Preparation for the 9th session of the UNCTAD Intergovernmental Group of Experts on Financing for Development/Session 2:

Leveraging digitalization to improve transport corridor efficiency in Africa: Challenges and Opportunities

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Fourth Development Plan (DP4): 2022-2026

Digitalizing and Decarbonizing the Transport Sector in Africa

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1. Why Improving Transport Corridor Efficiency Matters
2. Corridor Performance Monitoring Systems (CPMSs)
3. Status of Digitalization and policy environment in African Ports
4. Key Lessons and Recommendations

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Global transport costs have declined but not in low-income countries

-**Global transport costs have declined** by 33-39 percent and 48-62 percent, by weight and value respectively, between mid-1960s and mid-2010s *(Ganapati and Wong, 2023)*

But not in poorer countries:

-For example, it is over 50 % more expensive to export to the United States from a low-income country than from a high-income country, even when controlling for the distance, weight and types of goods being transported.

- In some African and Eastern European countries, the costs of moving goods within the countries are between 3 to 14 times as large as in the United States *(Atkin and Donaldson, 2015; Diaz de Astarloa and Pkhikidze, 2024).*

-**The higher costs faced by low-income countries are not just on the international leg but also in the domestic leg of the journey**.

Source: Shrinking Economic Distance, World Bank, 2025

On average, within-country transport costs to export and import in high-income countries are half those in low-income countries

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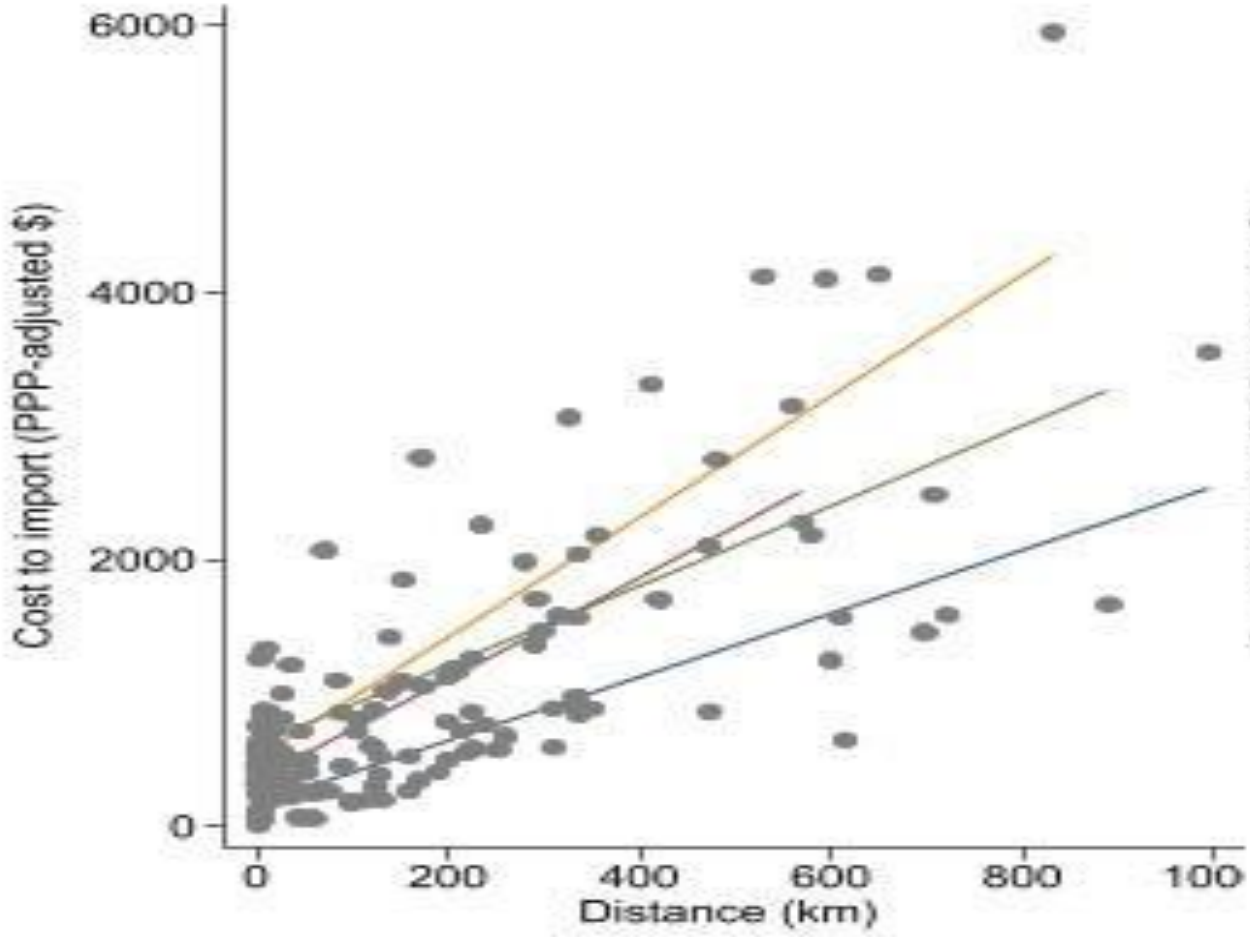

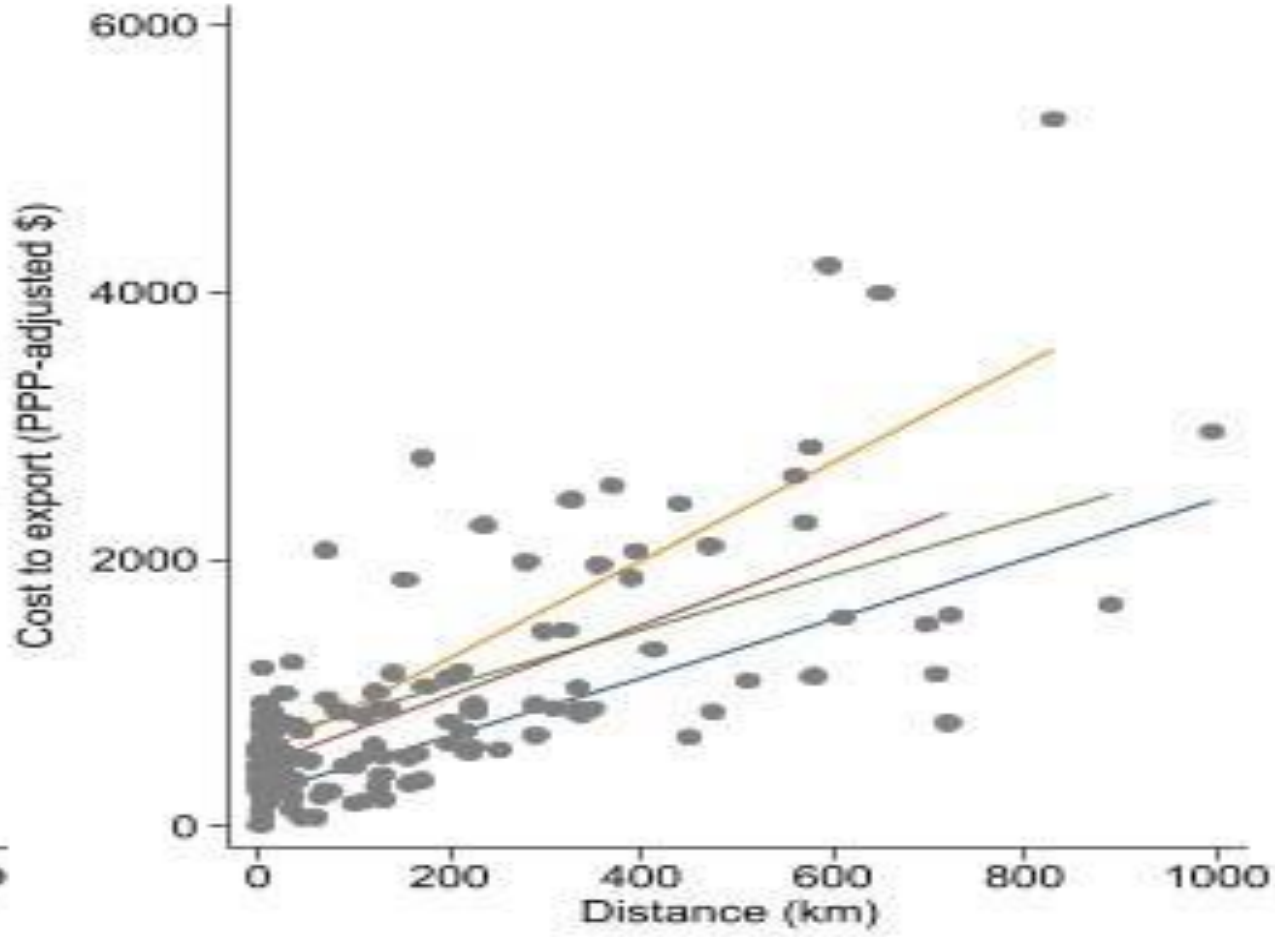

High income
Lower-middle income
Country observations
Upper-middle income
Low income

It takes significantly longer to move goods within low-income countries

-**Domestic times to export goods remain disproportionally high** compared to the distance travelled and are higher in developing countries, with a significant share of the time within the exporting country **spent at the port**.

- Not just travel to the main port and border crossing but **overall intercity travel tends to be persistently slower** in low-income countries (Next figure).

A country at the top decile of intercity road speed is about twice as fast as a country at the bottom decile (Nepal): Most African countries are lagging behind

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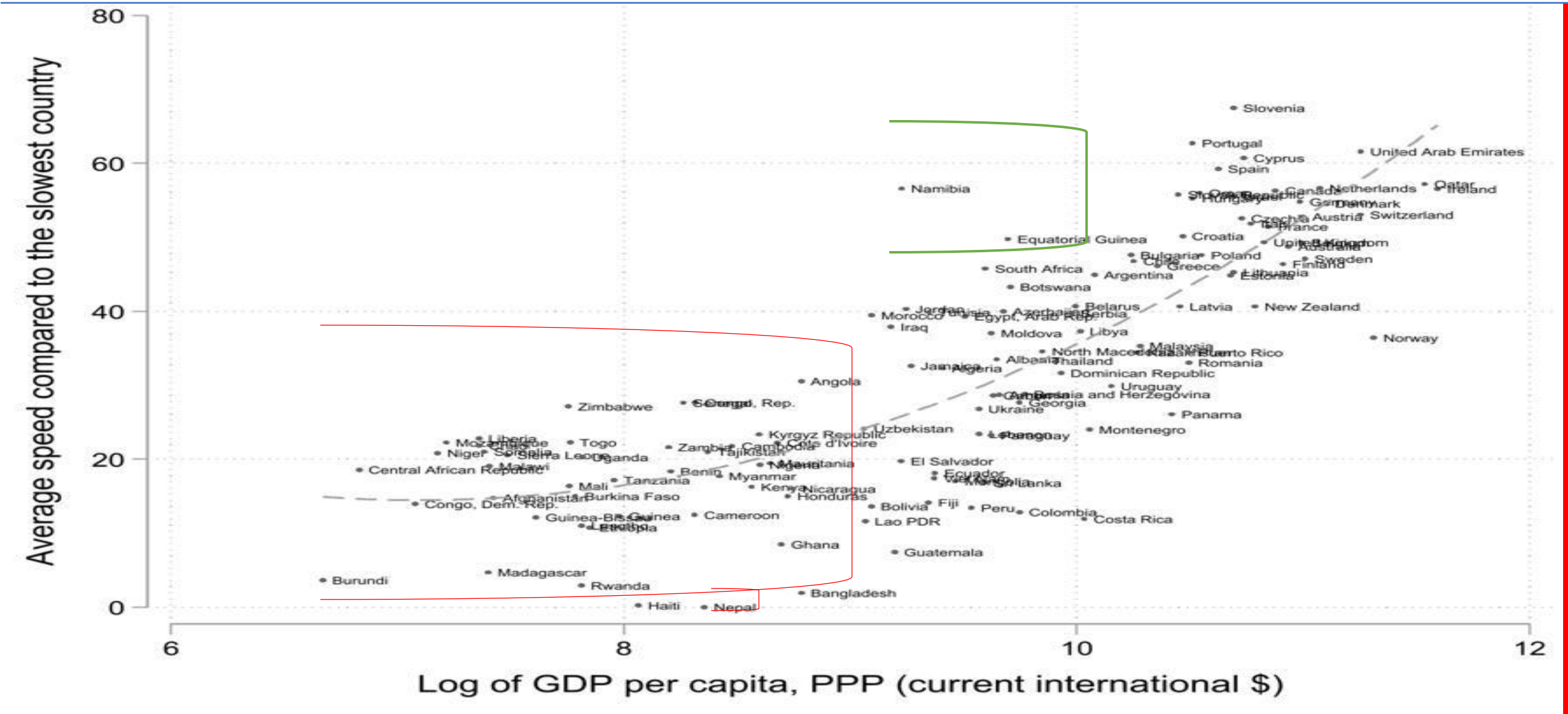
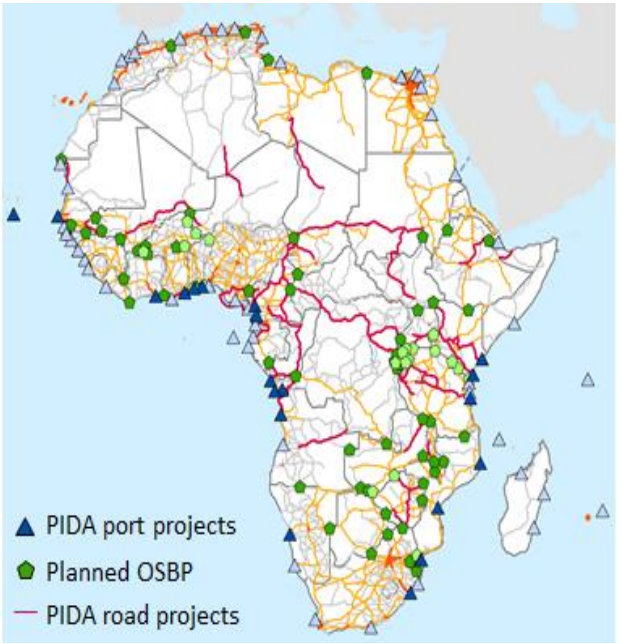
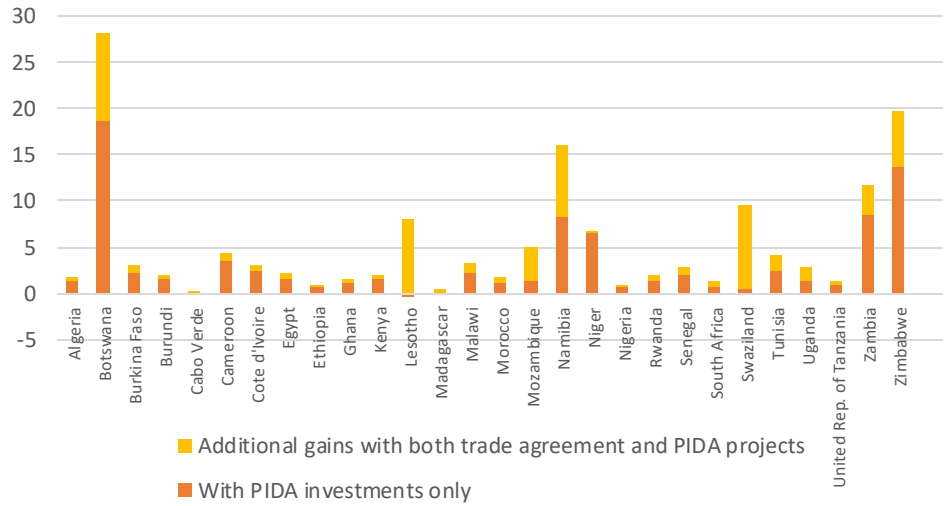


Soft policy reforms amplify development impact of hard infrastructure investments

- **Research question**: What are gains from implementing deeper trade agreements and large infrastructure investments in Africa?
- **Results**:
  - An agreement eliminating both tariff and non-tariff barriers would increase African countries' exports by an average of **2.7% and their GDP by 0.5%.**
  - Complementing this trade integration process with improved roads, land borders, and ports as planned in the future infrastructure improvements included in the Program for Infrastructure Development in Africa (PIDA) would increase exports by **12.2% and GDP by 2.2%.**
- **Policy implications**: Infrastructure improvements and trade agreements will be essential to reap the full benefits of the African Continental Free Trade Area, AfCFTA.



Simulated GDP growth (in percent)



DP4 Thematic Area 1 - Regional Connectivity and Economic Integration

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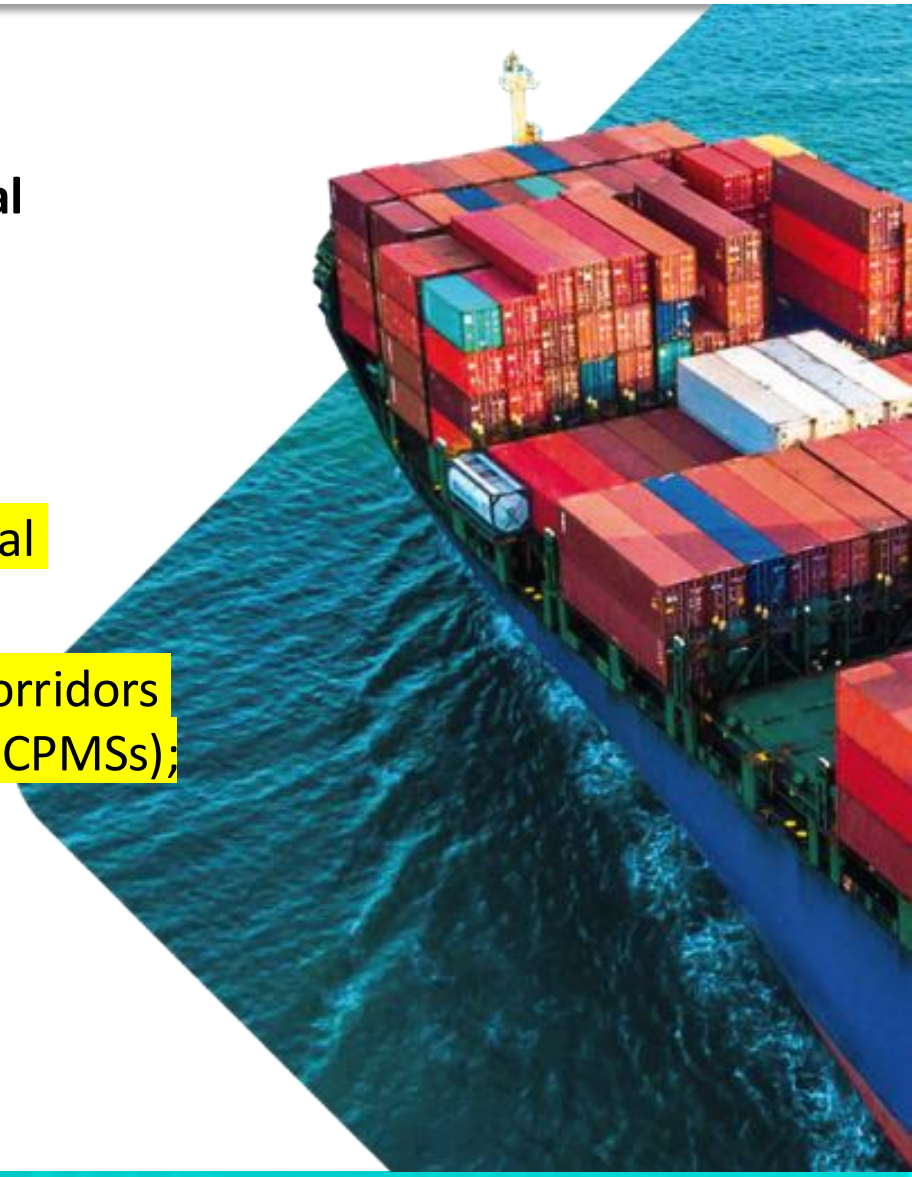
Objective

Facilitate the development of a more efficient and connected continental transport network to enhance Africa's economic activity and trade competitiveness

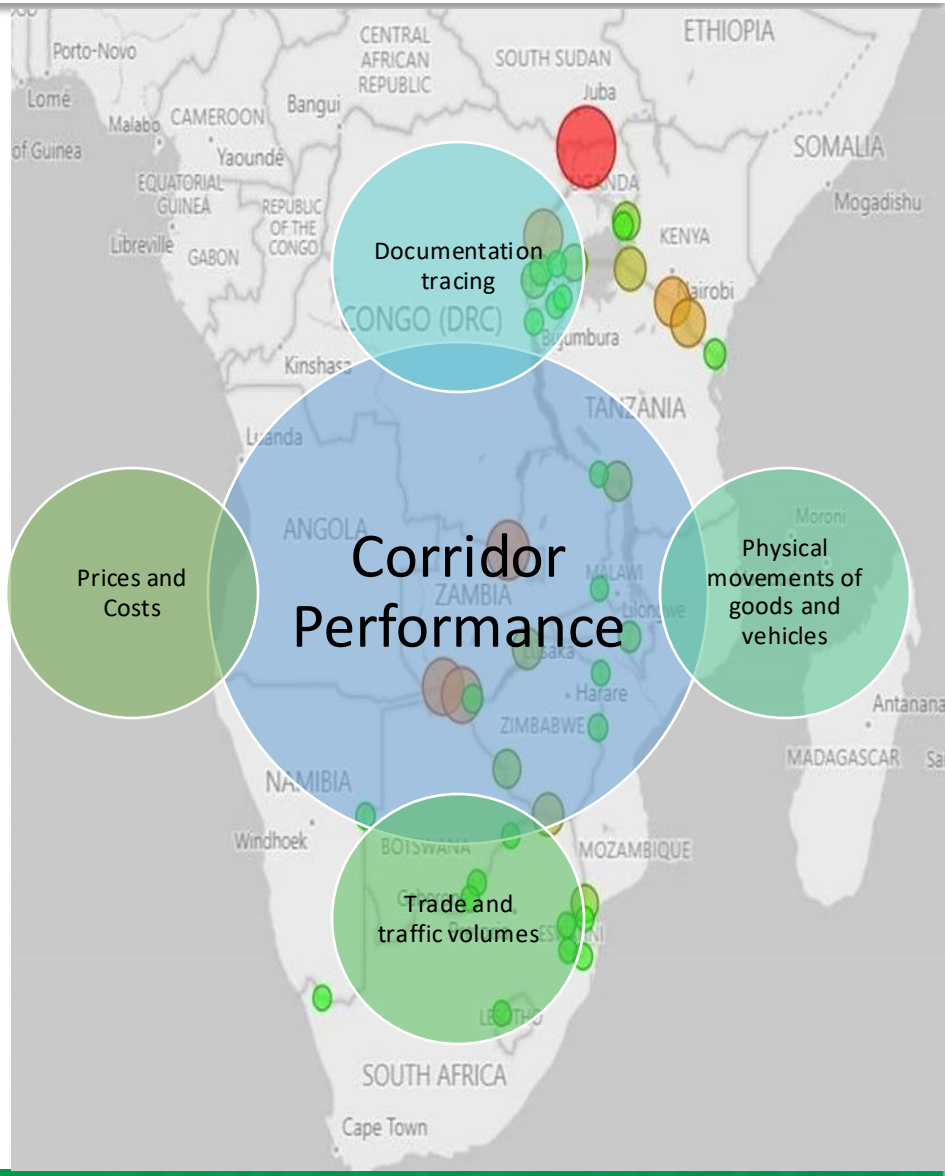
- Support the development of Regional/Sub-regional transport corridors strategies;
- Support to transport corridor management institutions using digital solutions;
  - 1- Guidance/Tools to assess and monitor regional transport corridors performance (i.e. Corridor Performance Monitoring Systems, CPMSs);
  - 2- Port and Logistic Platforms Digitalization;



Leveraging digital solutions: 1-Corridor Performance Monitoring Systems

2-TOWARDS A DATA DRIVEN UNDERSTANDING OF TRADE AND TRANSPORT CORRIDORS:

- An assessment of the potential of the existing transport corridor monitoring systems to foster policy dialogue and to strengthen corridors management institutions in Africa
- makes a comparative analysis of three corridor performance monitoring systems
  - (a) the corridor transport observatories (**CTOs**), (b) the Tripartite Transport and Transit Facilitation Programme's Corridor Trip Monitoring System (**CTMS**), and (c) the Logistics Monitoring System (**LMS**).
- and the extent and challenges of their use



Corridor Transport Observatoires (CCTO and NCTO)

- **The Central Corridor Transport Observatory (CCTO)** was established in 2013 and is housed within the Central Corridor Transit and Transport Facilitation Agency (CCTTFA)- with support from TradeMark Africa and donors. **The Northern Corridor Transport Observatory (NCTO)** is housed by NCTTCA was established in 2011 with initial funding from SSATP and later from TradeMark East Africa.

-**CTOs are built on a set of indicators:** volume of transactions, transit times, cost of services and transport, efficiency and productivity, and emissions.

-**CTOs are able to retrospectively pinpoint congestion**, bottlenecks, and barriers to trade, with analysis of performance data enabling the implementation of improvements to general operations, infrastructure, and processes

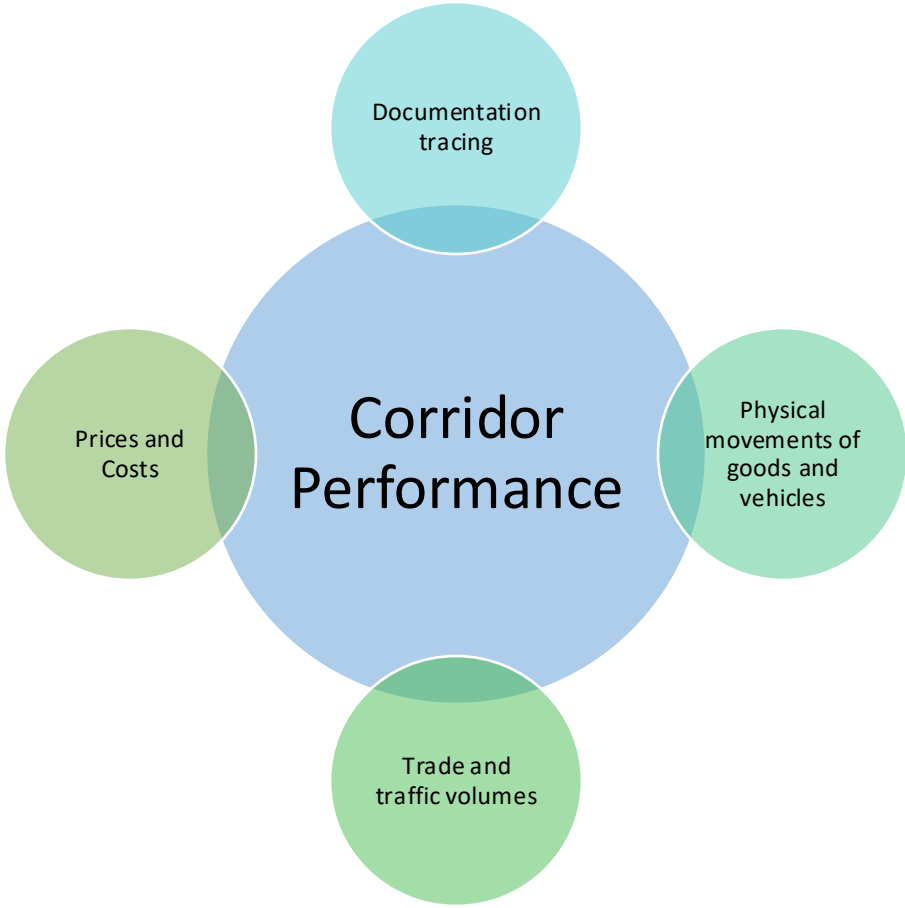
-CTOs have also been instrumental in **informing policy and regulatory changes along the corridors** and making improvements in efficiencies within the ports of Dar es Salaam and Mombasa

-**Trade and transport–related nontariff barriers have been reduced** by the ability of the CTOs to provide insight into the various barriers. -The CCTTFA reported improved resolution of issues facing traders on the corridor and over 14 documents/reports published since 2018

CTOs: Areas Requiring Strengthening

Stakeholders have highlighted five areas where the CTOs need strengthening:

1. Efficient and timely publication of data
2. Broader engagement with stakeholders and greater awareness and accessibility of the data analysis
3. Options for tailoring analytics to suite sector or audience-specific needs
4. Linking the identification of problem points to implementation of solutions
5. Real-time or near-real-time monitoring of road traffic



Corridor Trip Monitoring System, CTMS

- CTMS was developed by the Tripartite Transport and Transit Facilitation Programme (TTTFP) during COVID-19 to limit the disruption to trade and to ensure the health and safety of cross-border travelers. CTMS is hosted by Namibia and managed by SADC

-The management-level web application is also used to monitor routes used by vehicles and enables alerts should deviations occur – **CTMS is well aligned with the TTTFP objective to reduce corridor transport cost** and provides a basis to **SMART corridors implementation.**

CTMS allows the digitalization of the road transport logistics supply chain:

- The Trip Registration Certificate is made available digitally on the driver's smart phone;
- Allows scanning of QR code of electronic travel and cargo documentation scanned by handheld devices at border posts
- Uploads location tracking data, which supports consignment information and vehicle tracking

-CTMS integrates customs management systems and law enforcement for contactless inspection and release of vehicles

-Information exchange should assist in addressing bottlenecks at border posts that contribute to high transport costs

Implementation of the CTMS

-Deployment of the CTMS at the border posts and ports of the countries used for the pilot—Botswana, Namibia, Zambia, and Zimbabwe—and for the rollout in Malawi and Mozambique is funded by the German Development Cooperation through GIZ.

-Early indications are that data will only be made available to CMIs historically, in which case the dire need for real-time and near-real-time information may prove to be a challenge.

-However, as the implementation of the CTMS is in its initial stages, and the countries within which the **CTMS has been piloted do not all have operational CMIs,** it is still too early to determine the value, impact, and availability of the CTMS data for CMIs.

-Sustainability: EU funded the development of the CTMS, a viable, self-sustaining institutional model for the management and governance of the CTMS was to be decided by May 2023. A public-private partnership is being considered for the joint management and operation of the CTMS, as are other options

Logistics Monitoring System, LMS

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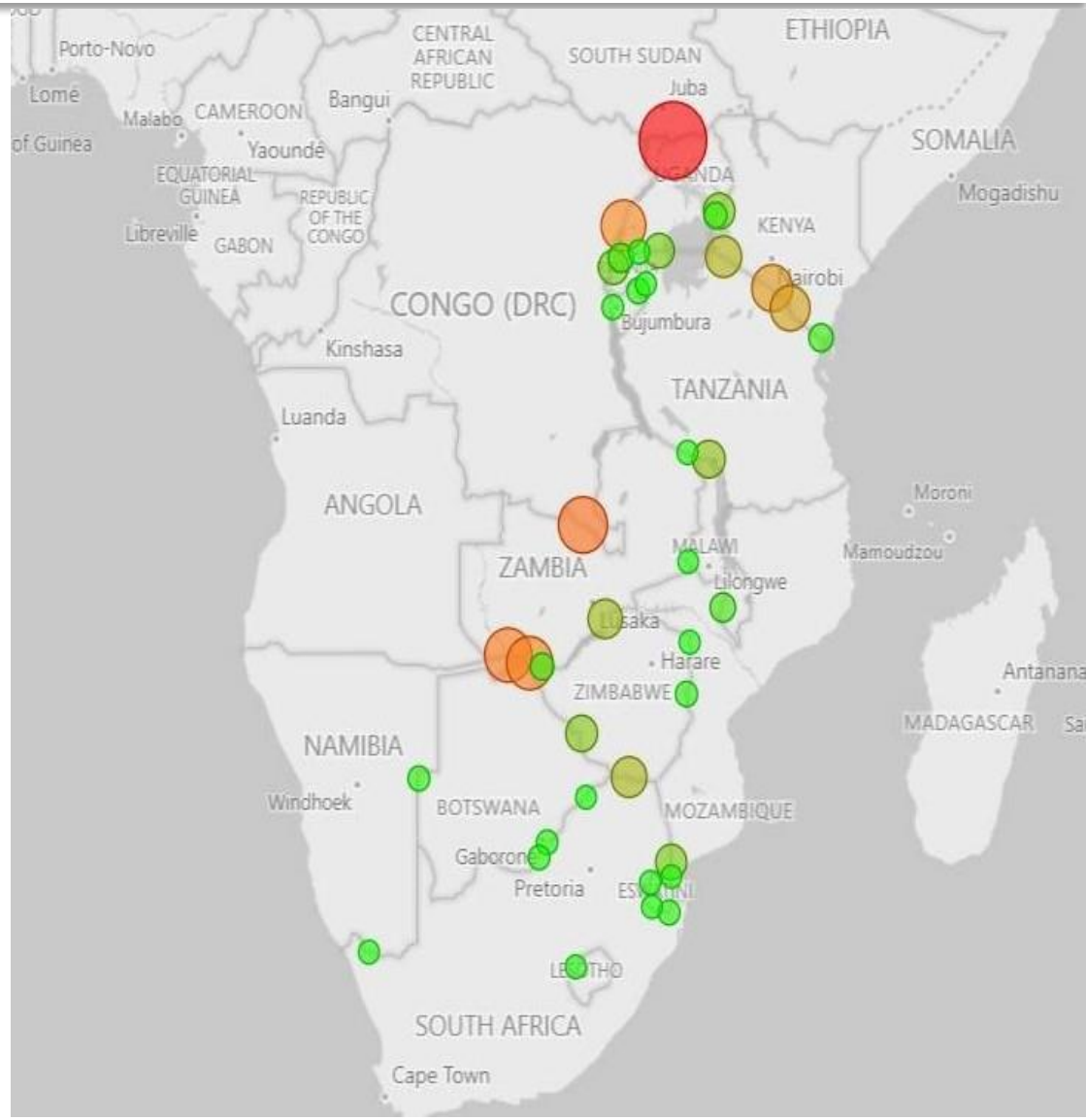
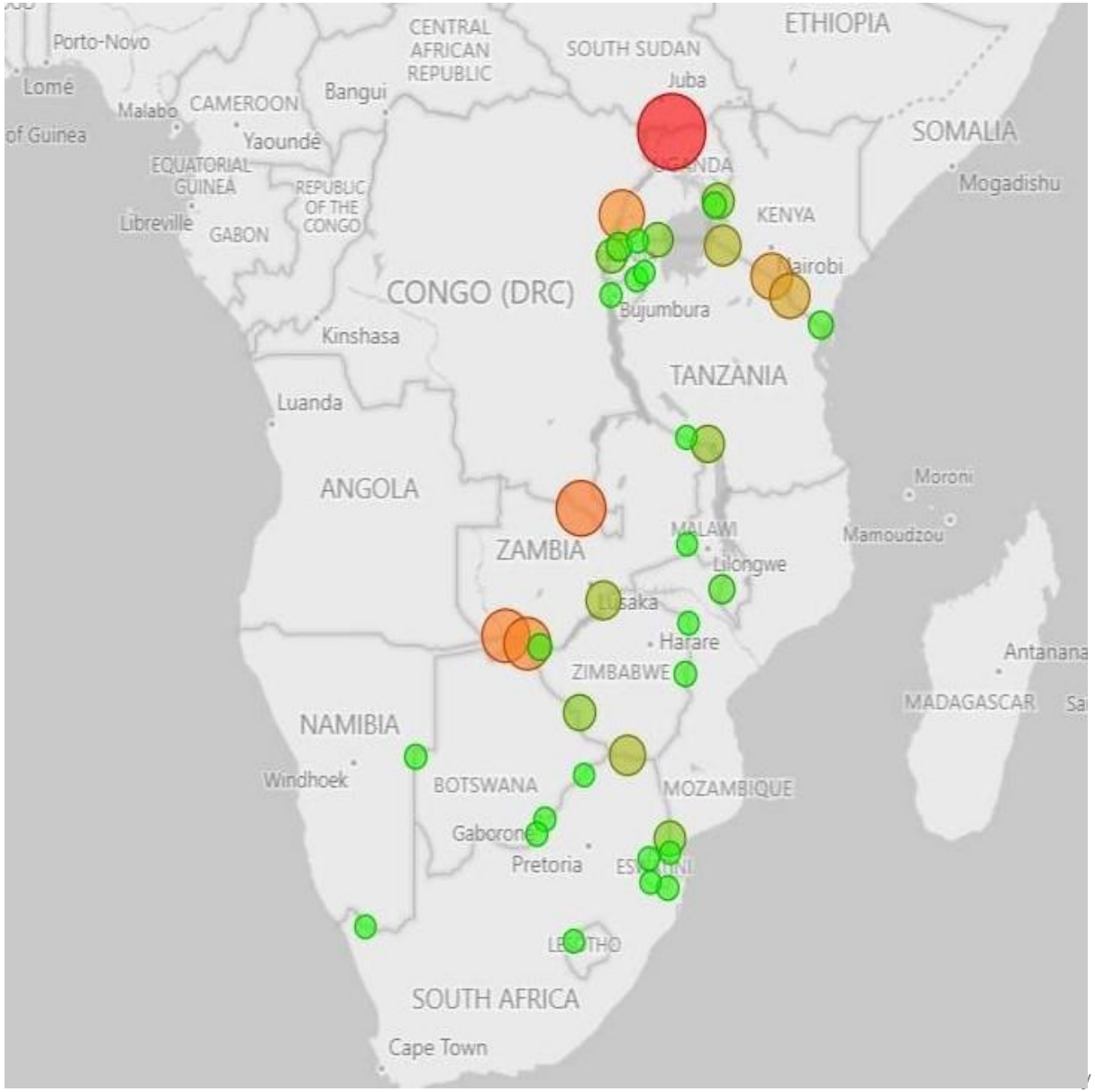
- **LMS is a custom-developed reporting platform** commissioned by the USAID, SSATP and the World Bank, that extracts and transforms large datasets of commercial vehicle GPS data into consistent, reliable and significant corridor performance insights monthly- with Crickmay as technical solution provider

- **LMS relies on positioning data** from a truck fleet close to 100,000 units deployed on routes spanning from South Africa to South Sudan, covering 20 countries and 42 borders and routes on all majors Eastern and Southern Africa corridors.



Using the LMS data: what it can do …

- Two primary targets:
  - **Border crossing** as choke points on the corridors
  - **Trip time along main corridors** (extended to wider cover through OD reporting)
  - Trip time monitoring **extended inside ports**
- Multiple descriptors for the performance measurement:
  - Median, percentiles (top 5, bottom 5)
  - Frequency distributions
  - Arrival patterns for choke points
  - Speed and idle time on corridor legs



Monitoring corridor competitiveness: Evolving itineraries between 2019 and 2020

- Case 1: Mombasa Kampala
  - In 2019, Busia was the preferred border post for over 40% of the trips, due to shorter trip time, 3.85 days compared to 4.6 through Malaba
  - In 2020, both borders saw increase in crossing time, but overall traffic decreased, making the Malaba route the fastest one, and 80% of the trucks are using it
- Case 2: Durban to Lusaka
  - In 2019, the direct route through Beitbridge was congested, with long trip times, close to 11 days. Trucking companies often preferred the indirect route through Botswana, longer but faster, with a median of 9 days
  - In 2020, with less traffic on the roads, the Beitbridge route takes now a median of 7 days and the Botswana route is no longer used
- Case 3: Harare
  - The two main accesses to the sea for Harare are Durban and Beira. The traffic on the Durban route dropped by 60% while the Beira route increased by 145%

Route	Trips Apr 2019	Trips Apr 2020	Median trip time Apr 2019	Median trip time Apr 2020	Traffic change	Trip time change
Durban to Gauteng	12,541	7,038	0.54	0.59	-44%	9%
Durban to Harare via Beitbridge	392	162	5.85	3.88	-59%	-34%
Durban to Lusaka via Beitbridge	86	74	10.58	7.00	-14%	-34%
Durban to Lusaka via Botswana and Vic Falls	100		9.22		-100%	-100%
Harare to Beira via Mutare	531	1,382	1.15	1.34	160%	16%
Harare to Durban via Beitbridge	527	178	3.37	4.04	-66%	20%
Mombasa to Kampala via Busia	325	114	3.85	5.07	-65%	32%
Mombasa to Kampala via Malaba	437	423	4.61	4.89	-3%	6%
Mombasa to Nairobi	4,972	3,086	0.93	1.00	-38%	7%
Beira to Harare via Mutare	642	1,573	2.38	2.12	145%	-11%

Dashboard LMS May 2021: Border crossing time (hour) monitoring

North South Corridor	Going North	Going South	Crossings
Beitbridge	37.15	17.33	2,291
Chirundu	28.05	18.54	3,135
Kasumbalesa	33.07	44.88	1,957
East Africa Corridors	From Coast	To Coast	Crossings
Busia	7.40	1.62	3,365
Malaba	18.58	2.14	2,963
Nakonde / Tunduma	4.92	9.52	790
Mozambique	From Mozambique	Into Mozambique	Crossings
Forbes / Machipanda	24.70	5.50	2,103
Lebombo / Ressano Garcia	4.65	14.88	7,886
Other South Africa Borders	From SA	Into SA	Crossings
Lavumisa	2.17	1.42	1,926
Martins Drift / Groblersburg	9.88	1.08	834
Maseru / Ladybrand	8.92	1.17	590
Oshoek / Ngwenya	2.28	1.13	976
Tlokweng / Kopfontein	5.27	0.65	1,068

Comparative Analysis of CPMSs

Aspect	CTOs (2010)	CTMS (2019)	LMS (2020)
Purpose & Origin	Established for corridor performance monitoring; policy dialogue	Developed by TTTFP during COVID-19 for trade continuity	Custom-developed for **GPS-based** corridor insights
Hosting Entity	CCTTFA & NCTTCA; donor-supported	Hosted by Namibia; managed by SADC	Technical provider: Crickmay; covers 20 countries
Data & Indicators	Volume, transit times, costs, emissions	Trip registration, QR codes, customs integration	GPS data from ~100,000 trucks; trip times, border delays
Coverage	Central & Northern Corridors	Piloted in 6 countries	Eastern & Southern Africa; major corridors
Strengths	Policy influence; bottleneck identification	Digitalization; real-time alerts	High real time data volume; versatile analytics
Challenges	Needs real-time data; broader engagement	Early stage; sustainability unclear	High cost; technical capacity required
Sustainability	Donor-supported; needs institutional strengthening	EU-funded; PPP model considered	Donor-supported; technical provider model
Use for CMIs	Supports credibility and financial sustainability	Potential but impact unclear	Immediate actionable insights; top performer

Despite Their Effectiveness, CPMSs Face Challenges in Achieving Full Uptake and Use

- **Accessing corridor-specific data**: lengthy bureaucratic processes, especially for non-public data
- **Capacity constraints**: limited human and financial resources within CMIs for data gathering and analysis
- **Lack of real-time or near-real-time data** availability in some systems (CTOs and CTMS)
- **Limited stakeholder engagement** and awareness of available data and analytics
- **"High cost" of systems and need for monetization strategies** to sustain operations
- **Unclear sustainability models for newer systems like CTMS**; reliance on donor funding
- **Technical solutions exist, but effectiveness depends on strong institutional frameworks and CMIs effectiveness**

CPMSs uptake is more likely in corridors with CMI but only 3 out of 9 SADC corridors have a CMI and none in west and central Africa

Corridor Name	Countries	Port	CMI	CPMS
1-Central Corridor	Tanzania, Zambia, Rwanda, Burundi, Uganda, eastern Dem. Rep. Congo	Dar Es Salaam	Yes	Yes, CTO
2-Northern Corridor	Kenya, Uganda, Rwanda, Burundi, eastern Dem. Rep. Congo, South Sudan	Mombasa	Yes	Yes, CTO
3-Maputo Corridor	Mozambique, Eswatini, South Africa	Maputo	No (Defunct)	LMS piloted in 2017
4-North-South Corridor	South Africa, Botswana, Zambia, Zimbabwe, Dem. Rep. Congo, Malawi, Mozambique	Durban (Maputo secondary)	No	No
4-Walvis Bay Corridor Group (WBCG)	Namibia, Botswana, South Africa	Walvis Bay	Yes	No
5-Trans Kalahari Corridor	South Africa, Botswana, Namibia	Walvis Bay	Yes	No
6-Walvis Bay Ndola Lubumbashi development corridor	Namibia, Zambia, Zimbabwe, southern Dem. Rep. Congo	Walvis Bay	Part of the WBCG	No (LMS pilot?)
7-Dar Es Salaam Corridor	Tanzania, Dem. Repub. Congo, Malawi, Zambia	Dar Es Salaam	No (Defunct)	No
8-Nacala Corridor	Zambia, Malawi, Mozambique	Nacala	No	No
9-Beira Corridor	Mozambique, Zambia, Zimbabwe, Malawi, southern Dem. Rep. Congo	Beira	No	No
10-Lobito Corridor	Angola, Zambia, southern Dem. Rep. Congo	Lobito	Yes	No

Lessons from Corridor Management Institutions: Dar es Salem (2009-2019) and Maputo Corridor Logistics Initiative (2004-2019)

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Building resilient institutions requires early attention to governance ownership, financial sustainability, and alignment of regional and national priorities:

1. **Securing Political Commitment**: Sustained political buy-in from member states is essential, particularly regarding financial contributions and governance ownership.
2. **Alignment of National and Regional Priorities:** Regional institutions must align closely with national priorities to ensure continued relevance and support. National governments may not always prioritise efficiency improvements at the regional level.
3. **Institutional Clarity:** Clearly defined roles and non-duplicative mandates between national and corridor-level institutions can enhance effectiveness and accountability.
4. **Balanced Public–Private Participation:** Effective corridor management requires sustained commitment and active engagement from both public and private sector stakeholders
5. **Financial Sustainability Planning:** Establishing a viable and binding funding mechanism at inception is critical. The assumption that proven performance would automatically attract government funding proved unfounded.

Leveraging digital solutions & Regional Integration: 2-Status of digitalization and policy environment in African ports

- a review of the digitalization status and policy environment in 31 countries and 39 ports across the African continent and
- makes a set of recommendations to help African ports achieve a higher level of digitalization

Scope

- **31 countries / 39 ports**

Country	Port
Angola	Luanda
Cabo Verde	Praia
Cameroon	Douala
	Kribi
Comoros	Moroni
	Mutsamudu
Congo, DR	Matadi
Congo, Republic	Pointe-Noire
Djibouti	Djibouti
Gabon	Libreville
Gambia	Banjul
Ghana	Tema
Guinea	Conakry
Guinea-Bissau	Bissau
Ivory Coast	Abidjan
	San Pedro
Kenya	Mombasa
	Lamu
Liberia	Monrovia
Madagascar	Toamasina

Country	Port
Mauritania	Nouakchott
Mauritius	Port Louis
Mozambique	Maputo
	Nacala
	Beira
Namibia	Walvis Bay
Nigeria	Apapa
Sao Tome et Principe	Sao Tome
Senegal	Dakar
Sierra Leone	Freetown
Somalia	Mogadishu
Somaliland	Berbera
South Africa	Durban
	Cape Town
	Ngqura
Sudan	Port Sudan
Tanzania	Dar es Salaam
Togo	Lome
Tunisia	Rades

Scope and surveys

1. Desktop review of the legal, policy and regulatory framework of the countries and ports in relation to digitalization.

2. A high-level review of the current IT systems and services provided at these ports (via survey and interview), specifically to identify:-

   i. Does the port meet the mandatory FAL convention requirements (current and new);

   ii. Systems used for digital health security;

   iii. Systems used for port call management and port management;

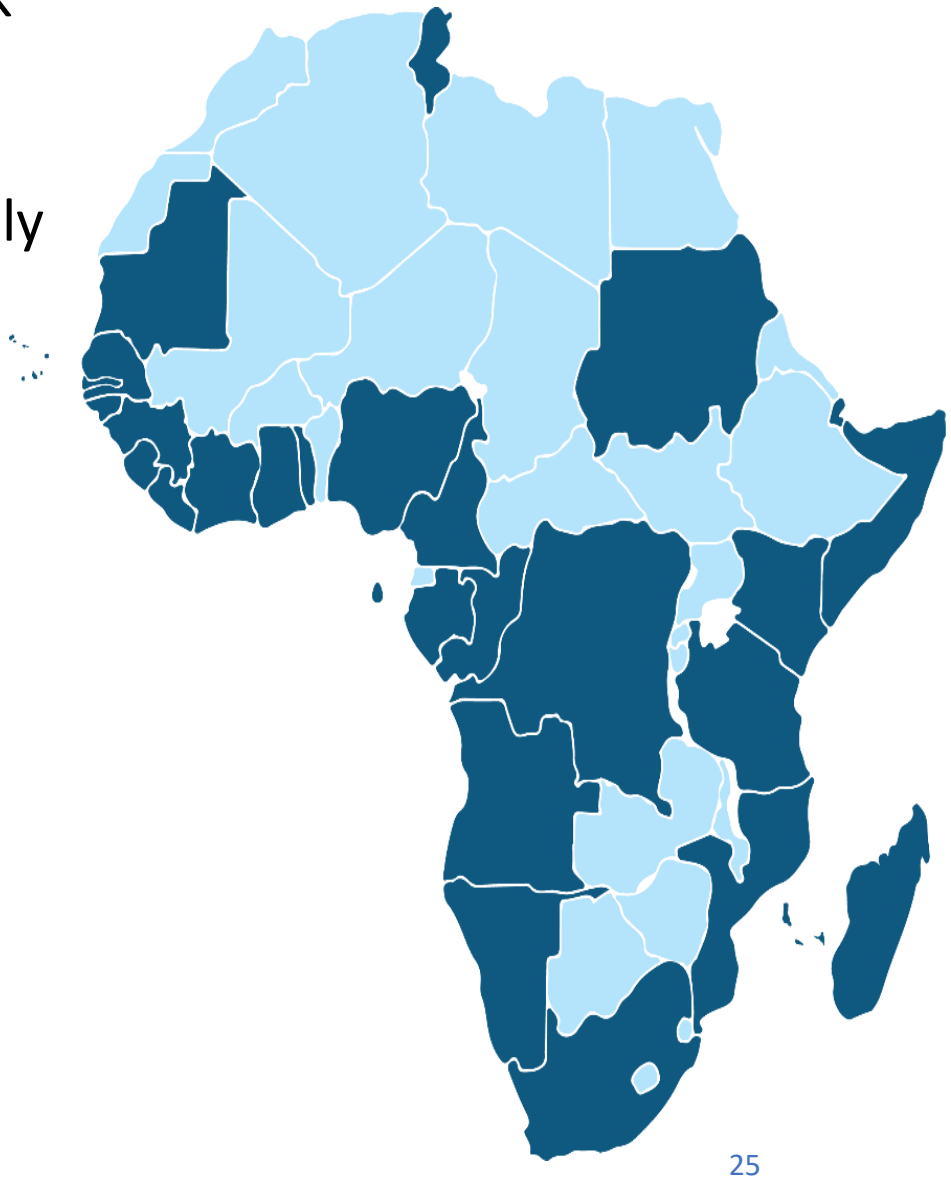
   iv. Systems used for terminal operations;

   v. Systems used to engage with the port community, and any plans/proposals to develop/introduce a Port Community System;

   vi. Systems used by Customs;

   vii. Systems used by Other Governmental Agencies related to international trade and other type of traffic such as cruises; and

   viii. Review of existing cyber-security measures, policies, and systems.



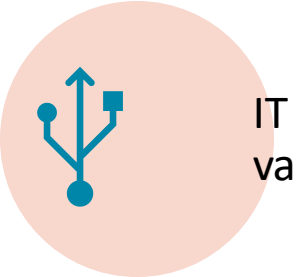
General Observations

Ambition and awareness of the importance of digital tools is strong.

Government policy and investment support for ports is weak and can be improved.

Most ports have essential foundational systems in place, such as a Customs System and Terminal Operations System (TOS).

There is limited appetite for automation, but digitalization is perceived as a means to improve trade and port efficiency.

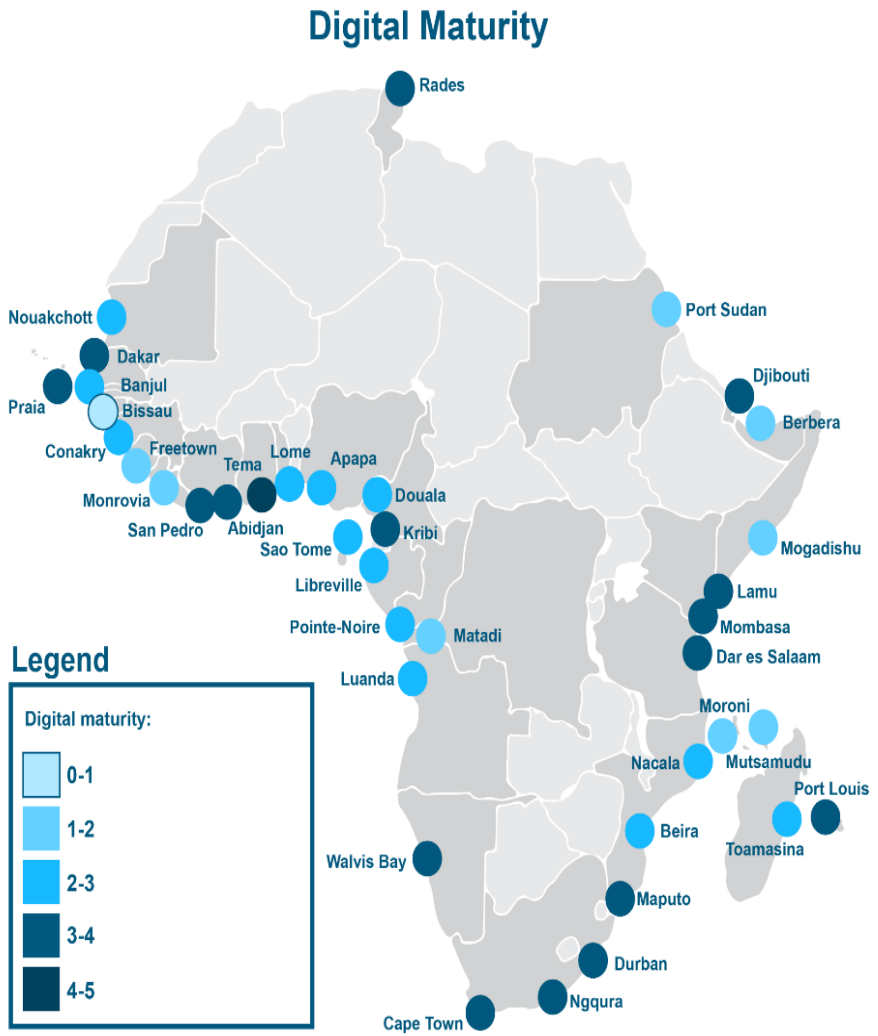


IT infrastructure and resilience is varied but generally weak.

Cyber-security awareness, preparedness and safe data management is generally very weak.

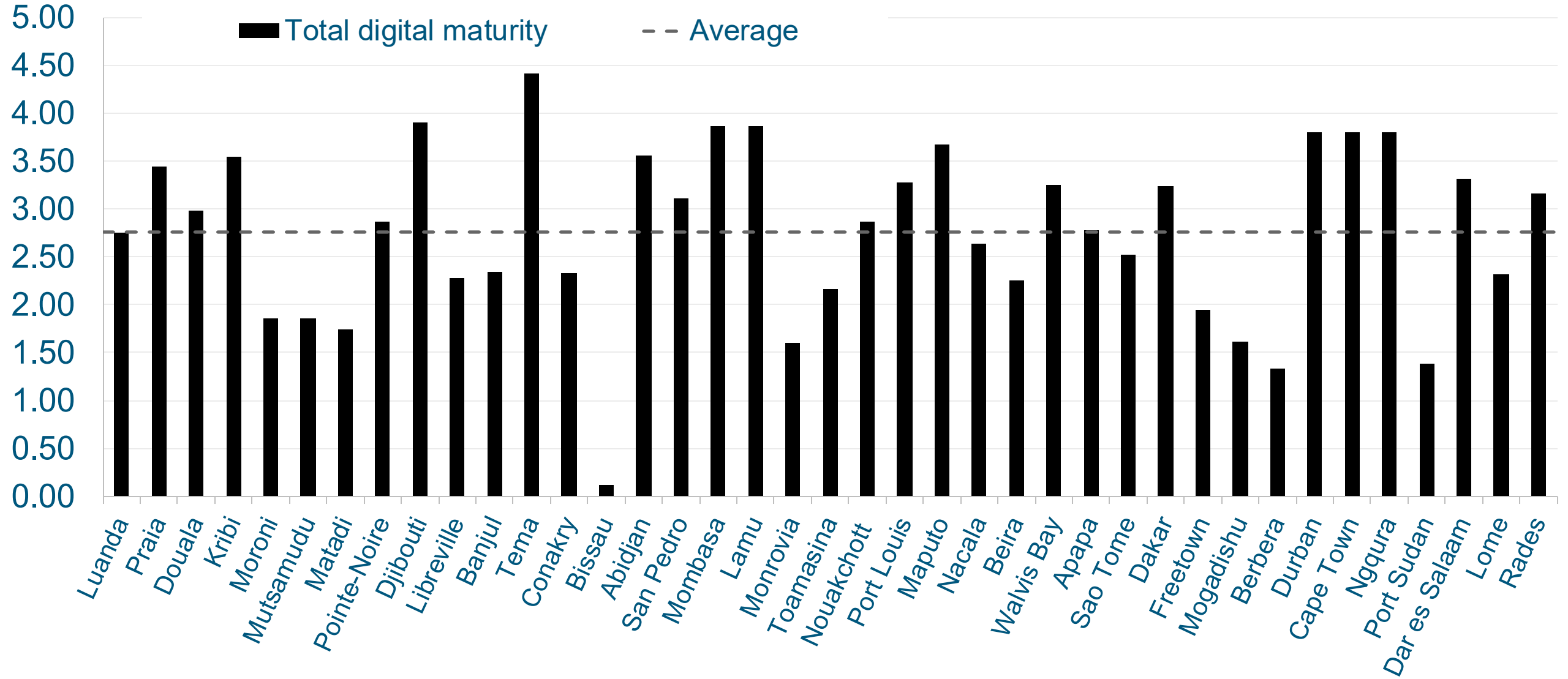
Port and maritime authority digital readiness

- The overall average for all countries surveyed was **2.76/5.0**
- Individual country scores can be seen in the graph on the following page.
- High digital maturity scores were not limited to particular regions, size of port, or economic development in a country.
- Generally, high scores were seen for digital maturity in cargo operations and low levels of maturity or scoring for the digitalization of customs processes and systems.



Port and maritime authority digital readiness

Digital maturity scores for all ports within the study



Digitalization Ambitions Are Not Matched by Implementation of Key Systems (e.g., Maritime Single Window)

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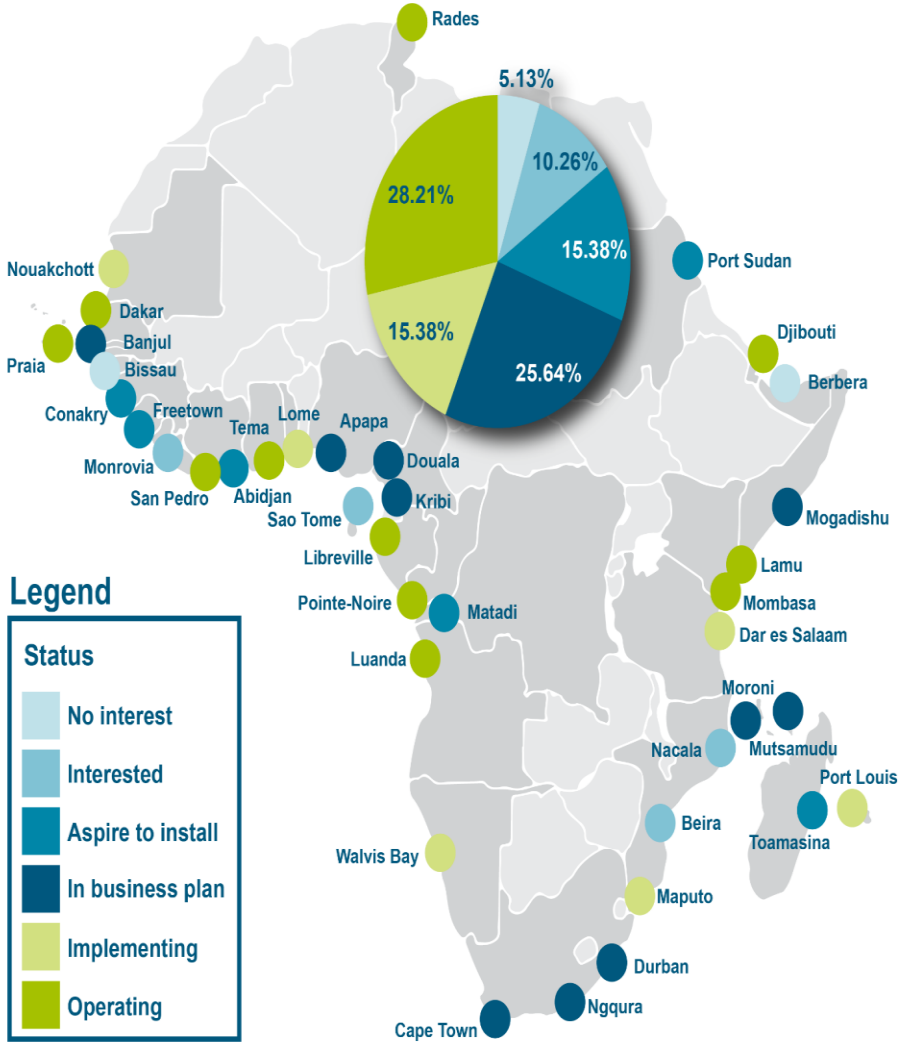
An **MSW** is a digital platform that enables ship operators, agents, and other maritime stakeholders to submit all required information and documents electronically to a single-entry point when a ship arrives at, stays in, or departs from a port. This system streamlines and harmonizes reporting formalities, reducing administrative burdens and improving efficiency for both port authorities and the shipping industry.

Key points:

- **The MSW is mandated by the International Maritime Organization (IMO) under the Facilitation (FAL) Convention.**
- **It replaces multiple, duplicative submissions to various authorities (customs, immigration, health, etc.) with a unified process.**
- **The goal is to enhance trade facilitation, transparency, and port efficiency, supporting digital transformation in the maritime sector.**

Most Ports Were Not Ready or Compliant with IMO FAL Regulations as of January 2024

- **Twenty-eight percent** of all ports in the study already have a “maritime single window”,*
- with another 15 percent actively implementing an MSW.
- **Twenty-six percent** of the ports indicate that they have concrete plans to implement one within the next three years.
- **The remaining 31 percent** of ports have no concrete plans or are not even interested in implementing an MSW.
- It is this last group that requires specific attention, to assist and raise awareness for the need of an MSW.



*Only 13 African countries have a Port Community System (PCS), and just 8 have implemented a Maritime Single Window (MSW) in line with IMO FAL.14(46).

Recommendations

31% of the ports have no plans to implement a Maritime Single Window

Raise awareness on MSW (and FAL) requirements - awareness is currently low.

Focus on ports with low digital maturity - each port has its own specific challenges in order to make sustainable improvements in digitalization.

9 study ports minimally use digital systems and/or platforms to support their port operations

Reliable, fast internet and available data centers are the most important enabler

Increased investment in ICT infrastructure - to drive further digitalization of ports and their supply chains.

Build digital skills - IT skills, and in particular those related to Cybersecurity, are often inadequate.

42% of the ports have no or untrained ICT personnel.

39% of port stakeholders think the government should play a leading role in digitalization

Align ports with their government – to create more effective digitalization policies and financing plans.

Facilitate regional port cooperation - ports that are lagging behind on certain topics can be coupled with other ports that have already advanced in these fields.

72% of the ports consider digitalization very important for the port and the economy