1061/JCEMD4.COENG-14592
[50] CAREC Institute, "Unlocking trade potential in CAREC: Addressing border inefficiencies," CAREC Institute, 2023. https://www.carecinstitute.org/publications/
[51] Asian Development Bank (ADB), "CAREC customs modernization strategy 2023: Enhancing trade facilitation and climate resilience," Asian Development Bank, 2023.
[52] T. Notteboom, A. A. Pallis, and G. Knatz, "Stakeholders' attitudes toward container terminal automation," *Maritime Economics & Logistics,* pp. 1-34, 2025. https://doi.org/10.1057/s41278-025-00322-7
[53] European Commission, "Guidelines for cross-border infrastructure management," 2023. https://eur-lex.europa.eu/resource.html?uri=cellar:f7b5247b-c296-11ed-a05c-01aa75ed71a1.0001.02/DOC_1&format=PDF
[54] M. Felsen, "Addressing worker safety and health through the lens of strategic enforcement—part one," *New Solutions: A Journal of Environmental and Occupational Health Policy,* vol. 34, no. 2, pp. 133-146, 2024.
[55] UNCTAD, *Review of maritime transport 2023: Chapter 4 – Port performance and maritime trade and transport facilitation*. Geneva, Switzerland: United Nations Conference on Trade and Development, 2023.
[56] W. M. Yusof, N. Rashid, N. Shaharin, and L. K. Xuan, "The impact of information technology towards logistics performance," *International Journal of Academic Reserach in Economics and Management Sciences,* vol. 13, no. 3, 2024.
[57] X. Wang, P. Zhang, Z. Du, A.-Q. Tian, and H. Lv, "Research on optimization of international multimodal transportation routes based on uncertainty theory," *Transportation Research Record,* vol. 2678, no. 11, pp. 798-821, 2024. https://doi.org/10.1177/03611981241242377
[58] K. Cullinane, H. Haralambides, and T. Notteboom, "Weathering the COVID-19 pandemic towards the 'new normal': Potential longer-term impacts on port and shipping governance, performance and infrastructure geopolitics," in Keeping the Focus on Sustainability: A Challenge for Governance/Vrooma, 2023, pp. 220-253.
[59] EBRD, "Financial report 2023," 2023. https://www.ebrd.com/home/news-and-events/publications/financial-report/financial-report-2023.html

[60] O. Oladeinde, "Digital technology, skill transformation, work design and social dialogue in the port industry: A contextual review and research direction," *Ife Social Sciences Review*, vol. 33, no. 1, pp. 235-248, 2025.
[61] WIPO (World Intellectual Property Organization), *Global Innovation Index 2022: What is the future of innovation-driven growth*, 15th ed. Geneva, Switzerland: World Intellectual Property Organization, 2022.
[62] CAREC (Central Asia Regional Economic Cooperation) Program, "Implementation progress report: 22nd ministerial conference," Central Asia Regional Economic Cooperation Program, 2023. https://www.carecprogram.org/uploads/CAREC-Implementation-Progress-Report-2023_22nd-MC-ENG.pdf
[63] Lloyd's, "Shifting powers: Physical cyber risk in a changing geopolitical landscape," 2022. https://assets.lloyds.com/media/0926f9be-0f3d-49cc-9960-52accc888aad/Lloyds_Shifting_%20Powers_Physical_%20Cyber_Risk_Final_2906.pdf
[64] S.-J. Park *et al.*, "Preventive percutaneous coronary intervention versus optimal medical therapy alone for the treatment of vulnerable atherosclerotic coronary plaques (PREVENT): A multicentre, open-label, randomised controlled trial," *The Lancet*, vol. 403, no. 10438, pp. 1753-1765, 2024.
[65] J. Monios, "The moral limits of market-based mechanisms: An application to the international maritime sector," *Journal of Business Ethics*, vol. 187, pp. 283-299, 2023. https://doi.org/10.1007/s10551-022-05256-1
[66] G. Wilmsmeier, A. A. Pallis, S. L. Schorch, and D. L. Trujillo, "Port governance and the implications of institutional fragmentation: Lessons from Colombia," *Research in Transportation Business & Management*, vol. 56, p. 101179, 2024. https://doi.org/10.1016/j.rtbm.2024.101179
[67] J. Mnookin, "Science, justice, and evidence," *Science*, vol. 382, no. 6672, p. 741, 2023. https://doi.org/10.1126/science.adm8834
[68] G. L. Grainger, "What barriers do administrators face whilst upgrading their data assemblage?," *Housing Studies*, pp. 1-24, 2024. https://doi.org/10.1080/02673037.2024.2416966
[69] EU GDPR European Commission, "Legal framework: EU data protection," 2023. https://commission.europa.eu/law/law-topic/data-protection/legal-framework-eu-data-protection_en
[70] National Institute of Standards and Technology (NIST), *NIST special publication no*. Gaithersburg, MD: U.S. Department of Commerce, 2023.
[71] R. Horton *et al.*, "Performance metrics for resilience of airport infrastructure," *Transportation Research Part D: Transport And Environment*, vol. 142, p. 104676, 2025. https://doi.org/10.1016/j.trd.2025.104676

Appendix.
Service Level Agreement Questionnaire.

1. Scope of Services
Statement
1. The SLA clearly defines all core service deliverables.
2. The scope includes specific performance timelines.
3. Service exclusions are explicitly stated.
4. Stakeholder expectations are reflected in the scope.
5. The scope is reviewed regularly for relevance.
6. The SLA specifies deliverables in measurable terms.
7. Changes to the scope are formally documented and communicated.
8. The scope aligns with organizational objectives and strategies.

2. Transfer of Assets
Statement
1. Asset ownership transfer procedures are documented.
2. The SLA includes a list of assets involved in service delivery.
3. Risk mitigation during asset transfer is defined.
4. Both parties agree on asset valuation.
5. The transfer process is timely and legally compliant.
6. The SLA specifies responsibilities for asset maintenance post-transfer.
7. Asset transfer timelines are clearly defined and adhered to.
8. Both parties are informed of any changes to asset transfer terms.

3. Rights and Responsibilities
Statement
1. Each party's obligations are explicitly defined.
2. Roles are distributed to avoid overlap.
3. Accountability mechanisms are in place.
4. Changes to responsibilities are formally documented.
5. Responsibilities are aligned with legal requirements.
6. The SLA outlines procedures for resolving role conflicts.
7. Both parties acknowledge their respective responsibilities.
8. Responsibilities are reviewed periodically to ensure alignment.

4. Service Levels and Quality Standards
Statement
1. Measurable service performance indicators are included.
2. Quality benchmarks are aligned with international standards.
3. The SLA defines penalties for service failures.
4. There are provisions for continuous improvement.
5. Service standards are regularly audited.
6. The SLA specifies targets for availability and reliability.
7. Customers are involved in setting service quality standards.
8. Service level achievements are reviewed and reported regularly.

5. Monitoring and Reporting
Statement
1. A performance monitoring mechanism is in place.
2. Reporting timelines and formats are specified.
3. Real-time data is used to track performance.
4. Reporting is transparent and accessible to both parties.
5. SLA reports influence management decisions.
6. The SLA specifies frequency and format of reviews.
7. Both parties agree on metrics used for monitoring.
8. Performance data is used to identify areas for improvement.

6. Charges and Payments
Statement
1. All cost components are transparently detailed.
2. Payment timelines are clearly defined.
3. The SLA includes clauses for billing disputes.
4. Payment methods are secure and efficient.
5. Price adjustments follow a predefined method.
6. Penalties for late payments are specified.
7. Both parties agree on payment terms and conditions.
8. Payment disputes are resolved through a defined process.

7. Insurance and Indemnity
Statement
1. Each party’s insurance obligations are outlined.
2. Indemnity clauses cover potential service failures.
3. Risk-sharing mechanisms are included.
4. Insurance providers are mutually agreed upon.
5. Liability limits are clearly stated.
6. The SLA specifies the scope of insurance coverage.
7. Any changes to insurance terms are communicated.
8. Insurance compliance is regularly verified.

8. Termination and Renewal
Statement
1. Conditions for contract termination are defined.
2. The SLA includes notice periods for termination.
3. Renewal procedures are formalized.
4. Early exit clauses are fair and enforceable.
5. Performance reviews are tied to renewal decisions.
6. Transitioning services upon termination is specified.
7. Both parties agree on contract renewal terms.
8. Termination conditions are reviewed periodically.

9. Dispute Resolution
Statement
1. A dispute resolution mechanism is included.
2. Mediation and arbitration options are available.
3. Dispute handling timelines are defined.
4. Resolution at the lowest level is encouraged.
5. Past disputes are documented and analyzed.
6. Escalation procedures for unresolved disputes are specified.
7. Both parties agree on the impartiality of the process.
8. Lessons learned are used to improve future agreements.

10. Confidentiality and Compliance
Statement
1. Data protection clauses meet international standards.
2. Confidentiality obligations are reciprocal.
3. Consequences of breaches are outlined.
4. Compliance with national/regional laws is ensured.
5. Periodic compliance audits are mandated.
6. Procedures for handling data breaches are specified.
7. Both parties are trained on confidentiality requirements.
8. Compliance reports are reviewed regularly.

11. SLA Effectiveness
Statement
1. SLAs have improved overall service delivery at borderland ports.
2. SLAs promote greater transparency and accountability in operations.
3. The implementation of SLAs has strengthened interagency coordination.
4. SLA-based governance has contributed to reduced dwell time and operational delays.
5. Overall, SLAs are effective tools for improving borderland port governance and performance.