Status of the Corridor Development and Smart Corridor in Africa (Corridor Development 2.0)

September 2022 Data Collection Survey on Corridor Development in Africa



Development Vision in African

"Agenda 2063" by the African Union (AU) is the highest level of the long-term development vision in Africa. In considering a corridor development approach, it is necessary to be consistent with that vision.

Seven Aspirations in Agenda 2063

Aspiration 1	Aspiration 2	Aspiration 3	Aspiration 4	Aspiration 5	Aspiration 6	Aspiration 7
A prosperous Africa based on inclusive growth and sustainable development	An integrated continent, politically united and based on the ideals of PanAfricanism and the vision of Africa's Renaissance	An Africa of good governance, democracy, respect for human rights, justice and the rule of law	A peaceful and secure Africa	An Africa with a strong cultural identity, common heritage, shared values and ethics	An Africa, whose development is people-driven, relying on the potential of African people, especially its women and youth, and caring for children.	Africa as a strong, united, resilient and influential global player and partner.

Source: AU, "Agenda 2063"

Recent Changes in the African Corridors

Change	Opportunity	Issues and Concerns	
Raising Awareness of SDGs	• Raising Awareness of "Sustainability"	 Convergence of sense of purpose and national and regional empowerment 	
International Collaboration	 Demonstration of regional cooperation initiatives centered on AUDA-NEPAD 	 Forming specific formations for individual themes and projects Information sharing and utilization 	
Private Sector Participation • Development of PPP Law and Increased opportunities for Private Investment		 Promoting both grassroots innovation and PPP infrastructure development 	
Spread of ICT	 Environment where even small entities can start their own business Botontial for development of the entire 	• Poor digital infrastructure in rural areas could	
Evolution of Technology	 Potential for development of the entire corridor, including digitalization, sharing of information among concerned parties, contribution to higher efficiency in logistics, provision of high value-added products, and introduction of electronic payments Involvement of a wide range of actors, including entrepreneurs, represented by JICA's Project NINJA 	 lead to further economic disparities with urban areas Needs to tackle the digital divide in both urban and rural areas Creating an environment so that small and medium-sized entrepreneurs can be active 	
COVID-19	 Possibility of increasing momentum for digitalization and automation in the wake of border and port closures Supply Chain Localization Further evolution of E-commerce 	 It is necessary to establish a crisis management system that does not impede the flow of necessary goods 	

External Environmental Changes affecting African Corridor Development (ICT Evolution/Spread)

The rapid adoption of ICT has had a significant impact on corridor development in Africa through e-commerce and finance.



- 1. With the spread of ICT, e-commerce is also making its way into the lives of people in Africa.
- 2. In Africa, mobile devices are the dominant form of ICT in business and life.
- 3. The spread of ICT has also led to the creation of start-ups across Africa with diverse ideas and methods.

Examples of prominent startups in Sub-Saharan Africa

Company	Country	Activities
Zipline Rwanda		Launch a country-wide medical delivery business using autopilot drones. Toyota Tsusho of Japan is one of the investors
Andela	United States	Foster African IT engineers and match them with IT companies around the world
Twiga Foods Kenya		Provide farmer and vendor direct business opportunities through B2B e-commerce platforms.

Investment in renewable energy for decarbonization in Africa is rapidly growing, and it is regarded as an important power source in the future.





Source: IRENA, Electricity Generation in Africa, by energy source 2019

Percentage of Energy Sources in Africa (2019)

Changes in the Amount of Investment Related to Renewable Energy in Africa

Corridor in Africa

- In Africa, RECs, donor countries, and others have created a number of corridors for achieving interregion development.
- Main purposes of corridor development are to activate economy of landlocked countries and inland regions through promoting trade activities beyond country borders.
- The target corridor in JICA's survey are five corridors: In this study, we surveyed five corridors, including the North-South corridor and the Central corridor as well as the three priority corridors defined by JICA.



Location of Major Corridors in Africa (Including Three Priority Corridors Defined by JICA)

Capital and

Five Barriers in the Development of Regional Corridors in Africa

- There are barriesrs which should be overcome in developing corridors.
- Barriars are different depending on their location: "Coastal and landlocked countries", "cities and provinces", "borders and gateways".

Overcoming those "barriers" requires a hard-software integrated approach.

Five Barriers in the Development of Regional Corridors in Africa

			Gateway	big city in a coastal country	Border	Capital of landlocked country	Roadside area
\bigcirc	Barrier of Distance and Time	Longer travel time due to distance from gateway to landlocked country and lack of infrastructure					
	Barrier of Transport Infrastructure Quality	Inappropriate maintenance and management, obsolescence due to user's inappropriate behaviors, and aging infrastructure					
舞	Barrier of Gateway and Border	Inefficient procedures at borders and gateways					
	Barrier of Regional Disparities"	Widening gap between cities with improved infrastructure and rural areas without investment					
@	Barrier of People and Consciousness	Harassment at national borders, slow progress in women's participation in society, lack of environmental awareness, etc.					



Five Pillars for Overcoming the Five Walls



 Document standardization

Activities in PIDA-PAP2

PIDA-PAP and the Corridor Development Approach



PIDA-PAP2 Approved Projects

A total of 69 projects were approved in PIDA-PAP2, including 25 projects in the transportation sector, 15 projects in the international water source development sector, 11 projects in the ICT sector, and 18 projects in the power sector. Those projects were approved considering balance of RECs (geographical balance).

Business Promotion Information and Database by PIDA-PAP

- PIDA-PAP has developed a database to promote understanding and participation of relevant institutions and prospective investors.
- PIDA-PAP1 built a Virtual PIDA Information Centre (VPIC) for data visualization and PIDA-PAP2 built an Interactive Virtual MAP (IVM) system. The data is managed by the African Infrastructure Database (AID).
- However, in the present system, there are issues about how to retain quality of database: quality, quantity and frequenciy of update.



Source: AUDA NEPAD, African Infrastructure Database Mechanism of AID

JICA's Data Management Support Measures (Draft)

Pproposal	Summary			
Support for strengthening data management and enhancement of VPIC and AID functions	Support for revision of management guidelinesHold data management workshops for stakeholders			
Collaboration in monitoring and Evaluating projects	 Evaluation of projects and recommendations for improvement Provide technical cooperation programs as needed on how to respond to bottlenecks in the preparation and implementation stages 			
Support for improving the structure of database	 Propose improvements for database items through analysis of browsing history. Support relevant parties so that they will understand the need to update data through analysis of browsing history and survey of relevant parties 			

Methodology of Corridor Development Impact Analysis

- Corridor development is expected to promote trade within and outside benefit areas by reducing transport costs and time, leading to the emergence of Wider Economic Benefits (WEBs) in the long term.
- Therefore, this survey defines intermediate outcomes which is the effects of transportation cost reductions expected in the short term due to corridor development, and WEBs as the medium- to long-term socioeconomic and environmental effects derived from the intermediate outcomes.

Social and Economic Effects (Wider Economic Benefit) Intermediate Outcome Corridor Develop ment

Intermediate Outcome

The intermediate outcome have been quantitatively analyzed through economic and financial analysis of individual transport projects. On the other hand, detailed data are difficult to obtain. Therefore, the survey mainly complements them with qualitative analysis, while showing rough changes over time.

WEB Proxies

Among the potential WEB proxies, the survey team selects some for Economic, Urbanisation and Environmental, which have frequently been cited as having statistically significant development impacts based on World Bank's review.

WEB Indicators and Data Sources Analyzed in the Survey



Nighttime Light Intensity

- As income increases, the amount of light used due to consumption/investment activities also increases.
 Therefore, there is a strong correlation between the amount of light at night and the target area GDP.
- The graph on the right shows the correlation between the annual average increase in nighttime light intensity and GDP growth for each country. A 1% increase in nighttime light corresponds to approximately 0.2% GDP growth.
- The figure below shows the change over time according to the night light intensity data of the Northern Corridor. Areas where nighttime light intensity were recorded appear to be expanding along the corridor, particularly thosein Kenya.



Night Light Intensity in 2012 (Northern Corridor)

Source: Defense Meteorological Satellite Program, Operational Linescan System, Visible Infrared Imaging Radiometer Suite, Day-Night Band







Night Light Intensity in 2020 (Northern Corridor)

Northern Corridor

Character of the Corridor

It is a multimodal corridor consisting of roads, railways and inland waterways that facilitates transport to inland and landlocked countries starting from the Port of Mombasa (Kenya).

Corridor Network

A network of trunk roads extend from the port of Mombasa to Uganda, Rwanda and Burundi.

Countries of the Corridor

Kenya, Uganda (Rwanda, Burundi)



Intermediate Outcome and

Issues

1	Port operations: Cargo volumes volumes and dwelling time have been improved since 2010 following operational improvements at the Port of Mombasa.		
2	Transportation infrastructure improvement: The development of standard gauge railway, the accession of South Sudan to EAC, and OSBP improved transportation cost and time.		
3	Inland transportation: Challenges remain in the development of transport infrastructure and dry ports to the west from Nairobi.		
4	Impact of COVID: Challenges remain in dealing with disruptions at borders, supply chain disruptions, and additional border procedures.		

WEB Results

Environmentally, the negative development effect with the traffic volume increase appears clearly.

Economically, the positive effects are limited (especially in inland areas).

It was confirmed that the growth rate slowed down due to the stagnation of international logistics caused by border congestion and blockade.

Kenya's economic structure has become more sophisticated.

Possibility of regional distribution revitalization through the emergence of E-commerce and E-distribution startup companies





Corridor Development WEB Effect

*The vertical and horizontal axes measure (1) CO2 emissions (tons/km $^{2/}$ per year), (2) regional growth (GDP per year), and (3) urbanization (population growth per year), respectively.

- The logistic related issues that the Master Plan has tackled were largely resolved
- In Kenya, in particular, demand for transport infrastructure has been largely met. Revitalize economic activity along the corridor has also confirmed
- In the future, efforts should be made to develop inland transportation infrastructure while existing cooperation policy among concerned stakeholders will be retained.
- Support for fostering base environment for local IT business as well as cooperation in response to new external factors such as elimination of non-tariff barriers are also important.

Nacala Corridor

Character of the Corridor

Economic and industrial development will be based on natural resources such as coal mined in western Mozambique, agricultural crops in landlocked countries making use of the gatewary of the corridor, the port of Nacala.

Corridor Network

From the Port of Nacala, the Northern Railway and the Malawi Railway and extends to Lusaka (Zambia).

Countries of the Corridor Mozambique (Malawi, Zambia)

Intermediate Outcome and Issues



1	Port operations: The volume of cargo at the Port of Nacala has continued to be sluggish, and the volume of containers treated has been significantly lower than at neighboring ports.	
2	Transportation infrastructure development: Traffic volume between Nacala and Nampula is increasing due to road development. There are many unpaved roads to the west from Nampula with less traffic volume.	
3	Transportation costs: Truck transportation costs are decreasing due to stable demands. On the other hand, railway transportation costs have not been reduced due to privatization.	
4	Transport time: The time of land cargo transport, especially for Lusaka, is extremely long. It is less competitive than travel time from Beira Port.	

WEB RESULTS

A negative environmental effect was identified in Mozambique due to coal mining. .

Almost all WEB indices resulted in statistically insignificant estimates.

The corridor development effect has not yet emerged.

Mozambique continues to depend on the export of mineral resources.

Amid the global decarbonization trend, it will be difficult to attract large-scale private investment in mineral resource development.



Corridor Development WEB Effect

*The vertical and horizontal axes measure (1) CO2 emissions (tons/km^{2/} per year), (2) regional growth (GDP per year), and (3) urbanization (population growth per year), respectively.

Implications from Development Impact Analysis

- Demand for logistics and diversification of industries, which are targets of the Master Plan, continue to be challenges
- The poor performance of the port of Nacala results in the lack of popularity of the Nacala corridor relative to competing other regional corridors
- In addition to improving the operation of the Nacala Port, priorities should include the development of port regulations and social infrastructure around Nacala.

West African Growth Ring

Character of the Corridor

It consists of three international corridors spanning three coastal countries and one landlocked country.

Corridor Network

Four main corridors: the Abidjan – Ouagadougou corridor, the Tema – Ouagadougou corridor, the Lome – Ouagadougou corridor, and the Abidjan – Lagos corridor

Countries of the Corridor

Cote d'Ivoire, Ghana, Togo, Burkina Faso (Benin)



Interim Results and Issues



*The vertical and horizontal axes measure (1) CO2 emissions (tons/km^{2/} per year), (2) regional growth (GDP per year), and (3) urbanization (population growth per year), respectively.

Implications from Development Impact Analysis

• Transportation costs and time savings between inland and coastal areas which were targets of the Master Plan are partially achieved

- After the completion of major port expansion projects, it is important to provide supports that contributes to the constructive
- promotion of competition among regional corridors.
- Future issues include improvement of road harassment, visualization of corridor performance indicators, and development of inland infrastructure.
- Strategic upgrade of the Abidjan-Lagos corridor, support for local IT business and development of legal system development on investment are also important.

Experience and Lessons Learned in Corridor Developments in Other Regions

Important Issues in Corridor Development Planning

Point	Contents
Clear Definition of transport infrastructure networks	 Specify and clarify target infrastructure Review schedule and status of unimplemented projects
Coordination in the construction, expansion, rehabilitation, and maintenance of priority corridor infrastructures	Coordination among stakeholders
Trade and transport facilitation and harmonization of corridor operating Procedures	 Unification of standards and procedures throughout the corridor, adoption of common facilitation measures, and cooperation among stakeholders Single administrative document (Adoption of WTO TFA regulation)
Provision of adequate power and modern ICT networks	 Power and ICT infrastructure along transportation corridors Ensure access to ICT for trade operations support
Allocation of budget for corridor development programs and projects	 Securing funds and human resources at the national level
Promotion of donor funding for corridor development programs and projects	Actively seek donor support

Importance Issues in Corridor Management

Establishment of Connectivity Coordination Committee: project identification, coordination of relevant organizations, and proposals/ recommendations at the Summit

Examples of Project Prioritization

Economic Corridor)

(East-West Economic Corridor, Southern

(Delhi Mumbai Industrial Corridor)

The Delhi Mumbai Industrial Corridor Development Corporation Limited was established: business promotion, bid management, private attraction, and monitoring

Examples of Smart Initiatives (East-West Economic Corridor, Southern Economic Corridor)

① Import/Export and Port Information Processing System), (2) Real-time Tracking Service, (3) Digital Trade Platform Construction Plan, (4Direct E-Commerce Platform (5) Remote Monitoring System (Delhi Mumbai Industrial Corridor)

① Logistics Visualization System (LVS), (2) Smart Community projects

Point	Contents			
Formulation of Strategy for implementing priority programmes and projects by Corridor management	 Appropriate infrastructure provision, policy/regulatory harmonization Systematic/Periodic Strategic Planning 			
Institutions				
Establishment and/or adoption of information sharing systems	Building a Data Sharing Platform			
Establishment of Corridor Databases (Observatories)	 Online databases and tools, including performance measurement and monitoring, data collection, processing and reporting systems 			
Establishment of Corridor Community Charters	 Establishment of the Corridor Community Charter Autonomous implementation of national obligations 			
Active participation of all stakeholders	 Public and private stakeholders participate in discussions on corridor management Establishment of organizations involved in corridor management 			
Coordination of programs/ projects Implementation	 Optimization of planning and resource utilization through collaboration with corridor management entities/RECs 			
Resource mobilization for programmes/ projects implementation	 Mobilize additional external funding sources Donors jointly fund corridor projects 			
Building institutional and human capacity to manage the corridor infrastructure and operations	 Identify target institutions and enhance capacity through provision of resources 			
Undertaking peer reviews, benchmarking and experience sharing	 Share lessons and experiences from other corridors Strengthen organizational and human capacity 			

Examples of Corridor-wide Database

(East-West Economic Corridor, Southern Economic Corridor)

The status of project performance is centrally managed throught information sheets, and monitoring and funding of priority projects are visualized.



Source: NEC Corporation,

Distribution Visualization System (Logistics Visualization System)

Proposal of Smart Corridor by JICA

Referring to the general definition of smart corridor, the recognition of PIDA/AUC and based on JICA's corridor development approach, "SMART + I" as JICA's version of smart corridor is proposed.

Summary of "SMART+I"

Field	Concept	Description		
Corridor Infrastructure (Transport and	Safety: Safety improvement	Raising awareness of legal compliance among companies and drivers and preventing accidents by strengthening enforcement of traffic rule violations and maintaining infrastructure quality by improving O&M using ICT		
Trade)	Mobility: Traffic facilitation	Traffic control optimization and non-stop tollgates using ICT to alleviate and eliminate traffic congestion (smoothing traffic flow)		
	Automation: incl. electronification	Electronification and automation of business and administrative procedures		
	<mark>Real-time:</mark> Data utilization	Data collection and accumulation with higher frequency and finer granularity than in the past, and decision making based on data		
	Trade: Trade facilitation	Facilitating trade and improving transparency by computerizing trade-related procedures and visualizing supply chains using ICT		
Industry / Social Development	Innovation: Creation and development of industrial and social services	Open platforms and data to allow adding values to existing industrial and social services and creating new services (economic revitalization and resolution of social issues)		



Image of the Smart Corridor

Case Example (1) [Real-time information collection and control of traffic conditions and vehicle position]

- Vehicle tracking: real-time monitoring of freight vehicle locations with GPS, RFID tags
- Traffic monitoring: Real-time monitoring of traffic conditions using data collected by cameras and sensors
- Monitoring and detection of accidents: Detect accident information from information data on the app that the driver

Precedents:

- ① Freight vehicle monitoring using RFID tag (Togo)
- ② Corridor Trip Monitoring System (North-South Corridor) :
- ③ Traffic control using ITS (Zimbabwe): Traffic signals will be linked through optical fiber network with a control center and lighting time is adjusted depending on traffic volume.

Potential introduction to the studied corridor:

- Vehicle monitoring has been adpted in each corridor. In the future, real-time detection and warning functions outside scheduled routes and information sharing between drivers and logistics managers are expected.
- For the purpose of monitoring the vehicle location outside the assumed route, it is desirable to have system that can transmit location information from equipment installed in the vehicle. One example is to use driver's smartphones.



Case Example (2) Advanced Data-Driven O&M

- The use of historical data from daily patrols enables efficient and sophisticated maintenance planning based on data.
 Appropriate maintenance plans will help reduction of the maintenance costs, improvement of the safety of hard
- infrastructure, and longer infrastructure life.

Precedents:

- 1 Sharing road information using smart phone application (Kenya)
- ② Road surface inspection by camera-equipped vehicles (South Africa)
- Potential introduction to the studied corridor:
- Installation cases are limited. It is taken that benefit from the upgrading of patrol inspection is not cost-effective.
- Enhancing road managers' awareness of O&M, data accumulation of road conditions and maintenance record will be key for imporving efficiency.

Case Example (3) Sophistication of the Crackdown

- Improve Corridor Safety: Standardization and strengthening of crackdown system for Overloading and speeding
- Ensure safety of whole corridor: Checkpoints are established along the corridor to check vehicle maintenance status, licenses, etc.
- Ensure transparency and increase credibility: checkpoints could cause congestion and harassment and corruption
 <u>Antecedents:</u>
- ① Application to overload control and road pricing by weight measurement sensor (Kenya)
- 2 Technical certificate and inspection center (Burkina Faso)

Potential introduction to the studied corridor:

- Crackdown on overloading and speeding has already practiced.
- In Burkina Faso, the introduction of human body authentication technology to various certificates and QR codes were also implemented.

NFC is a more secure option, but higher cost will be challenge.

Development of Smart Corridor Platform

- In the short to medium term, individual solutions will be introduced while taking into account the issues and implementation constraints of each corridor and country. In the long term, it is ideal to build a single platform (OS) for smart corridors.
- Basically, the operating system is supposed to be built and operated by the public, but it is realistic to use private software not only for services improvements but also for common functions on the operating system.



Smart Corridor Architecture (Image)

Recommendations on Smart Corridor Initiatives

Considering both short- and long-term perspectives, starting with what is feasible and efficient in the current infrastructure.

Category	Recommendation
Real-time traffic monitoring and control	Utilizes GPS functions such as smartphones. Set up cameras/sensors to grasp/control
Advanced Data-Driven O&M	Data accumulation of road information including images of road surface conditions and repair records
Sophistication of the crackdown	Stronger enforcement in areas far from the city where accidents and violations occur frequently



Structure, Effects and Challenges of JICA's Previous Master Plan for Corridor Development

In view of recent trends within and outside the African region, the direction of the corresponding evolution of the corridor approach (2.0) and JICA's draft cooperation policy for realizing the corridor development approach were examined.



	Effects		Challenges
•	Comprehensive Development: Industrial development & Social sector development	•	Limited achievement of coastal/inland and urban/rural disparities
•	Site Development: Benefits from enhancement of Gateway Capabilities	•	Strategies/plans closely aligned with social/industrial development
•	Border Facilitation: higher efficiendy in logistics through soft side actions	•	Less aware of needs to create an environment in which more private companies can participate in corridor development.

Spread of corridor development approaches to key institutions

Corridor Development Approach 2.0 Concept

Item

Basic

Goal

Concept

Subject/Subject

Use of ICT

Component

Approach 2.0 Balanced Emphasis on balanced development, Update Growth to meet environmental changes and technological innovations 1. Development Goal Any relevant entities Integration Integrated 0 Corridor Approach 1.0 plus global trends and Platform (OS) harmonization dustrial Devit dor Intr Consistent with Agenda 2063 and each RECs Inter target, in addition to set targets for individual Operability Corridor corridors Stra Development Approach Use of Dev. g Contribute to and utilize transparency and ICT consolidation

Regional

Digitalization

Resilience Company

/Inland

SME

perspective		consonauton
	Climate Change Countermeasures	CO2 emission reduction, use of renewable energy, power pool system, and microgrid development
	Private Sector Participation	Diversity-oriented private sector engagement and collaboration



Urban/

Local

Womer

Start-Up

Sustainability

3

Surrounding

Environment

Carbor

Neutr

Plan

Pursuit of

Inclusive Growth

ocial & Economic Mandat

Consideration of JICA Cooperation Policy (Draft) Elimination of Bottlenecks/ Support for Startup Smart Corridor **Enhancement of Connectivity** Expansion of OSBP Companies to Inland Areas Support development of Promote corridor development Contribute to creation of local Promote intra-regional through by linking issues and solutions industries and to the vitalisation infrastructure which contributes the horizontal development of in each country, considering of trade by supporting start-ups to improving value chains for the OSBP (e.g. Project NINJA) regional integration development of the corridorrelated database Image of Ka Control Centre Cashless Service in Ghana Source: JICA Tema Motorway Interchange OSBP at the Kenya-Tanzania Border (Project NINJA) (Ghana) Source: AfDB Source: JICA Source: JICA

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