

Assessing operational readiness for animal health inspection across Ghana's designated points of entry

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Abstract

Introduction:

Animal movements across international boundaries are common and have been identified as a major means of spreading transboundary zoonotic animal diseases, especially in sub-Saharan Africa (SSA). Effective animal health inspection at points of entry (POEs) requires adequate infrastructure, equipment, and operational readiness. However, existing evidence on the operational readiness of POEs to support animal health inspection in SSA is limited. We evaluated the readiness of animal health inspection systems for all designated POEs in Ghana.

Methods

We conducted a cross-sectional survey between November and December 2025 in 13 designated Points of Entry (POEs), including two composite POEs serving multiple entry modalities. We collected data using a structured checklist, partly adapted from the International Health Regulations (2005) Core Capacity Assessment Tools for Points of Entry and informed by the WOAHA Terrestrial Animal Health Code requirements. The study tool included domains on administrative and regulatory compliance, facility and infrastructure, quarantine and inspection procedures, sampling and laboratory testing capacity, and human resources/equipment. We scored each as follows: Yes = 1, No = 0, and partial/limited = 0.5. A POE was classified as having sufficient readiness if it achieved $\geq 80\%$ of the maximum possible score within a domain or overall.

Results

We assessed all 13 designated POEs in Ghana; median readiness was 41% (IQR: 18–71), and, critically, only 1 (8%) border met the $\geq 80\%$ overall readiness threshold. Standard operating procedures (SOPs) and holding areas were absent in all 13 POEs, and facility and infrastructure readiness recorded the lowest scores across all the assessed domains (range: 0–59). Quarantine facilities were present on only one POE, while sampling and laboratory capacity fell below 40% at most POEs. Stratified by POE type, readiness at the two dedicated seaports (POE 2 and POE 3) was 72% and 77%, and at the airport (71%), compared to land borders, which had a median readiness of 36% (IQR: 18–59%). The highest individual overall readiness score (80%) was recorded at a land border POE.

Conclusion

Operational readiness for animal health inspection at POEs is constrained by gaps in infrastructure, quarantine, and diagnostic capacity rather than a lack of policy intent or trained personnel. The complete absence of SOPs across all 13 designated POEs represents an urgent actionable priority. Addressing

these deficiencies requires SOP development and dissemination, tiered infrastructure investment guided by animal movement data, and strengthened laboratory referral systems, integrated within a One Health and risk-based surveillance framework to improve countries' resilience to transboundary animal diseases and support safer regional trade.

INTRODUCTION

Livestock movements across international borders are a major driver of the transboundary spread of zoonotic and animal diseases in low- and middle-income countries (LMICs) and sub-Saharan Africa (SSA), largely driven by informal and formal trade [1]. In such settings, formal and informal cross-border movements of livestock such as cattle, goats, pigs, and sheep often occur without systematic verification of disease status or inspection [2, 3]. Livestock movements are common at major points of entry, where livestock such as poultry, cattle, and goats are moved to medium markets without systematic verification of disease status or inspection results. This unrestricted movement increases the risk of spreading transboundary and zoonotic animal diseases, raising public health concerns and creating economic implications for the country [4, 5]. The effectiveness of veterinary inspections at points of entry (POEs), such as airports, seaports, and land borders, depends not only on the existence of legislation and policies but also on the provision of the necessary infrastructure and equipment, and the readiness of the personnel at the points of entry [6]. Despite this, operational readiness of POEs for animal health inspection remains inadequately documented across SSA, raising concerns about how well countries can respond to disease risks associated with cross-border trade and limiting evidence-based planning and investment.

Although border inspection systems are recognized as integral to preventing the spread of transboundary animal diseases (TADs) and zoonotic diseases, most published research in SSA has focused on disease surveillance in farms and markets, rather than on inspection systems at POEs. Studies at designated points of entry for public health purposes in Cameroon, Uganda, and Benin have highlighted areas of need in terms of infrastructure, trained personnel, and emergency preparedness for both human and animal health surveillance [7–9]. Additionally, the broader One Health discipline has highlighted the importance of having structured tools for assessing border health systems, particularly in areas where human and animal health risk factors intersect [10, 11]. Network-based approaches to livestock movement data have similarly demonstrated value in identifying high-risk corridors and informing targeted surveillance strategies [12], reinforcing the strategic importance of ready and functional POE inspection systems. Nonetheless, little research has examined the application of such tools in veterinary inspection facilities at animal entry points, especially in SSA. At the international level, the World Organization for Animal Health (WOAH) Terrestrial Animal Health Code provides the primary framework for official controls, import/export certification, and biosecurity measures at animal border posts. Under this framework, member countries are expected to maintain competent veterinary authorities at designated points of entry, enforce import risk analysis, and apply sanitary measures commensurate with disease risk. The absence of empirical data makes it difficult to formulate policies

and to plan strategically, since national veterinary authorities may not have a clear picture of the strengths and weaknesses of inspection systems at points of entry in the country.

Ghana represents an important case for SSA. The country sits within high-volume West African livestock trade corridors, with diverse POE types, including airports, seaports and multiple land borders, handling significant cross-border livestock movements [1, 3]. The Veterinary Services Department (VSD) of Ghana has a statutory mandate to regulate animal movements and ensure animal safety in trade. As a member of WOAH, the country is subject to these international standards for border veterinary inspection. However, the extent to which Ghana's designated POEs meet WOAH requirements has not been systematically assessed. This study aimed to provide the first comprehensive national assessment of operational readiness across all designated animal POEs in Ghana, generating evidence comparable across SSA.

MATERIALS AND METHODS

Study design

This was a cross-sectional survey. We collected data using a structured Animal Health Inspection Checklist, which was partly adapted from the IHR (2005) Points of Entry Core Capacity Assessment Tools [13] and informed by WOAH Terrestrial Animal Health Code Chap. 4.3 (Veterinary Legislation) and Chap. 4.4 (Veterinary Authority) requirements for border inspection posts. While IHR tools were designed for human health events, their structural domains (administrative compliance, infrastructure, procedures, laboratory capacity, and human resources) are directly relevant to animal health border assessment. Both systems share the same underlying logic of screening and documenting movement across a border checkpoint to detect and contain disease risk before entry. We therefore modified or added items to reflect veterinary-specific requirements, including ante-mortem examination, issuance of movement permits, verification of vaccination certificates, and zoonotic disease risk assessment. We used the checklist to assess the infrastructure, equipment, and operational readiness for animal health inspections conducted at the designated points of entry in Ghana. Specifically, this study assessed the availability of necessary tools and equipment and the preparedness of inspection teams to implement effective controls in line with national mandates and international standards.

Study area

The study was conducted across the three types of designated animal health points of entry in Ghana, i.e., airports, seaports, and land borders, through which animals enter or leave the country. According to the VSD administrative records, Ghana has 13 designated points of entry with active veterinary inspection mandates, all of which were included in this assessment, constituting a complete national census. The 13 POEs cover all operational types and represent diverse geographic contexts, including coastal, inland, northern, and southern borders, and they play a central role in international trade and

regional livestock movements within the ECOWAS sub-region. To ensure institutional confidentiality, POE names were de-identified to POE 1–13 at the request of the VSD, with no impact on the completeness or validity of the findings. Informal and undesignated crossing points, which may carry significant volumes of unregulated animal movement, were outside the scope of this assessment. The geographic distribution of the 13 assessed POEs is shown in the map (Fig. 1).

Data collection tool

The study assessment. These domains included administrative and regulatory compliance, facility and infrastructure availability, quarantine and inspection procedures, sampling and laboratory testing, and human resources and equipment. The number of items in each domain varied: administrative and regulatory compliance had 5 items, facility and infrastructure availability had 11 items, quarantine and inspection procedures had 13 items, sampling and laboratory testing had 6 items, and human resources and equipment had 10 items. Partial scores were awarded when field observations or document review revealed incomplete implementation, for example, when PPE was available for some but not all inspectors, when refrigeration existed but lacked freezing capacity, or when inspections occurred only on certain days. team. The assessment team made scoring decisions collectively to ensure consistency across sites. To adapt the IHR tool for animal health purposes, the team removed items specific to human passenger screening and traveler health declarations and added items relevant to veterinary inspection, including domains for quarantine and holding facilities, ante-mortem examination, verification of vaccination certificates, and issuance of animal movement permits. Three veterinary experts from the Veterinary Services Department (VSD), the Kwame Nkrumah University of Science and Technology (KNUST), and IDI reviewed the adapted checklist against WOAHA Chap. 4.3–4.4 requirements for content validity before deployment.

Data collection procedure

Data collection was conducted from November to December 2025. Before fieldwork, all data collectors participated in a one-day standardized training session covering checklist administration, scoring criteria for each item, document review procedures, and protocols for resolving discrepancies. During field visits at each POE, data collectors directly observed veterinary inspection areas, quarantine and holding facilities, available equipment, and process organization. To validate observations, we also reviewed inspection records, permits, and other relevant documents. We spoke with veterinary personnel to understand processes and verify checklist information. Where observations conflicted with documented records or staff reports, we convened a structured team discussion to reach consensus before finalizing the score for that item. Data were collected separately for each point of entry.

Data analysis

Data were imported into EpiInfo version 7 for cleaning and management. Each checklist item was scored on a three-point scale reflecting observed readiness: fully present (Yes = 1), partially present (0.5, where capacity existed but was limited in scope, staffing, frequency, or functionality), or absent (No = 0). Items not applicable to a given POE were excluded from its denominator to avoid underestimating performance. When staff reports and direct observation differed, the assessment team reached consensus through structured discussion before finalizing the score.

We calculated domain scores by summing item scores within each domain, dividing by the number of applicable items, and expressing the result as a percentage. We calculated overall readiness per POE as the simple mean of the five domain scores. We applied equal weighting because each domain represents a conceptually distinct and operationally necessary pillar of inspection readiness; a POE deficient in any single domain cannot be considered operationally ready, regardless of performance in others. A domain or POE was classified as having sufficient operational readiness at $\geq 80\%$, consistent with thresholds applied in comparable sub-Saharan African facility assessments [9, 14]. While these benchmarks were developed in human health settings, no validated animal health-specific threshold exists for POE readiness; we therefore adopted the 80% cut-off pragmatically, and future studies should develop veterinary-specific standards.

To identify systemic gaps and strengths beyond domain-level aggregates, we calculated item-level compliance frequencies for all 45 checklist items across the 13 POEs. We stratified them by POE type (airport, seaport, land border).

For each item, we computed the proportion of POEs achieving full or partial compliance. We calculated Wilson score 95% confidence intervals for all items and report them in full in Supplementary Table 1; because this assessment is a national census rather than a sample, we present them for transparency and interpret them as indicative ranges rather than formal inferential estimates. We ranked items by compliance proportion to produce a priority gap analysis, with particular attention to items with 0% compliance (universal gaps) and those with $\geq 90\%$ compliance (system-wide strengths).

RESULTS

Summary of POEs in Ghana

This study covered all 13 designated animal health Points of Entry in Ghana. Of these, 11 POEs were single-type facilities, while two were composite POEs serving multiple entry modalities at a single location. POE 3 functioned as both a seaport and a land border, while POE 7 combined airport, seaport, and land border functions (Table 1).

Table 1

Descriptive summary of Ghana's designated Points of Entry assessed for operational readiness

POE Type	Number Assessed	POE Identifiers
Airport	1	POE 1, POE 7†
Seaport	3	POE 2, POE 3*, POE 7†
Land Border	11	POE 3*, POE 4 – POE 13
Total	13	POE 1 – POE 13
Note: †POE 7 is a composite airport, seaport, and land border. *POE 3 is a composite seaport and land border. Row totals by type exceed 13 because composite POEs are counted under each applicable type; the total number of assessed sites remains 13.		

Overall operational readiness across points of entry in Ghana

Overall readiness varied considerably across the 13 POEs, ranging from 11% at the lowest-performing land border to 80% at the best-performing land border. Airport (POE 7) recorded 71% overall readiness, while the 2 seaport POEs recorded scores of 72% and 77%. The 11 land borders showed the widest variation, ranging from 11% to 80%; the majority of these scored considerably lower than the airport and seaports, with a median readiness of 36% (IQR:18–59%). However, POE 12 was a notable outlier with a readiness score of 80% among all POEs (Fig. 2).

Assessment of domain-specific readiness scores across points of entry

A summary analysis of operational readiness across five domains showed diverse levels among POEs. When POEs were ordered by overall readiness, at POE 12, the airport and seaport functions, as well as POE 12, had higher scores. These sites recorded moderate to sufficient readiness across administrative compliance, quarantine and inspection procedures, and human resources, sampling, and laboratory domains. In contrast, most land border POEs recorded absent–limited readiness across multiple domains, particularly infrastructure and laboratory capacity, with most land border sites falling below 50% in both domains. Quarantine and inspection procedures and human resources showed variable performance across land borders, with some sites recording moderate to sufficient readiness. Airports and seaports were more frequently represented in the moderate-to-sufficient readiness categories, while most land border POEs clustered in the minimal-to-limited readiness category across most domains (Fig. 3).

Item-level compliance frequencies and priority gaps

To identify specific systemic gaps and strengths beyond domain-level aggregates, we calculated item-level compliance frequencies for all 45 checklist items across the 13 POEs and stratified them by POE

type. Table 2 presents items recording critical gaps (0% compliance), major gaps ($\leq 10\%$), and system-wide strengths ($\geq 90\%$). The full stratified frequency table with proportions and confidence intervals for all 45 items is presented in supplementary Table 1.

Four items recorded 0% compliance across all 13 POEs, representing universal system-wide failures. These were availability of standard operating procedures (SOPs), holding areas for animals, storage for feed and bedding, and adequate overall facility readiness. Six additional items recorded $\leq 25\%$ compliance: presence of a quarantine area (1/13, 8%), availability of an isolation area (1/13, 8%), availability of rapid diagnostic test kits (1/13, 8%), waste disposal systems (3/13, 23%), sample materials (3/13, 23%), and review of logs before release (3/12, 25%). Waste disposal systems and sample materials were each present at only 3 (23%) of the 13 POEs.

In contrast, four items recorded $\geq 90\%$ compliance across all POEs: issuance of movement permits (13/13, 100%), visual inspection of animals, document verification, and availability of trained inspectors (12/13, 92%).

Stratified by POE type, airports and seaports consistently outperformed land borders across nearly all items. At land borders specifically, the majority of the infrastructure items recorded $\leq 20\%$ compliance. Critically, SOPs were absent at all POE types, including airports and seaports (Table 2).

Table 2
Analysis of gaps and strengths among Ghana's Designated animal Points of Entry, 2025

Domain*	Item	Number assessed	Number compliant	% **
MAJOR GAPS: 0% compliance				
Administrative & Regulatory	SOPs available	13	0	0
Facility & Infrastructure	Holding areas	13	0	0
Facility & Infrastructure	Adequate facility capacity	13	0	0
Facility & Infrastructure	Storage for feed/bedding	13	0	0
MAJOR GAPS: ≤25% compliance				
Facility & Infrastructure	Quarantine area	13	1	8
Facility & Infrastructure	Isolation area	13	1	8
Sampling & Laboratory	Rapid test kits available	13	1	8
Facility & Infrastructure	Waste disposal	13	3	23
Sampling & Laboratory	Sample materials available	13	3	23
Quarantine & Inspection	Logs reviewed before release	12	3	25
STRENGTHS: ≥75% Compliance				
Administrative & Regulatory	Competent authority exists	13	10	77
Quarantine & Inspection	Ante-mortem exam	13	11	85
Human Resources & Equipment	Trained inspectors	13	12	92
Administrative & Regulatory	Documents verified	13	12	92
Quarantine & Inspection	Visual inspection	13	12	92
UNIVERSAL COMPLIANCE: 100%				
Quarantine & Inspection	Movement permits issued	13	13	100

Domain*	Item	Number assessed	Number compliant	% **
MAJOR GAPS: 0% compliance				
*These items were present at every assessed POE.				
**95% Wilson score confidence intervals for all items are presented in Supplementary Table 1. Given the small sample size ($n = 13$), CIs are wide and should be interpreted with caution				

DISCUSSION

This national census of all 13 designated animal health POEs in Ghana revealed that procedural compliance was relatively preserved. At the same time, physical infrastructure and diagnostic capacity were critically deficient across all POE types. Only 1 of 13 POEs (8%) met the $\geq 80\%$ readiness threshold, and the most revealing finding was not the overall low scores but the nature of the gap: trained inspectors were broadly available, yet they operated without SOPs, quarantine facilities, sampling equipment, or cold-chain capacity. Our assessment points to systemic resource and infrastructure deficits rather than a human capacity failure.

These findings directly implicate Ghana's compliance with IHR (2005) core capacity requirements for POEs [13] and WOAHS Terrestrial Animal Health Code standards for border inspection posts. The complete absence of SOPs across all 13 POEs, including airports and seaports, is particularly concerning because SOPs are the operational backbone of IHR-compliant inspection systems; without them, inspection quality rests entirely on individual officer knowledge, producing the inconsistency these frameworks exist to prevent. The near-total absence of quarantine, isolation, and sampling infrastructure means that even where administrative compliance is in place, most sites lack the capacity to act on a suspected disease incursion.

This pattern mirrors findings from human health POE assessments in similar settings. For example, Cameroon's national PoE assessment found core IHR capacity scores ranging from 28% to 42% across the five evaluated sites, with none reaching even half of required capacity. Uganda's national assessment revealed even starker animal-specific gaps, with only 8% of POEs having any capacity to assess transported animals for priority transboundary diseases, and just 2% able to quarantine or isolate animals [7, 8]. These suggest that the animal health blind spot identified in this analysis is regional rather than Ghana-specific and reflect a regional weakness in which administrative gains outpace physical capacity [7, 8, 15]. Stronger administrative compliance at airports and seaports is consistent with governance improvements following the Ebola and COVID-19 outbreaks and with preparedness efforts across the ECOWAS region [16], though this study did not assess a causal link. Nonetheless, these administrative gains do not necessarily translate into operational readiness when infrastructural deficits persist.

Quarantine and holding areas were absent at all but one POE, isolation facilities at all but one, and sample materials available at only 3 of 13, conditions that make early detection and containment of TAD incursions operationally impossible even where trained staff are present[6]. Ghana's position within high-volume West African livestock trade corridors [1] sharpens this risk. Animal movement data document substantial disparities in volumes across crossings, with high-volume sites handling millions of movements annually and informal cross-border trade adding unmonitored biosecurity exposure [3]. The West Africa region has seen repeated outbreaks of Foot-and-Mouth Disease, Highly Pathogenic Avian Influenza, and anthrax at border communities where inspection deficits contributed to spread as documented elsewhere [4, 5, 15]. Climate-induced shifts in pastoralist corridors are channeling growing livestock volumes through sites not built for continuous inspection [17], and the scale-free topology of regional trade networks means a single infected animal at a high-volume crossing could seed disease rapidly across the wider network [12, 18].

Sampling and laboratory (diagnostic) capacity gaps were the most severe of all domains, with rapid test kits and sample material largely absent in most POEs, and totally absent in other POEs, echoing a situation no different from Cameroon and Uganda [7, 8]. Even where animals are flagged on visual inspection, no on-site mechanism exists to confirm or rule out disease, making this domain a precondition for any functional risk-based surveillance system in Ghana. This renders the risk-based surveillance approach demonstrated in Uganda [18] operationally out of reach under current conditions.

Trained inspectors were the most consistently present resource, confirming that the binding constraint is infrastructure and equipment rather than personnel [7, 8, 19]. Veterinary officers are working without the facilities, tools, and procedural guidance their mandate requires, a resource gap, not a training gap. Closing it will require equipping frontline staff and engaging traders, pastoralist communities, and market operators as active participants in surveillance and compliance [10]. Whether this resource gap is compounded by inconsistent understanding of inspection roles and responsibilities in the continued absence of SOPs was not directly measured here and warrants targeted assessment in future evaluations.

SOP development and dissemination are the most immediately actionable interventions. This demands institutional commitment rather than capital and is directly replicable across ECOWAS member states [19]. Beyond SOPs, mandate a minimum operational standard at every designated POE: basic PPE, cold-chain-capable sample collection capacity, and a documented referral pathway to the nearest diagnostic laboratory. Risk-tiered investment above this floor, guided by animal movement data, can then target high-volume corridors where the consequences of inspection failure are greatest. [18], as Uganda's experience targeting high-connectivity livestock movement nodes demonstrates [12, 18]. At the continental level, achieving IHR [13] and WOAHA compliance at animal POEs requires three commitments. First, the formal integration of animal health POE readiness into National Action Plans for Health Security[13, 15]. Second, ECOWAS and the African Union should set minimum infrastructure standards for animal POEs, analogous to existing IHR human health benchmarks [15, 19]. Finally, investment should be linked to time-bound targets and independent verification [6]. Without these, the gap between

policy intent and operational capacity documented here and across comparable settings [7–9] will likely persist.

A One Health approach is essential but structurally absent. Animals, people, and pathogens cross borders together [2, 16]. Our field observations suggested limited coordinated information-sharing between veterinary and human health authorities was absent at the land POEs assessed, an aspect the structured checklist did not capture, and a gap no amount of sector-specific investment can fully close [10, 11]. Rift Valley Fever, FMD, anthrax, and HPAI all carry zoonotic potential [4, 5], making animal POEs critical nodes for integrated surveillance. Future readiness assessments should embed One Health coordination mechanisms such as shared alert systems, joint risk assessment, cross-sectoral notification, as measurable indicators alongside infrastructure and procedural domains [10, 11, 19].

LIMITATIONS

This assessment covered all 13 designated animal health POEs, constituting a national census; informal and undesignated crossings, which may carry substantial volumes of unregulated livestock, were outside the scope. The cross-sectional design cannot account for seasonal variation during peak transhumance, when staffing and inspection volumes at land borders may differ substantially. The checklist was adapted from IHR [13] and WOAHA frameworks but not formally validated against WOAHA border inspection post standards, and inter-rater reliability was not formally quantified using a statistical measure such as Cohen's kappa. Discrepancies were resolved through structured team discussion, which may introduce subjectivity into scoring; future studies should formally calculate inter-rater reliability statistics to strengthen methodological rigor. As data collectors were present during assessments, observed practices may not fully reflect routine operations (a potential Hawthorne effect). The checklist also captured the existence of capacity and SOPs rather than the consistency of actual inspection performance during real animal movements. The 80% sufficiency threshold was adopted from human health literature [9, 14] and lacks animal health-specific validation. The absence of contemporaneous animal movement data at individual POEs limits direct linkage between readiness scores and disease risk, and future assessments should integrate movement permit data with readiness evaluations, drawing on approaches demonstrated in Uganda [12, 18].

CONCLUSION

This study demonstrates that operational readiness for animal health inspection at designated POEs can be critically constrained by resource and infrastructure deficits rather than a lack of policy intent or trained personnel. Evidence from Ghana's designated POEs reveals that while administrative compliance was comparatively established, physical infrastructure, quarantine capacity, laboratory support, and equipment were critically inadequate across most sites, and SOPs were absent even at airports and seaports. Given that comparable deficits have been documented at human health POEs across the region, this structural mismatch is unlikely to be Ghana-specific. Addressing it requires SOP development, risk-tiered infrastructure investment, and strengthened national laboratory systems,

alongside IHR- and WOAH-aligned minimum standards for animal POEs at the ECOWAS and African Union level, delivered within a One Health framework that explicitly integrates veterinary and human health border functions.

Declarations

DATA AVAILABILITY

The data supporting this study's findings are available from the Ghana Veterinary Services Department. Requests for data should be emailed to emmanuel.allegye-cudjoe@mofa.gov.gh

COMPETING INTERESTS

The authors declare no competing interests.

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ETHICAL APPROVAL

This assessment was classified as a public health program evaluation and therefore determined non-research. No patient-level, individual-level, or personally identifiable data were collected or analyzed. All data collected and documents reviewed were derived from publicly available national reports in Ghana. Palladium and the Ghana Veterinary Services Department provided administrative clearance under existing TDDAP2 consortium agreements.

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AUTHOR CONTRIBUTIONS

HK: Conceptualization, Methodology, Writing (original draft), formal analysis. AW: Supervision, Writing (review & Editing). VN, SY, CD & BE: Data Collection, Data Curation. MN: Data Collection, Formal Analysis. RK, BA & OD: Writing (review & editing). DB: Formal Analysis, Writing (review & editing). FK, JN, EOA, and SI: Conceptualization, Funding Acquisition, Supervision. BE, EAC, EFD, EE, BKS, FDS: Conceptualization, Writing (review & editing, Supervision, Validation. All authors reviewed the final manuscript.

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Figures

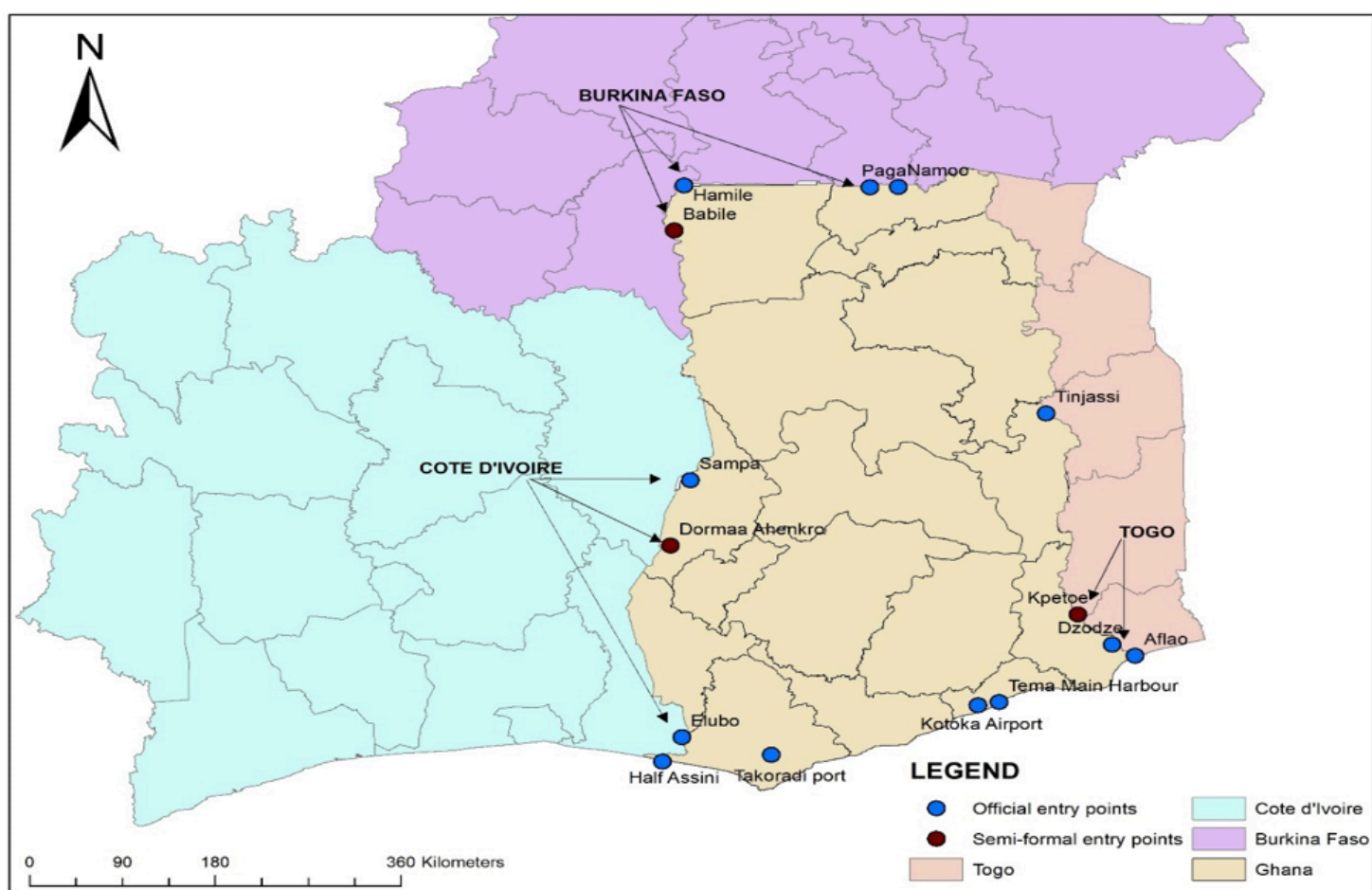


Figure 1

A map showing the points of entry in Ghana.

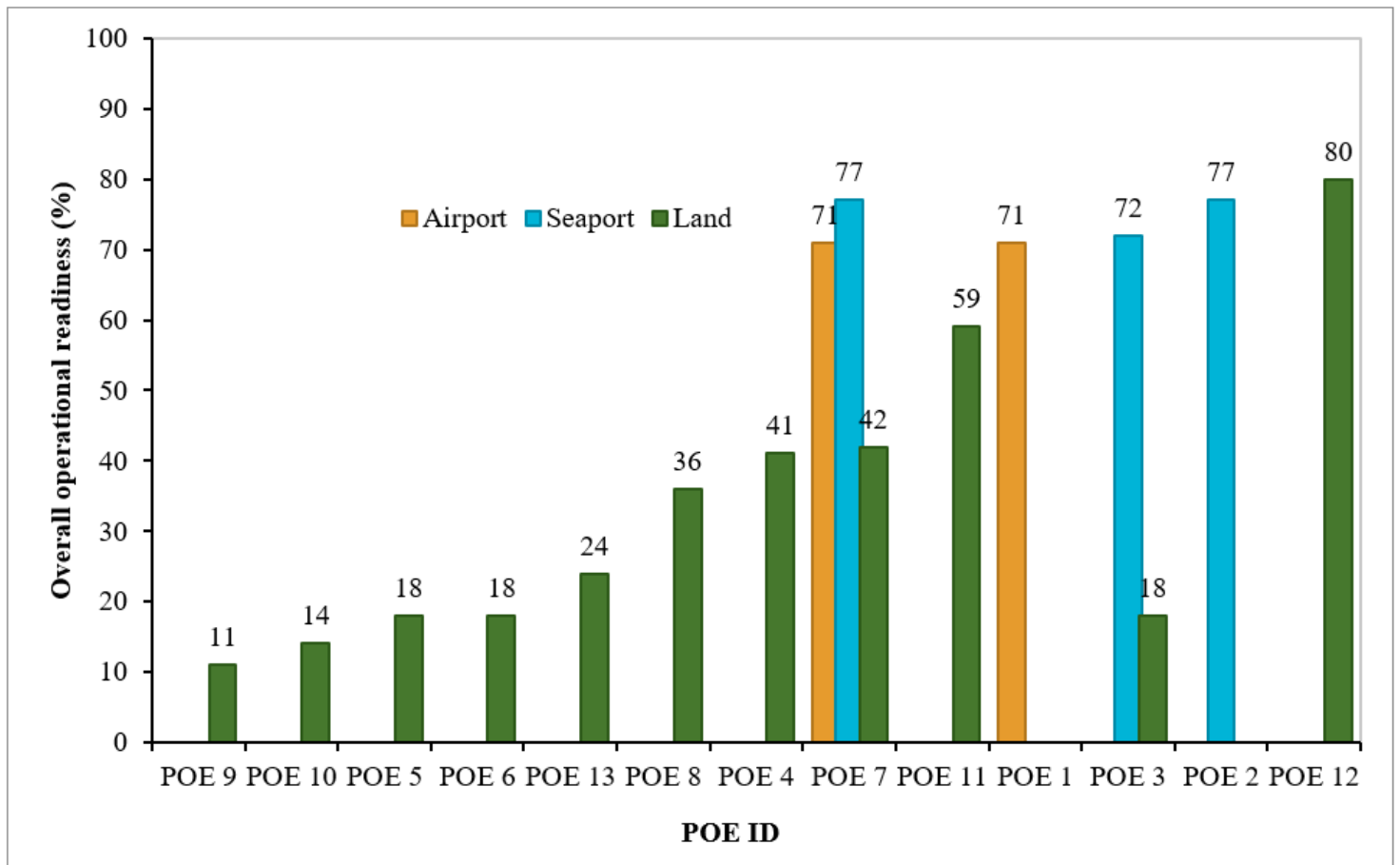


Figure 2

Overall operational readiness among Ghana's Ports of Entry, 2025. POEs 3 and 7 are composite ports having different POE types

POE ID	POE Type	Admin & Regulatory	Facility & Infrastructure	Quarantine & Inspection	Sampling & Laboratory	Human Resources	Overall
POE 12	L	80	36	100	83	100	80
POE 2	S	80	59	77	83	85	77
POE 3	S+L	80	45	100	67	70	72
POE 1	A	80	41	85	75	75	71
POE 11	L	60	18	69	67	80	59
POE 7	A+L+S	60	18	42	42	65	45
POE 4	L	60	36	46	33	30	41
POE 8	L	60	5	46	17	50	36
POE 13	L	40	9	62	0	10	24
POE 5	L	40	0	31	0	20	18
POE 6	L	40	0	31	0	20	18
POE 10	L	40	0	23	0	5	14
POE 9	L	40	9	8	0	0	11
Legend		≥ 80%	60–79%	30–59%	1–29%	0%	
		Sufficient	Moderate	Limited	Minimal	Absent	

Figure 3

Domain-specific readiness within different POEs in Ghana, 2025. Poe Type: L=Land, S= Seaport, A=Airport.