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Analysis from a Capacity Development Perspective

# **Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project in Kenya**

January 2007

Institute for International Cooperation  
Japan International Cooperation Agency



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in Secondary Education (SMASSE)  
Project in Kenya**

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The analysis and recommendations of this report do not necessarily reflect the official views of JICA. It is the fruit of a collaborative effort by the study group on “CD analysis on SMASSE project,” organized by JICA.

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## Preface

Although the term “capacity” used in “capacity development” originally refers to the “ability”, JICA defines it as the ability of developing countries “to set and attain goals, and to identify and solve the development issues of their own countries”; in other words “problem-solving abilities”. JICA also regards capacity development (CD) as “the ongoing process of enhancing the problem-solving abilities of developing countries by taking account of all the factors at the individual, organizational and societal levels”.

Based on the idea that CD is a useful concept in reexamining the nature of its projects, JICA attaches importance to the systematization and accumulation of lessons and experiences for future use by continuously analyzing previous cooperation activities from a CD perspective.

JICA conducts a variety of technical cooperation activities in developing countries in the basic, higher and technical education sectors. In the Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project in Kenya, which has been picked as a topic for this report, the training outcomes have successfully extended to the end training participants thanks to the use of concepts related to the achievement of student-centered lessons as keywords for the in-service training of mathematics and science teachers. Another distinguishing feature is the fostering of ownership and the creation of independent, sustainable training operation mechanisms such as the SMASSE Fund. This resulted from continuous approaches to a variety of stakeholders in the partner country, from administrative officials of the central and local government to local residents. Furthermore, this project has succeeded in establishing a network for inter-regional collaboration because the results have been extended not only to the Republic of Kenya but also to neighboring African countries.

This research synthesizes these features in order to put forward lessons and recommendations from the perspective of CD support. These lessons and recommendations are expected to be applied in managing the implementation of JICA’s cooperation for mathematics and science education around the world, as well as in formulating new projects. Moreover, in the larger context of JICA’s technical cooperation, they can suggest concrete support measures for improving the capacity of developing countries to address development issues.

Teaching materials will be created on the basis of the results of the present case analysis in order to incorporate them into training programs for JICA staff, experts, related personnel, and human resources in developing countries.

In this way, we hope that the lessons and recommendations obtained from this research will be

further deepened through on-site practice and discussions.

Finally, we would like to express again our gratitude to all those involved in the SMASSE project, who responded to interviews and cooperated in the realization of the present study.

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Japan International Cooperation Agency (JICA)

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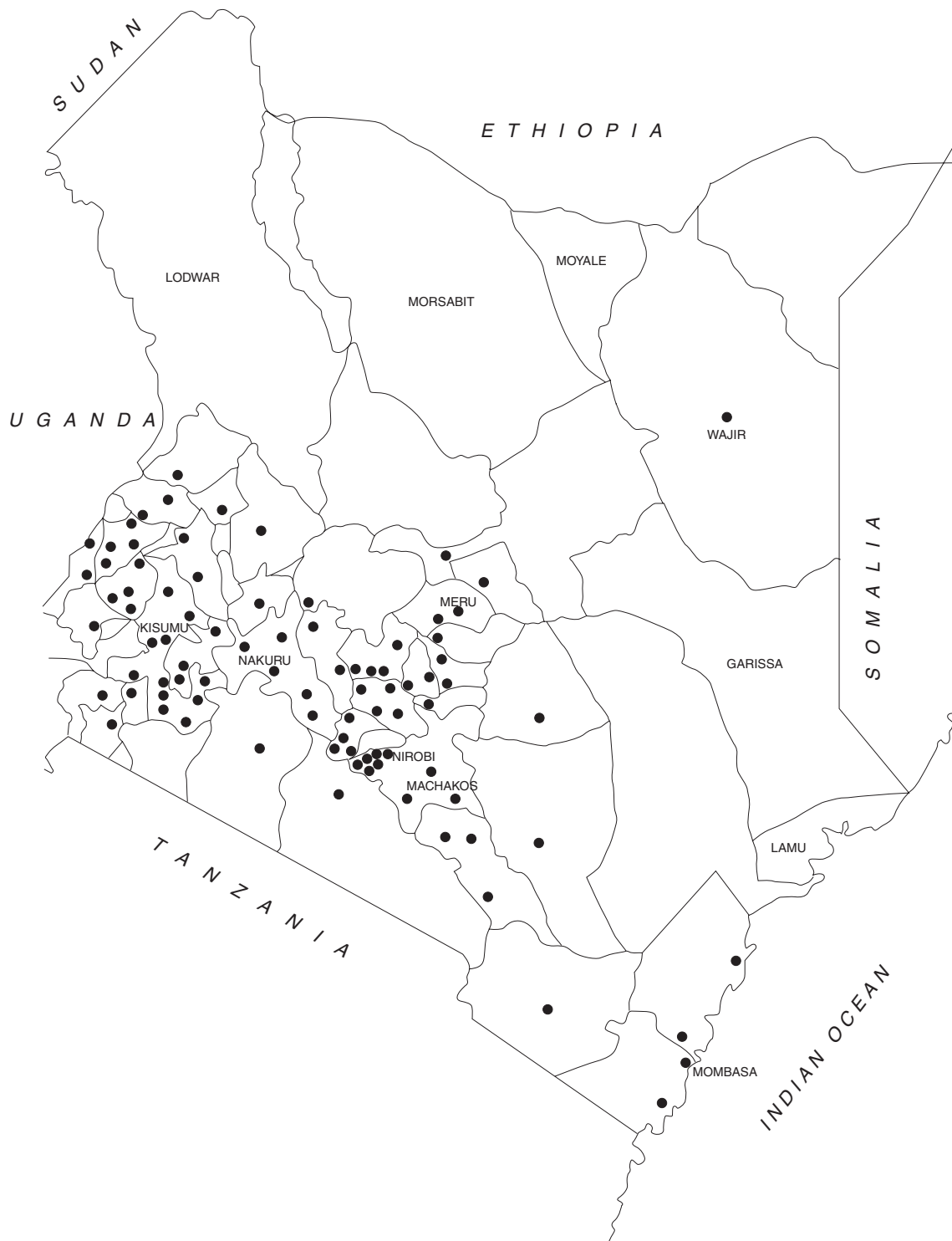
Director General: Toru Taguchi

### SMASSE-WECSA Member Countries



Source: SMASSE Project (2005)

### Map of Kenya (locations of district-level in-service training centers)



Source: SMASSE Project (2005)

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## Summary

### ■ Background and Purpose of the Case Study

The “Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project”, launched in Kenya in 1998, is aimed at the improvement of mathematics and science education through In-service Training (INSET) for teachers. The project focuses on lesson improvement as its key concept and established a training system using the cascade approach at the national and district levels, which facilitated the diffusion of training effects to all participants including those who are at the lowest level of the cascade. It has also set up mechanisms by which a part of school tuition fees is used to cover the costs for district-level training, thus ensuring the sustainability of training management and implementation. After the launch of Phase II in 2003, the Kenyan government established the national training center and INSET was extended both domestically, to cover the entire Kenyan territory, and intraregionally, to conduct activities to the strengthening of mathematics and science in secondary education in 30 Sub-Saharan countries.

The first objective of this study is to put together the characteristic features of cooperation in the field of mathematics and science education, and the lessons learned from the project, in order to facilitate their use in the planning and implementation stages of new activities, in the context of the expansion of cooperation of Japan International Cooperation Agency (JICA) for mathematics and science education worldwide.

JICA attaches great importance to the notion of “Capacity Development (CD)”, which supports the enhancement of the problem solving abilities of developing countries. The second objective of this study is to analyze the SMASSE project, which led to the establishment of INSET as a system, in terms of the stakeholders it targeted, of the approaches it used to elicit endogenous efforts, and of the roles played by the Japanese members, in order to formulate recommendations for the implementation and management of future technical cooperation in general. Although the targeted area of the project has been expanding, the focus of this study is limited to the analysis of CD in Kenya.

### ■ Definition of CD

JICA (2006) defines CD as “the ongoing process of enhancing the problem-solving abilities of developing countries by taking into account all the factors at the individual, organizational, and societal levels”. In light of this concept, the role of technical cooperation is not to “carry out CD”, but to assist the endogenous CD of developing countries. It is a way of thinking which defines capacity as “the ability of developing countries to solve development problems on their own” and considering it as “a complex combination of elements including institutions, policies, and social systems” (complexity of capacity), and the concept of CD attaches great importance to proactive and endogenous efforts (ownership) on the part of developing countries. Consequently, the role of JICA and its related personnel as CD facilitators is to

grasp the overall picture of the necessary capacity, and use it to strategically position its cooperation in a way that stimulates independent, and endogenous capacity enhancement processes.

### ■ Project Overview

The request for assistance in the field of mathematics and science in secondary education, addressed by the Kenyan government to Japan in 1996, resulted in the launch of the SMASSE project in 1998. The table below indicates the expected outcomes specified in the Project Design Matrix (PDM), together with the outcomes specified in the PDM for Phase II, which was launched in 2003.

**Project Design Matrix (PDM)**

	Phase I ( PDM Second Version )	Phase II Domestic Components	Phase III Regional Components
Overall goal	Capability of young Kenyans in Mathematics and Science is upgraded.	Capability of young Kenyans in Mathematics and Science is upgraded.	Quality of Mathematics and Science Education at secondary level in member countries is strengthened.
Project purpose	Quality of Mathematics and Science education at secondary level is strengthened through INSET for teachers in the Pilot District.	Quality of Mathematics and Science education at secondary level is strengthened in Kenya through INSET of teachers.	ASEI-PDSI is practiced in teacher training institutions and secondary schools in member countries
Outputs	<ol style="list-style-type: none"> <li>1. A system of training for the District trainers in Pilot Districts in Mathematics and Science will be established at KSTC.</li> <li>2. A system of INSET in Mathematics and Science will be established in the Pilot Districts.</li> <li>3. Role of KSTC and District INSET centers as resource centers will be strengthened.</li> </ol>	<ol style="list-style-type: none"> <li>1. A system of training for the District trainers in Mathematics and Science will be strengthened at National INSET center.</li> <li>2. A system of INSET in Mathematics and Science will be established in the Districts.</li> <li>3. Role of SMASSE National INSET Center and District INSET Centers as resource centers will be strengthened.</li> </ol>	<ol style="list-style-type: none"> <li>1. Trainers for ASEI-PDSI based INSET will be produced in member countries</li> <li>2. SMASSE National INSET Center will be consolidated as a resource center for Mathematics and Science in Africa.</li> <li>3. SMASSE National INSET Center will function as secretariat of SMASSE-WECSA.</li> </ol>

Source: Composed from Social Development Cooperation Department, JICA (2001), (2003)

### ■ Outcomes from a CD Perspective

The CD perspective was not clearly specified in the PDM of the project. As a result, several gaps can be identified between the PDM and the capacity factors required for establishing “a sustainable system for improving teachers’ capability to conduct lessons”. As the project was designed to focus on building INSET “implementation mechanisms” at the national and district levels, approaches at the policy level result directly at the school level, and changes in awareness were not included among the objectives of the project. However, the project succeeded in enhancing capacity factors necessary for “a sustainable system for improving teachers’ capability to conduct lessons” centering around the national training center, which is the direct beneficiary, and functioning at the national, district and school levels. The necessity of INSET as a tool for strengthening mathematics and science in secondary education has been acknowledged in governmental policy, and the system for implementing national-level training has been established. In the context of intra-regional cooperation in Phase II, Kenyan counterparts

(C/Ps), who had initially been the recipients of assistance, turned into providers and implementors of CD assistance for third countries, demonstrating the CD taking its root within the partner country.

Capacity required from a CD perspective is shown in the table below, together with the outcomes planned and produced so far in the project. (In the second column on the right “Planned”, “●” indicates planned activities, and “—” indicates unplanned activities. In the first column on the right “Achieved after 8 years”, “●” indicates capacity which has been developed, while “△” indicates capacity which still needs to be strengthened).

### Capacity Necessary for the Establishment of a “Sustainable System for Improving Teachers’ Capability to Conduct Lessons” and Outcomes Planned/Produced in the Project

		Necessary capacity factors	Planned	Achieved	
National level	International contribution	<ul style="list-style-type: none"> <li>Project outputs are shared with other countries of the region</li> </ul>	●	●	
	Societal	Policies	<ul style="list-style-type: none"> <li>Specification of INSET in educational policies and education-related legislation.</li> <li>INSET budgeting</li> </ul>	—	●
		Institutions	<ul style="list-style-type: none"> <li>INSET institutionalization</li> <li>School notification and follow-up</li> </ul>	●	●
	Organizational	<ul style="list-style-type: none"> <li>Development of training facilities, teaching materials and aid</li> <li>Organizational-level capacity to implement and monitor legislation (capacity to fulfill the functions of national-level training, including the development of teaching materials and aid)</li> </ul>	●	●	
	Individual	Knowledge Skills Techniques	<ul style="list-style-type: none"> <li>Individual-level capacity to implement and monitor legislation (capacity to fulfill the functions of national-level training, including the development of teaching materials and aid)</li> </ul>	●	●
		Awareness	<ul style="list-style-type: none"> <li>Policymakers acknowledge the importance of INSET and of regarding teachers as professionals who should constantly upgrade their skills</li> </ul>	—	●
Local level	Societal (Institutions)	<ul style="list-style-type: none"> <li>INSET plan formulation</li> <li>INSET budgeting</li> </ul>	●	●	
	Organizational	<ul style="list-style-type: none"> <li>Development of training facilities, teaching materials and aid</li> <li>Capacity for budget execution</li> <li>Organizational-level capacity to implement projects (capacity to fulfill the functions of district-level training)</li> <li>Monitoring capacity</li> </ul>	●	△	
	Individual	Knowledge Skills Techniques	<ul style="list-style-type: none"> <li>Individual-level capacity to implement projects (capacity to fulfill the functions of district-level training)</li> </ul>	●	●
		Awareness	<ul style="list-style-type: none"> <li>Recognition of the importance of INSET and of teachers’ attitude as professionals who should constantly upgrade their skills</li> </ul>	—	●
School level	Societal (Institutional)	<ul style="list-style-type: none"> <li>INSET budgeting</li> </ul>	—	●	
	Organizational	<ul style="list-style-type: none"> <li>Teachers’ capacity to learn from one another</li> <li>Monitoring capacity</li> </ul>	—	△	
	Individual	Knowledge Skills Techniques	<ul style="list-style-type: none"> <li>Teachers’ capacity to comprehend</li> </ul>	—	△
		Awareness	<ul style="list-style-type: none"> <li>School principals take a cooperative stance based on the awareness of the importance of INSET and of constantly upgrading teachers’ skills</li> <li>Teachers are willing to attend INSET</li> <li>Teachers express their intention to use what they learned through INSET in the classroom</li> </ul>	—	△

Source: Composed by JICA Research Group, Institute for International Cooperation (IFIC) (2002)

## ■ Project Features which Contributed to the Establishment of INSET as a System

Although the project was not initially planned from a CD perspective in its PDM, it succeeded in making a contribution to CD promotion because it did not limit itself to the outcomes envisioned in the planning stage, but consciously incorporated activities based on a CD perspective.

Five project features considered to have played a crucial part in achieving this goal are given below.

- 1) In the project formulation stage, the needs of a variety of stakeholders were identified and linked with the political concerns of the recipient country.
- 2) Approaches aimed at securing sustainability, such as utilizing the existing resources of the recipient country in order to form an independent financial base from the project formulation stage, were adopted for all the strategies and tactics in the project.
- 3) Fostering ownership by the recipient country at various levels was emphasized during the implementation process.
- 4) The tangible outcomes obtained as a result of content development and monitoring activities served to attract further support, which included support toward the specification of INSET in policies, and to changes in awareness at the individual level.
- 5) The “waiting” stance of Japanese experts contributed to the capacity enhancement process of the recipient country in the long run. Although resource loading and activity planning had to stay flexible in order to ensure sustainability, the project benefited from full support from the rest of the Japanese personnel involved, given the trust relationships between the experts and other Japanese personnel.

## ■ Recommendations for the Overall Implementation and Management of Technical Cooperation

On the basis of the above project analysis, a few recommendations can be formulated not only for JICA’s cooperation in the field of education, but also for the implementation and management of technical cooperation in general.

### (1) The Establishment of a Sustainable System and the Concept of “Complexity” in CD Achievement

The reason for the success of the project can be found in the careful planning of activities from the viewpoint of sustainability, based on the findings of the preliminary study, and in the thorough implementation of this plan. This process was made possible by the trust relationships built with the Kenyan side from the preliminary study stage. In order to select a sustainable cooperation approach, therefore, it is necessary to grasp multi-level needs through a comprehensive analysis of the recipient country’s capacity, from the project formulation and preliminary study stages. In the case of the SMASSE project, existing capacity was analyzed from the three perspectives of the institutional base,

of the financial base and of human resources, at each of the national, district and school levels. In addition, due consideration must be given to negotiation with the recipient side, as well as to the identification and involvement of key persons.

### **(2) Indirect Assistance Stimulating Developing Country-Driven Efforts**

Indirect assistance aiming to stimulate developing country-driven efforts should encourage counterparts to “think by themselves” in the context of needs assessment, content development, monitoring, evaluation activities, etc., with the purpose of nurturing ownership of the C/Ps. Moreover, the sustainability of ownership needs to be secured through an institutional framework which guarantees that efforts made within the project belong to the recipient country. Flexible operation management which leaves initiative and decision-making in the hands of the recipient side, which is willing to “wait” although it might take longer to produce the desired outcomes, has the potential to make a significant contribution to the CD of developing countries. It should be added that the identification and provision of effective non-economic incentives also represent a vital key to success.

### **(3) Lessons Learned as CD Facilitators with Respect to the Implementation System**

To put into practice the above concept of “complexity” and to engage in the assistance enabling the recipient country’s independent efforts, it is desirable that the JICA Headquarters, overseas offices and the project collaborate closely, so that relevant departments can respond promptly and adequately to on-site needs, from the formulation through the implementation and evaluation stages. It is also necessary to identify and train experts who can act as project managers, who understand the needs of developing country, and who can develop strategic scenarios with a vision for the future. JICA should also aim at maximizing the use of local resources, and to link its various operation schemes in the form of programs. Furthermore, in order to adequately evaluate projects which strive to achieve CD in parallel with their planned outcomes, it is desirable that a project management methodology which allows simultaneous evaluation of project outcomes and CD achievement will be developed.

## Introduction

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### 1 Background and Purpose of the Case Study

The “Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project” was initiated in 1998 with the purpose of improving mathematics and science education in Kenya through the training of in-service teachers in secondary schools. The project set the concept of “lesson improvement” as its key word and endeavored to facilitate the spreading of the training effects to end participants of the training while building an In-Service Training (INSET) system using the cascade approach at national and district levels. Furthermore, it established mechanisms in which part of the tuition fee is allocated to the operating costs of district-level training, thus fostering the sustainability of training management and implementation. In Phase II, which was launched in 2003, a national INSET center was set up by the Kenyan government, and the training was implemented across the country. At the same time, activities, intended to contribute to the strengthening of mathematics and science education at the secondary level in the 30 countries of Sub-Saharan Africa, are implemented through an intra-regional network.

In the context of the worldwide expansion of JICA’s cooperation for mathematics and science education, this case study aims at offering a systematic perspective on the features and lessons learned in the field of cooperation for mathematics and science education, and explore their applicability in the planning and implementation stages of new projects.

JICA emphasizes the need for a “Capacity Development” (CD) approach which supports the enhancement of the problem-solving abilities of developing countries. The second objective of this report is to analyze the project which established INSET in Kenya taking into account a number of aspects such as what stakeholders were targeted in the partner country, what kind of approaches were used in order to stimulate endogenous efforts, what role was played by the Japanese participants, and what kind of achievements and further challenges emerged as a result, in order to put forward suggestions regarding future implementation and management of technical cooperation as a whole. While the project area has been expanding, the focus of the present case study is limited to Kenya.

This case study is expected to be relevant to

- a reference material in the formulation and implementation of similar cooperation projects in the field of basic education and mathematics and science education

- feedback shared by the parties involved in education cooperation and major donors, in their initiatives on strengthening mathematics and science education
- a model for project analysis using a CD analysis framework
- a casebook for personnel and expert training

## 2 Implementation System and Methodology of the Case Study

Two leading offices, the Research Group of the JICA Institute for International Cooperation and Group 1 (basic education) of the Human Development Department, formulated the analysis framework to implement the present case study. In line with this analysis framework, the consultant\* took charge of the field study and the drafting of the report under the direction of the leading offices.

Table 0-1 shows the basic analysis perspectives used in this study, the points of analysis, and the CD framework, as established by the leading offices.

**Table 0-1 Framework of the Case Study**

Basic analysis perspectives	<ul style="list-style-type: none"> <li>• What steps were taken in order to elicit outcomes for the INSET system implemented in the project? Who were the stakeholders and what were their roles in ensuring the sustainability of the training system? Moreover, as the project area is expanding, how can the training system be adjusted to accommodate the needs of each country it is applied to?</li> </ul>
Points of analysis	<ul style="list-style-type: none"> <li>• Content analysis: development of the training pedagogy               <ol style="list-style-type: none"> <li>1) Formulation of pedagogy and lesson improvement methodology</li> <li>2) Formulation of training instruction methods</li> </ol> </li> <li>• Mechanism analysis: what were the organizational, personnel and finance-related aspects concerning establishment of a national-level sustainable training system?               <ol style="list-style-type: none"> <li>1) Establishment of the INSET system</li> <li>2) Institution-building for sustainable training management</li> </ol> </li> <li>• Project features aimed at yielding outcomes               <ol style="list-style-type: none"> <li>1) Features targeted at enhancing ownership by various Kenyan stakeholders</li> <li>2) Role of Japanese experts</li> <li>3) Inter-scheme coordination</li> <li>4) Features related to expanding regional cooperation</li> </ol> </li> <li>• A social environment enabling smooth implementation of project activities (external factors)</li> </ul>
CD perspective	<ul style="list-style-type: none"> <li>• What were the mechanisms providing incentives for Kenyan partners, which were used to ensure the sustainability of institution-building and the related activities?</li> <li>• Who were the actors involved and how did they operate in the above process?</li> <li>• What role did JICA personnel (experts, offices, etc.) play in order to achieve this purpose?</li> <li>• What were the facilitating and impairing external factors and actors and how were they addressed?</li> </ul>

Source: Composed by JICA Research Group (IFIC).

Following the above framework, experiences were extracted chronologically, starting from the project formulation stage to its implementation and evaluation.

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As shown in Table 0-2, the study methodology used in this case study relied on the analysis of project reports, interviews and simplified questionnaires addressed to Japanese parties, as well as direct and indirect beneficiaries. (Main interviewees are shown in Attachment 2). In addition, related documents drafted by governments and donors were also analyzed. Locations and travel schedules of the on-site study (from February 18 to March 19, 2006) are given in Attachment 3. Results of the on-site study questionnaire are shown in Attachment 4, the state of project implementation in visited districts in Attachment 5, and the state of project implementation in visited schools in Attachment 6.

**Table 0-2 Study Methodology**

Target		Method	Purpose	
Reports*	<i>The Project for Education in Kenya: Record of Study Results for Project Formulation (Material for internal examination) (1995)</i>		Literature review	To grasp project background, stakeholder situations, planning and implementation outlines and their changes, achievements, evaluation results, etc.
	<i>The Project for Education in Kenya: Record of Study Results for Second Project Formulation (Material for internal examination) (1996)</i>			
	<i>Report of the Basic Study Team (1997)</i>			
	<i>Report of the Preliminary Study Team (1997)</i>			
	<i>Report of the Consultation on Implementation Study Team (1998)</i>			
	<i>Report of the Implementation Guidance (Mid-term) Evaluation Team (2001)</i>			
	<i>Report of the End of Project Evaluation Team (2002)</i>			
	<i>Record of Consultation on Implementation of Phase II (2003)</i>			
<i>Information and Data for Mid-term Evaluation (2005)</i>				
Japanese staff	JICA personnel	Headquarter and overseas office personnel in charge	Interview	To grasp project implementation process, outcomes and further challenges
	Project staff	Former JICA experts/domestic support committees	Interview	
		Current JICA experts	Interview	
Direct beneficiaries	Central government organizations	Ministry of Education, Science and Technology	Interview	
		National INSET centers (national in-service trainers)	Interview/simplified questionnaire	
	Local government organizations	District-level board of education	Interview	
		District-level trainers	Interview/simplified questionnaire	
End beneficiaries	Secondary schools	Heads' Association (principals)	Interview	
		Mathematics and science teachers	Simplified questionnaire	
		Students	Simplified questionnaire	

\* Original Reports are written in Japanese.

Source: Compiled based on operational instructions and other materials.

### **3 Structure of the Case Study**

The present case study consists of 4 chapters. Chapter 1 summarizes basic CD ideas, and advances a hypothesis regarding the reasons why the project under study can be regarded as an instance of successful contribution to CD. Chapter 2 clarifies and analyzes the approaches applied within this project in chronological order. In chapter 3, the current situation of the project and its features and initiatives are analyzed from a CD perspective. Finally, chapter 4 highlights the lessons learned from this project, and formulates strategic implications for the overall implementation and management of JICA's technical cooperation.

