Global Logistics Analysis in the future of Corridor development in Africa

PIDA WEEK 2019
in Cairo, Egypt

26th November 2019

Pacific Consultants co., ltd. (PCKK)
Japan International Cooperation Agency (JICA)
Background and Objective
TICAD7

- TICAD7, The Seventh Tokyo International Conference on African Development was held in Yokohama.
  - Date: 28th - 30th August, 2019
  - Place: Yokohama city, Japan
  - Participant: More than 10,000 people

Thank you for Cooperation
TICAD7: Japan’s contributions for Africa

August 2019

Japan’s contributions

**Economy**
- Positioning business at the center of TICAD to achieve over 20 billion USD private investment
  - Develop industrial human resources
  - Promote innovation and investment
  - Invest in quality infrastructure to enhance connectivity
  - Ensure debt sustainability
  - Diversify industries

**Society**
- Achieving human security and SDGs
  - Promote UHC and Africa Health and Wellbeing Initiative
  - Build disaster resilient society
  - Provide quality education
  - Ensure sustainable urban development
  - Share the value of sport towards Tokyo 2020

**Peace and Stability**
- Supporting Africa’s own initiatives
  - Build institutions and enhance governance
  - Support initiatives led by Africa
  - Support refugees, IDPs and others

:: Focus of Japan’s contribution
1. Positioning business at the center of TICAD:

To achieve over 20 billion USD private investment, Japan will contribute to the improvement of the business environment in Africa. Japan will also support economic transformation in Africa through promotion of Japanese private sector’s advancement into Africa and innovation.

- Develop 3,000 industrial human resources to promote business between Africa and Japan in 6 years under ABE Initiative 3.0
- Train 140,000 people to diversify industries and create jobs in areas such as innovation, agriculture, blue economy and others through Kaizen Initiative and technical assistance through human resources training centers and trust fund of AfDB
- Empower women entrepreneurs by financial contribution to AFAWA through WeFi and JICA’s Private-Sector Investment Finance
- Support African students in Japan and ABE Initiative graduates to find employment in Japanese companies

Promote innovation and investment

- Launch Japan Business Council for Africa (JBCA) to promote Japanese companies’ businesses in Africa through public-private partnership; organize the 2nd Japan-Africa Public-Private Economic Forum
- Launch bilateral committee on improvement of business environment in 7 countries to discuss improvement in institutions; improve the investment environment through Enhanced Private Sector Assistance for Africa (EPSA) with AfDB (EPSA4: Joint target with AfDB of 3.5 billion USD in 3 years)
- Introduce and match African start-ups with Japanese companies through JETRO Start-up Cooperation Promotion Desk and pitch events; collaborate with private funds for African entrepreneurs
- Promote Japanese SMEs and SDGs businesses in Africa; support formulation of digital public goods to accelerate innovation in public and private sectors
- Promote international joint research and actual use in the society of its outcomes with international organizations to implement STI for SDGs
- Support financing for Japanese private sector to expand business in Africa through Facility for African Investment and Trade Enhancement (FAITH) of JBIC (4.5 billion USD in 3 years)
- Enhance risk money supply for Japanese private sector by JOGMEC
- Launch NEXI's new trade insurance scheme covering 100% of import costs and project financing in cooperation with African Trade Insurance Agency and Islam Development Bank Group
- Promote JICA’s Private Sector Investment Finance for African countries based on MoU to be signed between JICA and AfDB
TICAD7: Japan’s contributions for Africa – Economy (2/2)

**Invest in quality infrastructure to enhance connectivity**
- Promote quality infrastructure investment in line with the G20 Principles for Quality Infrastructure Investment particularly in **three priority areas** (East Africa Northern Corridor, Nacala Corridor and West Africa Growth Ring) where master plans were completed
- Develop communication and postal network and infrastructure to improve **connectivity**
- Promote quality infrastructure projects in the public and private sectors through **EPSA4** and other undertakings

**Ensure debt sustainability**
- Conduct training on **public debt and risk management** in a total of 30 countries
- Dispatch **debt management and macro-economic policy advisors** to Ghana, Zambia and others
- Provide technical assistance for **capacity building of recipient countries** through new financial contributions to trust funds of the IMF and World Bank

**Diversify industries**
- **Blue Economy:** **Train 1,000 people in 3 years** in the areas of maritime security, port enhancement and marine resource management; support port facilities improvement, ports management and operations; provide ships and equipments; **participate in the Indian Ocean Commission (IOC)** as an observer
- **Agriculture:** **Double rice production** (from 28 million to 56 million ton) by 2030 through Coalition for African Rice Development (CARD); support **agriculture transformation to increase farmers’ income** through Smallholder Horticulture Empowerment & Promotion (SHEP); dispatch **agriculture experts**; support development of global food value chain; develop and expand agriculture technologies; promote innovation in agriculture by the public and private sectors
- **Energy for manufacturing and service industries:** Develop **renewable energy** including geothermal; promote **off grid energy**; revise MoC on Japan-US energy cooperation in Africa

**Focus of Japan’s contribution**
Corridor development master plan draws inclusive growth scenario of the region.
Project Implementation Stage

- Comprehensively support the realization of the economic growth scenario by making full use of a variety of cooperation tools

### Corridor Infrastructure Development Plan

<table>
<thead>
<tr>
<th>Facility development/ Hard infrastructure</th>
<th>Institutional development and technology transfer/ Soft infrastructure</th>
</tr>
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<td>- Development of ports, roads, bridges, railways, etc. (grant/loan)</td>
<td>- Cross border facility and institutional building (technical cooperation)</td>
</tr>
<tr>
<td>- Energy supply facility development (grant/loan)</td>
<td>- Infrastructure operation and management capacity building (technical cooperation)</td>
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<tr>
<td>- One-Stop Border Post (OSBP) facility development (grant/loan)</td>
<td>- Financial assistance for private investment promotion (loan)</td>
</tr>
<tr>
<td>- Special Economic Zone (SEZ) development (grant/loan)</td>
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### Loan
- Development of ports, roads, bridges, railways, etc.
- Energy supply facility development
- One-Stop Border Post (OSBP) facility development
- Special Economic Zone (SEZ) development

### Grant
- Cross border facility and institutional building
- Infrastructure operation and management capacity building
- Financial assistance for private investment promotion

### Technical Cooperation
- Mining Industry
- Agriculture
- Technical Education

### Public Private Partnership
- Medical Care
- Public Health
- Education
- Water Supply
JICA has been providing support for the development of Economic Corridors and ports towards achieving sustainable growth in the mid-to-long term in Africa.

OSBP (One Stop Border Post)

Transport and Comprehensive Corridor Development in 5 Areas

Economic Corridor Development and Priority Corridors in 5 Areas

The Three Prioritized Regions for Comprehensive Region-Wide Development
## Northern Corridor Development

### Corridor Infrastructure Development Plan

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<th>Institutional development and technology transfer/Soft infrastructure</th>
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<td><img src="image" alt="Mombasa Port" /></td>
<td><img src="image" alt="Technical Transfer Meetings" /></td>
</tr>
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####【Loan】
**Mombasa Port Development Project,**
Kenya, 2007～

####【Grant】
**The Project for Improvement of Gulu Municipal Council Roads in Northern Uganda,**
Uganda, 2016～

####【Technical Cooperation】
**Project for master plan on logistics in northern economic corridor,**
Kenya, Uganda / 2017

####【Technical Cooperation】
**The Project for Capacity Enhancement of KCCA in Management of Traffic Flow in Kampala City,**
Kenya, Uganda / 2017

### Industrial Development

####【Technical Cooperation】
**Northern Uganda Farmers’ Livelihood Improvement Project,**
Uganda, 2015～2020

### Social Sector Development

####【Grant】
**Project for Improvement of Health Facilities in Bujumbura City,**
Burundi, 2009～
Background

Infrastructure Stock

- JICA has been active in assistance mainly through ODA for the development of the ports and logistics infrastructure, as gateways for corridors.

Make use of Infrastructure Stock

- In order to ensure that each individual project functions consistently and effectively, formulation of a comprehensive logistics development strategy is needed.

Need for Analysis

- It is therefore essential to analyze the global logistics taking into account region-wise economic growth potential and future uncertainties.
Objective

1. To analyze the global logistics taking into account region-wise economic growth potential and future uncertainties.

2. To draw policy recommendations for formulation of a logistics development strategy.
Approach

- This research performs the quantitative analysis along 2 steps.

1. **Scenario Planning**
   Scenario-based economic modelling with regards to uncertainty and risks.

2. **logistics analysis**
   Analysis of global logistics with intermodal logistics model.

Fig. Image of comprehensive logistics analysis
Research Method
Future Scenario Establishment

- Scenarios for 2040
  - 1) BL: Baseline
  - 2) S1: Economic Corridor Realization
  - 3) S2: Economic Corridor Failure

Forecasting Global Trade

- GTAP (Global Trade Analysis Project) Model
- Trade volume estimation by scenarios

Container Cargo Flow Simulation

- Intermodal network assignment model
- Impact of logistics policies such as transport infrastructure and trade facilitation measures
Future Scenario

■ BL: Baseline scenario (Business As Usual scenario)

➢ Trends of socio-economic activities in a base year will continue until the target year

➢ Population and GDP growth rate are set based on the “SSP2 - Intermediate challenges: Middle of the Road” scenario from Shared Socio-economic Pathways (SSP)

■ S1: Economic Corridor Realization

➢ Successful development of Africa Economic Corridor catalyzing socio-economic activities, such as trade and investment facilitation

■ S2: Economic Corridor Failure

➢ Failed development of Africa Economic Corridor leading to protectionism and stagnation of socio-economic activities
Forecasting Global Trade

Global Trade Analysis Project (GTAP) Model

- Most popular model package among the world for trade forecast
- CGE (Computable General Equilibrium) framework based on microeconomic theory
- Developed by Purdue University
- Many applications in practical field
Regional Classification

- 18 countries including East/Southern Africa (14) and South Asia (4)
- Other 13 regions of the world

East & Southern Africa

1. Egypt (236)
2. Ethiopia (31)
3. Kenya (34)
4. Madagascar (10)
5. Malawi (6)
6. Mauritius (11)
7. Mozambique (13)
8. Rwanda (6)
9. Tanzania (24)
10. Uganda (15)
11. Zambia (19)
12. Zimbabwe (11)
13. South Africa (404)
14. Botswana (15)
15. XEAfrica (79)

South Asia
16. Bangladesh (112)
17. India (1,880)
18. Pakistan (214)
19. Sri Lanka (59)
20. XSAsia (41)

Other 13 regions of the world
21. West and Central Asia (3,738)
22. South East Asia (2,209)
23. East Asia (15,204)
24. North Africa (380)
25. West Africa (571)
26. Central and Southwest Africa (211)
27. North America (18,491)
28. Central and South America (4,770)
29. Europe (18,491)
30. Oceania (1,595)

*31. Rest of World (0.2)

( ) indicates nominal GDP (bil. USD) in 2011
Estimated Trade Volume (GTAP model output)

- Estimated increased volume of export and import container between East Africa and the world (2016 to 2040)
Container Cargo Flow Simulation

- Two-layered intermodal network assignment model describing shipper’s behavior on transport mode and route choice

- Regional shipping demand and network are given

- Capacities of each transport mode (road, rail, ferry, and maritime shipping) is considered

- Developed by Shibasaki Lab, the Univ. of Tokyo

- Logistics policies can be input and evaluated

Container Shipping Demand (OD Cargo Volume) \( Q_{ij} \)

Intermodal International Container Cargo Shipping Super-Network Model
(stochastic network assignment model based on the generalized shipping cost)

Global Maritime Container Shipping Network Submodel
(user equilibrium assignment model with consideration of vessel capacities)

- Including around 150 major container ports of the world as well as all local ports in the focal area
- Including 20 world major shipping companies as well as local companies in the focal area
- Assigned based on shipping time
- Freight charge is assumed to be different from shipping cost

Regional Land Cargo Transport Network Submodel
(user equilibrium assignment model with consideration of road, rail, and inland waterway capacities)

- Assigned based on generalized shipping cost (by assuming that freight charge is equal to the marginal shipping cost)

Freight Charge (US$/TEU)

\[ FL_{oi} + FL_{jd} \text{ or } FL_{od} \]

Shipping Time (hours)

\[ TL_{oi} + TL_{jd} \text{ or } TL_{od} \]

\[ TPX, TPM, TTM \]

Land Port Maritime incl. inter-carrier transshipment

Freight Charge

\[ FL_{oi} + FL_{jd} \text{ or } FL_{od} \]

Shipping Time & Cost

\[ F_{oi} + v_{i} TL_{oi}, FL_{jd}, v_{i} TL_{jd}, FL_{od}, v_{i} TL_{od} \]

\[ q^{o}, q^{d}, q^{od} \]

Land OD (bet. zone and ports)

\[ F_{oi}, TPX, TPM, TTM \]

\[ q^{o}, q^{d}, q^{od} \]

Developed by Shibasaki Lab, the Univ. of Tokyo

Logistics policies can be input and evaluated
Liner Service Network

- Liner services to call at Port Louis (as of 2016)
In 2040, the total number of T/S containers in Port Louis, Pointe des Galets, and Toamasina is estimated approx. 1.5 mil TEU.

If T/S time is reduced to 1/3 of the present level, it will increase by 0.5 mil TEU.

*Transship time is reduced to the competitive level to the global hub ports.
Economic Impact by removal of trade barriers

What impact does removal of trade barriers through AfCFTA have on economies and industries?
Analysis with GTAP model: Economic Forecast 2011 - 2040

Real GDP Annual Growth

### Scenario 1
Success in Corridor Development

### Scenario 2
Failure in Corridor Development

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What impact does Economic Corridor development have on landlinked countries?
Changes in Transport Cost

- Economic Corridor development and Cross-border trade facilitation at OSBP would contribute to reduction of transportation cost
- Benefit is bigger in landlinked countries.

Cost reduction for coastal countries is 12%, whereas that of landlinked countries is 18%.

Reduction of average transport cost

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Port Usage Share

Which ports are important for each of East Coast African Country?
Port Usage Share

**in 2040 (S1 scenario)**

- Port usage are in principle consolidated into 8 major ports in the region.
- Importance of Economic Corridor development is amplified as the ports are all connected by the Corridor.

- Result shows inland countries such as D. R. Congo, Zambia has multiple choices of ports

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### Port Usage Share

**in 2040 (S1 scenario)**

- Several ports cover vast areas including inland countries:
  - Djibouti, Mombasa, Dar es Salaam, Nacala, Beira, Durban

- Improvement of these ports and ensuring connectivity through Corridor and OSBP is important.

**➢ Several ports cover vast areas including inland countries:**

- Djibouti, Mombasa, Dar es Salaam, Nacala, Beira, Durban

**➢ Improvement of these ports and ensuring connectivity through Corridor and OSBP is important.**
Port Usage Share Change

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Case Study: Dar es Salaam Port

- with-without Economic Corridor and OSBP – in 2040 (S1 scenario)
  - Dar es Salaam Port’s hinterland covers vast regions including inland countries: Rwanda, Burundi, Zambia, the northern part of Malawi
  - Corridor and OSBP development could lead to increasing the share in Malawi, however losing its share around the border with Kenya, and in Zambia

Dar es Salaam: Share by region

Share Change: with - without

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Case Study: Mombasa Port

- **with-without Economic Corridor and OSBP – in 2040 (S1 scenario)**
  - Mombasa Port’s hinterland covers vast regions including inland countries: Uganda, South Sudan, and D.R. Congo
  - Corridor and OSBP development would contribute to broadening its hinterland to Tanzania border, eastern part of South Sudan, and Burundi.

### Mombasa: Share by region

<table>
<thead>
<tr>
<th>Port Usage Share</th>
<th>1.00 – 0.90</th>
<th>0.90 – 0.80</th>
<th>0.80 – 0.70</th>
<th>0.70 – 0.60</th>
<th>0.60 – 0.50</th>
<th>0.50 – 0.40</th>
<th>0.40 – 0.30</th>
<th>0.30 – 0.20</th>
<th>0.20 – 0.10</th>
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</table>

### Share Change: with - without

<table>
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<tr>
<th>Port Usage Share</th>
<th>With</th>
<th>Without</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00 – 0.90</td>
<td>0.15</td>
<td>0.15</td>
<td>&lt; 0.02</td>
</tr>
<tr>
<td>0.90 – 0.80</td>
<td>0.15</td>
<td>0.15</td>
<td>&lt; 0.02</td>
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<td>0.15</td>
<td>0.15</td>
<td>&lt; 0.02</td>
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<tr>
<td>0.70 – 0.60</td>
<td>0.15</td>
<td>0.15</td>
<td>&lt; 0.02</td>
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<td>0.15</td>
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Case Study: Durban Port

- **with-without Economic Corridor and OSBP – in 2040 (S1 scenario)**
  - Durban port continues to be an influential port with vast hinterland.
  - However, with corridor and OSBP development, Durban may lose its hinterland due to competition with ports in Mozambique as well as domestic ports.

### Durban Port: Share by region

<table>
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<th>Port Usage Share</th>
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<tbody>
<tr>
<td>1.00 – 0.90</td>
<td>+0.15</td>
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<tr>
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<td>0.15 – 0.10</td>
</tr>
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<td>0.05 – 0.02</td>
</tr>
<tr>
<td>0.60 – 0.50</td>
<td>0.02 – 0.02</td>
</tr>
<tr>
<td>0.50 – 0.40</td>
<td>-0.02 – -0.05</td>
</tr>
<tr>
<td>0.40 – 0.30</td>
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Case Study: Djibouti Port

- with-without Economic Corridor and OSBP – in 2040 (S1 scenario)
  - Djibouti Port would be a primary port for Ethiopia, handling most of its cargo
  - Change for Djibouti Port’s hinterland area is limited regardless of development of corridor and OSBP

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Railway Impact
Case Study

How would railways impact the port hinterland?
Case Study: Nacala economic corridor

- Previous JICA Study emphasize the importance of Moatize – Nacala rail in transportation of coal.
  - Importance of cargo transport other than coal is also highlighted in ensuring multimodal transportation.

- The case study examines the impact and potential of Nacala railway when it is used for container cargo transport
  - Analysis with logistics model for the year 2040 under S1 scenario.
Port Hinterland Area Change: Nacala

- **Change of Nacala port hinterland area (with – without comparison)**
  - The result implies hinterland of Nacala port could cover Malawi, and southeast region of Zambia
  - Cargo handling (laden container) estimated to grow more than 70%

Without
[No container cargo on Nacala railway]

With
[Nacala Railway used also for container transport]

- Container handling ('000 TEU)
  - 249
  - 431
  - +72.7%
Port Hinterland Area Change: Beira

- **Change of Beira port hinterland area (with – without comparison)**
  - The result implies influence of Beira port would remain, but would be reduced to a lesser extent.

Without
[No container cargo on Nacala railway]

With
[Nacala Railway used also for container transport]
Infrastructure Gap

Does the current infrastructure development plan sufficiently address the future demand?
PIDA report points out concerns for infrastructure gap

- Cargo transport demand would increase significantly in the region due to growth in population and economy.
- Transport demand for cargo is forecasted to exceed the current transport network development.

Demand for development of Economic Corridors connecting landlinked countries

- Gap between demand and capacity exists especially at Djibouti Corridor, Mombasa Corridor, and Dar es Salaam Corridor.

*Container volume on land network excludes empty container and includes only laden containers*
**Future Port Plan**

- **Dar es Salaam Port**
  - In the master plan of Dar es Salaam Port, the construction of a container terminal for Berths 12-14 is planned.
  - After completion of the port will be reached a handling capacity of 1.2 million TEU.
  - Although Bagamoyo Port was planned to be built about 60km north of Dar es Salaam Port, construction has been suspended now.

- **Nacala Port**
  - The handling capacity of Nacala port will be reached 250,000 TEU in 2020 from 18,000 TEU in the current.
Port development plans need to be reviewed and implemented to meet future demand.

- Cargo demand could exceed planned capacity, especially at Dar es Salaam Port and Nacala Port.

It is important to provide strategies for port development with special considerations for the growth of cargo transport demand at hinterland.

* Cargo handling estimation includes empty container volume.

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Study Result
Demand for Integrated development of economic corridor and OSBP to advance further economic growth

- Integrated development of economic corridor and OSBP promote increase of products with competitive advantage, such as agricultural production.

- This research requires further accurate analysis and development projects should include control of gap between cargo demand and supply.
Infrastructure development to sufficiently address future cargo transport demand

- Mombasa Port, Dar es Salaam Port, Beira Port, Nacala Port, and Durban Port are important for the region, especially for inland countries.
- Cargo throughput demand in 2040 at Dar es Salaam Port and Nacala Port is estimated to exceed the planned capacity.
- Development of ports which includes inland countries in its hinterland is important for sustainable and inclusive development for the region.
Thank you for your kind attention.

- Speakers -
Hiroshi ISHIHARA, JICA
Ryuichi SHIBASAKI, University of Tokyo
Hitoshi ONODERA, PCKK

-Pacific Consultants co., ltd. (PCKK)
Japan International Cooperation Agency (JICA)-