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Promoting STI (Science, Technology, and Innovation) for SDGs in Africa: 11 Policy Recommendations from the Engineering Academy of Japan

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THE ENGINEERING ACADEMY OF JAPAN
Project for Promoting STI (Science, Technology, and Innovation) for SDGs in Africa
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THE ENGINEERING ACADEMY OF JAPAN

The Engineering Academy of Japan (EAJ) is a non-profit, non-governmental organization established for the purpose of contributing to the advancement of engineering and technological sciences in Japan. Its members are leading engineers in industry, academia, and government. EAJ has several project teams that tackle various issues fully utilizing its broad network and abundant experience and knowledge of its members. With these project teams playing the core roles, EAJ promotes investigation and proposal activities, also with the cooperation of external people and organizations. EAJ summarizes the outcome of its activities, and proposes leading and creative policies to the public agencies, legislative bodies, industry, academic societies, research institutions, etc. in terms of the direction the society shall head for, and provides support for the proposed policies to be socially implemented.

EAJ's project for **"Promoting STI (Science, Technology, and Innovation) for SDGs in Africa: 11 Policy Recommendations from the Engineering Academy of Japan"** Is the report of the discussion of the sub-committee, which is composed of a wide range of experts over a year, in the EAJ to consider how we shall contribute to the achievement of SDGs in Africa and what are the roles of engineers and scientists, as a representative in Japan's community associated with STI (science, technology, and innovation), bearing in mind that Africa still faces a number of societal challenges, such as water, food, energy, and poverty, etc., despite that the Continent is regarded as the "final frontier" in the world. The team drafted a report summarizing the results of its study, which was reviewed by the Policy Proposal Committee, examined by the Council, and finalized. Accordingly, the Council of EAJ decided to release the final version of the report. We hope you find this report informative and useful.

Promoting STI (Science, Technology, and Innovation) for SDGs in Africa: 11 Policy Recommendations from the Engineering Academy of Japan

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Acronyms and abbreviations

Acronyms/ abbreviations	Official Name	Japanese Official Name
ACE	Africa Center of Excellence	アフリカ・センター・オブ・エクセレンス
AfCFTA	African Continental Free Trade Area	アフリカ大陸自由貿易協定
AfDB	African Development Bank	アフリカ開発銀行
AFICAT	Africa Field Innovation Center for Agricultural Technology	日・アフリカ農業イノベーションセンター
AIST	National Institute of Advanced Industrial Science and Technology	産業技術総合開発機構
AMED	Japan Agency for Medical Research and Development	国立研究開発法人日本医療研究開発機構
AOTS	Association for Overseas Technical Scholarship	一般財団法人海外産業人材育成協会
ASEAN	Association of Southeast Asian Nations	東南アジア諸国連合
AU	African Union	アフリカ連合
AUDA-NEPAD	African Union Development Agency - New Partnership for Africa's Development	アフリカ連合開発庁
CCS	Carbon Capture & Storage	二酸化炭素貯留
CO2	Carbon dioxide	二酸化炭素
EAJ	The Engineering Academy of Japan	日本工学アカデミー
GDP	Gross Domestic Product	国内総生産
ICT	Information and Communications Technology	情報通信技術
ISID	Inclusive and Sustainable Industrial Development	包摂的かつ持続可能な産業開発
JAXA	The Japan Aerospace Exploration Agency	宇宙航空研究開発機構
JETRO	Japan External Trade Organization	日本貿易振興機構
JICA	Japan International Cooperation Agency	国際協力機構
JIRCAS	Japan International Research Center for Agricultural Sciences	国際農林水産業研究センター
JST	Japan Science and Technology Agency	国立研究開発法人科学技術振興機構
MAFF	Ministry of Agriculture, Forestry and Fisheries, Japan	農林水産省
MDGs	Millennium Development Goals	ミレニアム開発目標
METI	Ministry of Economy, Trade and Industry, Japan	経済産業省
MEXT	Ministry of Education, Culture, Sports, Science and Technology, Japan	文部科学省

MHLW	Ministry of Health, Labour and Welfare, Japan	厚生労働省
MOE	Ministry of the Environment, Japan	環境省
MOFA	Ministry of Foreign Affairs, Japan	外務省
NARO	National Agriculture and Food Research Organization	農業・食品産業技術総合研究機構
NEDO	New Energy and Industrial Technology Development Organization	国立研究開発法人 新エネルギー・産業技術総合開発機構
NIED	National Research Institute for Earth Science and Disaster Prevention	防災科学研究所
NIES	National Institute for Environmental Studies	国立環境研究所
NIID	National Institute of Infectious Diseases	国立感染症研究所
ODA	Official development assistance	政府開発援助
RIKEN	Institute of Physical and Chemical Research	理化学研究所
SATREPS	Science and Technology Research Partnership for Sustainable Development	地球規模課題対応国際科学技術協力プログラム
SCARDA	Strategic Center of Biomedical Advanced Vaccine Research and Development for Preparedness and Response	先進的研究開発戦略センター
SDGs	Sustainable Development Goals	持続可能な開発目標
SEZ	Special Economic Zone	経済特区
SMEs	Small and Medium-sized Enterprises	中小企業
STePPP	Sustainable Technology Promotion Platform	サステナブル技術普及プラットフォーム
STI	Science, Technology, and Innovation	科学技術イノベーション
STISA	Science, Technology, and Innovation Strategy for Africa	アフリカの科学・技術・イノベーション戦略
TICAD	Tokyo International Conference on African Development	アフリカ開発会議
UN	United Nations	国際連合
UNDP	United Nations Development Programme	国連開発計画
UNIDO	United Nations Industrial Development Organization	国連工業開発機関
WB	World Bank	世界銀行
WFP	World Food Programme	国連世界食糧計画

Introduction

Africa has long been called the last frontier. Indeed, recent economic growth has been remarkable, and by 2050, Africa's population is projected to reach 2.5 billion (2.1 billion in the sub-Saharan region).[1] Furthermore, recent information and communications technology (ICT) developments have led to a series of innovations known as leapfrogging. Nevertheless, Africa has yet to fully address the challenges stipulated in the Sustainable Development Goals (SDGs), such as hunger, water and energy supply, health, industrial development, and employment.

The African Union (AU) has launched "Towards Agenda 2063: The Africa We Want," a blueprint of what African countries hope to collectively achieve by the middle of this century, recognizing the importance of science, technology, and innovation (STI) in addressing the above challenges for better human wealth.[2] In particular, new forms of business have been increasing in African countries in recent years against the backdrop of digital technology and telecommunications infrastructure development. A different path of industrial development not experienced by Western countries, Japan, and East Asian countries, is attracting attention.

The United Nations (UN) General Assembly unanimously adopted the SDGs in 2015. Although the UN assessment at the 2019 milestone confirmed a certain level of progress, achieving them by 2030 at this rate will be challenging, and acceleration is required. There are concerns that the COVID-19 pandemic will further increase this delay, particularly in developing countries. It is necessary to systematically review future efforts toward STI for the SDGs to recover from this situation.

Japan has contributed to the development of Africa in human resources, infrastructure, research, educational systems, healthcare systems, and increased food production, mainly through official development assistance (ODA). Examples include the establishment of institutions such as the Jomo Kenyatta University of Agriculture and Technology in Kenya, Egypt-Japan University for Science and Technology, Noguchi Memorial Institute for Medical Science in Ghana; the Science and Technology Research Partnership for Sustainable Development (SATREPS) in collaboration with the Japan Science and

Technology Agency (JST), the Japan International Cooperation Agency (JICA), and local research institutions. The dissemination of maternal and child health handbooks; the transfer of drought-resistant New Rice for Africa (NERICA) cultivation technology; and the construction of roads, ports, and logistics facilities.

Africa remains a distant continent for many Japanese academic institutions and private companies. The number of Japanese companies currently operating in Africa is only approximately 600-800,[3] and because of the political situation in Africa since the 1980s, the numbers have declined in some areas. In addition, the West and China have made significant inroads into the region, and there is a sense of crisis that Japan's presence may disappear if this trend continues.

Over the past two years, the COVID-19 pandemic has significantly impacted the relationship between Africa and Japan. Although many investment projects have slowed, there has been a growing, albeit struggling, and a limited number of start-ups and small and medium-sized enterprises (SMEs) working with local partners to start new businesses in Africa.

This report is a collaborative effort with experts in the field of STI and experts in Africa (surprisingly, they seemed to have not interacted much before). Based on specific examples, it examines the roles of government, academia, private companies, and the Engineering Academy of Japan, a group of Japanese engineering professionals, in the mutually beneficial development of Japan and Africa through STI for SDGs.

0. Summary of “10+1” key policy recommendations

(1) Building a knowledge value chain to network research and innovation centers in Africa and Japan

- (For example,) establishment of a center for the implementation of a collaborative project between the World Bank's initiative, the Africa Center of Excellence (ACE), and Japanese universities

  (for this purpose, it is essential to dispatch a local survey caravan of Japanese university representatives to hold dialogues with local authorities in charge of higher education and science and technology in African countries.)

(2) Enhancing cooperation between national research institutes in Africa and Japan

- Depending on the needs and situations of African countries/institutions, cooperation, and collaboration among national research institutes, mainly in the fields of agriculture, healthcare and sanitation, industrialization, disaster prevention, and the environment

  (To this end, it is essential to dispatch a field survey caravan consisting of Japanese national research institutions and to hold dialogues with national research institutions and the authorities in charge in each African country.)

(3) Collaboration to develop course materials to strengthen university education in Africa and enhance human relationships through youth exchange/education programs

- Translation and distribution of lectures from the Open University of Japan into English and French
- Expansion of the Sakura Science Exchange Program by JST

(4) Initiating a “Hot & Cool Afro-Japan project (tentatively named)” to visually fascinate youth on the attractiveness and challenges of Africa and the STI of Japan

- Promoting Japanese video games, factories, industrial technology,

healthcare and wellbeing, and lifestyle-related infrastructure for African youth
- Conveying the attractiveness of subjects such as Africa's land, economic dynamism, human resources and culture, infrastructure development opportunities, and STI for Japanese youth

(5) Launching "Data Network for Problem Solving in Africa (tentative name)" to promote data-driven national land development, agricultural development, and approaches to social challenges in Africa

- Creation of a mechanism for sharing and utilizing data obtained from development projects
- Acceleration of the integrated use of data obtained from satellites, unmanned aerial vehicles (AUVs), drones, and on-the-ground probes (e.g., nominating a counterpart in Africa for the Tellus (satellite data platform) project led by the Ministry of Economy, Trade, and Industry (METI) and the private sector and establishing a support mechanism to use the platform for solving social issues and international cooperation purposes)
- Promotion of data sharing through joint research between African and Japanese universities and public research institutions, especially the utilization of data from the Japanese hyperspectral sensor for ultraviolet imaging (HISUI)
    - ○ Japanese research institutions are, for example, Japan International Research Center for Agricultural Sciences (JIRCAS), National Agriculture and Food Research Organization (NARO), National Institute of Advanced Industrial Science and Technology (AIST), RIKEN, National Institute for Infection Control (NIID), National Research Institute for Earth Science and Disaster Prevention (NIED), National Institute for Environmental Studies (NIES), Japan Aerospace Exploration Agency (JAXA), and universities

(6) Encouraging technology-oriented start-ups through the "Africa Investment Organization (tentative name)" proposed by Keizai Doyukai, a private organization

- Collaboration with the "Africa Investment Organization (tentative name)" proposed by Keizai Doyukai (Japan Association of Corporate Executives)

(7) Enhancing the policymaking process to promote industrialization and SMEs development in Africa

- Establishment of "Industrialization Policy Dialogue" and "SMEs Policy Dialogue" by the Japanese government, African governments, AUDA-NEPAD, JETRO, JICA, UNIDO, UNDP, WFP, WB, AfDB, and others to hold discussions on cooperation measures*
- Dispatch of Japanese experts for policy formulation and implementation on industrialization promotion and SMEs development
- Establishment of a large-scale industrial human resources training network for Africa in ASEAN** countries (i.e., Thailand) where Japanese-style management of manufacturing industries is well established (Collaboration with the Association for Overseas Technical Scholarship (AOTS))

(8) Construction of cross-country energy infrastructure, smart grids for rural areas, renewable energy, hydrogen infrastructure, and support for human resource development

- Implementation of the "Pan African Solar & Wind Resource Potential Survey" (comprehensive survey of solar and wind power potential in Africa to identify its optimal locations) by the New Energy and Industrial Technology Development Organization (NEDO)
- NEDO's technical demonstration of smart grid-type electricity infrastructure
- Construction of cross-country power generation and transmission infrastructure (e.g., Trans-Saharan superconducting power grid) (feasibility study (F/S) first)
- Promotion of blue hydrogen and blue ammonia projects in oil- and

* African Union Development Agency - New Partnership for Africa's Development (AUDA-NEPAD), Japan External Trade Organization (JETRO), United Nations Industrial Development Organization (UNIDO), United Nations Development Programme (UNDP), World Food Programme (WFP), World Bank (WB), African Development Bank (AfDB)
** Association of Southeast Asian Nations (ASEAN)

gas-producing countries (first F/S)

(9) Acceleration of collaboration between Japanese and African universities on the prevention of infectious diseases and joint research in the field of healthcare, such as vaccines, to meet Africa's needs

- Acceleration of vaccine development in collaboration with the Strategic Center of Biomedical Advanced Vaccine Research and Development for Preparedness and Response (SCARDA) initiated by the Japan Agency for Medical Research and Development (AMED)

(10) Holding an "Expanded Ministerial Meeting on STI for SDGs" and establishing a platform for discussion that brings together international organizations, academia, and industrial groups

- Holding an "Expanded Ministerial Meeting on STI for SDGs" with the participants of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Ministry of Foreign Affairs (MOFA), METI, Ministry of Health, Labour and Welfare (MHLW), Ministry of Agriculture, Forestry and Fisheries (MAFF), Ministry of the Environment (MOE), Cabinet Office, industrial groups including private companies, universities and national research institutes from Japan side

(+1) Showcase the results of Africa-Japan STI-related cooperation at the "STI for SDGs in Africa" pavilion (tentative name) at the Osaka Expo in 2025

- Organize the "STI for SDGs in Africa Pavilion (tentative name)" (as a part of the UN pavilion) at Expo 2025 Osaka to showcase the successful attempts of Africa-Japan STI-related cooperation

1. Cross-cutting perspectives for challenges in Africa

The challenges faced by Africa are highly diverse and differ from country to country. Although individual measures need to be carefully considered based on the situation in each country, this report is based on the following five cross-cutting perspectives common to each issue.

First perspective: "Change Japan, change the world from Africa. Africa is the birthplace of new models for the world"

Africa's social challenges represent a significant business opportunity. Some of these issues were solved decades ago in Japan and other developed countries. However, given the current situation in Africa, the past successful practices of developed countries, including Japan, cannot be directly applied to Africa. In addition, there are many young and talented human resources (innovators and entrepreneurs) in Africa, and working with them to develop new businesses that match the needs of Africa will lead to discontinuous innovation in stagnant Japan, which may even become a new global standard. This highlights the importance of recognizing Africa as the birthplace of new models for the world. This is widely known by those who started businesses or collaborated with local African partners. However, this perspective is not fully understood by the Japanese business sector. Therefore, it is crucial to recognize that working with Africa on STI will also help upgrade Japan.

Second Perspective: "Africa and Japan have the potential of economic developments by taking advantage of STI and each other's human resources are the key to the development."

Historically and politically, Africa has not thoroughly enjoyed economic development or solved social challenges over the past several decades. These reasons remain in the various forms of African society. At the same time, however, this could also be an opportunity to realize Africa's potential. In particular,

Japanese industry, academia, and government, which have no historical impediments to Africa, play a role in forming equal partnerships with Africa and harnessing its potential. There is also a need to persuasively convey the attractiveness of Africa to stakeholders other than the limited group of people, the “Africa-maniacs” African maniacs. African countries generally hold Japan in high esteem for its significant economic development after the Second World War through technology and human resources. In addition, African countries have a wide range of expectations of STI, such as solving the challenges they face, making dramatic progress through STI, and developing science and technology at the same level as developed countries. It is necessary to consider how these expectations should be positioned and what measures should be taken while closely observing the dynamically changing situation in Africa.

Third Perspective: "The past experiences of Asian industrial development practices will not be wholly applicable to Africa but it can still be effective in some situations, if carefully designed"

Africa is unlikely to experience the same path of economic development as other regions, especially Japan and East Asian countries, which have followed in the past, namely (1) labor-intensive textile and general merchandise industries; (2) capital-intensive steel, chemical, and other industries; and (3) knowledge-intensive semiconductor, advanced medical equipment, software, and other industries. This highlights the need for a new model. Nevertheless, depending on the country and its stage of economic development, it may be necessary to have a manufacturing industry that produces goods with stable quality, at low cost, and regularly, which generates a large number of jobs; in such cases, the above Asian-style approach will be effective. In other words, it is necessary to effectively apply STI in the local context rather than focusing exclusively on leapfrogging.

However, to this end, African youth must discover the attractiveness of Japan. Similarly, it is essential to further promote and understand the attractiveness of Africa to Japanese youth.

Fourth Perspective: "Speed and scale-up are the keys"

While science and technology are long-term investments in building foundations, speed is key to realizing innovation, in which the private sector plays a major role. In addition, the scaling-up method is important for realizing the SDGs in developing countries. Issues of speed and scale-up are also challenging for Japan, and it is necessary to consider the methods that can be used when collaborating carefully. Therefore, there is a need to recognize the importance of collaborating with speedy African innovators and entrepreneurs and incorporating partners not only in Japan but also in Western and other emerging countries.

Fifth Perspective: "Delivering the benefits of STI with no one left behind (by solving the Last-Mile Problems)"

This report attempts to accelerate the SDGs through the STI in Africa. In this sense, a new development model (third perspective) must be not only unprecedented but also inclusive. Inclusivity also requires sustainability. Therefore, finding a solution that considers the last mile of delivering the benefits of STI without leaving anyone behind is mandatory. In other words, what Africa needs is disruptive, inclusive, and sustainable STI (a new concept incorporating the idea of disruptive and inclusive innovation (DII) advocated by Iizuka (2021) and the concept of Inclusive and Sustainable Industrial Development (ISID) advocated by UNIDO).[4] In particular, the social challenges faced by African countries often require the empowerment of women as consumers in water and sanitation, food and nutrition, health and medicine, energy, education, and gender equality. For STI to accurately solve social issues, it is necessary to combine this perspective of empowerment for women and the STI concept and to have the perspective of "building the last mile to deliver the benefits of STI."

As mentioned above, the challenges facing Africa are extensive and vary from country to country in terms of severity. The next chapter will focus on the following five challenges (referred to as agendas), in order, that should be addressed by STI: promotion of human resource development; data-driven national land development and agricultural development; industrialization and acceleration of tech start-ups; solving energy, water, food, and environmental problems; and improving health and overcoming infectious diseases.

2. First Agenda: "Human resource development for achieving sustainable development in Africa"

2.1 Importance of "original scientific capability and technology" in Africa

Addressing Africa's challenges requires a complete understanding of the current situation and developing original (or unique) scientific capabilities and technologies that can respond to them. This idea was presented in the 1970 Sussex Manifesto, which stressed the need for developing counties to develop their indigenous technology.[5]

To begin with, what would be the "indigenous scientific capability and technology" that Africa needs? According to the "Strategy for Science, Technology and Innovation in Africa (STISA)" formulated by the AU, the six key areas are identified: Eradication of Hunger and Achieving Food Security; Prevention and Control of Diseases; Communication (Physical and Intellectual Mobility); Protection of our Space; Live Together- Build the Society; and Wealth Creation.[6] This suggests, for example, that in the case of agriculture, scientific capability and technology are required to create agricultural systems that incorporate issues such as the climate, soil, farmers, and food culture of the country. Similarly, scientific capability and technology need to develop medical systems that consider the local environment, infectious diseases, and people’s awareness or understanding of hygiene to prevent and control diseases.

Needless to say, "science," "technology," and "innovation," which encompass STI, are related, resonate, and overlap with each other, but all of them are important elements. It is most appropriate for Africa's development to have an appropriate balance of human resources that correspond to the respective characteristics of pure science, which is highly abstract; technology, which is embodied in tangible goods and services; and innovation, which functions within society. Therefore, the report considers it appropriate to treat as the domain of "STI" a wide range of areas, whose examples include the Next Einstein Initiative undertaken by the mathematical community, the SATREPS, an international joint research project of JST/AMED and JICA, technical cooperation implemented by JICA, direct investment promoted by private companies, and the improvement of skills in the real world.

Box 1 Science and Technology Policy in Africa

About 60 years ago, at the founding summit of the Organization of African Unity in Addis Ababa in 1963, Kwame Nkrumah, the President of Ghana at the time, mentioned the significance of science and technology, which triggered the promotion of the development of science and technology through various policies, including the "Lagos Plan of Action for Economic Development" in 1980 and the "Science and Technology Consolidated Plan of Action" in 2005. Subsequently, the African Union designated 2007 as the "Year for Scientific Innovations in Africa" and, in 2014, developed the Science, Technology, and Innovation Strategy for Africa 2024 (STISA2024).

In recent years, an STI index has been developed in the African Innovation Outlook 2018, an informal sector survey was conducted by the Human Science Research Council (HSRC) of South Africa, and the African Continental Free Trade Area (AfCFTA) has been concluded, increasing the need for policymaking using indicators, data, and evidence.

There is a strong need for Japan-Africa STI cooperation in a wide range of areas, including support for Agenda 2063, the recovery from the COVID-19 pandemic, human resource development, and the development of methodologies for building evidence such as indicators.

Source: Summary from the presentation by Prof. Iizuka (Professor, National Graduate Institute for Policy Studies)

Box 2 Locally-Based Circular Business

DOYA, Inc. is developing a clothing business (CLOUDY) that utilizes African fabrics and, based on the philosophy of the One Village One Product (Think Globally, Act Locally), aims to create brands of products from developing countries that can be sold worldwide. Through sales to CLOUDY, the company is helping to improve the status and independence of female workers and local creators employed at its factories in Ghana.

CLOUDY does not necessarily use advanced technology, but it has built and operates five factories in Ghana and has successfully employed more than 600 people locally. One of the key success factors is that CLOUDY has built its business around local needs, not its technology. The demand for science and technology ranges from industrial technology to know-how and is entirely different from country to country and region to region in Africa. Therefore, to apply the appropriate technology, it is most important to visit the local area, know the people, and understand their needs.

Source: Summary from the presentation by Mr. Doya (CEO of DOYA Inc.)

Box 3 Next Einstein Initiative (NEI)

The Next Einstein Initiative (NEI) was launched in 2008 by the African Institute for Mathematical Sciences (AIMS) to select and train young people with mathematical and scientific expertise. The program aims to prepare trainees for future leadership roles in academia, industry, and government by strengthening "Innovative Scientific Training," "Research & Breakthrough Discoveries," and "Teacher Training & Public Engagement."

In 2013, AIMS also launched the Next Einstein Forum (NEF), in partnership with the Robert Bosch Stiftung, to bring together people from diverse communities, including science, industry, civil society, and policy, to increase opportunities to use science for global development. The biennial NEF showcases the contributions of Africa's brightest young people in science and provides a platform for connecting science, society, and policy worldwide.

Source: Next Einstein Initiative (2022). Available at: https://nexteinstein.org/; Next Einstein Forum (2022). https://nef.org/

2.2 Strengthening of research cooperation through SATREPS and integration of "basic research to implementation in society" (Creation of "Knowledge Value Chain" in Africa)

SATREPS, promoted by MEXT and MOFA in collaboration with JST, AMED, and JICA, aims to research and develop the original science capability and technology

to tackle challenges in Africa while partly using technology from Japanese research institutions.

However, it seems that the existing SATREPS scheme was not effectively designed to apply research outcomes in the long term and develop a sustainable business. To overcome this challenge, it may be effective to accelerate "basic research to implementation in society in Africa" (creation of "Knowledge Value Chain" in Africa) by establishing Centers of Excellence (COE) at local universities enabling the continuation of long-term research and development, and incubating and supporting the start-ups from SATREPS and industry-academia collaborations through grants, support packages, and funding. In doing so, a mechanism to involve African partners (researchers, businesses, entrepreneurs, and government officials) more than ever is needed based on equal partnerships. It would further help if, as partners on the African side, more than 1,200 graduates from the ABE Initiative who have studied at Japanese graduate schools are given opportunities to play an active role in this process.

While Japan can establish such a mechanism from scratch, it would also be highly effective and efficient to collaborate with the existing scheme called the ACE project,[7] which the World Bank Group is already working on for all of Africa (20 countries, 72 research centers), to promote collaboration between research and higher education centers and Japanese universities. ACE invests in higher education, focusing on science, technology, engineering, and mathematics (STEM). Aligned with the SDGs, it fosters specialized industries by region. Because of the adoption of the project in 2014, more than 60 billion yen has been invested in ACE1 (West and Central Africa), ACE2 (East Africa), and ACE Impact (an expanded version of ACE1).

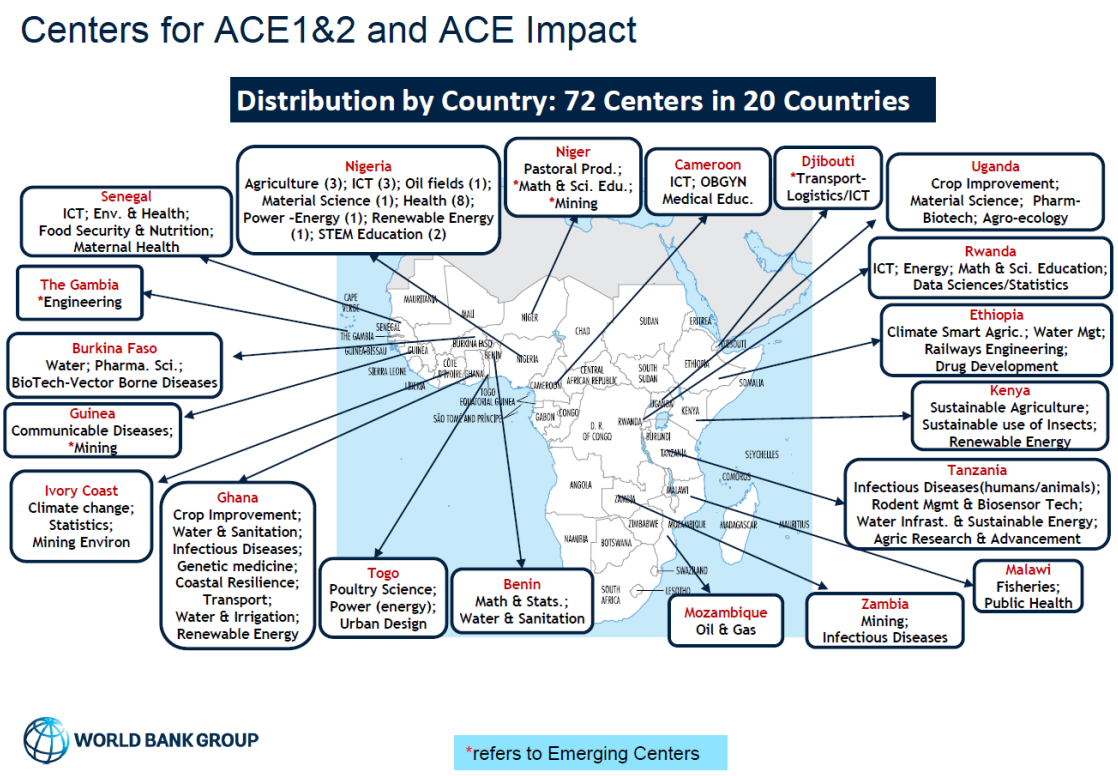


Figure 1 World Bank Group's Africa Centers of Excellence (ACEs)[8]

Challenges exist in motivating Japanese researchers to work on implementation in society. These university researchers are usually evaluated with papers with greater academic impact. In other words, involvement in social implementation can be detrimental to the career development of a researcher. In recent years, many young researchers have been placed in fixed-term contracts, and it is unlikely that they have enough time to complete their research, publish a report, and additionally involve themselves in implementation within a few years. To solve this problem, extending an employment contract (e.g., to 3-5 years of extension) for young Japanese university researchers working on issues related to Africa under the above "extended" SATREPS programs should be considered.

Box 4 Japan Science and Technology Agency (JST) Initiatives

Since 2008, JST has adopted and supported 168 projects worldwide (68 of them in cooperation) in the fields of environment, low carbon, bioresources, disaster prevention, and infectious diseases through SATREPS, and 42 projects in 21 countries in Africa (18 of them in cooperation), as of September 2021.[9] The project aims to promote international joint research to solve global-scale issues. As an example of support, through the University of Tsukuba's Alliance for Research on the Mediterranean and North Africa (ARENA), a network of universities and research institutions in Japan and North Africa has been established to provide scientific and technological cooperation and human resource development.

In addition, JST, under the name of the Africa-Japan Collaborative Research (AJ-CORE) program, focuses on research fields that contribute to solving important regional and global issues facing Africa and supports the development of science and technology in both Japan and Africa and the achievement of the SDGs.[10]

Source: Summary from a presentation by Mr. Okada (Research Officer, International Affairs Department, JST)

Box 5 Japan's involvement in Science, Technology, and Innovation (STI) in Africa

With the COVID-19 pandemic, innovation in the digital field is accelerating in Africa, and STI is becoming a tool not only for urban areas and elites but also for rural areas and conflict zones. In the future, Africa and the world expect Japan to actively engage in Africa, drawing on its experience accumulated through cooperation among universities, research institutions, and private-sector initiatives. In the short term, the "formation of high-quality individual projects that appeal to the international community and lead to a reversal of resource allocation in the future" will be needed. In the medium term, "policy dialogue that contributes to the formation of a strategic framework (STI, cross-disciplinary research on diplomacy, utilization of international organizations, etc.) " will be necessary. In the long term, "efforts aimed at reviving basic

research capabilities to solve problems in Africa and the world and to contribute to national interests" need to be accelerated.

Source: Summary from a presentation by Mr. Kanehira (Senior Strategic Operations Officer, Office of the Vice President for Human Resources, World Bank Group)

Box 6 ABE Initiative: Contactless IC Card Project by International Students

Daniel Elliot KWANTWI, an ABE Initiative student from Ghana who studied at the University of Tokyo from 2015-2021, established TranSoniCa Corporation and started a cashless payment service business using contactless IC cards in Ghana. After taking a cue from Japan's transportation IC cards, because he believed that the demand for contactless IC cards would be even greater in the face of the COVID-19 pandemic, he launched the business on the University of Ghana campus in October 2021, and the IC cards can now be used on buses and in retail stores.

Daniel pointed out that one of the challenges for the ABE Initiative is a lack of opportunities to strengthen ties between international students and Japanese companies in the business. Whether during their studies or after their return to their home countries, international students who are familiar with their own culture and networks and Japanese companies looking to expand into developing countries in Africa will be able to cooperate in business activities, which will help strengthen the relationship between Japan and Africa.

Source: Summary from the presentation by Mr. Daniel (CEO, TranSoniCa Company Limited)

2.3 Cooperation in strengthening African National Research Institutes

During Japan’s rapid economic development, research institutes under the Agency of Industrial Science and Technology (AIST) significantly contributed to the development of industrial technologies. The functions of research institutes at that time can be summarized as follows:[11]

(1) Identifying trends in advanced technologies (mainly from the West) and exploring their potential for use in the Japanese industry
(2) Research and development of original domestic technologies
(3) Joint research with private companies and technology transfer based on technical guidance contracts and patent licenses.
(4) Promoting technology evaluation and standardization as an impartial and neutral party (support for consensus building within the industry).

They are not necessarily applicable today, as these are all methods that were used at a time when public research institutions were clearly in a better position than private companies to access advanced research information and when many private companies were still unable to engage in long-term research and development (R&D) easily. Furthermore, it should be noted that the relationship between academia, private companies, and public institutions in Africa was not the same as in Japan at that time.

Nevertheless, it is not inconceivable that such a system would be beneficial for addressing social challenges and developing African industries. As there are already many national research institutes in African countries, it would be meaningful and effective to accelerate collaboration and research exchanges with Japanese national research institutes, mainly in the agricultural, healthcare, and industrialization fields.

Japan's national research institutes continue their research activities under severe budgetary and personnel constraints, and it is difficult for them to collaborate with public research institutes in all 54 African countries. In addition, public research institutions in African countries are not yet fully understood. Therefore, it will be necessary to form a project team of concerned parties from Japan and Africa to find a specific partner (for matching) and to determine cooperative themes for better cooperation and exchange. They are familiar with the research field and in a position to manage it and exchange opinions closely with each other.

Table 1 National Institutes in Major African Countries

Country	National Institute	Website URL
Egypt	National Research Center	https://www.nrc.sci.eg/
	Central Metallurgical Research and Development Institute	https://www.cmrdi.sci.eg/
	Tabbin Institute for Metallurgical Studies	https://tims.gov.eg/en/
	National Authority for Remote Sensing and Space Sciences	http://www.narss.sci.eg/
	City of Scientific Research and Technology Application	http://srtacity.sci.eg/
	Academy of Scientific Research and Technology	http://www.asrt.sci.eg/
	Information Technology Institute	https://www.iti.gov.eg/
	Agricultural Research Center	http://www.arc.sci.eg/
	Theodor Bilharz Research Institute	https://www.tbri.gov.eg/index.aspx
	Egyptian Petroleum Research Institute	http://www.epri.sci.eg/
	National Institute of Nutrition	
Ethiopia	Ethiopian Institute of Agricultural Research	http://www.eiar.gov.et/
	Ethiopian Space Science and Technology Institute	https://etssti.org/about-essti/
	Environment and Forest Research Institute	https://www.eefri.org/
	Ethiopian Biotechnology Institute	
	Ethiopian Health and Nutrition Research Institute	
Morocco	Moroccan Institute for Scientific and Technical Information	https://www.imist.ma/
	National Center for Scientific and Technical Research	https://www.cnrst.ma/index.php/fr/
	Pasteur Institute in Morocco	http://www.pasteur.ma/
	National Institute of Agricultural Research of Morocco	http://www.ias.csic.es/medileg/inram.html
	Scientific Institute at Mohammed V University	http://www.israbat.ac.ma/
Kenya	National Commission for Science Technology and Innovation	https://www.nacosti.go.ke/
	Kenya Industrial Research and Development Institute	https://kirdi.go.ke/
	Kenya Agricultural & Livestock Research Organization	https://www.kalro.org/

	Kenya Forestry Research Institute, Kenya Medical Research Institute	https://www.kemri.go.ke/
	KEMRI-Wellcome Trust Research Programme	https://kemri-wellcome.org/
	African Population and Health Research Center	https://aphrc.org/
Ghana	Council for Scientific and Industrial Research Ghana	https://www.csir.org.gh/
	Kintampo Health Research Centre	https://kintampo-hrc.org/
	Noguchi Medical Research Institute	https://www.noguchimedres.org/
DRC	National Institute of Biomedical Research	https://www.inrb.net/
Ivory Coast	National Center for Agricultural Research	https://cnra.ci/
	National Institute of Public Hygiene	
Nigeria	International Institute of Tropical Agriculture Nigeria	https://www.iita.org/
	National Veterinary Research Institute Vom	https://nvri.gov.ng/
	National Agricultural Extension and Research Liaison Services	
South Africa	Council for Scientific and Industrial Research	https://www.csir.co.za/
	Council for Mineral Technology	https://www.mintek.co.za/
	Agricultural Research Council	https://www.arc.agric.za/Pages/Home.aspx
	South African Medical Research Council	https://www.samrc.ac.za/
	South African Institute for Aquatic Biodiversity	https://www.saiab.ac.za/
	South African National Biodiversity Institute	https://www.sanbi.org/
	Human Sciences Research Council of South Africa	http://www.hsrc.ac.za/en
	South African National Space Agency	https://www.sansa.org.za/
	Forestry & Forest Products Research Centre	http://ffp.csir.co.za/

2.4 Cooperation to strengthen higher education in Africa

African elites often study undergraduates at top universities in each country and

postgraduate graduate schools in former sovereign states. Although the university enrollment rate is currently about 37% in North African countries and only 9.5% in Sub-Saharan African countries,[12] which is not high compared to advanced countries, the university and graduate school enrollment rates are likely to increase in line with the growth of gross domestic product (GDP) per capita in African countries.

In preparing curricula in a wide range of fields, distributing online study materials from the Open University of Japan (currently more than 900 courses for undergraduate, master's, and doctoral programs) should be considered after they are translated into English and French. Similar requests for cooperation have already been received from developing countries outside of Africa. Certainly, there are issues such as the need to create a telecommunication infrastructure for distribution and a method for assessing the reports required for course completion and credit approval. A close exchange of opinions among interested parties is required in the future.

Table 2 Examples of courses expected to be "useful for sustainable economic development in Africa" among the Open University of Japan's contents

Course	Subject	Contents
Undergraduate	Globalization and Japanese Monozukuri	Sketching the overall picture of "Monozukuri" by reviewing the actual technology and management of small to large companies, students will learn the strengths and weaknesses of Japanese companies and the realities of international competition and cooperation.
	Supply Chain Management	Learn principles, issues, and approaches related to sustainable circular supply chains, global supply chains, supply chain integration issues, and the role of logistics activities such as inventory control.
	Global Warming and Social Innovation	This course provides an overview of innovative efforts by governments, companies, research institutions, and citizens to address global warming and discusses possible actions that humanity can take to solve this problem and the possibilities of such actions.
	Development of women's career design	Understanding how women view their careers broadly, including work and lifestyle, and the social structures surrounding them, will inform the challenges they face and how to overcome them.
	Industrial/Org	Learn about the behavioral characteristics of people

	anizational Psychology	in organizations, personnel assessment and development for organizational management, the safety and health of workers, and the development of organizations through an understanding of consumer psychology for marketing purposes.
Master's Degree	Development of regional industries and entity formation	Study of entity formation and regional management (regional management) by regional stakeholders (e.g., local governments, companies, local residents), with a focus on agribusiness, through theory and practice (case studies).
	Data Science	Learn the fundamental technologies and methods necessary for data analysis and processing, and think about life and work in an era of data abundance, along with the current status, issues, and possibilities of data science utilization.
	Integrated Innovation System Study	Learn about each innovation strategy and fundamental laws in the era of integration of various areas of science, technology, and innovation policy, as well as related laws, ethics, and management in advancing scientific research.
Doctor's Degree	Advanced Social and Management Science	Establish their research methods and learn how to write a perspective thesis by independently deciding on a cross-cutting theme in social research and conducting basic research in the form of a research project.
	Software Engineering Research Methods	Students will learn the knowledge and skills required to solve problems with software in an age when the problems are becoming larger and more complex through planning, conducting, and evaluating case studies.

Source: Open University of Japan (2022). Course Guide. Available at: https://www.ouj.ac.jp/kamoku/

In addition, African youth must understand more about Japan, especially "what is attractive about Japanese STI," rather than just vague admiration or preconceptions. In this regard, the main objective of the "Sakura Science Program" implemented by the JST is to invite youth from abroad to Japan to experience science and technology through activities. From 2014 to 2019, 33,197 people were invited to Japan over 6 years.[13] As African countries have been included in the program since 2021, it is important to strategically utilize this program as an "entry point" to promote the current status of Japan's STI and future collaboration with Africa.

Since 2019, JICA has cooperated with the Open University of Japan to jointly produce content that systematically introduces Japan's modern and contemporary history in English (Table 3) and provides it to JICA-related foreign students and others who come to Japan for the program "Understanding the Japanese Development Experience/Japanese Local History and Development."" JICA has also collaborated with domestic universities, such as the National Graduate Institute for Policy Studies (GRIPS), to establish courses for a deeper understanding of Japan's development experience (JICA Development Studies Program[14]). As part of these programs, the "JICA Chair" program supports providing lectures on Japanese studies and strengthening existing research and education programs (joint research, research, and education opportunities in Japan for young researchers) in collaboration with leading universities in partner countries. Close collaboration among related Japanese institutions to plan and deliver these initiatives will also be important in promoting the understanding of Japan in Africa. They complement the contents from the Open University of Japan, and the Sakura Science Program mentioned above.

Table 3 Japanese Modernization Lecture Series

Lecture Titles	Lecturers
Chap 1. Meiji Revolution: Start of Full-Scale Modernization	Dr. Kitaoka Shinichi, President, JICA
Chap 2. Rise and Fall of the Party Politics in Japan	Prof. Iokibe Kaoru, the University of Tokyo
Chap 3. Japan after World War II	Prof. Tanaka Akihiko, President, GRIPS
Chap 4. Economic Growth and Japanese Management	Prof. Itami Hiroyuki, President, International University of Japan
Chap 5. Educational Development in Modernization in Japan	Dr. Kayashima Nobuko, Senior Vice President, JICA
Chap 6. From 'Asia and Japan' to 'Japan in Asia'	Dr. Shiraishi Takashi, President, Prefectural University of Kumamoto
Chap 7. A Japanese Approach to International Cooperation	Prof. Kato Hiroshi, International University of Japan
Chap 8. Intellectual and Social Aspects of Modernization in Japan	Prof. Matsuda Koichiro, Rikkyo University
Chap 9. Modern Japan and the Wars Part1	Dr. Kitaoka Shinichi, President, JICA
Chap 10. Japan and Modern International Law	Prof. Kanehara Atsuko, Sophia University

Chap 11. Modernization of Japan's Administrative System	Prof. Makihara Izuru, the University of Tokyo
Chap 12. Development of Industries and Industrial Policy	Prof. Okazaki Tetsuji, The University of Tokyo
Chap 13. Modernization in Japan-The Fiscal and Monetary Field	President Watanabe Hiroshi, Institute for International Monetary Affairs
Chap 14. The Road to a Nation of Science and Technology	Dr. Hasegawa Mariko, President, The Graduate University of Advanced Studies
Chap 15. Public Health and Health Systems in Japan a Historical Review	Emeritus Prof. Aoyama Atsuko, Nagoya University

Source: JICA (2022). JICA Chair: Japanese Modernization Lecture Series. https://www.jica.go.jp/dspchair/chair/modernization/index.html

Box 7 The Sakura Science Program

The Graduate School of Science and Engineering of Ibaraki University invited nine graduate students from India, Thailand, Vietnam, and Taiwan to participate in a program in 2018 under the theme of "Collaborative Research Utilizing Asian Country Networks to Link Experiments and Theories in Quantum Beam Molecular Science." In addition to participating in the theme of "Quantum Beam in Biology and Soft Materials" in the "3rd International Symposium on Quantum Beam Science at Ibaraki University," which focused on the study of the structure and properties of proteins and other biomolecules and soft materials, and their applications using quantum beams, the program also strengthened academic networks with other countries in the research fields of the faculty members of the host laboratory by organizing the "Asian Workshop on Theory and Experimentation of Quantum Beam Molecular Science."

St. Luke's International University and the National Institute of Infectious Diseases invited 27 young researchers from 10 countries over 3 years to work on infectious disease control in Asian countries to build a network of researchers in the region and contribute to infectious disease control in Asia in the future. The program provided an opportunity to learn about the current status of the use of science and technology in Japan's infectious disease control measures through a visit to a regional health research institute, which is the site of infectious disease control measures in local governments. At St. Luke's International University, in addition to a lecture on "Mathematical Models

and Infectious Diseases," the participants observed Japan's most advanced testing, diagnostic techniques, and treatment. The network of young researchers established through the Sakura Science Program has greatly contributed to the maturation of information sharing, teamwork, and trust necessary for infectious disease countermeasures in Asia.

Source: Japan Science and Technology Agency (2022). https://ssp.jst.go.jp/outline/pickup/

From a long-term perspective, considering the labor shortage risk in Japan, which will become even more pronounced in the future, it is necessary to accelerate human resource exchange between Africa and Japan and motivate young Africans who have studied in Japan to work and settle there. As in the past in Asia, young Africans who have studied in Japan could also contribute to forming a kind of brain circulation while moving back and forth freely between Japan and Africa through corporate activities. As a first step, creating, maintaining, and developing a network of African people who have become familiar with Japan through JICA, AOTS, the ABE Initiative, and other studies abroad programs will be necessary.

2.5 Measures to visually appeal to and convey the attractiveness of Japanese STI and the challenges in Africa to young people in both countries ("Hot & Cool Afro-Japan" Project (tentative name))

Let us consider, with an open mind, "What is the appeal of Japanese STI to the people of Africa? " This will probably differ greatly depending on the country, place of residence (urban or rural), sector, age group, and educational background. In addition, cooperation from the West (especially former European sovereign nations) and China has progressed considerably, and Japan needs to build on its comparative advantage successfully. To this end, it is necessary to convey Japan's "attractiveness of STI" in a catchy manner and to launch cooperative projects on these themes under cooperation between the public and private sectors.

Similarly, there is a huge need to promote the appeal of African youth to Japanese youth, given its diverse and significant opportunities and challenges. The "Hot

and Cool Afro-Japan" Project (tentative name) should be implemented on a large-scale through cooperation between industry, the government, and academia to promote and convey the attractiveness of both Africa and Japan.

The following are themes that could serve as examples of such projects. Themes 1) to 5) aim to promote the attractiveness of Japanese STI, and themes 6) to 10) aim to promote the attractiveness of Africa's diverse and remarkable opportunities and challenges. Through implementing these activities, it should be possible to have African youth discover the attractiveness of Japan and, at the same time, have Japanese youth discover the attractiveness of Africa.

1) Establishing specialized educational institutions or projects related to programming Japanese video games for African youth in particular.
2) Creating and providing content that visually appeals to the operational excellence of Japanese manufacturing plants, particularly for African industrialists.
3) Creating and providing content that concretely explains the history of Japanese industrial technology and the contributions of universities and national research institutions to university researchers and policymakers in Africa.
4) Creating and providing content that visually appeals to advanced and inclusive Japanese healthcare and well-being for those involved in healthcare and well-being in Africa.
5) Stakeholders in infrastructure development in Africa should create and provide content that visually conveys the situation of water and sanitation, food and nutrition, primary and secondary education, energy, waste disposal, and environmental conservation in daily life in Japan.
6) Creating and providing content that visually conveys the rich potential of Africa's land and nature.
7) Creating and providing content that persuasively conveys the dynamism represented by recent economic development and the richness of traditional African societies.
8) Creating and providing content that visually appeals to human resources and the cultural richness of Africa
9) Creating and providing content that persuasively highlights opportunities for infrastructure development in a wide range of fields in Africa

10) Creating and providing content that visually appeals to African STI and the prosperous future that it can bring to Africa.

Furthermore, a permanent TICAD (Tokyo International Conference on African Development) information website should be created, mainly by governments and TICAD organizers, to provide real-time information on the progress of specific partnerships, cooperation, and business creation, as well as to provide information on the Hot & Cool Afro-Japan Project.

Box 8 Initiatives at Digital Hollywood University

To encourage African youth to discover the appeal of Japan through the "Hot & Cool Afro-Japan" Project, cooperation and collaboration measures could be established based on the existing efforts, such as those of Digital Hollywood University. The university currently offers computer graphics (CG) technology education at the world's highest level and has recently accepted students from about 40 countries. Therefore, for example, it would be desirable for young people in Africa to have an opportunity to systematically learn the university's theoretical and practical subjects related to cutting-edge animation, games, and fashion, especially from Japan, as shown in Table 3. Currently, the following curriculum is offered only in Japanese, and it is challenging to establish a system that enables the translation of course content and correction of reports and work assignments to be provided in English and French. However, disseminating visually appealing content to African youth has vast potential to become one of the pillars of future collaboration with Africa.

Table 4 Examples of Courses Offered by Digital Hollywood University

Course	Content
Digital Animation Exercise	Learn the basic operation methods of animation drawing that can be used in Japanese commercial animation production while learning the practical application of each process in Japanese animation production using digital tools.
Animation Direction	To learn practical production techniques through the animation production process and knowledge and awareness building as a professional animation director.
Game	Students learn the process of creating a single work from

Development Exercise	scratch, using game development as the subject matter to acquire more practical development techniques rather than just programming to handle data.
Theory of Fashion Evolution:	Learn the history of fashion and how the latest technologies, such as wearable devices, can be integrated with fashion (e.g., fashion tech/design engineering).
Content Policy Theory	Understand trends in the content industry, various government promotion measures, and efforts by industry, government, and academia to develop human resources in the content field at universities across markets, overseas expansion, regional revitalization, and digital policy.

Source: Digital Hollywood University (2022). List of subjects. https://www.dhw.ac.jp/faculty/subject/

2.6 Addressing the " last-mile problem through STI

Measures to deliver the benefits of STI without leaving anyone behind require detailed studies for each issue, but the following ideas may be effective.

1) Hard infrastructure, such as reservoirs, pipelines, power generation facilities, and transmission/distribution facilities, are needed for water and electricity. Although public maintenance is essential in most areas, rural areas with low population density may better develop decentralized infrastructure, which is cost- and time-effective. Mobilizing private investment in such areas is an important policy consideration.

   Many African countries face the problem of over-indebtedness from China. It is not necessarily easy for Japan to issue more Japanese yen loans based on the Development Assistance Committee (DAC) guidelines by the Organization for Economic Cooperation and Development (OECD), and loans to Asian countries are often prioritized for Japan. Nevertheless, it is important to increase Africa's priorities strategically.

2) Building infrastructure to tackle the last-mile problem requires funds and human resources. Achieving optimal design and systematic infrastructure implementation will require actions such as training professionals in these

fields through the government's ABE initiative and Sakura Science Program.

3) Benefiting from innovation also needs human resource development to initiate innovation, expand innovation as a corporate activity, and implement it in society to deliver it to everyone. Japan and Africa should work together to develop well-balanced human resources and social institutions such that the benefits of innovation are equally distributed to all stakeholders. Case studies in Asia are sufficiently instructive.

4) In Japan, efforts are being made to revitalize local communities during the aging and depopulation of the local population. Since 2018, the government has been collecting proposals from municipalities on development initiatives integrating economic, social, and environmental sustainability towards achieving the SDGs as "Future City" and showcasing successful practices as "Municipal SDG Model Projects."[15] By 2021, 124 cities were chosen to be a "Future City," of which 10 projects are selected to be "Municipal SDG Model Projects" each year.[16] Although Africa anticipates future population growth, and the situation may be quite different from Japan, this initiative could benefit African countries and should be incorporated into policy discussions on achieving the SDGs in and around metropolitan areas.

3. Second Agenda: "Data-driven national land development, agricultural development, and approach to social challenges in Africa."

One of the biggest problems in Africa is the lack of data that concretely and clearly describes the challenges that need to be solved. Without these data, it is impossible to formulate effective policies and clarify priorities. This further discourages investors and innovators from expanding their activities in development through both ODA and the private sector. Consideration should be given to resolving this issue in the following ways.

3.1 Establishment of data acquisition and data use infrastructure for data-driven national land development, agricultural development, and approaches to social challenges

Detailed topographical and geological, climate, population distribution, and logistical data within a country are necessary for planning national land development. Similarly, agricultural development requires data on geology (soil), climate (precipitation and temperature patterns), optimum growing conditions for crops, and tackling social challenges (e.g., drinking water, food, electricity supply, healthcare, education, environmental conservation, and industrial development) also require detailed status data to describe each issue.

Unfortunately, the data that Japan has obtained over the years through ODA in Africa and other official cooperation activities (even future projects) are fragmented by individual projects and are not available in a unified form. Therefore, building a platform to integrate these data by theme and share them (or make them publicly available) with Africa is essential. Depending on the nature of the data, some data should be shared only between the concerned country and Japan, and specific rules are necessary for sharing with other countries. This stresses the role of Japan in creating a framework to manage these fragmented data, promote utilization, and take the lead in maintaining and developing it for the next 10 years.

Additionally, to accelerate the use of a wide range of data in Africa, Japanese and

African academic institutions and private companies can utilize the data obtained from nanosatellites (called CubeSat), sensors onboard unmanned aerial vehicles (AUV), drone sensors, and other sensors on land, which have been widely used in recent years for joint research and implementation in society. The government is expected to support these themes through public funding.

In collaboration with the private sector, METI developed and recently launched a cloud-based satellite data platform, Tellus, to create new business opportunities, mainly using satellite data from Japan. It will be necessary to nominate an African counterpart organization for this project, consider a support mechanism for using satellite data to solve social challenges and support human resource development for using satellite data in Africa. Existing cooperation schemes such as SATREPS and the ABE Initiative Project can also support this initiative.

According to Professor Shirasaka of Keio University, the future of Earth observation is expected to be dominated by constellation remote sensing using a large number of small satellites rather than a small number of large satellites.[17] In addition, more detailed observations and analyses are expected to become possible because commercial satellites are increasingly providing visible light image data. It will be possible to use data from the hyperspectral sensor for ultraviolet imaging (HISUI) launched by the Japanese government in the future, and the data from synthetic aperture radar, with which surface data can be observed regardless of weather conditions (cloudiness) at observation points, can also be used. While incorporating these trends, specific discussions, research, and development should be strengthened to solve social challenges in Africa.

Data obtained from human consumption behavior will naturally be collected by telecommunication carriers and mobile payment providers on a business basis. This will require no special consideration except for institutional arrangements, such as protecting personal information. However, because the above data are public goods and infrastructure for social development, it is necessary for the public sector to proactively regulate data acquisition and provide such data to the academic and business sectors at a low cost to encourage their utilization.

Box 9 Overview of RWASAT-1/2 launched in collaboration with the Ministry of ICT and Innovation, the Rwanda Public Works Regulatory Agency, the University of Tokyo, the Embassy of Japan in Rwanda, JAXA, JICA, and others

Rwanda advocates "ICT Nation" and promotes innovation using ICT to overcome the handicap of being a landlocked country. Specifically, Rwanda focuses on acquiring information from the sky using remote sensing and communication technologies. 2018 saw the development of the small satellite RWASAT-1 (Rwanda's first satellite, a 3U microsatellite) in collaboration with ArkEdge Space Inc. (a start-up from the University of Tokyo). It was released from the Japanese Experiment Module Kibo of the International Space Station in 2019. The second satellite, RWASAT-2, is currently under design and development and will be assembled solely by Rwandan engineers trained in Japan. The Ministry of ICT and Innovation, the Rwandan Utilities Regulatory Authority (RURA), the Embassy of Japan in Rwanda, JAXA, and JICA are also involved in supporting the realization of this achievement, underscoring once again the importance of effective cooperation between the public and private sectors.

Source: Kasumigaseki Foreign Service Association (KaFSA) (2019). https://www.kasumigasekikai.or.jp/2019-07-17-2/

Box 10 Case Studies of Satellite Remote Sensing for Agricultural Upgrading

Satellite remote sensing data is already being applied to the agricultural sector in various ways. The following are representative examples.

(1) The National Institute of Agro-Environmental Sciences (now the Institute for Agro-Environmental Sciences, NARO) has played a central role in this effort, and the results have been well summarized in three books[*]. To cite one

[*] Akiyama, Fukuhara, Saito, & Fukayama (eds.) (1996). Agricultural remote sensing - Quantitative analysis of environment and resources, Yokendo; Akiyama, Ishizuka, Ogawa, Okamoto, Saito, & Uchida (eds.) (2007). Handbook of Agricultural Remote Sensing, The Society of Systems Agricultural Engineers; Akiyama, Fukuo, Hirano, Ishizuka, Ogawa, Okamoto, Saito, Uchida, Yamamoto, Yoshizako, Zukemura (2014). Handbook of

example, according to Shiga and Ogawa (1996), satellite remote sensing using optical sensors helps estimate crop identification, growth status, and production based on spectral reflectance characteristics of agricultural land. The technology is also useful for planning crop planting by determining soil fertility (fertilizer requirements) and evaluating agricultural land productivity by estimating the amount of organic matter (i.e., carbon content) and soil moisture in agricultural soil. In addition, using microwave data unaffected by clouds, such as SAR (Synthetic Aperture Radar) images, it is possible to estimate soil moisture distribution without data loss, which can be useful for understanding irrigation needs and forecasting drought damage. Furthermore, when combined with field-observed meteorological data, the planning of the installation and operation of agricultural civil engineering infrastructure, such as irrigation and drainage facilities, can be improved. Recently, Yoshino and Philpot (2018) proposed an analysis method that reduces the influence of soil and emphasizes vegetation information based on satellite remote sensing data over large areas with vegetation.[18]

(2) The Japan Space Systems (JSS) has recently been operating a hyperspectral sensor (HISUI) aboard the International Space Station (ISS) and has been developing data analysis techniques for early detection of salt damage caused by soil salinity, differentiation between grasses and weeds, and estimation of grass productivity to promote utilization.

(3) Satellite remote sensing data determines temperature and precipitation worldwide. The International Cooperation Center for Agricultural Education at Nagoya University is promoting the African Rice Crop Development Project and created a map of possible cultivation areas for upland rice NERICA based on temperature and precipitation in Kenya. Plans are underway to include information about other African countries on the map.

Source: JSS (2022). Solutions. https://www.jspacesystems.or.jp/project/observation/hisui/; JSS (2017). Hyperspectral Data Application Guidebook; Saito, Ogawa, Makihara, and A sanuma (2015). Estimation of Potential Area for Upland Rice Production in Kenya.

Agricultural Remote Sensing, Supplemented Edition, The Society of Systems Agriculture, Japan.

Box 11 Toward the establishment of data infrastructure

Global data volume is expected to reach as much as 125ZB by 2025,[19] but the data held by Japan has not been able to demonstrate its strategic value. By releasing leading data currently used only in academic areas, converting it into valuable intellectual property (experience and knowledge), and strategically promoting its use in the activities (business and investment) of Japanese companies, the advancement and industrialization of sectors such as agriculture, forestry, and fisheries in Africa can be accelerated.

As private companies often find it difficult to collect and provide comprehensive data on their own, it is expected to have a "priming" effect on investment in Africa with private companies by establishing a system for collecting and providing various types of data as public goods through collaboration among the government, public institutions, and international organizations as public infrastructure. The Japanese government and related organizations, the African Union (AU), the United Nations, and private companies should play a central role in establishing a system for collecting and providing data and a mechanism for flexible collaboration among companies, universities, and research institutions (both Japanese and African) is also necessary for the utilization of data.

Source: Summary from a presentation by Mr. Ogura (Lecturer, The Open University of Japan)

Exchanging information for data use and developing human resources is needed for African countries to promote comprehensive national and regional land development, standardize data formats and communication protocols, distribute data, and guarantee mutual access. To this end, Japan, the AU and its member countries, and international organizations (or other developed countries also) can together form an organization for collaboration (tentatively named "Data Network for Problem Solving in Africa"). Before organizing it, full consultation with AUDA-NEPAD is required.

Specifically, it is crucial to establish a macro (Africa-wide) framework for data acquisition, distribution, and use and rules and systems for data management,

including cross-border data flows. Items that should be considered include the following.

1) Regulations on data ownership and data access for a public use
2) Rules for conflict management between multiple countries regarding cross-border data flows
3) Strategies for the development of infrastructure for acquisition, distribution, and use of data
4) Capacity building for the acquisition, distribution, and use of data (data scientists, businesses, and rulemaking)
5) Rules and plans to make existing official data digitally available (e.g., statistics on population, economy, trade/investment, infrastructure)

Japanese workers from the government, universities, public research institutions, and private companies can play an active role in these fields. In addition, to attract talented young people from Africa, the active acceptance and training of African government officials and ABE Initiative students in this field can be considered.

3.2 Establishment of the physical infrastructure to utilize data "on the ground"

After launching the "Data Network for Problem Solving in Africa (tentative name),” the issue of how to interpret data in the field, develop solutions, and put them into practice. This will require local policymakers, engineers, and business people to take ownership.

In terms of promoting implementation on the ground, STI in Japan can be supported in the following ways:

1) In the short term, it will be effective to list universities and public research institutions that can contribute to land development, agricultural development, and the development of approaches to social challenges in Africa and promote research cooperation with Africa. Japan can also strengthen the system for utilizing data on the ground by integrating the initiative from SATREPS (from basic research to social implementation–creation of a knowledge value chain) mentioned in Section 2.1.2 and encouraging joint research with African research institutions.

The following is a tentative list of universities and public research institutions based on information posted on their websites. The African and Japanese sides can closely discuss the selection and collaboration of institutions.

Table 5 Japanese Public Research Institutions Expected to Collaborate in Africa and Japan (tentative)

Research Institute	Website	Potential research areas for collaboration with Africa
Japan International Research Center for Agricultural Sciences (JIRCAS)	https://www.jircas.go.jp/ja	• Development of sustainable land management methods under extreme weather conditions in deserted areas • Development of integrated climate change adaptation technologies in agriculture for developing regions • Development of carbon recycling technology to convert agricultural waste into resources
National Agriculture and Food Research Organization (NARO)	https://www.naro.go.jp/project/challenge/index.html	• Development of data-driven distribution and preservation technologies to create smart food chains • Construction of a digital platform for agricultural infrastructure information • Development of technology for control of transboundary and high-risk pests and cutting-edge pesticide-free pest control
National Institute of Advanced Industrial Science and Technology (AIST)	https://www.aist.go.jp/aist_j/information/organization/research_units/index.html	• R&D of smart manufacturing technologies that contribute to the sustainable development of the manufacturing industry • Development of technologies for effective utilization of energy resources • Research for the development, integration, and advanced use of geological information
RIKEN	https://www.riken.jp/research/labs/index.html	• Robot technology for infrastructure maintenance and management • Development of rhizosphere microorganisms and experimental plant resources for research on plant-microbe symbiosis • Research on plant immunity as basic technology for crop applications
National Institute of Infectious	https://www.niid.go.jp/niid/ja/	• Infection epidemiology (enhanced surveillance of countermeasures related to human diseases)

Diseases (NIID)		• Research on vaccine development such as COVID-19
National Research Institute for Earth Science and Disaster Prevention (NIED)	https://www.bosai.go.jp/activity_special/	• Establishment of a collaborative system for data utilization that contributes to resilience improvement, especially in urban areas • Research on hazard and risk assessment • Development of water hazard prediction technology based on multi-sensing
National Institute for Environmental Studies (NIES)	https://www.nies.go.jp/kenkyubunya/index.html	• Resource recycling field (development of technologies and systems for environmental restoration and regeneration and their adaptation to developing countries) • Social systems field (development of theories and mathematical models to integrate economic and environmental issues) • Climate change adaptation (impact prediction based on climate and socioeconomic scenarios)
Japan Aerospace Exploration Agency (JAXA)	https://www.kenkai.jaxa.jp/research/	• Low-cost, High-capacity, High-speed Communication Satellite System for the Society 5.0 • Observation sensor research for the earth observation missions • R&D Program for small technology innovation satellites to shorten development time and reduce dost

2) In the medium term, funds with relatively few restrictions on use, such as grants for operating expenses to the abovementioned research institutes, can be allocated explicitly as basic research funds for land development, agricultural development, and the development of approaches to social challenges in Africa. It shall be continuously provided for at least 10 years (interim evaluation in the fifth year) to ensure stable employment of researchers, university research administrators (URAs), and research assistants. In this regard, research institutions, policy authorities, fiscal authorities, and diplomatic authorities in Japan are required to work together, taking this as a measure outside the recurring operating subsidy that must be reduced each fiscal year. Because it is unlikely that research on Africa will be one of the top priorities for all Japanese research institutions, increasing net funding for this area is still important.

Other measures also need to be taken to promote problem-solving start-ups in Africa (e.g., investment from public-private funds, low-interest loans for SMEs from financial institutions, tax incentives, and commendation programs), which will be discussed in Section 4.

3) To further strengthen long-term joint research, senior researchers from Japanese universities and public research institutions, as well as young Japanese innovators and entrepreneurs, to Africa for a relatively long period should be considered.

4) Because advanced information is now available to anyone in Africa via the Internet, constructing a decentralized network that provides easy and inexpensive access to power and telecommunications as hard infrastructure, even in rural areas, should also be considered important.

Box 12 Initiatives by Nippon Electric Company (NEC) for Data Utilization

In February 2018, NEC made a fast-growing South African system integrator a subsidiary and transferred the primary business operations from Japan to the local market, providing NEC's core system technologies customized to local needs. Continuous economic growth against the backdrop of long-term population growth and the rapid growth of the African ICT market indicate the high business potential of Africa. There is an urgent need to build data infrastructure, including the widespread use of digital national IDs.

However, private companies have limited knowledge and experience in the field at the community level to solve social issues across Africa. Therefore, partnerships with local companies and NGOs with grassroots activities that are well versed in the field are essential for delivering ICT systems. In addition, collaboration with universities and research institutions must be accelerated to analyze big data and AI data to determine how ICT systems can benefit the partner country.

Source: Summary from a presentation by Mr. Yoshifuji (Manager, Africa Business Development Office, NEC Corporation)

4. Third Agenda: “Accelerating industrialization and tech start-ups in Africa”

In addition to academia and research, the private sector significantly accelerates economic development in Africa through STI. As highlighted in Section 1, strengthening partnerships with young and talented human resources (innovators and entrepreneurs) in Africa is crucial. Specifically, the following measures can be considered.

4.1 Collaboration with the “Africa Investment Organization (tentative name),” proposed by Keizai Doyukai

In October 2021, Keizai Doyukai published a proposal titled "Establishment of the Africa Investment Organization (tentative name): Pathway to strengthen public-private partnerships further to accelerate development investment.[20] In particular, it proposes the establishment of a public-private partnership impact fund, tentatively called “the Africa Investment Organization,” as an institution to accelerate the Japanese government's continued efforts to cooperate with Africa and private-sector investment in African development. Keizai Doyukai decided to establish a "Preparatory Committee for the Establishment of the Africa Investment Organization," consisting mainly of members of the Africa Project Team of Keizai Doyukai and executives with knowledge of investment in Africa who are members of Keizai Doyukai. The committee begins discussions on basic matters related to the establishment of the management company, investment strategy, and management company members. Based on the discussions at the Preparatory Committee, the fund management company will be established by the end of this year, with the goal of fund management starting in the spring of 2023 and ultimately aiming to manage JPY 10-15 billion in the spring of 2024.

The EAJ strongly expects the realization of such a proposal from a private economic organization. In the context of STI, the expected function of such a fund would be to invest tens to hundreds of millions of yen each in the start-up phase to tech start-ups that seek to solve local problems in African countries through STI and to young Japanese entrepreneurs who are willing to work with these start-ups to create businesses. Because STI and start-ups are indispensable for

addressing societal challenges in Africa, the African investment organization is expected to invest heavily in this area and provide an opportunity to accelerate Japanese investment in Africa, which lags behind the U.S. and Europe. This needs to be carefully designed, as JICA is already providing investment and technical assistance to SMEs in the expansion stage in sub-Saharan Africa, mainly in French-speaking countries, by investing in impact investment funds, and the Innovation Network Corporation of Japan (INCJ) may also be conducting their work in this area.

Because it would not be appropriate to immediately invest this amount of funds without measuring the potential business risk, the existing schemes can be considered to fund the project conception stage and the project feasibility study (F/S) and demonstration stages. JETRO (the Africa Business Demonstration Project implemented from 2014 to 2018), METI (the J-Partnership Project), and JICA (the SME/SDGs Business Support Project) are examples of existing schemes. It is also expected that the scale of the budget will be greatly expanded or its usability further improved in response to the demands of the industry. International organizations such as UNIDO and UNDP, as well as private organizations such as AOTS, should make full use of their information provision and intermediary functions in these activities.

Box 13 Initiatives of International Organizations

The United Nations Industrial Development Organization (UNIDO) ITPO Tokyo has launched the Sustainable Technology Promotion Platform (STePP), a platform (online database) to introduce to overseas countries excellent Japanese technologies in the five fields of environment, energy, agribusiness, human health, and disaster management. [21] The platform provides opportunities for matching with government officials, corporate engineers, and technical consultants seeking technologies in developing countries and other regions by introducing technologies widely domestically and internationally through website postings and promotional activities at exhibitions and other events. Another feature of this platform is that it focuses on SMEs that do not necessarily have a large capacity to disseminate information overseas.

Since November 2020, the Japanese government (MOFA) has contributed

approximately 432 million yen to the STePP Demonstration Project in developing countries. About 10 Japanese companies have been selected to provide technology and technical training to assist developing countries in combating COVID-19 and other infectious diseases.[22]

UNDP (United Nations Development Program) has established Accelerator Labs (A Labs), whereby each country decides on the development issues it wants to solve. Local governments, businesses, and citizens collaborate to implement innovative community-based solutions to support knowledge-sharing among countries.[23] In Japan, the Japan SDG Innovation Challenge for A Labs, a joint effort by UNDP and Japanese companies to create and validate business models, enables Japanese companies to pursue business solutions to the country-specific challenges identified by A Labs.

In 2021, UNDP and the African Electronic Trade Group signed a plan to expand the digital capacity of women and youth in the African Continental Free Trade Area (AfCFTA).[24] To achieve "development that leaves no one behind," it is important to focus on youth and women's communities and consider their access, contribution, and capacity building to STI to identify business demand.

Source: Summary from presentations by Dr. Yasunaga (Former Head, UNIDO ITPO Tokyo) and Mr. Kondo (Representative in Japan, UNDP)

4.2 Supporting African governments for industrialization and SMEs development promotion policies

As mentioned in the second perspective in Section 1, because it is likely that Africa will experience an economic development path different from that of Japan or East Asia, past successful policies for promoting industrialization and SMEs development are not necessarily applicable to Africa.

However, discussions with officials of investment promotion agencies in African countries participating in the Delegate Program implemented by UNIDO ITPO Tokyo reveal that their interest in industrial and SME policies is extremely high.

Specifically, industrial policies that African countries are currently implementing are, in effect, various investment incentives for foreign companies (e.g., allowing the establishment of 100% foreign-owned companies in a wide range of industries, remittance of business profits in foreign currencies, and corporate tax exemptions for a certain period for foreign investments in SEZs (Special Economic Zones)), by which they intended to leverage the attraction of such foreign-invested companies to create new businesses in related and supporting industries in the local industrial sector.

However, public financial institutions that provide funds to local SMEs and training centers that provide technical guidance do not always have sufficient personnel with practical skills (in some cases, they are leaking overseas). The local SME promotion function is still weak in many cases.

In light of this, it may be effective for the Japanese government, African governments, AUDA-NEPAD, JETRO, JICA, UNIDO, UNDP, AfDB, AOTS, and other related organizations to create a forum for "industrial policy dialogue" and "SME policy dialogue" and link them to projects such as dispatching policy experts in necessary fields. In implementing this kind of cooperation, it is important to "obtain the commitment of high-ranking government leaders as much as possible," "customize the cooperation according to local conditions without imposing the Japanese or East Asian style," and "obtain the participation of local industries and Japanese private companies with interests in the country." The cooperation project in Ethiopia, which includes industrial policy dialogue and "Kaizen," led by the Ethiopian Prime Minister's Office, Ministry of Industry, JICA, and the Ohno Laboratory of GRIPS,[25] is a model case, even though the country is currently in a de facto civil war. Efforts in Ethiopia are being undertaken in close collaboration with the UNIDO investment advisors. In planning such projects, it is important to have a comprehensive view that incorporates the results of the aforementioned World Bank ACE project, UNDP development projects, UNIDO industry creation projects, and consults and collaborates with these multilateral organizations as needed.

In particular, looking at successful cases of Japanese manufacturers expanding into the ASEAN region, upgrading the skills of local human resources in the

supporting industries (parts and component manufacturing), with Thailand at the core, is considered to have contributed greatly to the success of such expansion. Collaborating with the AOTS that is currently investigating its project opportunity in ASEAN countries (i.e., Thailand), where Japanese-style management of manufacturing industries is well established, establishing a large-scale industrial human resources training network for Africa will be extremely important and effective.

Although many readers may have the impression that "industrial policy" and "SME policy" are different from "tech start-up promotion policy," the two are complementary. First, there is a need for policy support to ensure the steady growth of start-ups. In addition, fostering manufacturing-led development in the Japanese and East Asian styles is necessary to ensure operational excellence in countries where economies have grown to a certain degree and the manufacturing industry, with the goal of "standardized production, improved quality, mass production at low cost," is planning further economic development (whether to replace the demand for imported goods in the domestic market or for export to overseas markets).[26] In ASEAN, the intra-regional division of labor has led to the development of assembly-type manufacturing industries such as home appliances and automobiles. In Africa, the focus will first be on broadly defined industries, including food processing and daily necessities manufacturing, and not limited to supporting industries such as machine parts. Furthermore, it is important to note that this manufacturing industry can significantly contribute to increasing employment among young people and rural areas, which African countries seek. It will be essential for Africa's industrial structure to develop "new global standard" industries, perhaps through "tech start-ups," and to simultaneously pursue the two goals of "absorbing employment of the young" and "boosting the economy as a whole" through the manufacturing industry.

Box 14 Macroeconomic situation in Africa in recent years

Macroeconomic trends in Africa have been recently characterized by the expansion of the e-commerce market. It is estimated to have more than $28 billion in size (sales) and 330 million users in 2021, and it is expanding rapidly, especially among young people.[27] The total amount of funds raised by African start-ups from venture capital (VC) was 3.5 times higher in 2018 than the

previous year.[28] This shows the potential for Japanese companies to develop their business quickly and with high certainty by collaborating with start-ups regarding access to potential customers and marketing. If the right partner can be found, there is an opportunity to avoid the risk of financial recovery, which has been a bottleneck for expansion into Africa, and to reduce the initial investment costs for establishing a base and marketing.

Currently, there are few financing schemes in Japan for developing countries in which the government co-finances and shares risk, and in the field of technology and innovation, it is even more difficult for private companies to take risks on their own. Japan should consider establishing investment and loan schemes that consider return earning and cooperation with other countries, referring to Japan's experience in overseas investment and loans and investment cases.

Source: Summary from the presentation by Mr. Sugano (Former Deputy Executive Director of JETRO Johannesburg. Currently Director for International Exhibitions, METI)

Box 15 Importance of long-term policy dialogue

For the sustainable development of African countries, promoting start-ups aiming at leapfrogging and strengthening the policy and institutional capacity of African countries and governments are essential to nurture enterprises in the long run. It is therefore important to provide support for traditional Japanese enterprise and human resource development, such as "kaizen" (improvement), and academic and capacity building, such as vocational-technical training and primary education, to meet the needs of today's Africa.

Because Japan's human resources are limited, it will be necessary to hold in-depth dialogues with highly motivated leaders of a selected country and establish a mechanism to link public support and corporate initiatives with policy measures, to use resources effectively. However, the success or failure of such policy dialogue will largely depend on the qualifications of the leaders and their interest in Japanese ideas. Japan needs to make a long-term commitment and support scheme beyond just Japan.

In the case of Ethiopia, the commitment of Prime Minister Meles from that time, who even made a specific request, was very significant. It is also noteworthy that the project incorporated learning-by-doing elements, including the mobilization of experts and practitioners not only from Japan but also from East Asia (e.g., Malaysia, Thailand, Vietnam), and the combination of specific support from JICA as needed, such as kaizen (improvement), creation of champion products, and investment promotion, to link this to actual policies rather than just discussions.

Source: Summary from the presentation by Prof. Ohno (Professor, National Graduate Institute for Policy Studies)

5. Fourth Agenda: “Solving Africa's energy, water, food, and environmental problems”

In Africa, especially in sub-Saharan countries, serious challenges remain to achieve the SDGs, such as lack of access to energy, drinking, and domestic water, and insufficient food supply networks. The lack of infrastructure for waste disposal and inadequate sewage and wastewater treatment facilities because of the increasing population influx into cities have caused severe health problems. In addition, future energy and environmental policy challenges are significant, as the energy supply is inadequate (non-attainment of energy sufficiency[29]) to achieve carbon neutrality, which has become a global challenge. Although government ODA projects have previously tackled these areas, the total amount of ODA is far short of the amount of investment required (even if all the world's ODA is added). Therefore, it is necessary to discuss these areas from the perspective of STI, including attracting private investments.

5.1 Solving energy supply and energy environment problems

As mentioned earlier, access to energy is not entirely guaranteed, particularly in sub-Saharan countries. There are 29 countries in which only 50% or less of the population has access to electricity, 27 of which are concentrated in sub-Saharan countries (the other two are North Korea and Haiti).[30] This means that energy "sufficiency" has not been achieved.

This challenge must first be addressed. To this end, the following measures were taken in parallel:

(1) Development of stable and scalable hydroelectric and geothermal power plants

- There is an urgent need to survey the hydropower development potential of large rivers, such as the Congo, Upper Nile, Zambezi, Limpopo, Niger, and Volta rivers, and formulate a hydropower development plan for the entire African region.
- There is an urgent need to survey the potential for geothermal power plants in Kenya, Uganda, Ethiopia, Djibouti, and Tanzania and

formulate a geothermal development plan for the entire East African region.

(2) Development of a national grid and connection with neighboring countries

- In addition to developing a plan for the development of a national power grid, a country should actively consider connecting its power grids with those of neighboring countries.
- Technically, if large-scale photovoltaic power plants are constructed across the low-density population area from east to west (from Egypt to Morocco), and these plants are connected by a superconducting power grid, relatively stable and continuous power generation will occur from the time of sunrise in Egypt to the time of sunset in Morocco. Such a concept, especially large-scale renewable energy generation in the North African region, has often been discussed as a "source of electricity supply to Europe, where electricity demand is significant," as represented by the Desertec concept. However, in the future, it will be important to recognize it as a carbon-free power source that improves the value of African countries' industries.

(3) Develop renewable energy power plants that are localized to the region and install smart grids

- In rural areas of African countries, where population density is low, and the use of renewable energy is considered reasonable in certain areas, a plan for the development and use of renewable energy that takes into account the characteristics of the region should be formulated as soon as possible. Specifically, the following areas should be targeted.
    1. Wind power generation on the west coast of the continent at approximately 30° latitude (Morocco, Namibia, and South Africa).
    2. Photovoltaic power generation throughout Africa (especially in Maghreb countries with a high percentage of sunny days).
    3. Micro-hydropower, especially in inland areas.
- NEDO has accumulated knowledge and experience in the use of renewable energy technologies. For example, regarding photovoltaic power generation, NEDO has conducted practical training programs

for developing countries in the past (12 countries participated in Africa) to acquire equipment construction and management technologies. NEDO has networks with some African countries (Morocco and South Africa) as key members of the International Energy Agency (IEA) technical cooperation program. According to the understanding gained from these relationships, local needs for solar power generation have increased, similar to those in developed countries that have introduced renewable energy, if not leapfrogging. When constructing power plants, it is essential to confirm not only the amount of solar radiation but also the profitability of the project, taking into account the effects of salty and humid air, dust pollution, and grid connection costs in some areas, even in deserts, and the fact that 20 million solar home systems are in use throughout Africa.[31] In formulating development and utilization plans, it would be effective to utilize the latest knowledge from Japan, which is ahead of other countries in mass adoption.

- Furthermore, researchers are increasingly interested in value-added studies, such as developing effective linkage systems between renewable energy and electric vehicles. There is a potential need for collaboration between Japanese and African research institutions in renewable energy. NEDO's "Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration" will effectively meet such needs. Such activities would demonstrate Japan's contribution to the promotion of renewable energy sources in the future.
- NEDO also has a wealth of experience in Europe, the U.S., and the Asia-Pacific region in the field of smart grid infrastructure technology demonstrations combined with energy storage devices to absorb output fluctuations and is expected to play a role in the implementation of this field.
- METI has already conducted a feasibility study project on "Overseas Development of High-Quality Energy Infrastructure." In 2022, the proposal was approved for a "feasibility study on the development of a green hydrogen value chain in Kenya utilizing renewable energy such as geothermal energy" by Toyota Tsusho Corporation and Nippon Koei Corporation.[32] The development of a support

environment for full-fledged business development of such projects will also be an issue to be considered in the future.

(4) Construction of blue hydrogen and blue ammonia production facilities and associated CCS (carbon capture and storage) facilities in gas-producing countries

- In oil- and gas-producing countries, such as Egypt, Algeria, Gabon, Nigeria, and Angola, oil and gas revenues account for a substantial share of national income. In addition, because the development and extraction of fossil resources are conducted by state-owned companies in these countries, it is believed that they are considering a smooth transition to the production and export of blue hydrogen and blue ammonia in the medium term.
- Japan is expected to contribute to producing and exporting blue hydrogen and blue ammonia in these countries because of its engineering companies with superior technologies and general trading companies with comprehensive project management expertise.
- In addition, because CCS facilities are indispensable for these activities, Japan is expected to conduct feasibility studies and provide technical assistance for CO2 (Carbon dioxide) absorption and sequestration. These activities should be carried out in conjunction with establishing an international framework that will allow Japan's contribution to be counted as an appropriate reduction under the Joint Credit Mechanism (JCM).
- As hydrogen becomes more widely used as a fuel, fossil resource-rich countries will be affected, but it is also expected that various other countries (e.g., solar and wind resource-rich countries in terms of green hydrogen production and export) will increase their presence as "new resource-rich countries." Amid these trends, Japan's energy security environment is likely to change significantly. African countries that have not been energy suppliers to Japan in the past, mainly because of their geographical location and distance, may be able to utilize their potential fully. From a medium- to long-term perspective, this is expected to lead to a new cooperative relationship between Japan and Africa.

(5) The location of fossil fuel power generation, exceptionally, in countries with small populations, late-stage economies, and small renewable energy potential.

- Although carbon neutrality is an important issue worldwide, the top three countries in terms of global greenhouse gas (nearly equal to CO2) emissions are the United States, China, and India, which account for more than 50% of global emissions.[33] Therefore, it may be appropriate to allow countries with small populations, latecomers economically, and small renewable energy potential to first achieve energy sufficiency using inexpensive coal-fired power generation for the time being.
- In such countries, measures such as using ODA to construct energy-efficient Japanese ultra-supercritical coal-fired power generation facilities should be considered.

As mentioned above, implementing these cooperation programs through ODA is unrealistic, so intensive investment through public-private cooperation will be required. It is also important to create a framework that allows the private sector to follow suit and invest as a pure business and to develop a form of cooperation among international organizations, such as UNDP and UNIDO, and international financial institutions such as AfDB, WB, and the European Bank for Reconstruction and Development (EBRD).

Additionally, human resources are paramount for African countries to take ownership of these fields. Therefore, the current ABE initiative is expected to be utilized (and expanded if necessary) to provide large-scale and continuous cooperation for developing researchers and engineers in fields such as heavy electric machinery, civil engineering, and chemical engineering. Engineers and government officials with experience in such fields in Japan will also play a specific role, and consideration should be given to dispatching them to the relevant departments in African countries.

A forum for policy discussions among Japan, the AU (AUDA-NEPAD), international organizations, and international financial institutions is essential. TICAD-8 is expected to provide momentum for the development of large-scale

discussion forums.

Box 16 Innovative Start-ups in Japan

WASSHA Inc. is developing an Energy as a Service (EaaS) business in Tanzania, Uganda, Mozambique, and other countries, in which customers are provided with the minimum necessary electricity (lights and cell phone recharging) as a "service" for a specific period. Through a network of local retail outlets, this innovative model rents solar-powered rechargeable LED lanterns developed by the company to people with insecure incomes in off-grid areas. However, this innovative idea was not necessarily technology-driven. Initially, the company failed in its attempt to develop a project to provide individual households with electricity in rural areas on the digital grid. Rural areas did not have access to electricity in the first place, and there was no desire for the service. For the local people, it was more important whether the technology was useful or not, not whether it was high-tech or low-tech. The company transformed its business model by utilizing local networks and listening to local people and opinions on the issues, which has led to the success of the business.

The industry (private sector) responsible for implementing technology into society must keep themselves updated by learning about technology and things that will be of value. Currently, however, there is not enough cooperation between academia and industry. Engaging in cutting-edge research and having a forum for technology-related exchanges could create a beneficial opportunity for the industry.

The company also points out that the general impression of local people in Africa toward Japanese companies is that "Japanese companies contribute less money than companies in other countries, despite the lengthy and time-consuming procedures for contributing funds." There is an urgent need to review and improve the procedures and amounts of contributions to increase the competitiveness of Japanese companies.

GOOD ON ROOFS, an incorporated association, installs solar panels on "industrial roofs" of offices and factories of companies throughout Japan free of

charge, sells the generated renewable energy to sponsors, and then receives a portion of the profits earned, plus a portion of the roof rent back, to support the installation of solar panels in developing countries such as Africa.

In addition to the fact that Japanese companies can use renewable energy without any initial investment or operational burden by "just" renting their roofs, they can also contribute to the SDGs with the electricity bills they have been paying. Developing countries in Africa and elsewhere can be equipped with power generation facilities, and the energy generated there can be used for children's education.

Source: Summary from presentations by Mr. Akita (CEO, WASSHA Corporation) and Mr. Kawaguchi (Executive Director, GOOD ON ROOFS)

5.2 Solving water problems

Water is an essential factor in achieving many of the SDG targets, such as reducing child mortality, preventing infectious diseases through improved sanitation, increasing school attendance among children, who are often forced to engage in 'water fetching' labor, and advancing women in society, as well as ensuring healthy lives through access to hygienic drinking water. In addition, developing sewage and wastewater treatment infrastructure will reduce the risk of environmental pollution and bacterial and chemical contamination of drinking water, further improving the quality of life.

However, there are significant hurdles in solving water problems in Africa. This is because, according to the WHO (World Health Organization), the proportion of people with access to safe drinking water is low, especially in sub-Saharan countries,[34] and the potential reason for this can be that people have to travel long distances to swamps and rivers to fetch unsanitary water, especially in rural areas.

However, according to Oki and Kanae (2006), lack of water is not because of low rainfall but because water is unevenly distributed in time and space, and areas that lack facilities to equalize it and provide a stable supply are water-stressed,[35] suggesting that the development of infrastructure for water supply in Africa is

considered to be the key to solving the problem.

Indeed, the goal on the water in the Millennium Development Goals (MDGs) before the SDGs (“By 2015, halve the proportion of people without sustainable access to safe drinking water and basic sanitation”[36]) was reported to have been achieved by 2015.[37] However, Fukuda et al. (2019) reported that the greatest contribution to this goal was the diffusion of water supply facilities because of economic development in China and India.[38]

Although it seems impossible to find many studies that are expected to contribute to solving the water problem in rural Africa from the current themes through Grants-in-aid for Scientific Research in Japan, the development and implementation of an appropriate water supply that addresses the local challenges with "indigenous science and technology,” as pointed out in Chapter 2, is essential. Oki (2019) notes that Japan's value in Asia was also in the fact that it was the only exception to the rule: “Japan could enjoy advanced technology and build a prosperous society without having to copy the West.”[39] It is, therefore, important for African stakeholders to see Japan's water infrastructure, not only in urban areas but also in rural areas, and at the same time, to implement ongoing collaboration and cooperation with young researchers, entrepreneurs, and government officials to realize appropriate water infrastructure.

5.3 Solving Food Problems

Solving food problems is extremely important in Africa. Although the EAJ does not necessarily have sufficient knowledge in this area, JICA is currently studying the AFICAT based on discussions with the African Business Council. JICA is studying the Japan-Africa Agricultural Innovation Center for Africa (AFICAT).[40] The AFICAT includes the following two priority actions: (1) establishment of an agricultural digitalized infrastructure and (2) promotion of the introduction of advanced agricultural technologies through public-private partnerships. JICA has already conducted field surveys in Ghana, Nigeria, Tanzania, and the Ivory Coast by utilizing its extensive network.

The EAJ is also expected to contribute to the realization of this concept actively.

Box 17 Initiatives by United Nations World Food Programme (WFP)

Since 2017, WFP has partnered with Palantir to build a data management system to optimize the supply chain called DOTS. The integrated data is visualized using Tableau and other tools to provide data to external parties.

In addition, it has identified digital transformation (DX) as one of the issues to be addressed to improve support efficiency. It is working on the WFP Innovation Accelerator, which is based on WFP's trust with local governments to demonstrate innovative technologies in the field in Africa.[41]

In recent years, the WFP has also accelerated its collaboration with Japanese companies to support small-scale farmers to enter food markets and improve their livelihood and women's groups to improve their livelihood and nutrition. Using and selling goods, using local products, and "linking them to behavioral change among local people" are important elements of good public-private partnerships, which will also contribute significantly to achieving the SDGs.

Source: Summary from the presentation by Ms. Yakiya (Representative in Japan, WFP)

5.4 Solving environmental problems

In African countries, various environmental problems occur because of the high economic and population growth rates and the large population influx into cities, which are outpaced by the development of infrastructures, such as sewage systems and waste treatment facilities. In the context of STI, the following measures can be considered to address these challenges:

(1) Infrastructure development, such as sewage systems and waste treatment facilities

Fundamentally, institutional development and budgetary measures for the public sector in African countries are of paramount importance for developing such public infrastructure and establishing a management system. However, the human resources needed to make this possible may still be in short supply; therefore, the current ABE initiative may be

utilized (and expanded if necessary) to provide large-scale and continuous cooperation for the development of researchers and engineers in fields such as sanitary engineering and waste treatment. Engineers and government officials with experience in such fields in Japan could also play a specific role, and consideration should be given to dispatching these people to relevant departments in African countries.

(2) Measures against industrial pollution, including treatment of industrial and mine wastewater and illegal dumping of industrial waste

On the regulatory side (government), the problems are mainly institutional and organizational issues related to official environmental regulations (wastewater, air quality, noise), whereas on the business side, the problems are primarily technological and investment issues.

Cooperation in terms of human resources is also important here. Taking the same measures as described in 5.1 can be considered. It is also important to promote the entry into Africa of Japanese companies with appropriate and applicable technology and technology transfer on the practical side.

Addressing acidic wastewater treatment from formerly closed mines is also needed, especially in metal mining countries, such as the Democratic Republic of Congo and Zambia. This is an area where Japan's experience can be fully utilized, starting with the national government (legislation) and the subnational government (cooperation with residents and local communities) as well as in terms of technology (design, implementation, and operation of neutralization treatment facilities).

(3) Circular society

Promoting the 3 Rs (reduce, reuse, and recycle) and resolving the marine plastic problem are considered important issues for this problem. This is also an area where Japan's experience can be fully utilized from various aspects, including the national government (legislation) and subnational government (waste sorting and collection mechanisms, establishment of recycling facilities), consumer awareness, boosting

business, and solutions through new technologies (e.g., use of biodegradable plastics and new packaging materials).

Promoting coordination and cooperation activities that enable knowledge-sharing among policy experts, researchers, engineers, and practitioners in these fields with African countries are important. It should be noted that African countries are also seeking to develop experts with a systemic mindset that will enable them to make policy decisions and build infrastructure in these areas on their own in the future.

In January 2021, JICA launched the "JICA Clean City Initiative," which aims to improve the capabilities of African countries to comprehensively address air and water pollution and waste treatment in urban areas by strengthening waste disposal structures to create a recycle-oriented society and healthy water, air, and soil environment through environmental regulations and pollution prevention measures. [42] Incorporating these existing initiatives effectively in future actions must also be considered.

6. Fifth Agenda: “Improving health and overcoming infectious diseases in Africa”

The realization of universal health coverage (UHC) in Africa has been one of the biggest challenges in Africa, and it remains so after two years dominated by the COVID-19 pandemic. Undoubtedly, this is one of the areas where Japan can contribute the most to its realization. This discussion is expected to lead to significant progress in TICAD-8 and other forums in the future.

Regarding infectious diseases, four institutions in Japan have established research and education centers with institutions in African countries.

Table 6 Main activities in the field of infectious diseases

Research Institute	Website	Main Activities
Kenya Research Station, Institute of Tropical Medicine, Nagasaki University	http://www.tm.nagasaki-u.ac.jp/nairobi/	• Malaria infection control measures (e.g., vector mosquito monitoring systems) • Measures against sand flea infections • Development of rapid diagnostic methods for yellow fever and Rift Valley fever and their outbreak alert systems in Kenya • Research on schistosomiasis in Kenya • Development of an early warning system for infectious disease outbreaks based on climate prediction models in Southern Africa
Hokudai Center for Zoonosis Control in Zambia	https://www.czc.hokudai.ac.jp/zambia/	• Research and human resource development to contribute to zoonosis control in Zambia • Research on the epidemiology of viral zoonoses in Africa
Research Institute for Microbial Diseases, Osaka University	http://www.biken.osaka-u.ac.jp/	• Vaccines to prevent the onset of malaria • COVID-19 vaccine development
Institute of Medical Science, The	https://www.ims.u-tokyo.ac.jp/imsut/jp/	• Ebola research in Sierra Leone (search for viral receptors and analysis of particle formation mechanisms)

University of Tokyo (IMSUT)		• Research on strengthening the infectious disease surveillance system and protection against enteric mucosal infections, such as *Vibrio cholerae* and HIV in Ghana

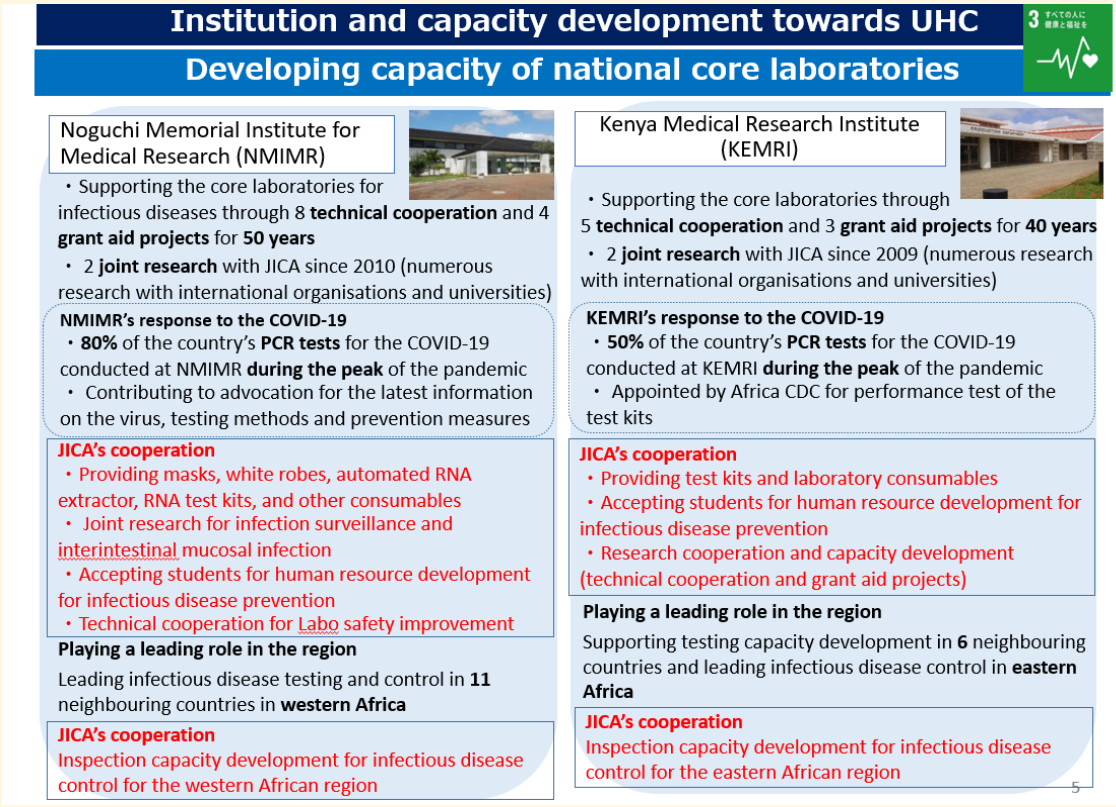
For developing countries, Japan has contributed to the international distribution of COVID-19 vaccines through the COVAX Facility (COVID-19 Vaccines Global Access) but is still lagging in developing domestically produced vaccines, which are still at the second- or third-tier clinical trial level.[43] SCARDA was established within the AMED to strategically promote future vaccine development for infectious diseases. It aims to deliver safe, effective, and internationally contributing vaccines against nationally defined infectious diseases as quickly as possible in an emergency, both domestically and globally.[44] Thus, developing vaccines that can be stored near room temperature, required in Africa and other developing countries where cold chains are not widely developed, is expected to be a joint research theme that will lead to such international contributions.

JICA's contribution in Africa can be seen mainly in establishing the core centers for infectious diseases while collaborating with Nagasaki University, Hokkaido University, IMSUT, NIID, and the National Center for Global Health and Medicine (NCGM). For example, JICA has been assisting for more than 40 years to the Noguchi Memorial Institute for Medical Research in Ghana, the Kenya Medical Research Institute (KEMRI), and the School of Veterinary Medicine at the University of Zambia, which have played a central role as centers for infectious disease control during the COVID-19 pandemic. Furthermore, in collaboration with the Africa Centers for Disease Control and Prevention (CDC) under the AU, which was established in the wake of the 2014 Ebola outbreak in West Africa, the CDC demonstrated remarkable achievements, serving as a base laboratory for infectious disease countermeasures in each sub-region and playing a central role in human resource development to strengthen the testing capacity of countries in the region. By collaborating with these institutions, the CDC, and other JICA partners, JICA will continue to develop cooperation through the "Partnership for Building Resilience against Public Health Emergencies through Advanced Research and Education (PREPARE)."[45] These are noteworthy examples of how Japanese universities and research institutes while respecting African ownership,

have worked together with JICA to build institutions and human resources steadily from a long-term perspective (Box 18).

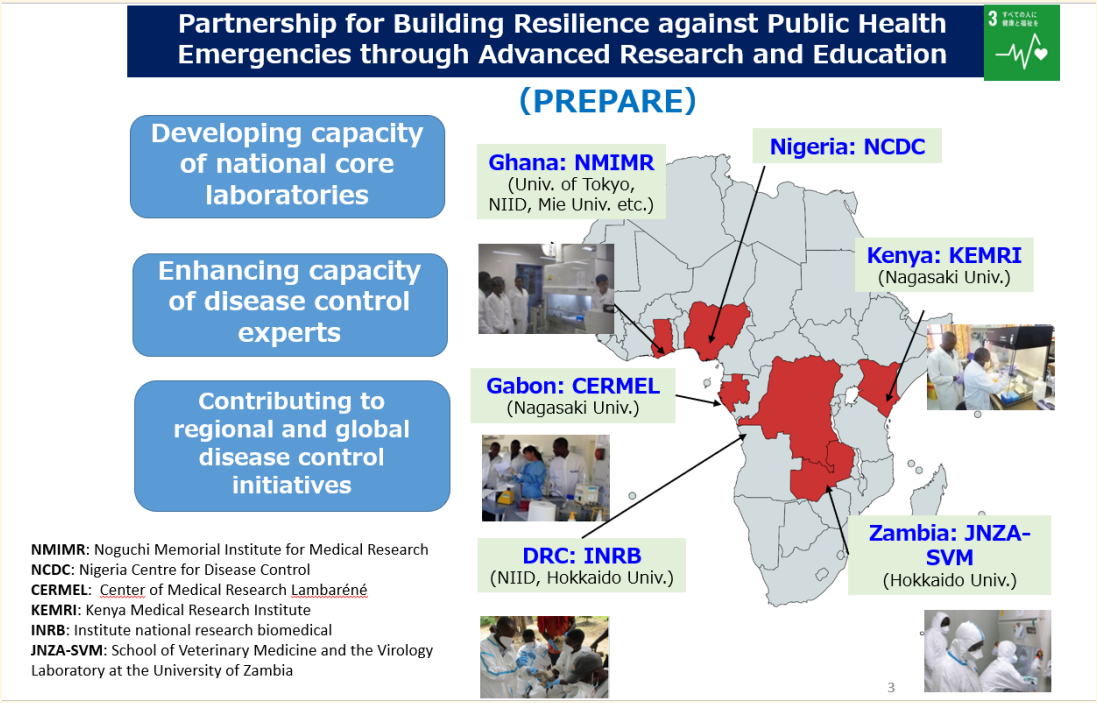
Box 18 JICA's initiatives for achieving UHC (Universal Health Coverage)

Achieving UHC requires improving the overall health care system in developing countries. Among these, one of the JICA's priorities is to strengthen infectious disease control capabilities and testing centers efficiently and effectively by utilizing Japan's advantages and networks established through long-term cooperation in this field. The figure below is a representative example of JICA's efforts in the Noguchi Memorial Institute for Medical Research in Ghana, the Kenya Medical Research Institute (KEMRI), contributing to strengthening the health care system by reinforcing treatment systems, research and alert systems, and prevention.



In addition, the "Partnership for Building Resilience against Public Health Emergencies through Advanced Research and Education (PREPARE)" (see below) can contribute to improving the capacity of African countries to respond

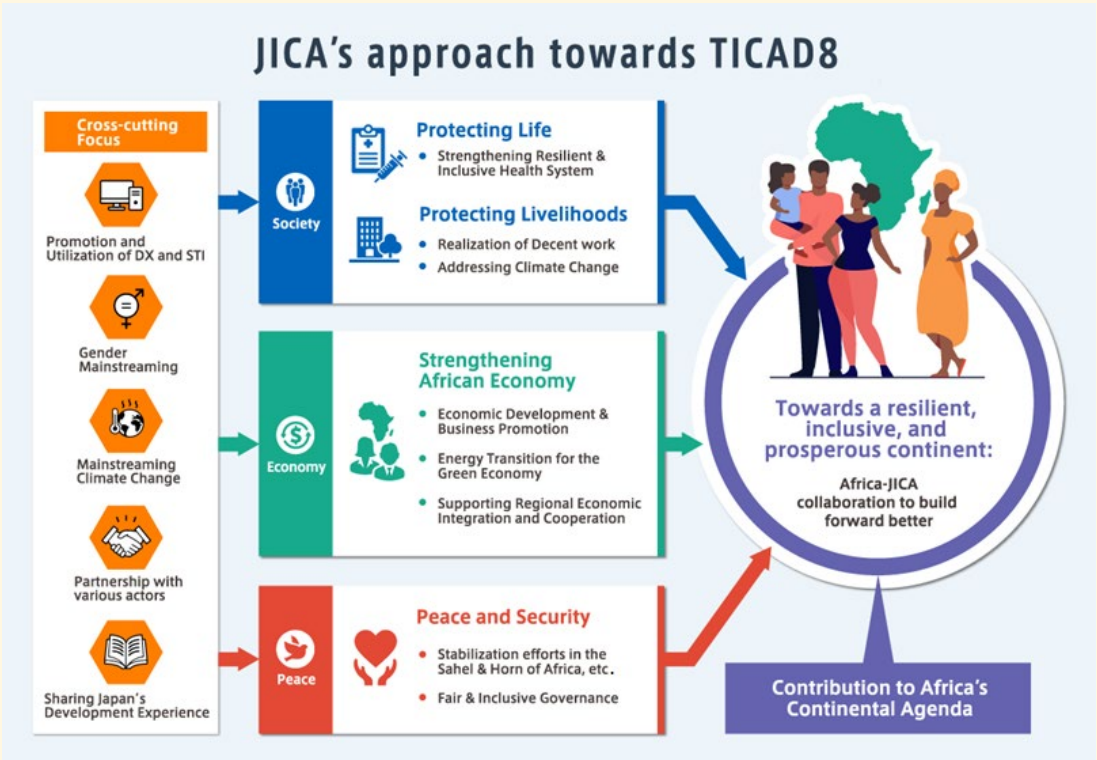
to health crises by developing the capacity of national core laboratories, 2) enhancing the ability of disease control experts, and 3) contributing to regional and global disease control initiatives.



Source: Information provided by Mr. Kato (Vice president, JICA)

Box 19 JICA's approach towards TICAD-8

The spread of COVID-19 led to the first negative growth of an African economy in 2020, with GDP per capita falling back to a decade ago. Recovery after 2021 will be slow because of delays in vaccine dissemination, and the gap with developed countries is widening. In addition, the loss of educational and labor opportunities because of lockdowns and other factors is significant, and the poverty population rate has reversed to an increasing trend. To cope with this situation, JICA has confirmed its cooperation policy with a view to TICAD-8 (see figure below). JICA will support the realization of a resilient, inclusive, and prosperous African continent by promoting social development, protecting life and livelihoods, strengthening the African economy, and achieving peace and security.



Source: Summary from the presentation by Mr. Kato (Vice president, JICA) and Mr. Shishido (Vice president, JICA)

Box 20 Initiatives by Ajinomoto Foundation

Ajinomoto Foundation is implementing the Ghana Nutrition Improvement Project (GNIP) in Ghana. In Ghana, approximately 30% of children aged 2 years suffer stunting. Therefore, focusing on nutritional imbalances during infancy, the company began working to improve the nutrition of mothers and children using a food product (KOKO Plus) that contains nutrients that are often lacking in weaning food. However, selling food alone did not change the mothers' behavior. The mothers' primary source of information about health and nutrition was the nurses, who used a single commercial poster with jargon and no explanation as a resource for their infant care seminars. If this was difficult for all mothers to see and understand during the seminar, it was even more impossible for them to remember and return home. What was needed was to discover and solve the essential issues from the viewpoint of the beneficiaries. Therefore, the organization worked with local nurses to develop posters that anyone could easily understand, and the nurses used them to educate women. In 2020, the organization provided nutrition education to the Ministry of Health

in Ghana, and the national coverage rate of the product dissemination collaboration area has been expanded to 20%.

However, it is difficult for Japanese private companies to confront African markets and government agencies individually. In fact, in the case of this foundation, the meeting with the First Lady and the Minister of Health was realized through the support of the government (embassy and JICA), and the joint attendance of the Japanese public and private sectors facilitated subsequent contacts. Cooperation as Team Japan is strongly required.

Source: Summary from the presentation by Mr. Uesugi (Executive Director, Ajinomoto Foundation)

7. To make recommendations on an important cooperation agenda between Japan and Africa and to create significant momentum

The specifics and details of the ideas discussed above require further investigation. However, TICAD, attended by high-level government officials in Japan and Africa, will serve as an opportunity to launch a major framework and gain significant momentum toward this goal.

The Africa-Japan Ministerial Dialogue Meeting on STI for SDGs was organized as a side event at TICAD-7 held in Yokohama in 2019, where the former MEXT minister Shibayama and ministers responsible for STI in Africa attended.[46] Building on this, MEXT can consider having discussions on deepening cooperation between Japan and African countries in STI (tentative name: "Expanded Africa-Japan Public-Private Dialogue on STI"), which incorporates ideas on STI diplomacy from MOFA, industrial technology promotion from METI, healthcare technology promotion from MHLW, agricultural technology and food supply improvement from MAFF, and other inputs from the cabinet office. In this process, it is necessary to invite the participation of international organizations, such as the World Bank, AfDB, UNDP, UNIDO, and WFP, as well as EAJ, industrial organizations (Nippon Keidanren, Keizai Doyukai, chambers of commerce, and industry in African countries, and industry associations), and academic organizations.

At this meeting, a wide range of stakeholders, from policymakers to practitioners and private sectors, should discuss each of the topics mentioned in this report collectively, namely promotion of human resource development, data-driven national land development, agricultural development, industrialization, and acceleration of tech start-ups, solving energy, water, food, and environmental problems, and improving health and overcoming infectious diseases. Specifically, if the "Expanded Japan-Africa STI Public-Private Dialogue (tentative name)" can be held, for example, in the year of TICAD, it would be ideal for holding workshops or subcommittees on each theme in the intervening years.

To continuously develop this framework, it is important to disseminate the results

of African–Japan cooperative projects in the field of STI in an easy-to-understand manner. One of the opportunities to showcase the results, for example, is to organize an "STI for SDGs in Africa Pavilion (tentative name)" at the Osaka World Exposition to be held in 2025. Because a joint pavilion of UN agencies will be set up at the exposition, utilizing part of the space seems to be a realistic measure.

Annex 1 Summary of Committee Meetings

1st Committee Meeting (Wednesday, June 16, 2021, 18:00-20:00)
Agenda: Project Overview
(1) Opening remarks (Prof. Seiichiro Yonekura).
(2) Project overview (Dr. Yuko Yasunaga)
(3) Keynote presentation (Prof. Seiichiro Yonekura)
(4) Discussion

2nd Committee Meeting (Friday, July 9, 2021, 18:00-20:00)
Agenda: Macro political and economic trends in Africa
(1) Presentation: Political Trends in Africa (Prof. Sadaharu Kataoka)
(2) Presentation: Macroeconomic trends in Africa (Mr. Masafumi Sugano)
(3) Discussion

3rd Committee Meeting (Wednesday, August 18, 2021, 18:00-20:00)
Agenda: Microeconomic characteristics and trends of Industries in Africa
(1) Presentation: Ajinomoto Foundation's project to improve nutrition in Ghana (Mr. Takashi Uesugi)
(2) Presentation: NEC's Business in Africa (Mr. Hiroki Yoshifuji)
(3) Presentation: WASSHA’s business in Africa (Mr. Satoshi Akita)
(4) Presentation: GOOD ON ROOFS efforts to improve access to electricity in Africa (Guest speaker: Mr. Nobuhiro Kawaguchi)
(5) Discussion

4th Committee Meeting (Wednesday, September 21, 2021, 18:00-20:00)
Agenda: Start-ups and STI in Africa
(1) Presentation: Data infrastructure (Mr. Shinji Ogura)
(2) Presentation: Start-ups and STI Trends in Africa (Mr. Naoto Kanehira)
(3) Presentation: Initiatives of the DOYA Corporation (guest speaker: Mr. Yuto Doya)
(4) Presentation: JST’s projects: SATREPS and AJ-CORE (Mr. Shinsuke Okada)
(5) Discussion

5th Committee Meeting (Tuesday, October 26, 2021, 18:00-20:00)
Agenda: Japan-Africa cooperation
(1) Presentation: Cooperative relations between JICA and Africa (Mr. Ryuichi

Kato and Mr. Kenichi Shishido).
(2) Presentation: STI Policy Initiatives in Africa (Professor Michiko Iizuka)
(3) Presentation: Lessons from the Ethiopian Industrial Policy Dialogue (Prof. Izumi Ohno)
(4) Discussion

6th Committee Meeting (Friday, November 26, 2021, 18:00-20:00)
Agenda: Discussion on a Policy Paper
(1) Presentation: UNDP's initiatives (Mr. Tetsuo Kondo; guest speaker: Mr. Yusuke Kobayashi)
(2) Presentation: WFP initiatives (Ms. Naoe Yakiya)
(3) Presentation: UNIDO's initiative (Dr. Yuko Yasunaga)
(4) Presentation: TranSonica's business to promote IC cards in Ghana (guest speaker: Mr. Daniel Elliot Kwantwi)
(5) Discussion

7th Committee Meeting (Thursday, December 16, 2021, 18:30-20:30)
Agenda: Policy Paper Review
(1) Presentation of the report (Dr. Yuko Yasunaga)
(2) Discussion

8th Committee Meeting (Wednesday, March 16, 2022, 18:30-20:30)
Agenda: Policy Paper Review
(1) Presentation of the report (Dr. Yuko Yasunaga)
(2) Discussion

Online discussion with the African diplomatic corps (ADC) in Tokyo (Tuesday, May 17, 2022, 11:00-12:30): 39 participants from 27 countries from the ADC side.
Agenda: Exchange of opinions on the draft report
(1) Presentation: Key policy recommendations (Dr. Yuko Yasunaga).
(2) Discussion

9th Committee Meeting (Tuesday, May 17, 2022, 18:30-20:30)
Agenda: Discussion on the policy paper
(1) Presentation of updates to the report (Dr. Yuko Yasunaga)
(2) Discussion

10th Committee Meeting (Monday, June 27, 2022, 18:00-20:00)
Agenda: Discussion on a revised policy paper
(1) Progress since the previous 9th meeting
(2) Presentation of updates to the report (Dr. Yuko Yasunaga)
(3) Discussion

Online discussion with the African diplomatic corps (ADC) in Tokyo (Wednesday, July 20, 2022, 17:00-18:00): H.E. Mr. Titus M. J. Abu-Basutu (Ambassador of the Embassy of Zimbabwe in Japan) and H. E. Mr. Ernest RWAMUCYO (Ambassador to the Embassy of Rwanda in Japan) from the ADC side.
Agenda: Exchange of opinions on the report
(1) Presentation: Key policy recommendations (Dr. Yuko Yasunaga).
(2) Discussion

Annex 2 Committee members

Project Leader	
Seiichiro Yonekura	Professor, Hosei University/Professor Emeritus, Hitotsubashi University/President, Creative Response-Social Innovation School
Project Subleader	
Yuko Yasunaga	Former Head, UNIDO ITPO Tokyo (~June 2022)/ Deputy to Director General, UNIDO/Director, Engineering Academy of Japan (EAJ)
Board	
Shinsuke Okada	Researcher, Japan Science and Technology Agency (JST)
Hideki Murakami	Deputy Head, UNIDO ITPO Tokyo
Committee Members	
Kan Aoki	Director, Global Relations Department, NEC Corporation
Satoshi Akita	CEO, WASSHA Inc.
Tateo Arimoto	Visiting Professor, National Graduate Institute for Policy Studies (GRIPS)/Principal Fellow, Center for Research and Development Strategy, Japan Science and Technology Agency (JST-CRDS)
Michiko Iizuka	Professor, National Graduate Institute for Policy Studies (GRIPS)
Takashi Uesugi	Secretary General, The Ajinomoto Foundation
Izumi Ohno	Professor, National Graduate Institute for Policy Studies (GRIPS)
Shinji Ogura	Lecturer, The Open University of Japan
Sadaharu Kataoka	Professor, School of International Liberal Studies, Waseda University
Ryuichi Kato	Vice President, Japan International Cooperation Agency (JICA)
Keiichi Kaneko	Managing Director, Kinsei Sangyo Co., Ltd.
Naoto Kanehira	Senior Strategy and Operations Officer, Office of the World Bank Group Human Resources Vice President/ Visiting Researcher, American Association for the Advancement of Science (AAAS)

Takao Kuramochi	Senior Deputy Director-General, Center for Research and Development Strategy, Japan Science and Technology Agency (JST-CRDS)/Director, Engineering Academy of Japan (EAJ)
Tetsuo Kondo	Director, UNDP Representation Office in Tokyo, Japan
Kenichi Shishido	Vice President, Japan International Cooperation Agency (JICA)
Hiroshi Nagano	Advisor, Engineering Academy of Japan (EAJ)
Michiharu Nakamura	Advisor, Engineering Academy of Japan (EAJ)
Yutaka Hada	Former Manager, Overseas External Affairs Group, Toyota Tsusho Corporation (~March 2022) (Currently Manager, Audit Group, Toyota Tsusho Corporation)
Yuko Harayama	Vice President, Engineering Academy of Japan (EAJ)
Ryoichi Matsuyama	Executive Director, International University of Japan (IUJ)/Former Ambassador Extraordinary and Plenipotentiary of Japan to Botswana
Koichi Morimoto	Executive Director, Japan Agency for Marine-Earth Science and Technology (JAMSTEC)/Executive Director, Engineering Academy of Japan (EAJ)
Naoe Yakiya	Director, UN WFP Japan Relations Office
Kunihiko Yoshino	Professor, Graduate School of Agricultural and Life Sciences, University of Tokyo
Shuichi Rokugawa	Chief Research Officer, National Research Institute for Earth Science and Disaster Resilience/Senior Researcher, Faculty of Engineering, University of Tokyo

Observers

Daisuke Asakura	Deputy Executive Director, Japan External Trade Organization (JETRO) Johannesburg (Participating since November 2021)
Masanori Kobayashi	Director, Smart Community and Energy Systems Department, New Energy and Industrial Technology Development Organization (NEDO) (Participating since September 2021)
Masafumi Sugano	Former Deputy Executive Director, Japan External Trade Organization (JETRO) Johannesburg (~June

	2021)/Director for International Exhibitions Ministry of Economy, Trade, and Industry (METI) of Japan
Takashi Hanajiri	Head, Asia External Representation Office, African Development Bank (AfDB)
Hiroyuki Yamada	Director General, Frontier and Moonshot Technology Department, New Energy and Industrial Technology Development Organization (NEDO) (Participating since September 2021)
Guest Speakers	
Tatsuo Arai	Former Ambassador Extraordinary and Plenipotentiary of Japan to Senegal/Former Ambassador Extraordinary and Plenipotentiary of Japan to Djibouti
Nobuhiro Kawaguchi	Executive Director, GOOD ON ROOFS
Yusuke Kobayashi	Officer, UNDP Tunisia
Joji Tateishi	Senior Managing Director, the Association for Overseas Technical Cooperation and Sustainable Partnerships (AOTS) (Participating since May 2022)
Yuto Doya	CEO, DOYA Inc./President, Doooooooo
Hiroki Yoshifuji	Director, Global Relations Department, Africa Business Promotion Group, NEC Corporation
Daniel Eliot Kwantwi	CEO, TranSoniCa Co., Ltd.
Secretariat	
Keisuke Takamatsu	Consultant, UNIDO ITPO Tokyo

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