"Project Formulation Survey"

under the Governmental Commission on the Projects

for ODA Overseas Economic Cooperation

in FY2013

Summary Report

The Republic of Kenya

Project Formulation Survey on Improvement of Teaching Abilities of Science Teachers and Improvement of Learning Environment

March 2014

Joint Venture of NARIKA Corporation and ILINK Corporation

The content of this report is a summary of the project formulation survey, which was commissioned by the Ministry of Foreign Affairs of Japan in the FY 2013 and is carried out by the consortium (NARIKA Corporation and ILINK Corporation). It does not represent the official view of the Ministry of Foreign Affairs.

□. Description of the current situation and development needs of the concerned development issues in the surveyed country

The global effort for improving access to the basic education is also recognized as one of the major political achievements of the government of Kenya with former president Mwai Kibaki. Free primary education was introduced in 2003, free secondary education in 2008, that has greatly increased number of school enrollment in the last decade. As for the number of teachers, however, has not been increased, only with minimum recruitment for natural decrease (retirement and death). Accordingly, the number of students per teacher has increased sharply, which causes big hindrance for quality improvement of school education.

On the other hand, the government of Kenya established a long-term development strategy in 2008, Vision 2030, to achieve full industrialization of the country. In order to achieve these goals, Vision 2030 highlights the importance of human resource development in the field of science and technology. Projects are listed up in Education and Training sector to strengthening partnerships with the private sector; reforming and revising the curriculum according to the changing social needs; introducing modern ICT skills, et al. Government revised Education Act in 2013 to carry out "Free Compulsory Basic Education" in line with the new constitution amended in 2010. The direction of the educational reform is moving toward "creation of international competitiveness through more efficient productivity in education, training and research". However, school facilities and learning materials have not yet well provided because the budget increase of the Ministry of Education is falling behind the rapid growth in student numbers.

Japan has been implementing technical assistance since July 1998 to December 2013 on the capacity development of teachers who take important part to improve science and mathematics education in secondary schools in Kenya. The teachers training system which has been established through the assistance has provided basic knowledge and practical method of "Student Centered Learning/Teaching in Science and Mathematics Classes" among the science and mathematics teachers, to improve the learning performance of the students.

The training package called "ASEI/PDSI Approach" aims at encouraging science teachers to be more creative to operate inclusive learning, involving students into experiments and practical activities by utilizing locally available resource materials. This training is to change teachers' practice and attitude towards lesson organization, establishing a sustainable pattern as a professional teacher to operate Plan (Material Analysis, Lesson Plan Revision, Teaching Material Arrangement), Do (Lesson Practice), See (Lesson Review) and Improvement.

A joint research of Japan and Kenya has proved effectiveness of the training and the hypotheses that "the annual teachers training for 1-2 weeks enhance science and mathematics teachers' positive attitude and capability to conduct the lessons, so that students would be able to enjoy learning science and mathematics, and result in good performance". ASEI/PDSA Training is also appreciated as an effective program to improve science and mathematics lessons among other African countries and donor institutions.

However, practical operation of ASEI/PDSI approach in actual school classrooms still has a number of barriers, such as rapid increase of students per teacher, lack of school facilities and materials because of the limited amount of school budget, and lack of motivation for teacher training. So the next step should be taken to promote and to fully establish the achievement of teacher training across the nation.

In such condition, the survey revealed that Kenyan education authorities have foundation (needs) to accept Japanese science materials, that have been developed for student-centered, practical and effective science classes, as the tools to improve science education in Kenya, in harmony with the existing teacher training system.

Ⅱ. Possible applicability of the SME's products and technologies, and prospects for future business development

The proposed company has no.2 share in the area of science educational materials in Japan. In their product catalogue, there are about 15,000 types of science materials and they have capability to manufacture and distribute all the experiment devices shown in science textbooks to all schools across the country. Among their products, a manual electric power generator called “Genecon” is their major product..

Since 1981 when the company started to manufacture and distribute Genecon, it has been highly appreciated by science teachers in elementary and junior high schools throughout the country. Genecon does not require consumable dry batteries to operate experiments involving electricity, and just by rotating a handle, it enables students to observe and experience the principle of generating electricity, which is usually invisible in our daily life. The company continued development and proposal of various educational methods, quality improvement and cost deduction. Consequently, experiment using manual electric power generator was adopted in the course of study for elementary and junior high education and a picture of Genecon appeared on textbooks.

Genecon is available in various models and used to demonstrate several dozens of experiments in Japanese schools. V3: low-voltage for safe demonstration of simple experiment of electricity, DUE: more efficient power generation model suitable for water electrolysis, Electrostatic High Voltage: designed for experiments of high voltage static electricity.

In Kenyan education curriculum, 7th graders study “Electricity” and 8th graders study “Transformation of Energy”. Our nation wide field study at primary school to demonstrate the product for school principals, teachers and students in various regions of the country shows that Genecon have been highly appreciated and confirmed to be able to contribute science education in this country.

Table I　Features of Manual Electric Power Generator, Genecon

Genecon V3 (JPY 1,800)		By turning the handle, approximately 3V direct-current electricity is generated. Safe and easy to use with low voltage that may not damage experimental light bulbs, LED and electric melody modules.
Design	Durable, light and portable, easy to hold and handle, easy maintenance, require no battery or electricity resource	
Educational	Large variety of adapter modules to operate various experiments. Transparent body for observing inside mechanical movement, introduced in Japanese school textbooks	

As mentioned in Chapter 1, with support by Japan, Kenya has achieved to establish a teacher training system and is conducting continuous training projects to improve teaching abilities of science teachers and to promote student-centered learning concept. In order to enhance and maintain the outcome of these efforts and to raise the level of students' performance, introduction of well-designed science materials to the classrooms in various schools in Kenya is very effective. If these science materials can also be applied to curriculums of existing teacher training, in-school training and lesson analysis and becomes a topic of material analysis, it would contribute largely to enhance the value of teacher training and to maintain the quality of training programs..

Portable science materials which can be easily carried into the classroom to operate science experiment is very popular and "common items" in Japan. However, there is no such material in Kenya and suppliers providing books and teaching materials to schools are not aware of such portable materials either. In other words, the proposed company will have to promote products to schools across the country and develop consumer needs and new market for such products.

Main target of the products are 3 groups indicated below. Levels of purchasing motivation and capability vary depending on schools including over 30,000 primary and secondary schools all over Kenya, but sales of approximately Ksh 50 million per year can be estimated..

(1) Public primary and secondary schools
(2) Private primary and secondary schools
(3) Teacher training institutes and teacher training centers

Operating business based on the Capital City Nairobi to the schools and educational institutions throughout the country of Kenya makes easier connection to the market in East African countries and other Anglophone countries. This would expand business opportunities and enables the risk-hedge system to cover the failure in one country with the success in other countries. The discussion for establishment of Bilateral Investment

Treaty between Kenya and Japan, which was started in June 2013 at TICAD V, is also supportive factor. Whole population in African Continent is about one billion which is almost the same size as India and China, and its age structure of population is typical pyramidal (i.e. large volume in school age population). This trend will continue for a while, and the population is expected to double in 2030 as 2 billion, so as the school age population growth will certainly continue to grow for another 20 years. In Kenya alone, population has been growing by 1 million every year in the recent decade to be estimated as about 40 million these days. Out of this 40 million, 10 million are primary school students and 1.5 million are secondary school students.

With this situation, and also the positive brand image towards "made-in-Japan Science and Mathematics Education" has been established by the Japanese technical assistance on Science and Mathematics Education Improvement in many African countries will work very supportively. There is fairly large opportunity for a business to introduce and promote "Made in Japan" science educational materials into school education in Kenya.

Potential challenges in sales and marketing in Kenya for the moment are listed below, but they can be solved by the company in cooperation with the local agency and associated companies .

Table II Challenges in Local Sales and Marketing

Challenges	Solutions	Results
Development of localized packages	Curriculum research in science education Arrangement of English labels and users' manuals	Compulsory for product approval
Product approval	Product localization along with promotion and lobbying for governmental Institutes and schools Verification of educational impact	Marketing expansion to public schools
Logistics and customs	Finding reliable agent both in Japan and Kenya	Price reduction of products
Sales and money collection	Rental service to MOEST and other training institute Promotion to the government and donor institutions	Reduction of uncollected money
Effective use of products and maintenance	Training seminar for science teachers on practical usage along with verification of the educational impact in classrooms	Expansion of channel for sales Establishment of reliable relationship with teachers

III. Verification of adaptability of the SME's products and technologies to the surveyed country (Demonstration and pilot survey)

The proposed company conducted promotion and product demonstration to major authorities in education sector as MOEST, KICD, TSC and CDE/DEO, and explained the purpose of this survey. And they confirmed that the government of Kenya would welcome implementation of the project..

In the consultation with related authorities, introduction of the proposed products has been highly appreciated and demanded to contribute largely to the improvement of science education, for practical activities in learning. Authorities have advised the proposed products should be applied to the Technical Evaluation by KICD and MOEST to be listed on "Orange Book" which enables the full distribution to the public primary schools and TTC.

Based on advises from above authorities, the proposed company conducted a survey among primary schools and educational institutions in various regions of Kenya. Product demonstrations with teachers and students have shown great impact on the classroom activity. Appropriate pricing and packaging contents have also been examined.

1) The gradual acquisition and solid progress of "Student Centered Learning and School Management" have been confirmed among the primary schools in Kenya. Visiting many of the prize winning schools of CFS Contest, we have observed lots of wall display and learning materials, as some schools hold Science Exhibition by students. Some science teachers started to visit neighboring schools to teach the method from SMASE Cluster Training to other teachers. These schools can also be observed as "attracting more students to join, and to promote higher learning performances" acknowledged by school principals and community residents.

2) As a result of product demonstration, proposed products have been highly appreciated among the authorities concerned with School Education in Kenya (MOEST, KICD, CEMASTEA, KISE, PTTC, TSC, KEPSHA, and private schools) and students (7^{th} and 8^{th} graders). These products were considered as real innovative learning/teaching materials, for science education to uplift more practical and enjoyable one in primary (and secondary) school in Kenya. That means the proposed products would be acknowledged and appreciated among Kenyan schools, as actual and practical tools to introduce and promote CFS and ASEI/PDSI.

3) On the other hand, there are some requirements for primary school teachers to improve their skills in scientific experiment, also to increase related basic knowledge and understanding. Therefore, continuous guidance and training workshops should be provided for local teachers by utilizing the local agent and staffs, to make effective use of proposed products among the schools in Kenya. --There is a similar experiment-training workshop called “NARIKA Science Academy” provided in Japan, by the proposed company.

4) While continuing application process to KICD Technical Evaluation, marketing activities should be prepared for customers considering purchase of the proposed products before acquiring an approval by

KICD in Orange Book. There is no problem in purchasing the proposed products by private schools, which do not accept FPE fund from the government, nor for some public schools to use independent fund other than FPE fund. There are some enquiries from several private school head teachers, asking about prices of the products so that they can include it in the school budget for next year.

5) From the interviews with the head teachers, we observed their financial situation. Head teachers spent a lot of effort and time for applying FPE Fund to MOE, while the process takes long time and the fund is not enough to cover the cost, as FPE unit price has not increased since 2003 (1,020Ksh/student). They are interested in purchasing science materials like NARIKA products, but another process is required to get the fund, while there is no clear reference in SIMBA account to purchase this kind of materials. So if they want to buy such kind of material, they need to divert from the fund for textbooks.

Although we could not collect numeral data in this survey, we observed great impact of actual teaching demonstration with the proposed products in the school classroom, through hearings and interviews to the educational authorities, and large numbers of comments from head teachers and science teachers. If Genecon can be utilized properly in science lessons, we can expect numbers of advantages to the teachers and students as listed below.

Table III Positive Impacts by Introduction of Genecon

	Direct Advantages	Expected Indirect Advantages
Teachers	Time saving in preparation for "Children Centered Learning Lessons" Deeper understanding of science topic and subject for teachers Enjoyable lessons Faster understanding of students Improvement of quality and performance of the lessons Faster progress of syllabus	Better work performance evaluation as science teachers Gaining professional mind as science teachers Positive attitude towards school
Students	Experience science theories in the five senses Understand science theories in relation with daily life Enjoyable science lessons Better performance in science subjects	Better understanding for science topic other than Genecon Better performance in science subject in general Positive attitude towards teachers and school

IV. Expected development impact and effect on business development of the proposing SME(s) in the surveyed country through proposed ODA projects

For continuous improvement of quality in science education in Africa, number of private agents and institutions must develop and distribute abundant quality textbooks and materials in the market so that many children can learn effectively (and teachers can teach effectively) as well as government-led educational improvement policies established and developed and with the support of Japan. And from that aspect, educational practice in Japan is helpful example, especially skills and knowledge of private education companies that strongly support school education in Japan.

Based on the results of survey and analysis, following chart shows how the proposed products and skills of the company can be relevant to the development issues in educational sector in Kenya..

Table IV Proposed Product Features and its Relevancy to the Development Issues

Development Issues	Product Feature	Measures for Solution
Providing free compulsory quality education	Corresponds to the education curriculum in Kenya and good in durability and cost-performance	Adoption in the textbooks based on KICD Science Education Curriculum; Recommendation of science materials in PTTC curriculum, SMASE Training and school-based trainings; Promotion of science facilities and materials improvement with the guideline from MOEST; Extension of the market in development of textbooks and teaching materials enables to include private sectors; Based on above improvement of teaching environment, teachers would be able to provide more practical science lessons to nurture a lot of younger people with scientific knowledge .
Science and mathematics education aims at economic growth and industrialization	Enables to visualize basic science theories necessary for industrialization	
Shortage of teachers	Enables effective performances of science lessons in front of large numbers of students	
Teachers' lack of knowledge and related skill about the subject	Enables teachers to enjoy themselves using science materials and gain deeper knowledge related to the subject	
Shortage of textbooks and teaching materials	Enables to understand theories written in the textbooks in relation to the practical experience and knowledge already learned Provide quality development skills of science materials	

Japan has already been implementing continuous and multi-regional ODA projects to assist science and mathematics education in Africa, but by introducing made-in-Japan science educational materials to the

African market, Japan can directly contribute to improvement of teacher training and classroom lessons. In addition, private-public initiative for educational materials development methodologies to “inspire African science teachers by new educational materials and to promote localization by its feedback” will establish the practice of teacher training, which was achieved by JICA’s cooperation, and set the foundation for the new type of technical cooperation project to bring the practice to the next level.

Proposed ODA projects described in the following chapter will not only uplift the basic level of primary and secondary science education in Kenya, but also contribute to the human resource capacity development in the target country government, MOEST and school teachers, to the market expansion of educational material development and distribution, to the creation of job opportunities countrywide which are related to the material maintenance and distribution and to give huge impact on the improvement of science literacy for whole population of the country. If we can work in cooperation with the network of SMASE-WECSA for science and mathematics education in Africa, it enables to cover large area of African region.

From the aspect of the proposed company’s business development, significant result can be expected in the medium and long-term.

V. Proposals for formulating ODA projects

The ODA project proposed in this chapter is expected to achieve further expansion, establishment, and synergy effect of the results from technical cooperation projects that Japan has been working on Kenyan primary and secondary education for a long time. These projects are also expected to contribute largely in overseas business development of proposed company.

Significance of ODA project formulation can be roughly categorized as below:

(1) Lobbying to policy makers, co-operation with the existing Teachers Training (as in SMASE program)
(2) Promotion and sharing information of practical lesson plan utilizing the proposed products, and verification and improvement of educational impact.
(3) Establishment of Science Education Improvement Model for project formulation to contribute whole area of Kenya.

In order to utilize the proposed products to resolve issues on education development in Kenya, it is effective to operate educational training programs targeting science teachers, head teachers and staffs for related maintenance, as well as the introduction of the proposed materials. It is ideal to apply the technical assistance scheme for capacity development targeting above practical users. In this framework, the proposed company can provide local technical training (lesson improvement, science materials development support, maintenance training etc.) and technical training in Japan.

Based on the discussion above, the list of ODA projects proposal in this report is as follows.

Table V Proposed ODA Projects

	ODA Projects	Operating Period
1)	Private-Sector Proposal-Type Technical Cooperation Promotion and verification of proposed products based on the development of science materials kit and verification survey of its impact on school education. Policy proposals for the promotion of science education. Promotion to WECSA countries.	FY2014-2016
2)	JICA Partnership Program (or Technical Cooperation Projects) Promotion of science materials, technical training for science teachers and experiment assistants for utilization in schools.	FY2017-
3)	Technical Training Promotion of science materials, technical training for science teachers, head teachers and educational authorities for utilization in schools. Skill training to reflect on course of study and textbook.	FY2017-
4)	SMEs Non-Project Assistance Supplying science materials to the teachers training institutions at County level.	FY2017-

Co-operative activities by the proposed company and local partner agents and above listed ODA projects will make an impact by complementing each other to secure improvement of science education in Kenya. It will also establish concrete foundation of overseas business management of the proposed company. When the proposed company can establish their brand as Japanese science material company in Kenya through such process, the business opportunity will also be expanded to the other African countries. Considering the large scale of growth in the African market, it may stop (or even reverse) the downward trend of sales decline due to shrinking Japanese market for science materials.

Project Formulation Survey
Republic of Kenya, Feasibility Study by NARIKA Corporation

SMEs and Counterpart Organization

- Name of SME: NARIKA Corporation
- Location of SME: Tokyo, JAPAN
- Survey Site・Counterpart Organization: Nairobi, Kenya. Ministry of Education, Science and Technology (MOEST), Kenya Institute of Curriculum Development (KICD), et al.

Concerned Development Issues

- New Constitution: Every child has the right to access free and compulsory basic education
- Vision 2030: The creation of international competitiveness through more efficient productivity in STI (Science, technology and innovation)
- Population Growth and Luck of Teachers -> increase of the number of student per classroom
- Lack of teacher's knowledge and teaching skills

Products and Technologies of SMEs

- Effective and Durable Educational Materials for Science Classrooms
- Visualize science theories & Students experience knowledge through reality
- Demonstration Workshop on Hands-on activities for Science Teachers
- Interactive Material Development with Schools and Science Teachers

Proposed ODA Projects and Expected Impact

- SMEs Support Project: Development of science educational materials to promote the Student-Centered Learning and acquisition of the products' positive impact on educational achievement (improvement in learning performance).
- JICA Partnership Program (or Technical Cooperation Project): Improvement of school environment and science teachers' ability to utilize science materials by the promotion of the science materials and Teaching method to promote Student-Centered Learning.
- Technical Training: Gaining acquisition of Government officers and school principals on the improvement of school environment and science teachers' ability to utilize science materials

Future Business Development of SMEs

- Global contribution through quality science education materials promotion: Based in Nairobi, we promote the improvement of school environment by providing science materials to the schools and educational institutes countrywide. By utilizing the achievement of JICA technical assistance, business sustainability will be confirmed by extending the project more widely to grass roots revel. Other EAC countries and English-Spoken Countries in Africa can also be a potential field after the experience in Kenya.