Appendix 2

JOINT TERMINAL EVALUATION REPORT

ON JAPANESE TECHNICAL COOPERATION PROJECT

FOR

STRENGTHENING CAPACITY FOR MEASLES VACCINE

PRODUCTION IN VIET NAM

13 November 2009

CENTER FOR RESEARCH AND PRODUCTION OF VACCINES AND BIOLOGICALS (POLYVAC), VIET NAM
AND
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA), JAPAN

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Abbreviations

EPI	Expanded Program on Immunization
GAVI	GAVI Alliance (Former name: The Global Alliance for Vaccines and Immunization)
GCP	Good Clinical Practice
GMP	Good Manufacturing Practice
IQ	Installation Qualification
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
MFT	Media Fill Test
MR vaccine	Measles and Rubella combined vaccine
MV	Measles vaccine
NICVB	National Institute for Control of Vaccine and Biologicals, Viet Nam
NIHE	National Institute of Hygiene and Epidemiology, Viet Nam
NRA	National Regulatory Authority
OJT	On the Job Training
OQ	Operational Qualification
PDM	Project Design Matrix
POLYVAC	Center for Research and Production of Vaccines and Biologicals
PQ	Performance Qualification
PV	Process Validation
PVF	Primary Vaccine Failure
QA	Quality Assurance
QC	Quality Control
SIAs	Supplementary Immunization Activities
SOP	Standard Operating Procedure
SPF	Specific Pathogen Free
SVF	Secondary Vaccine Failure
VN	Viet Nam
VND	Vietnamese Dong
WHO	World Health Organization
WPRO	Western Pacific Regional Office, WHO

Chapter 1: Introduction

1-1 Background

The Vietnamese government has implemented the Expanded Program for Immunization since 1981 as effective measures to decrease infant mortality rate and to control infectious diseases. The government has promoted domestic production of EPI vaccines and resulted in producing domestically EPI vaccines other than measles vaccine.

Morbidity rate of measles is high especially for children and measles is one of the major causes of child death. Even though the measles vaccination cover rate has been kept as high as 90 %, the number of cases has shown an increasing trend since 1997 and reached 19,000 in 2000. The Vietnamese government has started provision of two doses of measles vaccine per child according to the WHO/WPRO's strategy. Therefore, it is estimated that the domestic demand for the vaccine will increase. On the other hand, international vaccine manufacturers have tended to shift from measles vaccine production to more profitable vaccines production, so there is a concern on stable supply of reasonable measles vaccine. Under these circumstances, domestic production of measles vaccine to secure stable supply is also an important issue for reducing prospective financial burden of the Ministry of Health.

The Vietnamese government requested to the Japanese government for grant assistance on measles vaccine production facility and technical cooperation to produce measles vaccine, which complies with WHO-GMP standard. In response to this, the Japanese government made decision on construction of measles vaccine production facility as a part of POLIOVAC (currently POLYVAC) by grant assistance and on technical cooperation project for strengthening capacity for measles vaccine production (hereinafter referred to as "the Project").

The facility had been constructed since September 2004 and completed March 2006. In parallel with this, the Project has started for the purpose of making POLYVAC to be capable of producing measles vaccine complying with Vietnam-GMP, which has met WHO-GMP standard since 24 March 2006 for four years. With the support by the Kitasato Institute technical transfer has been in place since July 2006.

This Terminal Evaluation aims to review the progress of the Project, identify its outstanding challenges and confirm the direction and plan of activities after the termination of the Project.

1-2 Joint Evaluation Team

Evaluation of the Project was jointly conducted with ## Vietnamese members. The members of Joint Evaluation Team (hereinafter referred to as "the Team") were indicated below.

< Japanese side >

Name	Job Description	Professional Affiliation	Detachment Period
Dr. Mitsuhiro USHIO	Team Leader	Executive Technical Advisor to the Director General, Human Development Department, JICA	November 5–14, 2009
Dr. Hiroshi OHARA	GMP	Bureau of International Cooperation, International Medical Center of Japan	November 5–14, 2009
Mr. Shinji SATO	Cooperation Planning	Infectious Diseases Control Division, Health Human Resources and Infectious Disease Control Group, Human Development Department, JICA	November 5–14, 2009
Dr. Yoichi INOUE	Evaluation and Analysis	Consulting Division, Japan Development Service Co., Ltd.	November 1–14, 2009

<Vietnamese side>

Name	Professional Affiliation
Dr. Nguyen Dang Hien	Director of POLYVAC
Ms. Tran Thi Hong Thuy	Product Manager
Ms. Nguyen Nu Anh Thu	Quality Control Manager
Ms. Nguyen Thuy Huong	Quality Assurance Manager

1-3 Schedule of the Terminal Evaluation Team

Schedule of the Team is indicated below.

Date		Time	Consultant - Dr. Inoue	Mission: Dr. Ushio, Dr. Ohara, Mr Sato
1-Nov	Sun	11:00 15: 10	Narita VN955 Hanoi	
2-Nov	Mon		・ Meeting and Interview Japanese expert. ・ Courtesy call to Director of POLYVAC and explain about method of evaluation. ・ Observe factory, expert and C/P's activities. ・ Meeting and interview C/P.	
3-Nov	Tue		・ Meeting with Japanese expert ・ Meeting and interview C/P	
4-Nov	Wed		・ Meeting with Japanese expert ・ Meeting and interview C/P	
5-Nov	Thu		Analysis studied data, drafting evaluation report	11:00 Narita VN 955 15: 10 Hanoi Team meeting
6-Nov	Fri	8:30-9:00	Meeting with JICA Vietnam office	
		10:30-11:00	Courtesy call to the MOH Representatives of Int'l Cooperation Dept, Drug Management Dept	
		11:30 -	Courtesy call to Embassy of Japan: Mr. NISHINO	
		14:00-14:30	Courtesy call to Director of POLYVAC: Dr. Nguyen Dang Hien	
		14:30 -	Explanation of project activities by experts and C/P	
7-Nov	Sat		Revising document	
8-Nov	Sun		Team meeting	
9-Nov	Mon		Drafting JER	9:30-12:00 Technical observation and evaluation of POLYVAC
		14:00-15:00	Meeting with WHO (Mr. Toda in-charge)	
10-Nov	Tue	9:00-10:00	Meeting with NICVB - Dr. Le Van Phung, Director	

		11:00-12:00	Meeting with NEPI
		14:00-16:00	Discussion with POLYVAC (confirm process)
11-Nov	Wed	9:30-16:00	Discussion with POLYVAC (review of achievement, evaluation by five criteria) Finalization draft of evaluation report
12-Nov	Thu	9:00-11:30	Observation activities of NIHE (Dr. Ushio and Mr. Sato)
		14:00-16:00	Preparation for JCC
13-Nov	Fri	9:30-12:00	JCC Meeting Signing MM
		15:00-16:00	Report to Embassy of Japan
		16:30-17:30	Report to JICA Vietnam office
		18:00	Reception by the Kitasato Institute
14-Nov	Sat	0:10 06: 40	Dep. Hanoi VN954 Narita

1-4 Framework of the Project

Framework of the Project is described below.

Super Goal & Indicator	Super Goal The health status for the children in the Socialist Republic of Viet Nam is improved. Objectively Verifiable Indicators for Super Goal Infant Mortality rate in the Social Republic of Viet Nam
Overall Goal & Indicators	Overall Goal Measles Infection Rate in the Socialist Republic of Viet Nam will be decreased from the current level. Objectively Verifiable Indicators for Overall Goal 1. Rate of children infected with measles in the Social Republic of Viet Nam 2. Number of children immunized with measles vaccine in the Social Republic of Viet Nam
Project Purpose & Indicators	Project Purpose POLYVAC will be capable to produce necessary amount of measles vaccine for use of measles control activities in the Socialist Republic of Viet Nam complying with Viet Nam-GMP, which has met WHO-GMP standard. Objectively Verifiable Indicators for Project Purpose 1. Measles vaccines are produced in POLYVAC at a rate of 300,000 doses x 25 batch (i.e. 7,500,000 doses)/year. 2. Clearance on the Production and quality management by NRA which has met WHO-GMP
Outputs & Indicators	Output 1 Staff of POLYVAC acquires appropriate technical skill to produce quality measles vaccine.

	Objectively Verifiable Indicators for Output 1 1. Number of Staff in POLYVAC who get technical training to reach a sufficient technical level (i.e. level 4 * for staff categorized as A) for measles vaccine production. (*Level 4: be able to work by themselves and could retain others.) 2. Standard Operation Procedure (SOP), equipment maintenance list, equipment inventory and other necessary documents for operation and maintenance of the facilities and production equipment by POLYVAC shall be prepared. 3. Details on equipment, apparatus, raw materials, spare parts and consumables are properly administrated and inventory is properly managed. Output 2 Production and quality management meet Vietnam-GMP, which has met WHO-GMP standard. Objectively Verifiable Indicators for Output 2 1. Performance Qualification (PQ) and Process Validation (PV) are executed as scheduled. 2. Validation complying with VN-GMP is conducted periodically by POLYVAC. 3. GMP documentation complying with VN-GMP is prepared. 4. SOPs complying with VN-GMP are prepared and production process is done according to the SOPs.
Activities	Activity 1 1-1. Conduct technical transfer on bulk, filling, freeze-dry through the process of producing vaccine from the imported bulk. 1-2. Conduct technical transfer on production of bulk vaccine through the processing of producing bulk vaccine from the seed virus. 1-3. Conduct technical transfer on proper operation of mass production (7.5 million doses/year) of the measles vaccine. 1-4. Conduct technical transfer on quality control of the products. Activity 2 2-1. Conduct PQ/PV for vaccine production from bulk vaccine. 2-2. Conduct PQ/PV for vaccine production from seed virus. 2-3. Establish validation system for the production and strengthen the validation skill of the staff. 2-4. Establish and implement quality assurance functions complying with Vietnam-GMP, which has met WHO-GMP standard. 2-5. Prepare and implement necessary SOP for the process of production, storage, carrying in/out of the products, etc. 2-6. Conduct technical transfer on preparation of documents that need to meet Vietnam-GMP, which has met WHO-GMP standard, and to be approved by NRA in the Socialist Republic of Vietnam.

Chapter 2: Methodology of Terminal Evaluation

2-1 Chief Survey Item and Data Collection Methods

2-1-1 Methodology of Evaluation

The Terminal Evaluation was conducted in accordance with the JICA Guidelines for Project Evaluations issued in 2004. Achievements and implementation process were assessed based on the investigation results, which are consolidated in the evaluation grid, from the aspects of the five evaluation criteria of relevance, effectiveness, efficiency, impact, and sustainability, based on the Project Design Matrix (PDM) Version 2 (Annex 1), which was revised at the time of the Mid-term Evaluation in December 2007.

2-1-2 Data Collection Methods

Both quantitative and qualitative data were collected and utilized for analysis. Data collection methods used by the Team were described below.

Literature Survey	Gathering necessary information from published statistics, survey reports, project reports and so on.
Questionnaires	Using survey questions that are prepared in advance, we conduct interviews and/or send questionnaires with respondents such as Japanese experts, counterparts (POLYVAC staff), Vietnamese members of joint evaluation, Ministry of Health-affiliated agencies (NRA, etc.) and WHO, to gather information.
Direct Observation	Confirm the manufacturing process for MV and the actual situation of maintenance and/or recording of GMP-pertinent materials by observing directly to POLYVAC.
Interviews	Conduct interviews with the relevant parties to the Project such as Japanese experts, counterparts (POLYVAC staff), Vietnamese members of joint evaluation, Ministry of Health-affiliated agencies (NRA, etc.) and WHO to gather information.

2-2 Five Evaluation Criteria

Definitions of "Achievements", "Implementation Process" and "Five Evaluation Criteria" and relationship with PDM are described below.

2-2-1 Definitions of "Achievements" and "Implementation Process"

Achievements	Information in regard with the achievements or forecast of achievements of Input, Output, Project Purpose and Overall Goal on the basis of PDM.
Implementation Process	Information in regard with the progress of the Project and any matters arising from the Project activities.

2-2-2 Definitions of Five Evaluation Criteria

Relevance	The extent to which the objectives of a development intervention are consistent with beneficiaries' requirements, country needs, global priorities and cooperating partners' policies.
Effectiveness	The extent to which the development intervention's objectives were achieved, or are expected to be achieved, taking into account their relative importance.
Efficiency	A measure of how economically resources/inputs (funds, expertise, time, etc.) are converted to results.
Impact	Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.

Sustainability	The continuation of benefits from a development intervention after major development assistance has been completed. The probability of continued long-term benefits. The resilience to risk of the net benefit flows over time.

2-2-3 Relationship between "Five Evaluation Criteria" and PDM

	Relevance	Effectiveness	Efficiency	Impact	Sustainability
Overall Goal	The degree to which the project can be justified in relation to local and national development priorities.			The changes and effects positive and negative, planned and unforeseen of the project, seen in relation to the target group and others who are affected.	The extent to which the positive effects of the project will continue after external assistance has been concluded.
Project Purpose		The extent to which the purpose has been achieved; Whether this can be expected to happen on the basis of the outputs of the project.			
Outputs			How economically inputs are converted into outputs. Whether the Inputs same results could have been achieved in another better way.		
Input					

Chapter 3: Summary of the Achievements of the Project

3-1 Inputs

3-1-1 Inputs by Vietnamese side

1) Counterparts (Annex 2)

The number of POLYVAC staff members was increased from 43 at the time of commencement of the Project to 68 at the time of Terminal Evaluation in accordance with progress of the production process. The number of resident staff members in POLYVAC, including the Director-general, is 57 (Median age [range] = 29.8 years old [22-45], which is sufficient to manufacture 7.5 millions doses of Measles Vaccine (MV) per year.

A4-level staff members, capable of giving guidance to lower-level personnel, properly trained the newly hired staff members on-the-job. The Quality Assurance (QA) Department continuously offers training regarding GMP standard to all the members of POLYVAC.

2) Provision of project office and equipment

The Vietnamese side provided office space to the Project firstly in the Measles Vaccine Production Facility (MVPF). Then, the Project office was moved to the administration building in POLYVAC in September 2007.

The Vietnamese side provided the necessary office equipment and supplies as well.

3) Operational expenses for the Project

The Vietnamese side has so far provided 78,890 million VND (approximately 525.6 million JPY) since the planning stage of Japanese grant aid in 2001 (Annex 3).

Trends in the Vietnamese Counter Budget are indicated below.

Fiscal Year	Counter Budget (Million VND)			JICA exchange rate (Annual Average)	Yen Equivalent (Million JPY)
	Ministry of Health	POLYVAC	Sum Total		
2001-2006	18,790	1,500	20,290	0.0075	152.2
2007	21,500	2,000	23,500	0.0073	171.6
2008	14,500	3,000	17,500	0.0061	106.8
2009	10,500	7,100	17,600	0.0054	95.0
Grand Total	65,290	13,600	78,890	—	525.6

3-1-2 Inputs by Japanese Side

1) Dispatch of Experts

All the Japanese experts were dispatched as short-time experts; therefore, no long-term experts including Project Coordinator were allocated.

Experts were dispatched according to careful planning and preparation (Annex 4).

The input of Japanese experts is as indicated below.

Japanese Fiscal Year	Man / Months	Number of times
2006	50 M/M	55
2007	52 M/M	70
2008	29 M/M	49
2009 (by October 2009)	11M/M	20
Sum Total	142 M/M	194 times

2) Provided equipment and hand-carried equipment

Equipment comprising the following has so far amounted to 35.0 million JPY (approximately 6,475 million VND, 1JPY=185 VND) (Annex 5).

	Comprised Items	Sum Total (Million JPY)
Provided equipment	Equipment for Calibration and Validation	21.0
Hand-carried equipment	Equipment for Calibration and Validation	12.5
Others	-	1.5
Grand Total	-	35.0

3) Training in Japan (Annex 6)

In the Japanese fiscal year of 2006, two trainees from the QC department were trained at the Kitasato Institute for Life Sciences, Kitasato University, and underwent training for "Antibody Value Measurement Technology" for two months from January 2007.

In the Japanese fiscal year of 2007, one trainee each from the QA and quality control (QC) departments were trained at the Kitasato Institute, Research Center for Biologicals and underwent training for "General GMP/Validation" and "General Quality Control" for one month in February 2008.

There was no training under Japanese funding in the fiscal year of 2008, though a total six staff members, three from Technical Department, one from Procurement and two from Administration Department, were given training in their respective fields comprising equivalent quality to JICA training in Japan under the Vietnam Government's own budget for three weeks at the Kitasato Institute Research Center for Biologicals. The Institute received these six trainees without compensation.

In the Japanese fiscal year of 2009, one trainee each from the Bulk and Final production departments were trained at the Kitasato Institute, Research Center for Biologicals and underwent training for "Bulk Production" and "Final Production" for one month in September 2009.

4) Local Cost (Annex 7)

The local cost from the Japanese side until the Terminal Evaluation is as indicated below.

Japanese Fiscal Year	Contract Budget (Million JPY)	Authorized Amount (Million JPY)
2006	5.318	5.172
2007	7.889	7.031
2008	6.668	6.252
2009	7.682	On going
Sum Total	27.557	18.455 (Until the JFY of 2008)

3-2 Achievements of the Project

3-2-1 Achievements of the Project Activities

Achievements of the Project Activities under Outputs are as indicated below.

Outputs	Activities under Outputs	Achievements under Outputs
1. Staff of POLYVAC acquires appropriate	1-1. Conduct technical transfer on bulk, filling, freeze-dry through the process of producing vaccine from the imported bulk.	PV for 1/3 production volume (100,000 doses per batch) was completed and the first marketing license was acquired on May 21 of this year. Shipment to Vietnam EPI was completed on August 2009.

	1-2. Conduct technical transfer on production of bulk vaccine through the processing of bulk vaccine from the seed virus.	PV for the complete process of bulk vaccine from seed virus was implemented. The technology transfer for the complete production process from seed virus to final product was completed, followed by the completion of PV for it. Safety and efficacy of the product were confirmed in the second clinical trials, and awaits marketing license in November 2009.
	1-3. Conduct technical transfer on proper operation of mass production (7.5 million doses/ year) of measles vaccine.	It is expected to achieve the target annual production of 7.5 million doses of MV for bulk production (final product equivalent). As for the final production, routine production of five continuous batches over a two-month period will be attempted from mid October. If this is successful, the transfer of the total large-scale production technology will be completed, following the successful results of scale-up trial from 100,000 doses /batch to the target production target of 300,000 doses/batch.
	1-4. Conduct technical transfer on quality control of the products.	The transfer of technology for quality control has been basically completed. The quality control tests for bulk process, final production process and validation have been soundly carried out.
2. Production and quality management meet VN-GMP, which has met WHO-GMP standard.	2-1. Conduct PQ/PV for vaccine production from bulk vaccine.	PQ and MFT of final production processes, media preparation processes as well as periodic calibration and QC validation of related equipment have been completed. PV of final production processes was also successfully completed in December 2007. As required documents for these have also been prepared and are being used, all the scheduled activities for PQ and PV from bulk vaccine have been completed.
	2-2. Conduct PQ/PV for vaccine production from seed virus	All the scheduled activities for PQ and PV of MV production from seed virus have been successfully completed.
	2-3. Establish validation system for the production and strengthen the validation skill of the staff.	Compilation of necessary documents, including protocols, reports, SOP, and all PQ, MFT, and PV required for each department and process have been completed to schedule. Periodical calibration and validation have also been completed as required. Regular follow-up and additional guidance to retain acquired technology have also been carried out.
	2-4. Establish and implement quality assurance functions complying with VN-GMP, which has met WHO-GMP standard.	Organizational framework, staff assignment and GMP related documentation have all been completed and are operated in good order. The appropriateness of the framework and implementation of GMP is supposed to be confirmed by the marketing license on November 2009 by NRA of Vietnam based on the confirmation of high safety and efficacy shown by the second clinical trials.
	2-5. Prepare and implement necessary SOP for the process of production, storage, carrying in/out of the products, etc.	The minimum SOP required for the compliance of GMP have been prepared and are implemented with ongoing review and revision as necessary. Standardization of documentation is being continued under the management of the Production Manager of POLYVAC.
	2-6. Conduct technical transfer on preparation of documents that need to meet VN-GMP, which has met WHO-GMP standard to be approved by NRA in the Social Republic of Vietnam.	Quality manuals, GMP standard documents (GMP Management Rules, Manufacturing Control, Sanitation Control, Quality Control), GMP SOP (Handling Abnormity and Deviations SOP, Self Management SOP, Change Control SOP, Education and Training SOP) documentation have been completed and are implemented in actual production. Revisions through self-inspections on site to identify gaps between description and actual process are conducted as follow-up measures.

Note: Preparation of GMP related documents

1. GMP Related Documents (Annex 8)

GMP related standards and related manuals number 21 volumes in total. All volumes have been prepared and verified by QA Department and implemented in actual production.

2. SOP Related Documents (Annex 9)

Since the commencement of the Project up to August 2009, SOP documents have been prepared in the following numbers; 75 volumes for Bulk Production Process, 98 volumes for Final Production Process, 86 volumes for Biological Quality Control, 86 volumes for Physics-Chemical Quality Control, 39 volumes for Laboratory Animal Quality Control, 58 volumes for Media Preparation Process, 33 volumes for Technical Department, and 48 volumes for Quality Assurance, and 31 for Common Cross-Departmental use. The total volumes prepared or under preparation are 524. Almost all of these have been verified by QA.

Unverified documents in the process of being revised or prepared are the SOP for maintenance of equipment, which is not directly related to quality control of MV.

3. Validation Related Documents (Annex 10)

All the documents for PQ and PV were verified by QA. The departmental documents regarding PQ and PV are as follows; 23 volumes for Quality Control, 44 volumes for Final Production and 20 volumes for Media Preparation. The documents for Bulk Production are concurrently under preparation and 38 volumes have been completed as of 2009. The total will be 125 volumes. Protocols for MFT and PV have been prepared and successfully implemented.

3-2-2 Achievements of Outputs

1) Output 1

Activities under Output 1 were largely conducted without delay after the Mid-term Evaluation, and achievement of indicators was satisfactorily completed at the time of the Terminal Evaluation. Efficacy and safety of MV manufactured by POLVAC have been proven in clinical trials, therefore, which is implying technical transfer regarding MV production from seed virus has achieved. Moreover, POLYVAC staff members acquired technical skills of high quality.

However, hands-on experiences as a manufacturer of MV is definitely insufficient. Strengthening of practical problem-solving capacity for inexperienced problems, such as abnormity and deviancy from tolerable limits, will be the future tasks. Strengthening of transferred techniques of MV production and data management/analysis will be required to acquire institutional self-sustainability.

Output 1 "Staff of POLYVAC acquires appropriate technical skill to produce quality measles vaccine."	
Verifiable Indicators	Achievements
1-1. Number of Staff in POLYVAC who get technical training to reach a sufficient technical level (i.e. level 4 * for staff categorized as A) for measles vaccine production. **level 4 : be able to work by themselves and could retain others*	• At least one level-4 staff member is nurtured in each production process by the time of the Mid-term evaluation. The number of level-4 staff members has steadily increased as the result of continuous activity of technology transfer (Annex 11). As of November 2009, the personnel-processes of level-4 staff members is 695 against a total of 559 processes (1.24 persons per process). • It is confirmed that POLYVAC is technically capable of developing MV. However, the development of capacity for early detection of abnormity and deviancy will only be attained by actual experience. Although POLYVAC organized a working-group for risk management, those issues will be future tasks.

1-2. Standard Operation Procedure (SOP), equipment maintenance list, equipment inventory and other necessary documents for operation and maintenance of the facilities and production equipment by POLYVAC shall be prepared.	*The Team reached the conclusion that the indicator for 1-2 would be appropriate to indicate the achievement for Output 2 since "preparation of SOP, equipment inventory and other necessary documents" must be prerequisite for GMP documentation. The team, therefore, reads this indicator as, "MV is manufactured in conformity with all GMP documents".* • Documents required to fulfill the GMP compliance were almost fully prepared hitherto, and MV is manufactured in conformity with all GMP documents. • GMP standard is not fully understood by all staff members in POLYVAC. They are working on improving the level of understanding of GMP standard under QA division and the GMP working-group.
1-3. Details on equipment, apparatus, raw materials, spare parts and consumables are properly administrated and inventory is properly managed.	*The Team reached the conclusion that the indicator for 1-3 would be inappropriate to indicate the achievement for Output 1 since the activities related to stock control are not defined in the activities, and "stock control" itself is regulated under the GMP standard.* *In this column, the achievements for this indicator are described below for reference.* • POLYVAC personnel are able to procure chief materials and equipment by themselves under the procurement working-group. • Stock control using PC as well as SOP for in-house order procurement has been established hitherto. • Most of reagents and raw materials are imported from Japan. POLYVAC has established the procurement system under the procurement working-group except for a limited number of items.

2) Output 2

Activities under Output 2 were largely conducted without delay after the Mid-term Evaluation, and achievement of indicators was satisfactorily completed at the time of the Terminal Evaluation, as well as activities under Output 1. Establishment of GMP system moved ahead steadily in POLYVAC as the MV manufacturer, resulting in the launching of MV to Vietnamese market through EPI.

However, follow-up and additional guidance will be further required for the proper maintenance of GMP compliance at the commencement of routine manufacturing of MV in POLYVAC. Control of GMP-related documents should be further improved for the obtainment of prequalification from WHO.

Output 2 "Production and quality management meet Vietnam-GMP which has met WHO-GMP standard."	
Verifiable Indicators	Achievements
2-1. Performance Qualification (PQ) and Process Validation (PV) are executed as scheduled.	Requisite PQ and PV for the MV from imported bulk and from seed virus were executed by December 2007 and April 2009, respectively.
2-2. Validation complying with VN-GMP is conducted periodically by POLYVAC.	• PQ, MFT and PV were executed as scheduled on the basis of VN-GMP standard. Follow-up and additional guidance are being conducted for the stabilization of validation-related technologies, which are transferred by Japanese experts. • The future task is to improve analytical and explanatory skill of corrected data from validation, while validation according to VN-GMP is established technically. • POLYVAC does not have any experience of changeover validation for reagents etc. to cut manufacturing cost. And, the workload for it will be heavy.
2-3. GMP documentation complying with VN-GMP is prepared.	Minimal GMP documentation complying with VN-GMP has been prepared properly hitherto. Regular revision of GMP-related documents should be conducted according to GMP

	standard.
2-4. SOPs complying with VN-GMP are prepared and production process is done according to the SOPs.	*"SOPs complying with VN-GMP are prepared" and "production process is performed according to the SOPs" are duplicated with indicators 2-3 and 1-2, respectively. The Team, therefore, decided that indicator 2-4 couldn't be used in this part as a result of verification of appropriateness for indicators.*

3-2-3 Achievement of Project Purpose

The MV manufactured from imported bulk was shipped to the Vietnamese market in August 2009, followed by clinical trials for the verification of its efficacy and safety. The MV manufactured from seed virus is expected to be licensed for Vietnamese market in November 2009 by NRA as well. Moreover, POLYVAC acquired capacity to manufacture MV with sufficient doses for annual domestic demand of 7.5 million. It is suggested that POLYVAC has functioned as an MV manufacturer from these achievements.

However, as aforementioned in "Achievements of Outputs", strengthening of practical problem-solving capacity for inexperienced problems, such as abnormity and deviancy from tolerable limit, will be the future task. Strengthening of transferred techniques of MV production and data management/analysis will also be required to obtain institutional self-sustainability. These issues can be conquered with time and on-hand experiences as an MV manufacturer.

[Project Purpose] POLYVAC will be capable to produce necessary amount of measles vaccine for use of measles control activities in the Socialist Republic of Viet Nam complying with Viet Nam-GMP, which has met WHO-GMP standard.	
Verifiable Indicators	Achievements
1. Measles vaccines are produced in POLYVAC at a rate of 300,000 doses x 25 batch (i.e. 7,500,000 doses)/year.	• It is expected to achieve the target annual production of 7.5 million doses of MV, following the successful scale-up trial from 100,000 doses /batch to the target production target of 300,000 doses/batch. • It is also expected to success the MV mass-production of continuous five batches (1.5 million doses), which went into production from mid-October 2009. • Technical transfer required for POLYVAC was completed to reach a minimal level to function as an MV manufacturer complying VN-GMP. Accordingly, required technique for MV manufacture complying with VN-GMP was transferred to POLYVAC.
2. Clearance on the Production and quality management by NRA which has met WHO-GMP	The MV manufactured from imported bulk entered the Vietnamese market in August 2009, followed by clinical trials for the verification of its efficacy and safety. The MV manufactured from seed virus is expected to be licensed for the Vietnamese market in November 2009 by NRA as well.

3-3 Implementation Process of the Project

3-3-1 Progress Assessment of Technical Transfer

Activities for technical transfer on each production process have been conducted in line with the Master Schedule (Annex 12). Expected outputs have been achieved sufficiently though there were some delays in delivery of equipment and commencement of clinical trials due to unexpected external factors.

Since MV for Vietnamese market is currently produced in POLYVAC at a rate of 300,000 doses x 25 batches (i.e. 7,500,000 doses)/year, the Project is definitely supposed to achieve the Project Purpose within the Project duration.

3-3-2 Inputs by Japanese and Vietnamese sides

Necessary inputs were carried out from both sides.

As shown in Figure 1, the Viet Nam side allocated necessary budget in total though manufacturing cost of MV is relatively high in comparison with retail price of imported MV. There are several reasons for the high production cost. Chief reason is that the raw materials and reagents, which have already been validated in the Kitasato Institute, are imported from Japan due to the short Project Period of four years to sufficiently transfer the necessary technology.

Figure 1 shows that the budget from the Ministry of Health is decreasing from 2008 while the budget from POLYVAC is increasing, resulted in a stable sum total amount. This trend is explained as follows;

(1) The Ministry of Health expected sales profit of MV in latter half of the Project period,

(2) POLYVAC has shifted its budget from polio vaccine to MV to maintain the activities for MV production.

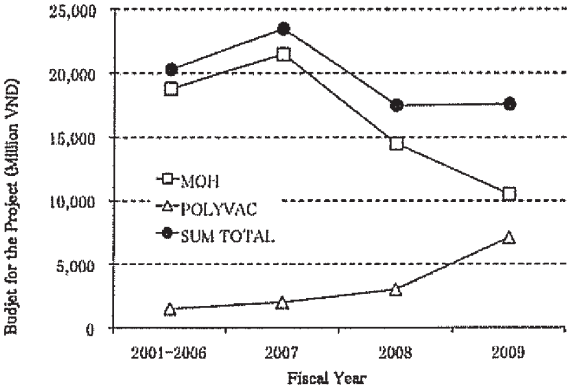


Fig. 1 Trend of Budget for the Project from Viet Nam Side

3-3-3 Implementation Process

1) Technology Transfer

Technical transfer was conducted effectively and efficiently in accordance with detailed planning of experts' dispatch and field activities.

There was some difficulty in communication, especially for understanding of technical terms, between Japanese experts and staff members in POLYVAC at the beginning of the Project due to the linguistic barrier. After that, the Project developed teaching materials written in Vietnamese, which accelerated the communication especially for the technical guidance in restraining area.

Moreover, POLYVAC staff members organized Japanese and English conversation classes by themselves, and the Project provided indirect support to the classes by dispatching language teachers. This effort contributed to better communication.

2) Management system of the Project

Daily coordinating conference among Japanese experts, morning assembly, evening assembly, and weekly meeting in POLYVAC have been continued from the beginning of the Project, and have contributed to progress management of the Project in terms of information sharing of outputs, decision making and so on. The weekly meetings, the morning and the evening assemblies are held as usual in unattended period of Japanese experts.

3) Ownership

POLYVAC ownership of the Project was nurtured as a result of consideration for the autonomy of POLYVAC by the Japanese experts. Staff members in POLYVAC, who received "Training in Japan", play a central roll in MV manufacturing. Working-level staff members are very conscious to obtain technical skills as well.

Cross-sectional eight working-groups (as referred to hereinafter), voluntarily organized by POLYVAC, also contributed to the achievement of Outputs.

Chapter 4: Evaluation Results

4-1 Relevance

The relevance of the Project is basically maintained at the time of the Terminal Evaluation.

4-1-1 Consistency of the Project Purpose with the Vietnamese Health Policy

The Vietnamese government has implemented the EPI since 1981 as effective measures to decrease infant mortality rate and to control infectious diseases. In the Vietnamese long-term healthcare policy (2001-2010), the importance of public health and preventive medicine is emphasized.

While the Vietnamese government is aiming for higher immunization rate in the EPI, the government has been addressing the self-supply of EPI vaccines such as polio, measles, diphtheria, pertussis, tetanus, and tuberculosis. Accordingly, EPI vaccines, except for MV, were manufactured in Viet Nam at the commencement of the Project. The Vietnamese government has started provision of booster dose of MV in addition to first dose since 2006 according to the WHO/WPRO's strategy. Although the MV coverage of two-dose MV immunization was kept as high as 97% in 2008, a significant measles outbreak was observed from the end of 2008. The number of suspected measles cases was more than 16,000 as of September 2009, and this is the largest epidemic in the past decade. Bimodal peaks are observed in age groups of under-6-year-olds and 18-26-year-olds. According to the statistical analysis, WHO/WPRO recommended the following strategies to the Vietnamese government; implementation of nationwide MV campaign for under-6-year-olds, changing the routine booster dose of MV from 6-years to 15-18 months, provision of chance to young-adults by any means. According to the recommendations, the Vietnamese government expressed their intention to address the strengthening of measles control strategy.

The Vietnamese government has higher expectations of the achievements of the Project under the circumstance of the measles outbreak in terms of the increasing MV domestic demand, and the realization of self-supply of MV is currently recognized as a first priority in the Ministry of Health. Therefore, the Project Purpose is highly consistent with the Vietnamese health policy.

On the other hand, WHO/WPRO also recommended to the Vietnamese government that providing measles-rubella vaccine instead of monovalent MV during supplementary immunization activities (SIAs) provides protection against rubella and prevention of congenital rubella syndrome. In case that the Vietnamese government adopted the MR vaccine for booster dose, the relevance of the Project might be reduced.

4-1-2 Consistency of the Project Purpose with Japan's Aid Policy and JICA's Country-by-Country Assistance Implementation Policy

The healthcare cooperation area is regarded as the "improvement of basic social services" under "improvement of society and life, and disparity adjustment" in Japan's country-by-country aid program for the Socialist Republic of Viet Nam issued in July 2009. Likewise, in the JICA's country-by-country assistance implementation policy issued in April 2009, infectious disease control is described as follows; JICA emphasizes a long-term relationship with the National Institute of Hygiene and Epidemiology (NIHE), and provides assistances for the capacity enhancement and the acceleration of sustainability. JICA considers new assistances according to epidemic situation of the infectious diseases.

Therefore, the Project meets the aid policies of Japan as well as JICA since the Project has been implemented with a good relationship with NIHE through regular information sharing and personnel exchange.

4-1-3 Consistency of the Project Purpose with Needs of the Target Group

Morbidity of measles is higher than other countries in the western Pacific region. Though MV coverage has been kept as high as 93%, the number of cases has shown an increasing trend since 1997 due to primary vaccine failure (PVF) and secondary vaccine failure (SVF), and outbreaks have been observed every 7–8 years. The Vietnamese government started provision of booster dose in addition to first dose in 2006 according to the WHO/WPRO's strategy. In spite of the best efforts of Vietnamese government, a significant measles outbreak

occurred from the end of 2008. Therefore, needs for vaccination against measles by MV is ever-increasing not only for children but also the younger generation.

On the other hand, production of MV with high efficacy and safety in POLYVAC is expected to contribute to solve the problem of SVF. The POLYVAC-made MV, which is heat-resistant, will contribute to solve the problem of PVF.

4-1-4 Appropriateness of Assistance Procedure

The Project is an extension of Japan's Grant Aid "Project for the Construction of the Facilities for Measles Vaccine Production". Since a coherent approach was employed to deal in hardware followed by software assistance, the appropriateness of the setting of POLYVAC as a direct target group is obviously high.

The Grant Aid was aware of export of Vietnamese MV product to neighboring countries as well as stable supply for the domestic use. A total of 18 trainees from POLIOVAC were sent to Japan, and given practical training for manufacture of MV at the Kitasato Institute from 2002 to 2005. The trainees are playing a central role in the Project. Therefore, it is considered that the relevance of the Project is high from the aspect of the effective utilization of human resources.

4-2 Effectiveness

The effectiveness of the Project is generally high at the time of the Terminal Evaluation for the following reasons, while the achievement of technical skills of the staff members in POLYVAC should be further improved.

4-2-1 Achievement of Project Purpose

Achievement of the Project Purpose of "MV manufacturing complying VN-GMP" can be attributed to the achievement of the Outputs of "Improvement of technical skills for MV manufacturing" and "Compliance of VN-GMP standard". Since the relationship between the Project Purpose and Outputs is logically correct, it is considered that the Project took the most effective approach to achieve the Project Purpose. Furthermore, it is decided that the effectiveness of the Project is high since indicators for the Project Purpose and Outputs are sufficiently fulfilled. Obtainment of capacity to manufacture sufficient amount of MV for domestic demand in Viet Nam would be very challenging as an attainment target in the setting of four-year project period. These results are attributed to the unified cooperation and persistent efforts of all concerned, especially the staff members in POLYVAC and Japanese experts. The number of level-4 staff members has steadily increased as the result of continuous activity of technology transfer. As of November 2009, total personnel-processes of level-4 staff members are 695 against a total of 559 processes (1.24 persons per production process).

However, POLYVAC is just standing at the start line as an MV manufacturer, so the hands-on experiences as a manufacturer of MV is definitely insufficient. Practical problem-solving capacity for inexperienced problems, such as abnormity and deviancy from tolerable limit, will only be acquired by practical experiences through the routine business. Though the operational skills for MV manufacturing are achieved to sufficient level, strengthening of transferred techniques of MV production and data management/analysis of various kinds of validation remain as future tasks.

4-2-2 Important assumptions

There was not any impact of personnel transfer and/or turnover in POLYVAC on the progress of the Project activities and manufacturing of MV itself throughout the Project period.

However, several cases were found that some staff members took long leaves for child delivery, etc. Therefore, the importance of smooth handover of assignments and education and training for new employees is increasing.

4-2-3 Contributing Factors for Effectiveness

1) Self-organization of working groups (Annex 13)

Working groups consisting of representatives from each division, were phased in according to the progress of the Project, as recommended by Japanese experts from the beginning of the Project period. As of the time of the Terminal Evaluation, eight self-organized working groups of Calibration/Validation, Formalin Fumigation, Environmental Pollution Control, Environmental Monitoring, Procurement Control, Risk Management, Document Control and Clinical Trial are functioning for solving various kinds of problems arising from arising in and out of the Project. The working groups were organized by POLYVAC voluntarily under the indirect support from Japanese experts, and contributed to the achievement of Outputs.

2) Issuance of certificates of ability

Issuance of certificates of ability to POLYVAC staff members contributed to the clarification of official responsibilities and job description, and boosted motivation.

3) Inhibitory Factor against Effectiveness

No factors inhibiting the effectiveness of the Project were observed.

4-3 Efficiency

The efficiency of the Project was generally high at the time of the Terminal Evaluation for the following reasons, even though several unexpected external factors vitiated the efficiency of the Project.

4-3-1 Progress Management of the Project Activities

Dispatch of Japanese experts has been conducted on schedule mostly, and efficiently modified in accordance with progress of the Project activities and the local situation.

As for the general outline of experts' activities for technical transfer, necessary MV production-related and GMP-related documents and teaching materials were drafted by experts in Japanese during domestic service in Japan, and translated from Japanese to Vietnamese by national staff members of the Project in Viet Nam. During the period of field activities in Viet Nam, the experts conducted the training and guidance to POLYVAC staff members intensively by using the translated documents and the materials. During the unattended period of Japanese experts in Viet Nam, technical advice and guidance were efficiently continued via communication tools such as international call and e-mail.

The efficiency of the Project has been generally maintained after the Mid-term Evaluation. In spite of the delays of equipment delivery and clinical trials, indicators for the Project Purpose as well as the Outputs were almost fulfilled at the time of the Terminal Evaluation.

4-3-2 Collaboration with Existing Resources

JICA is operating a health-related technical cooperation project in National Institute of Hygiene and Epidemiology, Viet Nam (NIHE). NIHE and the Project arbitrarily exchange information as necessary. POLYVAC accepted one technical staff from NIHE for a month, and conducted training and guidance regarding validation-related technology.

BIOFARMA, the only vaccine manufacturer which GMP compliance is qualified by WHO in southeastern Asian region, conducted training and guidance, under the theme of Production Process, GMP documentation and so on, for 5 times from 2005 to 2007.

4-3-3 Contributing Factors for Efficiency

1) Preparation of teaching materials (glossary)

Language barrier prevented smooth communication between POLYVAC staff members and Japanese experts at the beginning of the Project period. The Project hired translators as national staff, and conducted phase-in preparation of teaching materials written in Japanese, Vietnamese and English. These materials significantly contributed to smooth communication, especially in restricted areas where translators could not enter for hygienic reasons.

The teaching materials prepared as of August 2009 are as follows; 112 volumes for Quality Control (QC) Division, 199 volumes for Final Product Division, 88 volumes for Medium Preparation Division and 133 volumes for Bulk Production Division, making 532 volumes in total.

2) Convening of Japanese conversation classes

POLYVAC staff members organized Japanese conversation classes by themselves, and most of the new employees are attending the classes. The Project provided indirect support to the classes by dispatching national project staff members as language teachers. This effort contributed to better communication.

3) Establishment of continuous information sharing and communication system

Daily coordinating conference among Japanese experts, morning assembly, evening assembly, weekly meeting in POLYVAC have been continued from the beginning of the Project, and contributed to progress management of the Project in terms of information sharing of outputs, decision making and so on. The weekly meetings (167 times as of November 29, 2009), the morning and the evening assemblies have been held as usual during the unattended period of the Japanese experts.

Furthermore, establishment of communication and information sharing system via e-mail and international call significantly contributed to enhancing the efficiency of the Project during the unattended period of Japanese experts. POLYVAC appreciated quick response and accurate advice from the Japanese experts.

4-3-4 Inhibitory Factors against Efficiency

1) Delay on equipment delivery

There was a several-month delay of equipment delivery at the commencement of the Project due to a time lag in approval of the Project from the Vietnamese side. In accordance with the delay of the equipment for calibration and validation, the Project could not conduct some parts of the scheduled activities. However, the Kitasato Institute circumvented the significant effects on the overall progress of the Project activities by renting some missing equipment with its private fund.

2) Delay on clinical trials

The commencement of clinical trials for MV from imported bulk was delayed for six months approximately due to the delay on the establishment of NRA. Likewise, the commencement of clinical trials for MV from seed virus was delayed for one month approximately due to the improvement orders from the ethical committee in Viet Nam, which were not based on the international standard.

Eventually, the clinical trials were properly conducted with some delay through the indirect support of the Project even though the trials should be implemented by the Vietnamese side itself. These clinical trials were successfully complemented and proved the efficacy and safety of the POLYVAC-made MV. Then, the second marketing license is expected to be issued by the end of 2009, and the Project Purpose is expected to be achieved within the Project period.

3) Negative impact of electrical power outage on MV production

The relative electrical shortage is a growing problem amidst the recent significant economical development and industrialization in Viet Nam, especially in Ha Noi. In POLYVAC, power outages have caused frequent stoppages of the production line.

Though POLYVAC is capable of producing 7.5 million doses of MV per year at its production rate, it cannot be denied that the frequent power shortages affect the practical production of 7.5 million doses. Addition of a private power generator should be taken into consideration since a radical solution cannot be expected at an early date.

4-4 Impacts

The following positive or negative impacts are confirmed or expected in line with the implementation of the Project.

4-4-1 Probability of achievement of the Overall Goal

Logical discrepancy is observed between the Project Purpose of "obtaining capacity for manufacturing sufficient amount of MV" and "reduction of measles infection rate from the time of the commencement of the Project" since there is no direct cause-and-effect relationship between them.

However, at the time of the Basic Design Study of "the Project for the Construction of the Facilities for Measles Vaccine Production" implemented under Japan's Grant Aid, it was already expected that "stable supply of Vietnamese MV products for domestic use" as a direct impact from the Grant Aid, as well as "supply of Vietnamese MV products for neighboring countries" as an indirect impact will be achieved assuming steady operation of the facility and addition of necessary equipment by Vietnamese independent efforts. Based on the past background, the Project has been implemented with a view to the acquisition of the Prequalification of MV export from WHO.

Therefore, the Team evaluates "Probability of the achievement of the Overall Goal" as an impact of the Project based on the following two items indicated as (2) and (3).

4-4-2 Probability of MV production covering domestic demand

Currently, the annual consumption of MV for routine EPI is estimated at 5 million doses. POLYVAC acquired the capacity to manufacture 7.5 million doses of MV per year, which fulfills the domestic demand. According to the significant outbreak of measles in Viet Nam, an ad-hoc and massive EPI campaign is expected to be launched by the Vietnamese government in the near future. Taking the additional consumption necessary for the campaign into account, the current capacity of MV manufacturing of 7.5 million doses per year is not enough.

4-4-3 Probability of MV export for neighboring countries via UN Agencies

To export the POLYVAC-made MV product, it is a pre-condition that POLYVAC is a capable of manufacturing a sufficient amount of MV product for export above the fulfillment of the domestic demand. It is expected that POLYVAC is theoretically capable of manufacturing MV products up to 15 million to 20 million doses per year (i.e. around 2.5 times the current production capacity) under the right circumstances. In that case, there are several critical problems such as securing qualified human resources, training and guidance for new personnel, procurement of sufficient materials for MV production, and addition of the freeze dryer that determines the production rate. The electrical power shortage is suspected to be worse than ever before in case of the production increase. In that case, therefore, additional power generator will be required.

In the usual inspection manner for prequalification, the inspection team from WHO will devote a substantial amount of time working on the inspections in line with the current WHO-GMP (WHO-cGMP), and will order a certain amount of improvement to the inspected party. In the case of POLYVAC, basic techniques and procedures in regard to validation complying with the GMP standard have just been transferred from the aspect of quality assurance. Several issues also remain such as strengthening of practical problem-solving capacity for inexperienced problems of abnormity and deviancy from tolerable limit, as well as maintenance of transferred technical skills. Therefore, it is suggested that technical assistances, by any means, will be essential for POLYVAC to acquire the prequalification from WHO to export MV products.

4-4-4 Important Assumptions for Overall Goal

1) <u>For probability of MV production covering domestic demand</u>

Important assumption for the achievement of MV self-sufficiency covering domestic demand is a certain magnitude of financial assistance from the Ministry of Health to POLYVAC until it achieves financial independence followed by MV manufacturing revenue stabilization.

The Ministry of Health is hoping for Japan's additional technical cooperation until POLYVAC acquires the prequalification from WHO. Vice-Minister of the Ministry of Health also has great interest in the achievement of the Project from the perspective of infectious disease control in Viet Nam. Therefore, it is expected that the Ministry of Health will provide continuous financial support to POLYVAC.

2) For probability of the export of POLYVAC-made MV products

An important assumption for the achievement of exporting POLYVAC-made MV products is the accreditation of the six necessary functions of NRA (supervision of clinical trials, GMP inspection, lot release, licensing, laboratory access and post-marketing surveillance). As of the time of Terminal Evaluation, only three out of six functions are at an acceptable level. And, the serious conflict of interest for members of the ethical committee and the licensing committee is a remaining issue of major concern to date.

A positive impact is observed for the functional enhancement of NRA functions through the indirect assistance of the Project (described under "Impact" in detail). However, in case of taking into consideration some assistance for activities aimed at the acquisition of the prequalification from WHO, the acquisition of accreditation of NRA functions is one of the important assumptions. JICA should assess the following issue; the aforementioned "conflict of interest" can be a "killer assumption" for the assistance.

On the other hand, WHO conducted continuous support to NRA by dispatching short-time consultants. As a result, the function of NRA is improving in incremental steps. As for the Vietnamese side, the Ministry of Health is pursuing its own measures to improve the actual situation. Therefore, certain progress can be expected for the functional enhancement of NRA.

4-4-5 Other Impacts

1) Impact for Measles Elimination

Stable self-sufficiency of MV with high efficacy and safety contributes to the achievement of measles elimination target by 2012 in Viet Nam. When export of MV products from Viet Nam could be materialized, similar impacts on measles elimination to neighboring countries would be expected.

2) Impact for Pharmaceutical Industries in Viet Nam

Introduction of the well-established GMP standard to POLYVAC is highly significant since this is a relatively new concept for Vietnamese pharmaceutical Industries. And, the outputs and experiences of the Project can be a good reference to all medical manufacturers in Viet Nam.

However, it will be difficult to expect "propagation effects" of the achievements of the Project at high level due to the technical and financial problems with their independent efforts. Therefore, the Vietnamese government requires a significant commitment to addressing "dissemination" instead of expecting "propagation effects".

3) Impact for the Functional Enhancement of NRA

Functional enhancement of NRA has not progressed in spite of continuous assistance from WHO. Given these circumstances, the Project executed indirect assistance for the functional enhancement of NRA via WHO and WPRO on the basis of their requests, resulting in more improvement of NRA functions than ever. WHO headquarters, as well as WPRO, values the unstinted efforts of the Project.

4) Impact for Infection Control

The project has established a tight relationship not only with POLYVAC but also with the Vietnamese government as well as the Ministry of Health. Pandemics of emerging infectious diseases, especially novel influenza, are a threat to the entire human race demanding the adoption of a serious stance as a global issue. Therefore, it is of strategic significance for Japan to have POLYVAC as a reliable partner, capable of manufacturing vaccines, from the perspective of Japanese policy for infection control as a global issue.

5) Impact for the Implementation of Clinical Trials

Officers of the Ministry of Health value the Project as they acquired a certain amount of knowledge and experience of supervision through the implementation of GCP-compliant clinical trials.

4-5 Sustainability

Under the current circumstances, it is difficult for POLYVAC to assure a self-sustainability without continuous assistances by any means.

4-5-1 Political and Institutional Aspects

The Ministry of Health has particularly large expectations for the impact of the Project outputs on the EPI in Viet Nam, and the Project is afforded top priority on the health agenda in Viet Nam. The Project Purpose is highly consistent with the health policy and principles, especially for the national EPI. Therefore, it is believed that the policies regarding national EPI will be sustained and enhanced. However, around half (i.e. 2.5 million doses per year for the booster immunization) of the estimated annual MV domestic demand of 5 million doses will be financially donated by the GAVI Alliance until 2011. The current annual defrayment of 2.5 million doses is obligated gradually from imported to POLYVAC-made MV. This means that POLYVAC can obtain income from 2.5 million doses of MV products until 2011. Though POLYVAC has the capacity to manufacture up to 7.5 million doses per year, the more POLYVAC manufacture MV products, the more the size of the overall deficit expand in POLYVAC or the Vietnamese government inversely. Meanwhile, the domestic demand of MV product will increase according to the implementation of nationwide countermeasures such as massive campaign for MV immunization against the measles outbreak taken place currently in Vietnam. Therefore, the Vietnamese government should utilize the MV manufacturing capacity of POLYVAC, acquired though the implementation of the Project, by the allocation of the expenses for purchasing POLYVAC-made MV products as well as the equipment investment for MV production increase.

To export the POLYVAC-made MV products to the international market through United Nations agencies, it is required for NRA to acquire the accreditation from WHO prior to the application for prequalification of POLYVAC to WHO. In other words, the acquisition of NRA accreditation from WHO is an important pre-condition. Under the circumstances, the Ministry of Health is addressing the functional enhancement of NRA under the leadership of the vice-minister.

4-5-2 Financial Aspects

The MV from imported bulk has already been launched on the Vietnamese market. The MV from seed virus is expected to be licensed in December 2009 as well. Moreover, POLYVAC has acquired the capacity for a sufficient amount of MV manufacturing, which meets the domestic demand. From the aforementioned achievements of the Project, it is expected that POLYVAC will obtain a certain level of financial independence. However, current manufacturing cost for MV is rather expensive since the prices of raw materials are rising globally, and most of the reagents are still procured from Japan*. Therefore, it is required that the Ministry of Health continue financial support to POLYVAC until it becomes capable of operation and maintenance of the facilities and equipment as well as procurement of consumables.

As for POLYVAC, it is required to conduct validation to switch over the reagents from Japanese-made to inexpensive products. However, it would be technically difficult for POLYVAC to conduct the validations autonomously due to its lack of experience.

A certain amount of budget should be allocated for additional freeze dryer, private power generator, and hiring of new staff members.

*: *In fact, the government-estimated MV manufacturing cost of 7,420 VND per dose is significantly higher than the Vietnamese market price of 5,469 VND per dose, currently posting a deficit of 1,951 VND per dose.*

4-5-3 Technical Aspects

In the usual inspection manner for prequalification, the inspection team from WHO will devote a substantial amount of time working on the inspections in line with the current WHO-GMP (WHO-cGMP), and will order a certain amount of improvement to the inspected party. In case of POLYVAC, basic techniques and procedures in regard to validation complying with the GMP standard were just transferred from the aspect of quality assurance. Several issues also remain such as strengthening of practical problem-solving capacity for inexperienced problems of abnormity and deviancy from tolerable limit, as well as maintenance of transferred technical skills. Therefore, technical assistances, by any means, will be essential for POLYVAC to acquire the prequalification from WHO to export MV products.

4-5-4 Comprehensive Sustainability

The Project achieved the Project Purpose of, "Staff of POLYVAC acquire appropriate technical skill to produce quality measles vaccine". However, improvement of problem-solving capacity through the practical experiences for MV manufacturing will be a future task for POLYVAC to continue the MV manufacturing of equivalent quality to the present level.

The application form for Japan's technical cooperation has been submitted to the Japanese government as a second phase technical assistance. However, it is necessary for the Vietnamese side to promise continuous support, in accordance with its long-term health policy, for POLYVAC MV manufacturing including certain financial assistance as well as the functional enhancement of NRA, which is a pre-condition for acquisition of prequalification from WHO. Without those efforts from the Vietnamese side, it is suspected that the sustainability of POLYVAC as an MV manufacturer is uncertain, while the sustainability of POLYVAC from the aspect of practical and/or operational skills for MV manufacturing can be maintained at a certain level.

Furthermore, necessary capacity as a manufacturer in areas such as cost management, manufacturing control, physical distribution planning, and purchasing management is the remaining issue to be technically transferred.

4-6 Conclusions

POLYVAC acquired the capacity for VN-GMP-compliant MV manufacturing of sufficient amounts for domestic demand by the time of the Terminal Evaluation. Setting of a four-year project period was rather challenging to achieve the Project Purpose of practical MV manufacture and launch into the Vietnamese market. Therefore, these achievements showed that a technology transfer with high relevance, effectiveness and efficiency was executed by the Project.

However, the impact of the Project from the aspect of achieving Overall Goal as well as sustainability of the Project cannot be evaluated, since POLYVAC has just started as an MV manufacturer, and also several issues remain to be conquered such as the compliance of GMP standard and practical problem-solving capacity for problems arising from inexperience such as abnormity and deviancy from tolerable limit and so on. According to the aforementioned reasons, the Team concludes that POLYVAC requires assistances to complement its lack of experience as an MV manufacturer aspiring to become an MV exporter as well as stable self-supply of MV for the domestic demand including the campaigns.

Chapter 5: Recommendations

Based on the review on the achievement of the activities and the outputs of the Project, both sides confirmed the recommendations as follows:

1. It is required for the Ministry of Health to continue the procurement of the MV manufactured by POLYVAC in order that they can use the full capacity for Vietnam-GMP-compliant MV manufacturing through the Project and to raise domestic supply for MV rapidly.

2. It is needed that the Ministry of Health continue financial support to POLYVAC until it becomes capable of operation and maintenance of the facilities and equipment as well as procurement of consumables independently with the income from MV products.

3. POLYVAC is required to conduct validation to switch over the reagents from Japanese-made to inexpensive products one by one for reducing high manufacturing cost.

4. NRA is required to enhance its six functions regarding WHO accreditation as soon as possible so that POLYVAC could become an exporter of MV in the near future.

5. POLYVAC staffs need to strengthen practical problem-solving capacity for inexperienced problems of abnormality and deviancy from tolerable limit with Japanese experts' support by the end of the Project.

6. Since there being no alternative sources of import for Specific Pathogen Free (SPF) eggs causes high manufacturing cost, it is recommended for POLYVAC to keep persistent discussion with concerned Ministries to convince them to approve importing the SPF eggs even when the exporting countries report Highly Pathogen Avian Influenza (HPAI) infection among poultries.

7. It is suggested that POLYVAC continues staff training in order to strengthen and maintain the knowledge and skill regarding GMP standard.

8. The first version of Vietnam-GMP was released in 2002 and the revised version released in 2004 is currently valid. It will be necessary for the MOH to consider the revision in case of the new recommendation coming from WHO as the compliance with Vietnam-GMP, which has met WHO-GMP standard, is the essential component of the Project.

Project Design Matrix (PDM) (Version 2) Date: December 19, 2007

Project title: Technical Cooperation Project for Strengthening Capacity for Measles Vaccine Production Project Duration: 4 years, from March 24, 2006

Target Area: The Socialist Republic of Vietnam Target group: Children in the Socialist Republic of Vietnam (focus on those under 5 years old)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Super Goal			
The health status of the children in the Socialist Republic of Vietnam is improved.	・Infant mortality rate in the Socialist Republic of Vietnam	Ministry of Health	
Overall Goal	・Rate of children infected with measles in the Socialist Republic of Vietnam.	Ministry of Health	・Public Health activities in the Socialist Republic of Vietnam is strengthened.
Measles Infection Rate in the Socialist Republic of Vietnam will be decreased from the current level.	・Number of children immunized with measles vaccine in the Socialist Republic of Vietnam.		・The vaccine is licensed by NRA.
Project Purpose	1.Measles vaccines are produced in POLYVAC at a rate of 300,000 doses x 25 batch (i.e. 7,500,000 doses)/year.	Ministry of Health, NRA(NICVB) POLYVAC WHO	・EPI activities will be sustained and enhanced.
POLYVAC will be capable to produce necessary amount of measles vaccine for use of measles control activities in the Socialist Republic of Vietnam complying with Vietnam-GMP which has met WHO-GMP standard.	2.Clearance on the Production and quality management by NRA which has met WHO-GMP		
Outputs			
1 **Staff of POLYVAC acquires appropriate technical skill to produce quality measles vaccine.**	1-1 Number of Staff in POLYVAC who get technical training to reach a sufficient technical level (i.e. level 4 * for staff categorized as A)for measles vaccine production. *level 4 : be able to work by themselves and could train others	Ministry of Health POLYVAC	・GMP inspection will be done by NRA.
	1-2 Standard Operating Procedure (SOP), equipment maintenance list, equipment inventory and other necessary documents for operation and maintenance of the facilities and production equipment by POLYVAC shall be prepared.		
	1-3 Details on equipment, apparatus, raw materials, spare parts and consumables are properly administrated and inventory is properly managed.		
2 **Production and quality management meet Vietnam-GMP which has met WHO-GMP standard.**	2-1 Performance Qualification (PQ) and Process Validation (PV) are executed as scheduled.	WHO Ministry of Health, NRA(NICVB)	
	2-2 Validation complying with VN-GMP is conducted periodically by POLYVAC.		
	2-3 GMP documentation complying with VN-GMP is prepared.		
	2-4 SOPs complying with VN-GMP are prepared and production process is done according to the SOPs.	Records of production, quality control, validation, maintenance of equipments and facilities, and quality assurance of POLYVAC	

Annex 1: PDM version 2

Activities	Inputs		
	Japan	Vietnam	
1 Staff of POLYVAC acquires appropriate technical skill to produce quality measles vaccine. 1-1 Conduct technical transfer on bulk, filling, freeze-dry through the process of producing vaccine from the imported bulk. 1-2 Conduct technical transfer on production of bulk vaccine through the processing of producing bulk vaccine from the seed virus. 1-3 Conduct technical transfer on proper operation of mass production (7.5 million doses/year) of the measles vaccine. 1-4 Conduct technical transfer on quality control of the products. **2 Production and quality management meet Vietnam-GMP which has met WHO-GMP standard.** 2-1 Conduct PQ/PV for vaccine production from bulk vaccine. 2-2 Conduct PQ/PV for vaccine production from seed virus. 2-3 Establish validation system for the production and strengthen the validation skill of the staff. 2-4 Establish and implement quality assurance functions complying with Vietnam-GMP which has met WHO-GMP standard. 2-5 Prepare and implement necessary SOP for the process of production, storage, carrying in/out of the products, etc. 2-6 Conduct technical transfer on preparation of documents that need to meet Vietnam-GMP which has met WHO-GMP standard and to be approved by NRA in the Socialist Republic of Vietnam.	*Experts* (1) Chief Advisor / Vaccine Production (2) Bulk Production (3) Medium Preparation (4) Final Production (5) Quality Control (6) Management of Experimental Animals (7) Quality Assurance (8) GMP (9) Validation (10) Facility Management ***Other necessary fields.*** ***Full-time project staff*** (1)Secretary (2)Interpreter ***Training in Japan*** (1)Production management (2)Quality management ***Equipment and materials*** (1)Equipment for Validation (2)Equipment for Technical Activities on Vaccine Production and Quality Assurance (3)Other equipment mutually agreed upon as necessary. * *The equipment to be provided will be subjected to change due to the budgetary conditions of the Japanese side.* ***Local cost*** (1)Training textbooks, and materials (2)General expenses of the project office	***Counterpart officers*** (1) Director (2) Vice Director (Production Management) (3) Vice Director (Quality Management) (4) Chief of WHO-GMP license ***Full-time project staff*** (1)Production Unit Staff (2)Quality Management Unit staff (3)Engineering Staff ***Equipment and materials*** (1)Project Office facilities (2)Stationary (3)Cosumables for Vaccine Production ***Local cost*** (1) Vaccine Bulk (2) Maintenance for equipment	・Trained Staff will not leave POLYVAC. **Pre-conditions** NRA of Vietnam including NICVB will be functioning according to WHO recommendation. The policy of promotion on measles elimination programme will be sustained.

Note: GMP: Good Manufacturing Practice, NRA: National Regulatory Authority, SOP: Standard Operating Procedure
PQ: Performance Qualification, PV: Process Validation

Annex 2: List of Counterparts

PERSONNEL LIST

Updated: 31, August, 2009

No	Name in full	Position	Note
Quality Control Dept			
1	Nguyen Nu Anh Thu	Manager	
2	Ngo Thu Huong	Biological group	
3	Pham Anh Thu	Biological group	
4	Vu Thi Huong	Biological group	
5	Ngo Thi Thanh Huong	Biology control	
6	Nguyen Thi Mai Huong	Biological group	
7	Nguyen Minh Phuc	Biological group	
8	Le Van Duy	Animal group	
9	Nguyen Thi Nga	Animal group	
10	Le Trung Dung	Animal test group	
11	Tran Thi Bich Hanh	Immunology group	
12	Dang Mai Dung	Manager -Chemical group	
13	Nguyen Thi Nguyet	Chemical group	
14	Nguyen Thi Mai Huong	Chemical group	
15	Le Thi Huong	Chemical group	
16	Nguyen Anh Tuyet	Chemical group	
17	Cao Xuan Ngoc	New comer	
Quality Assurance Dept			
1	Nguyen Thuy Huong	Manager	
2	Le Thu Nga	Documentation group	
3	Hoang Thi Lan	Documentation group	
4	Le Thi Hoa	Documentation & change control group	
5	Nong Thi Thanh Van	Pro. Release group	
6	Tran Thi Phuong	Validation Deviation & Self inspection group	
7	Hoang Thi Phuong Thu	Validation Deviation & Self inspection group	
8	Pham Thi Phuong Thao	Registration, training group	

Production Management Dept			
1	Tran Thi Hong Thuy	Manager	
Medium Preparation Dept			
1	Le Tuan Anh	Manager	
2	Nguyen Phuong Lan	Measles Medium Preparation Group	
3	Le Thi Oanh	Measles Medium Preparation Group	
4	Nguyen Thai Hoc	Measles Medium Preparation Group	
5	Nguyen Danh Binh	Measles Medium Preparation Group	
6	Pham Huu Manh	Measles Medium Preparation Group	
Measles Bulk Production Dept			
1	Nguyen Xuan Hoa	Head of Measles Bulk Production Dept	
2	Lai Quynh Mai	Cell culture Group	
3	Le Van Dung	Washing & Sterilize Group Materials control Group	
4	Vu Thi Mai	Prepare tools & materials Group	
5	Ha Hoang Phuong	Documentation Group CAL & VAL Group	
6	Pham Van Khoi	Environment monitoring Group	
7	Pham Thanh Truong	Virus culture Group	
8	Nguyen Thi Khuyen	Cleaning & sanitation Group	
9	Pham Le Tuan	Washing & Sterilize Group	
Final Production Dept			
1	Le Quoc Hung	Head of Final Production Dept	
2	Nguyen Thi Thanh Van	Final bulk composition group	
3	Nguyen Luong Ngoc Thanh	Environmental monitoring group	
4	Nguyen Binh Nguyen	Vial washing and sterilizing group &	
5	Ta Kim Quoc	Filling group	
6	Nguyen Dang Quynh	Freeze – Drying group	
7	Nguyen Manh Hien	Capping group	
8	Tran Minh Toan	Labeling group	
9	Nguyen Huy Truong	Filling group	
10	Dam Van The	Vial washing and sterilizing group &	

Main & Tech Dept			
1	Nguyen Dang Anh	Head of Main & Tech Dept	
2	Dang Anh Tuan	Head of Official equipment and manufacturing machine group	
3	Nguyen Tuan Dung	Official equipment and manufacturing machine group	
4	Vu Van Dung	Official equipment and manufacturing machine group	
5	Nguyen Manh Dung	Head of Centre air conditioner, steam, air compressor system group	
6	Luu Van Chien	Centre air conditioner, steam, air compressor system group	
7	Nguyen Quoc Phong	Water supply system- waste water treatment system group	
8	Cao Minh Duc	Head of water supply system- waste water treatment system group	
9	Le hoang Nam	Head of Electrical system, extinguish fire system group	
10	Tran Cong Thang	Electrical system, extinguish fire system group	
GMP Supporting Dept			
Administration and Personnel Department			
1	Nguyen Thi Hai Thanh	Head of Administration and Personnel Dept	
2	Dao Ngoc Dien	Deputy Head of Administration and Personnel Dept	
3	Cao Hai Anh	Staff	
Financial Dept			
1	Nguyen Thi Thanh Mai	Head of Financial Dept	
2	Dang Bich Lien	Staff	
Material and Planning Dept			
1	Nguyen Thanh Thuy	Head of Material and planning Dept	
2	Nguyen Manh Khue	Deputy Head of Material and planning Dept	
3	Tran Trong Hai	Staff	
4	Nguyen Duc Thang	Driver	

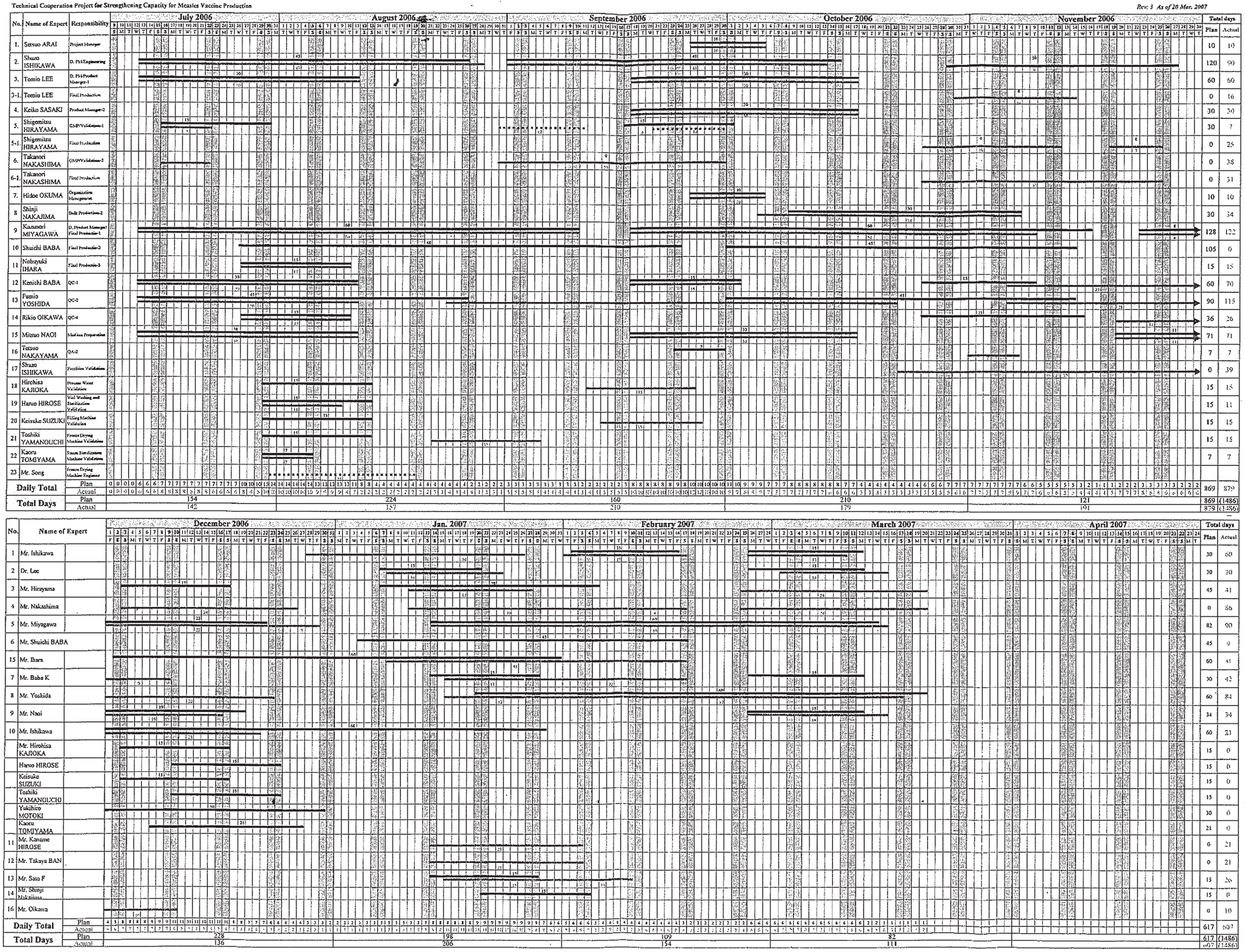
Annex 3: Budget Allocation by Vietnamese Side

Year	Budget （VND)			Exchange Rate of JICA (Annual Average)	Japanese Yen
	Project (MOH)	POLYVAC	Total		
2001-2006	18,790,020,000	1,500,000,000	20,290,020,000	0.0075	152,175,150
2007	21,500,000,000	2,000,000,000	23,500,000,000	0.0073	171,550,000
2008	14,500,000,000	3,000,000,000	17,500,000,000	0.0061	106,750,000
2009	10,500,000,000	7,100,000,000	17,600,000,000	0.0054	95,040,000
Total	**65,290,020,000**	**13,600,000,000**	**78,890,020,000**		**525,515,150**

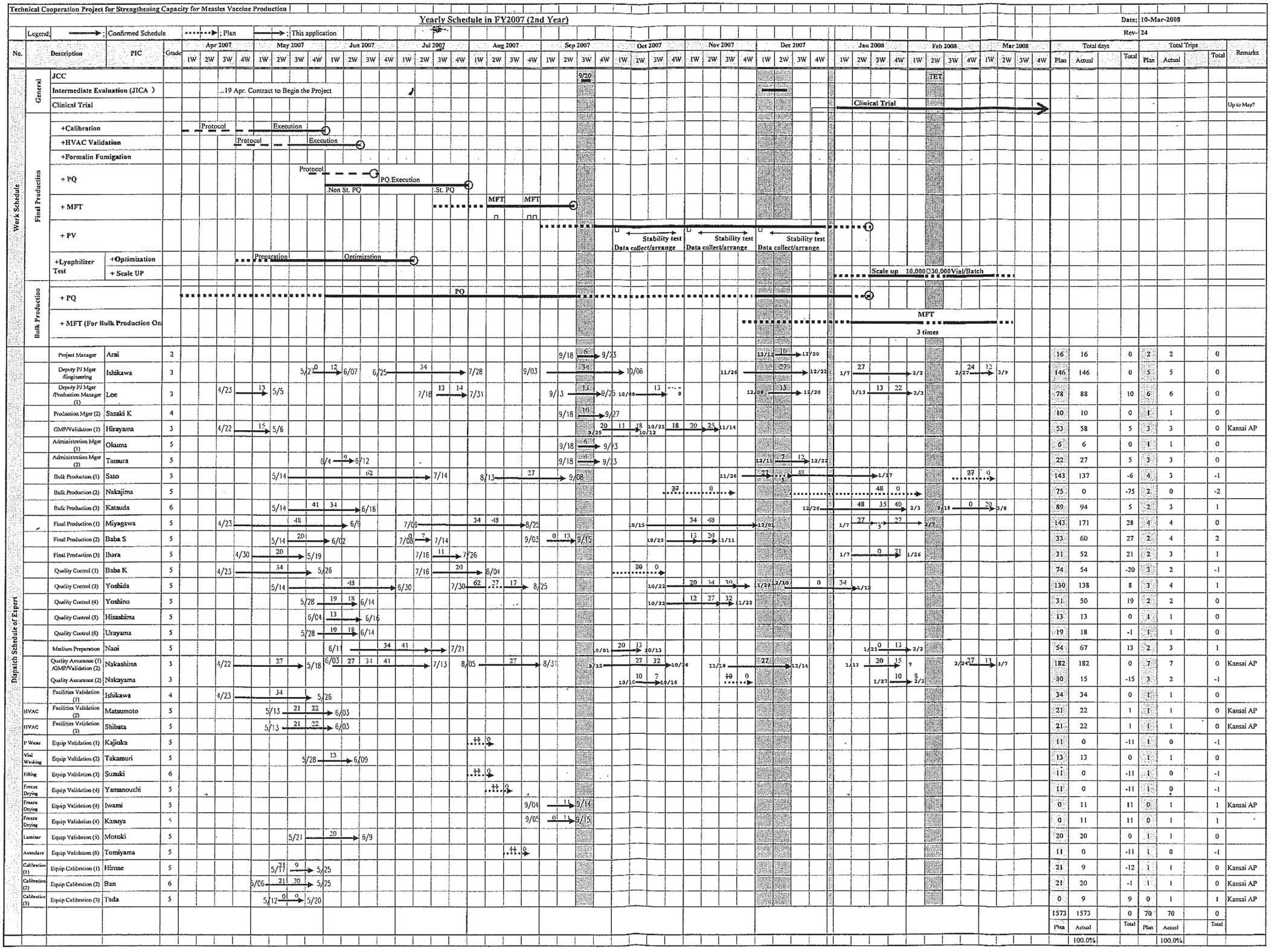
Annex 4: List of Dispatched Japanese Experts for 2006

Technical Cooperation Project for Strengthening Capacity for Measles Vaccine Production

Rev: 3 As of 20 Mar, 2007



Annex 4: List of Dispatched Japanese Experts for 2007



Annex 4: List of Dispatched Japanese Experts for 2008

Dispatch Plan of Experts in FY2008

Rev-15
10 February 2009

Legend; ——— : Confirmed Schedule ····· : Plan ——— : This application

No.	Category		Description	PIC	Class	Apr 2008 1W 2W 3W 4W	May 2008 1W 2W 3W 4W	Jun 2008 1W 2W 3W 4W	Jul 2008 1W 2W 3W 4W	Aug 2008 1W 2W 3W 4W	Sep 2008 1W 2W 3W 4W	Oct 2008 1W 2W 3W 4W	Nov 2008 1W 2W 3W 4W	Dec 2008 1W 2W 3W 4W	Jan 2009 1W 2W 3W 4W	Feb 2009 1W 2W 3W 4W	Mar 2009 1W 2W 3W 4W	Total days Plan	Actual	Present	Total	Total Trips Plan	Actual	Present	Total	Remarks
1	General / Event	General	JCC								9/26					TBC									
			WHO HQ/WPRO																						
			Clinical Trial														Clinical Trial Process								
		All Dept.	+Calibration			Preparation & Protocol	Execution (Bulk□Medium□QC□Final)																		
			+HVAC Periodical Validation			Preparation & Protocol	Execution (Bulk□Medium□QC□Final)																		
		Medium & QC	Retrospective Validation	Water (WFI, PS, UFW)			Execution																		
				Environmental Monitoring			Execution																		
		Final Production	+ Re-PQ Validation (Including QC and Medium)					Preparation & Protocol	Execution																
			+ MFT(Lot Size 5,000Vials)							Preparation & Protocol	MFT Pre.		MFT □		MFT □										
			+ PV(Lot Size 30,000Vials)											Preparation & Protocol		PV□ PV□ PV□									
			+Lyophilization Test	+ Scale UP		Preparation & Protocol	10,000□30,000Vial/Bat																		
							□Placebo		□Active				Scale up No.3		Scale up No.4	Scale up No.5 and No.6									
		Bulk Production	+ Re -PQ Validation				Preparation & Protocol	Execution																	
			+ PV				Preparation & Protocol				PV□		PV□		PV□										
2	Management		Project Manager	Arai	2						9/23 6 9/28							6	6	0	0	1	1	0	0	
			Deputy PJ Mger /Engineering	Ishikawa	3		6/2 20 6/21	6/30 20 7/19			9/8 27 34	10/11	11/10 20	11/29		1/28 20 13	2/5 2/22 13 15	3/08	120	120	0	0	6	6	0	0	
			Deputy PJ Mger /Production Manager (1)	Lee	3		5/26 13	6/7		8/17 13 7	8/23 9/14 13 15	9/28		12/24	21 25	1/17			60	60	0	0	4	4	0	0	
			Production Mger (2)	Sasaki K	4						9/23 10	10/2							10	10	0	0	1	1	0	0	
			Administration Mger (1)	Okuma	5						9/23 6	9/28							6	6	0	0	1	1	0	0	
			Administration Mger (2)	Tamura	5	4/23 11	5/3				9/23 11 10	10/2					2/2 11 11	3/07	23	32	-1	-1	3	3	0	0	
			GMP/Validation (1)	Hirayama	3			6/22 13 7/4		8/12 13 8/24		10/21 13 18	11/07						39	44	5	5	3	3	0	0	
3	QA/GMP		Quality Assurance (1) /GMP/Validation (2)	Nakashima	3	5/4	34	6/6	7/20 27	8/15	9/25 27	10/2	11/23 27 13	12/5 1/4	13 20	1/23	2/8 13 30	2/27	141	141	0	0	6	6	0		
			Quality Assurance (2)	Nakayama	3		6/3 7 6/8				9/22 7 6 9/27				1/14 7 9	1/22			21	21	0	0	3	3	0	0	
4	BP		Bulk Production (1)	Sato	5			7/17 41 28 8/9			10/5 41 21	10/25	20 0						102	49	-53	-53	3	2	-1	-1	
			Bulk Production (2)	Katsuta	6					8/25 34 27	9/20	10/22 34 25	11/15						68	52	-16	-16	2	2	0	0	
5	FP		Final Production (1)	Miyagawa	5						9/1 27	9/27		12/24	20 25	1/17			47	52	5	5	2	2	0	0	
			Final Production (2)	Baba S	5		5/12 13 14	5/25	6/30 0 27	7/26	13 0	10/6 0 13 18	10/23						26	59	33	33	2	3	1	1	
			Final Production (3)	Ihara	5	5/5	13	5/17						12/08 13	12/20				26	26	0	0	2	2	0	0	
6	QC		Quality Control (1)	Baba K	5									12/15 13	12/27				13	13	0	0	1	1	0	0	
			Quality Control (2)	Saijo	5				6/30 27	7/26		10/27	20 11/15						47	47	0	0	2	2	0	0	
			Quality Control (6)	Urayama	5					8/14 11 15 8/28									11	15	4	4	1	1	0	0	
7	MP		Medium Preparation	Naoi	5								11/17 13	11/29					13	13	0	0	1	1	0	0	
8	Validation / Engineering	Facilities General	Facilities Validation (1)	Ishikawa	4	4/15	34	5/18											34	34	0	0	1	1	0	0	
		HVAC(1)	Facilities Validation (2)	Matsunoto	5	5/4	13 6 5/3												13	6	-7	-7	1	1	0	0	
		HVAC(2)	Facilities Validation (3)	Shibata	5	5/4	13 20	5/23											13	20	7	7	1	1	0	0	
		Freeze Dryer(1)	Equip Validation (1)	Iwami	5		13 0					10/6 0 13 18	10/23						13	18	5	5	1	1	0	0	
		Freeze Dryer(2)	Equip Validation (2)	Kasuya	5							10/6 0 13 18	10/23						0	18	18	18	0	1	1	1	Additional
9	Summary																		862	862	0	0	48	49	1	1	
																			Plan	Actual	Present	Total	Plan	Actual	Present	Total	
																				100.0%				102.1%			

Annex 4: List of Dispatched Japanese Experts for 2009

Dispatch Plan of Experts in FY2009

Rev-10
02 Sep. 2009

Legend: ——— : Confirmed Schedule ····· : Plan ——— : This application

No.	Category	Description		PIC	Class	Mar 2009	Apr 2009	May 2009	Jun 2009	Jul 2009	Aug 2009	Sep 2009	Oct 2009	Nov 2009	Dec 2009	Jan 2010	Feb 2010	Mar 2010	Total days				Total Trips				Remarks
						1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	1W 2W 3W 4W	Plan	Actual	Present	Total	Plan	Actual	Present	Total	
1	General / Event	General	+ Final Evaluation / JCC No.5											Final Evaluation(JCC No.5			TE1									
			+ 2nd Clinical Trial(CT-2)					Approval by NICVB	Approval by EC	2nd Clinical Trial (Bridging Study)			Report	Approval by EC												
			+ Marketing License(ML-1 and 2)					1st Marketing License						Expected 2nd Marketing License												
			+ WHO HQ/WPRO												Final Assessment											
			+ Application for WHO Pre Qualification (POLYVAC)													Application										
		All Dept.	+Calibration																							
			+HVAC Periodical Validation																							
		Common	+ Periodical Validation	Water (WFI, PS, UFW)																						
				Environmental Monitoring																						
		Final Production	+ PV(Lot Size 30,000 vials)			PV①	PV②	PV③	PV (WFI, QC Results																	
			+ Actual Production (Lot Size 30,000 vials from imported bulk)						300																	
			+ Packaging and Shipping (Doses)						300			300			900											
			+ MFT(Lot Size 5,000 vials) Change control								Preparation & Protocol	MFT														
			+ Actual Production (Lot Size 30,000 vials)										Production													
		Bulk Production	+ MFT(PST)																							
			+ Re-PQ Validation/Calibration, etc.																							
			+ Actual Production (For 30,000 vials)				16/3 to 8/4	29/4 to 26/5		8/7 to 4/8		9/9 to 6/10		21/10 to 17/11												
							1/4 to 28/4		13/5 to 9/6		22/7 to 18/8		23/9 to 20/10													
									27/5 to 23/6		5/8 to 1/9		7/10 to 3/11													
2	Management		Project Manager	Arai	2									11/8 8 11/15					8				1				
			Deputy PJ Mger /Engineering	Ishikawa	3		4/15 20	5/4 5/20 5 5/24				9/7 13 9/19	10/27	20 11/15		20 7	13 31		86	38	5		5	2	-3		
			Deputy PJ Mger /Production Manager (1)	Lee	3						8/17 13 8/2			11/2 20 11/21		13			46	13			3	1	-2		
			Production Mger (2)	Sasaki K	4											7			7				1				
			Administration Mger (1)	Okuma	5									11/8 8 11/15					8				1				
			Administration Mger (2)	Tamura	5									11/8 11 11/18					11				1				
			GMP/Validation (1)	Hirayama	3				6/2 13 7/4		8/21 20 13 9/5			11/16 13 11/28					20	26	6		1	2	1		
3	QA/GMP		Quality Assurance (1) /GMP/Validation (2)	Nakashima	3			5/1 20 13 5/29		7/20 13 8/1		9/21 13 20 10/10			12/7 13 20 12/26				85	26	-7		6	2	-4		
			Quality Assurance (2)	Nakayama	3							9/17 11 9 9/25							11				1				
4	BP		Bulk Production (1)	Sato	5			5/13 20 5/30											20	20		0	1	1		0	
			Bulk Production (2)	Katsuda	6			5/23 20 6/1											20	20		0	1	1		0	
5	FP		Final Production (1)	Miyagawa	5			5/12 7 5/16					10/12 20 10/31						27	7			2	1	-1		
			Final Production (2)	Ihara	5				6/29 20 7/18										20	20		0	1	1		0	
6	QC		Quality Control (1)	Baba K	5			5/3 7 5/9											7	7		0	1	1		0	
			Quality Control (2)	Saijo	5					7/20 27 8/15									27	27		0	1	1		0	
7	MP																										
8	Validation / Engineering	Facilities General	Facilities Validation (1)	Ishikawa(NS)	4			5/25 34 6/27											34	34		0	1	1		0	
		Process Water	Equip Validation (1)	Kajioka (Organo)	5				6/21 7 6/27										7	7		0	1	1		0	
		Freeze Dryer	Equip Validation (2)	Iwami (IMA Edwards)	5			5/25 20 6/15											20	20		0	1	1		0	
9	Summary																		464	265	4	0	30	16	-9	0	
																			Plan	Actual	Present	Total	Plan	Actual	Present	Total	
																				57.1%				53.3%			

Annex 5: List of Equipment and Materials Provided by Japanese Side

List of Equipment and Materials by Japanese side

Date : 14 Sept 2009

Prepare by : Hai (procurement) ; Thu (QA)

No.	Date	Code No.	Name of Equipment	Brand Name	Model No.	Q'ty	POLYVAC dept.
1	FY2006	A-1	Vibration Meter	Rion - JP	VM-63A	1	Engineering
2		A-2	Sound Level Meter	Rion - JP	NL-20	1	Engineering
3		A-3	Stopwatch	Seiko - JP	SVAE-997	1	Engineering
4		A-4	Thermo-Hygro Recorder	T&D - JP	TR-72U	30	Engineering
5		A-5	Aerosol Generator	TSI - USA	3079	1	Engineering
6		A-6	Mist Generator	Shiro - JP	SCM-2000	1	Engineering
7		A-7	Particle Counter	Rion - JP	KC-01E	1	Engineering
8		A-8	Gas Detector Set	Gastec - JP	GV-100S	2	Engineering
9		A-9	Gas Mask	Shigematsu - JP	GM-165	2	Engineering
10		A-10	Gap Torque Meter	Imada - JP	DTX-2	1	Engineering
11		A-11	Spectrophotometer	Themo Electron - EN	Helios Gamma	1	Engineering
12		A-12	Measuring Tape	KDS - JP	GL-12-30	1	Engineering
13		A-13	Digital Strobosope	A&D - JP	DT-2239A	1	Engineering
14		A-14	Electric Balance	A&D - JP	GX-200	1	Engineering
15		A-15	Digital Surface Themometer	TES - Taiwan	TES-1304	1	Engineering
16		A-16	Low Temperature Water	Eyela - JP	PSL-1800	1	Engineering
17		A-17	Standard Thermometer	Sato - JP			Engineering
		A-17-1	Standard Thermometer (-50 ÷ 0 degC)	Sato - JP	No-0022	1	
		A-17-2	Standard Thermometer (0 ÷ 50 degC)	Sato - JP	No-0022	1	
		A-17-3	Standard Thermometer (50 ÷ 100 degC)	Sato - JP	No-0022	1	
		A-17-4	Standard Thermometer (100 ÷150 degC)	Sato - JP	No-0022	1	
18		A-18	Hygrometer	Sato - JP	7450-60	1	Engineering
19		A-19	Multifunction Calibration	Yokogawa - JP	CA-71	1	Engineering
20		A-20	Weight Calibration				Engineering
		A-20-1	Weight Calibration (20kg)	Troemner LLC - USA	7508-F2PW	1	
		A-20-2	Weight Calibration (10kg)	Troemner LLC - USA	7509-F2PW	2	
		A-20-3	Weight Calibration (1kg)	Troemner LLC - USA	7513-F2PW	1	
		A-20-4	Weight Calibration (500g)	Troemner LLC - USA	7514-F2PW	1	
		A-20-5	Weight Calibration (100g)	Sansho - JP	61-1173	1	
		A-20-6	Weight Calibration (20g)	Sansho - JP	61-1171	2	
		A-20-7	Weight Calibration (10g)	Sansho - JP	61-1170	2	
		A-20-8	Weight Calibration (5g)	Sansho - JP	61-1169	2	
		A-20-9	Weight Calibration (2g)	Sansho - JP	61-1168	2	
		A-20-10	Weight Calibration (1g)	Sansho - JP	61-1167	2	
		A-20-11	Weight Calibration (100mg)	Sansho - JP	61-1164	2	
21		B-1	Intergrity Tester	PALL		1	Medium
22		C-1	Spare Parts				Engineering
		C-1-1	Thermocouple for Sakura Atuclave (Type T)	Okazaki - JP		80	Engineering
		C-1-2	Thermocouple for Sakura Atuclave (Type K)	Okazaki - JP		15	Engineering
		C-1-3	Thermocouple for Airtech Japan (Type K)	Okazaki - JP		16	Engineering
		C-1-4	Thermocouple for BOG Edward (Type T)	Okazaki - JP		60	Engineering
23		C-2	Hybrid Recorder	Yokogawa - JP	DR232-12-00	2	Engineering
24		D-1	Sensor Fitting	Sakura SI - JP		3	QC,Bulk,Final
25		E-1	Temperature Calibrator	JOFRA/ AMETEK - DENMARK/EU	ITC-320A	1	Engineering
26		E-2	Pressure Calibrator	JOFRA/ AMETEK - DENMARK/EU	CPC-200CBXXG	1	Engineering
27		F-1	Accessories for Freeze Dryer				Final
		F-1-1	Tray	Suzuki - JP		2	Final
		F-1-2	Frame (Size(mm): W391 x D565.5 x H28.5)	Suzuki - JP		1	Final
		F-1-3	Frame (Size(mm): W391 x D557 x H30)	Suzuki - JP		79	Final
		F-1-4	Loading Bar	Suzuki - JP		2	Final
28		G-1	Tank Tansporter	Ikemoto - JP	ESB - 5	1	Final

Annex 5: List of Equipment and Materials Provided by Japanese Side

List of Equipment and Materials Provided by Japanese side

Date : 14 Sept 2009

Prepare by : Hai (procurment) ; Thu (QA)

No.	Date	Code No.	Name of Equipment	Brand Name	Model No.	Q'ty	POLYVAC dept.
1	**FY2006**	CE-0601	Tank Transporter	Ikemoto - JP	ESB-5	2	Final
2		CE-0602	Package Leak Tester	Takachino Seiki - JP	PLT-3021FX	1	Final
3		CE-0603	CO2 gas Analyzer	Bacharach - US	11-9026	1	Final
4		CE-0604	Flange for Tank for Bulk	Shirai	Special	3	Final
5	**FY2007**	CE-0701	Digital temperature indicator	Ametek	DTI-1000	1	Engineering
6		CE-0702	Pipe Heater	As-one	Type B	3	Bulk
7		CE-0703	Pressure resistance and ezplosion-proof type electric power pumps	SHOEI	HC-100	1	Bulk
8		CE-0704	Electric handy pump-1	KYORITUKIKO	HP-601	1	Medium
9		CE-0705	Electric handy pump-2	KYORITUKIKO	HP-701	1	Medium
10		CE-0706	Electronic balance for guinea pig	METTLER TOLEDO	XS-400S	1	QC
11		CE-0707	Electronic balance for mouse	METTLER TOLEDO	XS-802S	1	QC
12		CE-0708	Printer	METTLER TOLEDO	RS-P42	2	QC
13		CE-0709	Dry block temperature calibrator	AMETEK	ITC-155A	1	Engineering
14		CE-0710	Anemometer	KANOMAX	6541/6543	1	Engineering
15		CE-0711	Micro manometer	HALSTRUP KRONE COMPANY	KAL 84	1	Engineering
16		CE-0712	Particle counter	HACH ULTRA ANALYTICS	237B	1	Medium
17		CE-0713	Aerosol generator	KANOMAX	TDA-4B	1	Engineering
18	**FY2008**	CE-0801	Portable Generator	KAME	KDE25T3D	1	Engineering
19		CE-0802	Oil Bath	EYELA	OHB-2000S	1	Engineering
20		CE-0803	Heater controller	Hakko	DGC2150	3	Bulk
21		CE-0804	Weight for Calibration	Sartorius	YCW553-00, YCW613-00,	1	Bulk
22		CE-0805	Industrial Scales w/Weight	Sartorius	FBG64EDE-S	1	Medium
23		CE-0806	Automatic Homogenizer	Nihomseiki Kaisha, Ltd	ED-3	1	QC

Date : ...../...../2009

QA leader

Date : ...../...../2009

Director

Annex 6: List of Trainings in Japan

LIST OF STAFFS FOR TRANSFER OF MEASLES VACCINE PRODUCTION TECHNOLOGY

Updated on 31/8/2009

No.	Full name	Position	Purpose of overseas business trip	Time in Overseas	Expense source	Name and address of overseas partner	Remarks
1	Tran Thi Bich Hanh	Staff of QC	Antibody serum	18/1-17/3/2007	JICA	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
2	Pham Anh Thu	Staff of QC	Antibody serum	18/1-17/3/2007	JICA	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
3	MA Nguyen Thuy Huong	Vice Manager of QA Dept.	Training about quality assurance and verification of Vaccine quality	2/4-3/5/2008	JICA	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
4	MA Nguyen Nu Anh Thu	Vice Manager of QC Dept.	Training about quality control and verification of Vaccine quality	4/2-5/3/2008	JICA	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
5	Nguyen Dang Anh	Manager of Engineering Dept.	Training about maintenance, operation of equipment and trouble shooting	18/7-2/8/2008	Vietnamse side	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
6	Nguyen Manh Dung	Staff of Engineering Dept.	§ Training about maintenance, operation of equipment and trouble shooting	18/7-2/8/2008	Vietnamse side	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
7	Cao Minh Duc	Staff of Engineering Dept.	§ Training about maintenance, operation of equipment and trouble shooting	18/7-2/8/2008	Vietnamse side	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
8	Dang Bich Lien	Staff of Accounting Department	Confirm copyright system and supervise accounting system	18/7-2/8/2008	Vietnamse side	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
9	Nguyen Thi	Vice Manager of	Confirm copyright system and	18/7-2/8/2008	Vietnamse	Kitasato Institute, 6-111	

No.	Full name	Position	Purpose of overseas business trip	Time in Overseas	Expense source	Name and address of overseas partner	Remarks
	Thanh Mai	Accounting Department	supervise accounting system		side	Arai, Kitamoto shi, Saitama 364 -0026, Japan	
10	Tran Trong Hai	Staff of Material and Planning Department	Training about system of controlling inventory and buying material	18/7-2/8/2008	Vietnamse side	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
11	Ta Kim Quoc	Vice Manager of Final Production Department	Reconfirm technique transferred by experts. Learn the way of management and working in KI	13/9-10/10/2009	JICA	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	
12	Ha Hoang Phuong	Vice Manager of Bulk Dept.	Reconfirm technique transferred by experts. Learn the way of management and working in KI	13/9-10/10/2009	JICA	Kitasato Institute, 6-111 Arai, Kitamoto shi, Saitama 364 -0026, Japan	