

No.

タイ王国
国家計量標準機関プロジェクトフェーズ2
終了時評価調査報告書

平成19年7月
(2007年)

独立行政法人国際協力機構
タイ事務所

タイ事

JR

07-008

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序 文

タイ王国において、タイ産業の輸出競争力強化のために、タイ国内において国際的同等性を確保した計量標準体系を確立するといった産業基盤整備の必要性が高まっています。

現在、タイには国家計量標準の一元的な整備・維持・供給システムがなく、一部の大企業は構成を海外に依存しており、このために、高コスト・手続き遅延といった問題が生じ、タイ産業の輸出促進の阻害要因となっています。

タイ政府は、この阻害要因を解消すべく、1997年8月には国家計量制度整備法を制定するとともに1998年6月に国家計量標準機関（NIMT: National Institute of Metrology (Thailand)）を設立し、タイ国内の計量標準基盤整備に着手しました。さらに、翌1999年5月には国家計量基盤整備マスタープランが閣議決定され、NIMTの整備計画が了承されました。

このようなタイ政府の動きに対し、日本政府はNIMTの新庁舎建設・機材整備を目的として1999年より国際協力銀行（JBIC）を通じて第24次及び第25次円借款の実施を決定しました。一方で、タイ政府は、円借款による供与機材を用いた国家計量標準を維持・供給するためのNIMT技術者の育成を目的として、日本政府に対し、1999年にプロジェクト方式技術協力（当時）を要請し、これを受けてJICAは5年間の技術協力プロジェクトを計画し、既存庁舎で実施できる技術移転をフェーズ1（2年間）と、新庁舎完成後に実施する技術移転をフェーズ2（3年間）として2段階に分けて実施することになりました。

本フェーズ2はR/Dに基づき2004年10月から3年間実施の予定ですが、プロジェクトの終了時期を間近に控え、JICAはプロジェクトの実績を評価するとともに、NIMTの今後の自立発展性を協議するため、終了時評価調査団を平成19年6月11日から同年6月22日まで派遣しました。

本報告書はその結果を取りまとめたものです。ここに本調査団の派遣に関し、ご協力頂いた日本・タイ両国の関係各位に対し、深く御礼を申し上げますとともに、今後も引き続きご支援賜りますようお願い致します。

2007年7月

独立行政法人国際協力機構

タイ事務所

所 長 小 野 田 勝 次

目 次

プロジェクト位置図

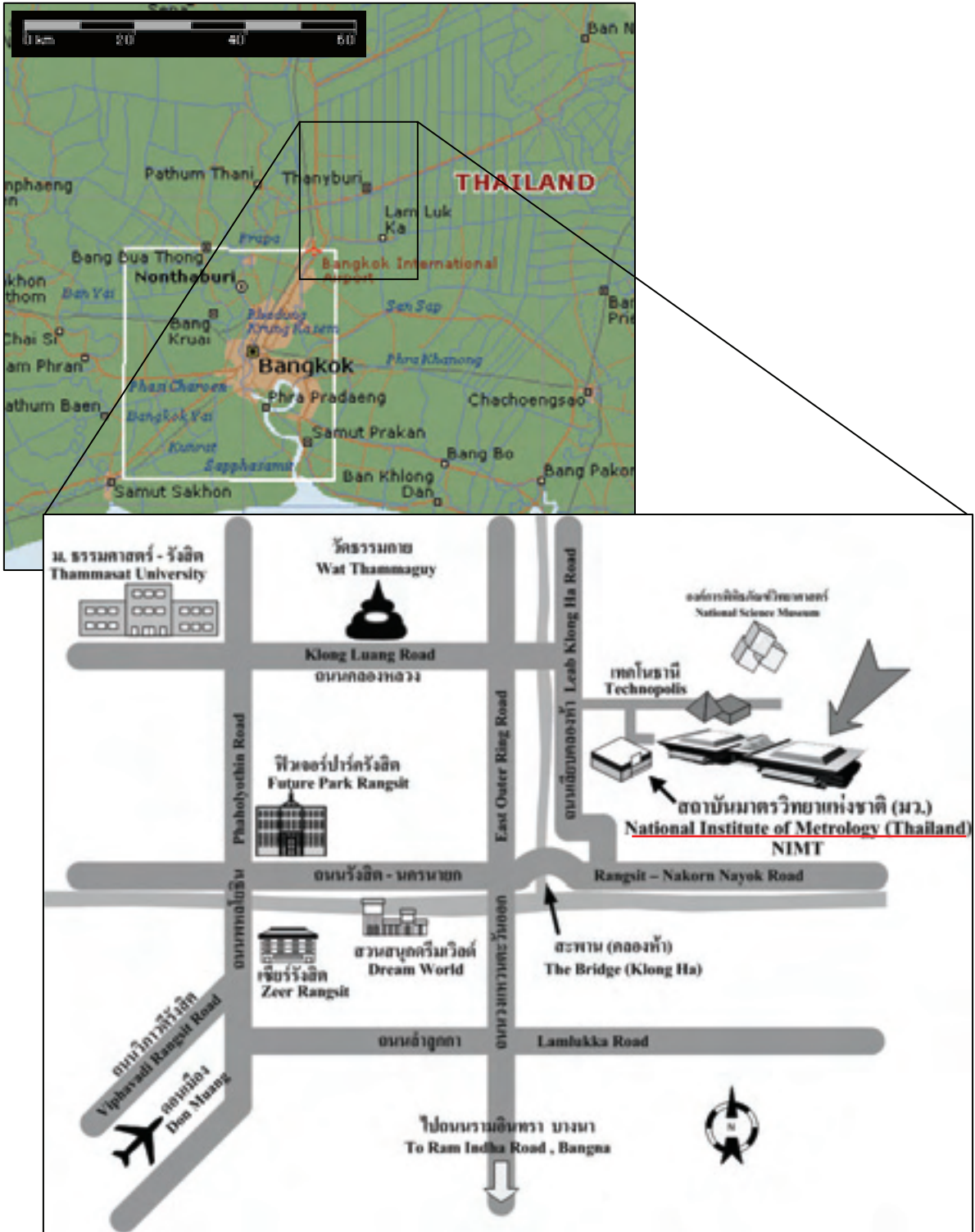
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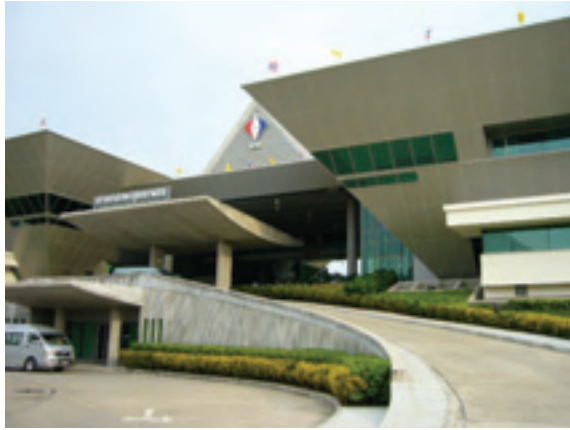
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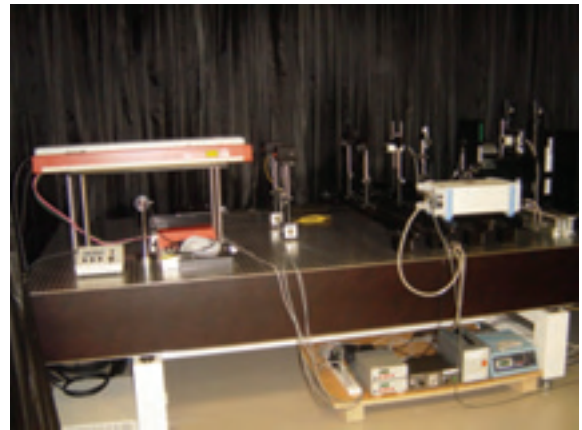


Project Location Map



Picture 1: 円借款で建設された新庁舎

Picture 2: 円借款で調達された機材
(レーザーパワー標準)



Picture 3: 日本及びタイ側の参加で執り行われたキックオフミーティング
(2007年6月18日)

Picture 4: 第8回合同協議会において本評価報告書に両側代表者による署名
(2007年6月22日)



1. 案件の概要	
国名：タイ王国	案件名：
分野：民間セクター開発：産業基盤制度	タイ国家計量標準機関プロジェクト（フェーズ2）
所轄部署：JICA タイ事務所	援助形態：プロジェクト方式技術協力
協力期間 (R/D)： 2004年10月16日～ 2007年10月15日	協力金額（評価時点）：約3.0億円
	先方関係機関： タイ国家計量標準機関（NIMT）
	日本側協力機関：経済産業省産業技術環境局知的基盤課、産業技術総合研究所・計量標準総合センター（NMIJ）、日本品質保証機構（JQA）、日本電気計器検定所（JEMIC）、製品評価技術基盤機構（NITE）、化学物質評価研究機構（CERI）等
	他の関連協力： 第24次・第25次円借款「国家計量標準整備計画事業」

1-1 協力の背景（および概要）

タイの産業は輸出を促進するためには競争力の向上が求められており、質の良い製品を製造しなければならない事態に直面している。タイ政府は輸出製品の信頼性を向上するために国家計量システムを整備することが必要であると考え、その必要性を第8国家経済社会開発計画（1997-2001年）に明記した。1997年8月、政府は国内産業の国際的な競争力を強化するため、国家計量システム整備法を制定した。これを受けて1998年6月、タイ国家計量標準機関（NIMT）を設立し国内の計量基盤整備に着手した。1999年5月には国家計量標準システム整備マスタープランが閣議了承された。こうした動きに対して日本政府は、NIMTの新施設建設・機材整備を目的として2000年から国際協力銀行（JBIC）の有償資金協力で第24次・第25次円借款、国家計量標準整備計画事業を行っている。これらと並行し、タイ政府は、上記円借款で調達する機材を用いた国家計量標準の維持・供給のため、NIMTの技術者の育成を目的として、日本政府に対し1999年に本プロジェクトの要請を行った。

これを受けてJICAは5年間の技術協力プロジェクトとして検討を進めていたが、円借款による新庁舎建設の遅れが出ていたことを踏まえ、フェーズ1（2年間）及びフェーズ2（3年間）の2フェーズに分けることとし、まずは旧庁舎で実施可能な量目に限り2002年10月16日からフェーズ1としての協力を実施した。その後、フェーズ1の実施が順調に進んでいること、また懸案であった新庁舎の建設も順調に進んでおり、フェーズ1での協力が成果を挙げていること、及びフェーズ2の協力に必要な前提条件が満たされることが確認されたため、フェーズ2として技術協力を2004年10月16日から開始した。

本プロジェクトではフェーズ1、フェーズ2を通じ、NIMTが国際的に承認されるレベルの正確さの国家計量標準の設定・維持が可能となることを目標に、8分野（長さ、質量、時間・周波数、電磁気、測温、化学、測光、音響・振動）の量目にかかる技術移転に取り組んできたが、2006年10月の中間評価において、技術移転の量目数を40量目と明確化し、また、国際的な信頼性の証明という観点から、認定を受ける必要のある量目に関してはすべて認定審査を受けることが提言され、以後の活動に盛り込まれた。

※ 各国が保持する最も高度な標準を「国家標準」と呼び、国家標準を基に下位の標準が定められる。NIMTには、国家標準を維持すると同時に、国家標準を基に下位の標準を設定する能力が求められ、下位の標準を利用して設定することを、「標準を供給する」という。この標準の供給は、「校正」と呼ばれる。

1-2 協力内容

本プロジェクトは当初5年間を計画していたが、新庁舎建設の遅れが出ていたことを踏まえ、フェーズ1（2年間）及びフェーズ2（3年間）の2フェーズに分けることとし、まずは旧庁舎で実施可能な量目に限り2002年10月16日からフェーズ1としての協力を実施した。また、フェーズ1の終了後、2004年10月16日から残る量目についてフェーズ2が開始された。本プロジェクトは、フェーズ1とフェーズ2を通して合計8分野40量目の計量標準について技術移転を行う計画である。

(1) 上位目標

タイにおける国家計量システムが強化される。

(2) プロジェクト目標

NIMTが国際的に承認されるレベルの正確さで国家計量標準を設定・維持する。

(3) 成果

- 1) NIMT側のプロジェクトに対する運営管理体制が強化される。
- 2) NIMTの計量標準機材が適切に操作・維持管理される。
- 3) カウンターパート(NIMT職員)の技術力が向上する。
- 4) NIMTにおける計量標準の精度が向上する。
- 5) NIMTが国家計量標準を適切に供給する。

(4) 投入（評価時点）

日本側：（）内は予定

長期専門家派遣	5名	機材供与	約3.8百万円
短期専門家派遣	30名（36名）	プロジェクト実施予算	約3.0億円
研修員受け入れ	16名		

タイ側

カウンターパート配置 合計37名：内訳（管理1名、技術36名）

プロジェクト運営費負担 約0.15億円：現地通貨4,009千バーツ

施設・建物・スペース提供

2. 評価調査団の概要

調査団	1 八重樫 成寛（団長）	JICA アジア地域支援事務所 次長
	2 松井 洋二	経済産業省産業技術環境局知的基盤課工業標準専門職
	3 瀬田 勝男	製品評価技術基盤機構 認定センター長
	4 桧野 良徳	産業技術総合研究所 計量標準管理センター 国際計量室長
	5 丸尾 和也	JICA タイ事務所 所員
	6 Thanyatom Singrueng	国際航業株式会社 研究員（コンサルタント）

調査期間	評価種類
2007年6月11日～2007年6月22日	終了時評価

3. 評価結果の概要

3-1 実績の確認

(1) 成果1 NIMT側のプロジェクトに対する運営管理体制が強化される。

指標1: プロジェクトに必要な人員と予算が配分される。

プロジェクトに必要なC/P配置、長期専門家の派遣は計画通りに実施され、短期専門家についても円借款機材調達が遅延したものの量目を除き、計画通り派遣されている。また、予算についても日本側及びタイ側機関で配分されている。

(2) 成果2 機材が適切に操作・維持される。

指標1: 国家計量標準がプロジェクトで技術移転を行う40量目で導入される。

指標2: 機材メンテナンス記録及び校正記録の記述

指標3: 機器操作及びメンテナンスマニュアルの整備

2007年5月時点で37量目の技術移転を終了しており、プロジェクト終了までには42量目¹で技術移転が完了する見込み。また、機器導入後は計量機器のメンテナンス記録が行われており、機器操作やメンテナンスに関するマニュアルについても整備され、その運用状況は良好である。

(3) 成果3 カウンターパートの技術能力が向上する。

指標1: 技術協力プログラムの策定

指標2: 適正なC/Pの配置

プロジェクト開始当初より、技術協力プログラムは策定され、活用されており、C/Pも適正に配置されている。

指標3: 不確かさの向上

指標4: 研修後の技能向上” Skill After training”

終了時評価時点では14量目で不確かさ見積りシートが整備されており、他の6量目においても準備が進んでいることが確認できた。また、技術移転評価シートにて複数の評価指標から評価した結果、全ての量目について技能は向上している。

指標5: セミナー及び合同研修実施回数

2007年4月までに33回開催され、32量目について研修が行われた。

(4) 成果4 国家計量標準の正確さが向上する。

指標1: 不確かさの向上

指標2: 実験室の環境データの整備

指標3: 国際比較の実施回数

不確かさおよび実験室の環境データ整備も、認定審査の過程で整備されることになっており、14量目については整備済みである。また、終了時評価時点において12量目において23回の国際比較が実施されている。

(5) 成果5 NIMTが国家計量標準を適切に供給する。

指標1: 校正技術の向上

指標2: 校正手順の整備数

41 量目に対するトレーサビリティチャートの整備が完了しており、校正手順書も 37 量目について作成されており、うち 17 量目については整備を行っている状況である。

指標 3: 品質システムの指摘事項およびその改善

品質システムの評価は認定審査時に行われ、システム改善を指摘されることがあるが、現在 14 量目が認定されており、今後も認定審査での指摘事項について改善する予定である。

3-2 評価結果の要約

(1) 妥当性

本プロジェクトは、タイ国における産業界からのニーズ、第 10 次国家経済社会開発計画における計量システムの重要性及び日本の援助方針の点から妥当性が高いと言える。

(2) 有効性

期待される成果の発現状況は、全ての成果で良好である。また、上記調査結果から成果とプロジェクト目標を関連付ける外部条件の有効性も確認された。この分析結果を PCM 評価手法に沿って評価すると、プロジェクト目標は、概ね達成していると言えるが、本プロジェクトの前提条件でありコントロール不可能である「円借款機材の計画的な調達」の部分での遅れが一部の量目の技術移転に影響する等、プロジェクト目標²の阻害要因となっていることから、目標の達成度はある程度低く評価せざるを得ない。なお、円借款機材の調達を早めるために入札方法の変更などの対応を実施している。

(3) 効率性

質問表調査や聞き取り調査結果を考察すると活動のタイミングや投入量は、非常に適切であったと評価できる。特に各量目の技術移転においては、本邦研修（3 ヶ月）⇒カウンターパート自習（2 ヶ月）⇒ 専門家派遣による Follow-Up 研修（1 ヶ月）とカウンターパートが集中して技術習得できるよう計画され、短期専門家の派遣時期も、円借款での機材設置時期と同時期に行なわれるように調整されたことから、効果的な活動となり成果の発現が良好であったと考察できる。しかし、機材調達の遅れが発生した一部の量目で成果の発現を阻害してしまったことは、本プロジェクトでコントロールできる要因ではないことを考慮しても非常に残念なことである。

(4) インパクト

上位目標達成指標において、いくつかの分野での成果の発現が見られていることから、将来的には達成される見込みは概して高いと考えられ、上位目標の達成を実現するためにも、全ての量目において速やかに技術移転を完了し、出来るだけ多くの認定を受けることが肝要と考えられる。

また、波及効果として定期的に ASEAN 地域の国家計量標準機関から参加者を参集するセミナーやワークショップを開催しており、NIMT の ASEAN 地域での認知度は将来的にも徐々に高まると予想される。

(5) 自立発展性

本プロジェクト成果の持続発展性は、タイ国内の組織的な NIMT の位置付けや政策・財政的な支援が得られている現状を勘案すれば高いと考えられる。しかし、NIMT が確固たる地位を築き、プロジェクト成果の持続を行なっていくには、国際的レベルの認定を取得することが重要である。

3-3 効果発現に貢献した要因

(1) 計画内容に関すること

国家計量制度整備法に変更や更新事項は無く、NIMT を頂点とする国家計量標準システムは有効であ

り、プロジェクトにより発現した成果が下部組織に波及しやすい状態であった。

(2) 実施プロセスに関すること

定期的な打ち合わせや合同協議会の開催が行なわれ、関係者間でのプロジェクト実施に関する相互理解が促進された。

3-4 問題点及び問題を引き起こした要因

(1) 計画内容に関すること

特になし。

(2) 実施プロセスに関すること

「円借款による機材調達が計画通りに行われる」という前提条件の未達成が、本プロジェクト成果全般に影響を与えている。「国際的なレベルの正確性」を達成するために、プロジェクト目標を「認定審査」まで含めていることから、現行協力期間での協力の終了は適当ではない。

3-5 結論

円借款で実施された NIMT 新庁舎建設及び機材調達の遅れたものの、全量目の技術移転がプロジェクト終了までに完了する見込みである。しかしながら、前述の遅延により、NIMT が国際的に承認されるレベルの正確さを保有していることを証明するための認定審査については、プロジェクト期間内に完了することは困難である。

これまでの活動実績を分析すると、認定審査を受けるまでにプロジェクトで技術移転後、約1年間を要していることから、ほとんどの量目³での認定は、本プロジェクト期間終了後、約1年以内で取得可能と推察される。よって、当初のプロジェクト目標を達成するために、2008年10月までのプロジェクト期間の延長が必要であると考えられる。

3-6 提言

上記の評価結果より以下の提言を行う。

a. プロジェクト実施期間の延長

円借款による新庁舎建設、及び、機材調達の遅れにより、42量目の技術移転はほぼ完了したものの、プロジェクト目標である「国際的なレベルの正確性」を達成するための認定については、37量目中14量目の認定取得に留まっている。本プロジェクトの目標である技術移転の成果を国際的な承認を得られる認定という形で定着させるために、NIMT 側からの延長に対する要望もあり、ほとんどの量目で認定取得が可能な1年間の協力期間の延長が適切と考える。

b. 化学標準

化学系の、ガイド34⁴の対象品目については、1年間で認定取得までの達成は困難であり、認定取得のための品質システムの確立をこの期間内でめざすことが適切である。これを達成するためにガイド34、及びガイド35⁵についての適切な研修受講が必要である。

c. CIPM-MRA Appendix C⁶

NIMT が、技術移転が終了した量目について CIPM-MRA の Appendix C への登録作業を速やかに行なうよう要請する。

d. 持続的な人材育成

カウンターパートに対する技術移転終了直後における評価と比較し、ある程度の時間経過後の評価において、明らかな能力と意欲の向上が認められ、人材的な自立発展の基礎が築かれつつあると評価でき

る。今後とも、継続的な活動意欲の向上が図られるよう期待する。

e. 人材投資

少ない人数での健闘については敬意を表するが、安定した計量標準の維持・供給には、NIMTにおける技術系人材を確保するとともに、今後の標準供給の重要性に応じた集中的な人材の投資を行うことを希望する。

f. マネージメント体制の一貫性

本プロジェクトによって NIMT における認定された量目数が増加している。更に多くの量目について認定が効果的に得られるように品質管理や DQM（Department Quality Manual）、技術マニュアルの整備を担当するような部署の設立を提案する。この部署は、NIMT 内の異なる部署間の相互コミュニケーションを促進し、NIMT の管理体制における無駄な作業を軽減することが期待され非常に重要である。

g. 施設

一部、既に装置が購入され、技術移転も終了しているにもかかわらず、これを収納する建屋が未完成のものがあった。（標準ガス）タイ側での必要な措置を急ぐことを希望する。

h. 安全管理

高圧ガスボンベが支持無しで置かれているなど、安全管理への配慮に欠ける面がある。重大な事故を招く怖れがある事項であるので早急な改善を希望する。

i. 国内普及

NIMT は国内トレーサビリティ体系全体⁷について、二次校正機関⁸の能力向上にも貢献している。今後とも、認定機関との協力や、大手ユーザーへの直接校正等による、効率的な貢献の在り方についての検討を希望する。

j. 諸外国への普及

今後、本プロジェクトの成果を活用し、周辺の ASEAN 諸国への NIMT トレーサブルな計量標準の普及を図り、ASEAN 地域のハブ機関として活動することを期待する。

3-7 教訓

円借款により調達する機材を前提とした技術協力を同時並行的に実施する場合、機材調達に関するリスクを十分考慮した技術協力計画が必要である。

1 プロジェクト開始後、NIMT より 2 量目の追加要請があり、妥当と判断されたことから追加。（中間評価では当初計画の 40 量目で記載されている）
2 中間評価時に、国際的なレベルの正確性を達成するために、プロジェクト目標を「認定審査」まで含めた。
3 NIMT としては、当初計画 37 量目のうち、化学標準 2 量目（無機標準液・有機標準液）を除く 35 量目を目標とし、延長期間の 1 年間で可能な限りの認定を目指すこととしている。
4 ガイド 34：「標準物質生産者の能力に関する一般要求事項」
5 ガイド 35：「標準物質認証の指針」
6 国際相互承認協定付属書 C：国家計量機関の校正及び測定能力に関するデータベース
7 測定器は標準器によって校正される。その標準器はより正確な（不確かさがより小さい）標準器によって校正される。この標準器もより正確な標準器によって校正される、というようにより正確な標準器をもとめていくと国家標準に辿り着く。このような体系をトレーサビリティ体系と言う。
8 同一の量の一次標準と比較して値が決定された標準を保有する校正機関

略語表

AIST	National Institute of Advance Industrial Science and Technology 産業技術総合研究所
C/P	Counterpart カウンターパート
CERI	Chemicals Evaluation and Research Institute, Japan 化学物質評価研究機構
DAC	Development Assistance Committee 開発援助委員会
DQM	Department of Quality Manual 品質マニュアル部
DSS	Department of Science Service 科学サービス部
EOJ	Embassy of Japan 日本大使館
IAJapan	International Accreditation Japan 認定センター
JBIC	Japan Bank for International Cooperation 国際協力銀行
JCC	Joint Coordinating Committee 合同協議会
JEMIC	Japan Electric Meters Inspection Corporation 日本電気計器検定所
JICA	Japan International Cooperation Agency 国際協力機構
JQA	Japan Quality Assurance Organization 日本品質保証機構
METI	Ministry of Economy, Trade and Industry 経済産業省
MOST	Ministry of Science and Technology タイ国科学技術省
NIMT	National Institute of Metrology (Thailand) タイ国家計量標準機関
NITE	National Institute of Technology and Evaluation 製品評価技術基盤機構

NMIJ	National Metrology Institute of Japan 計量標準総合センター
ODA	Official Development Assistance 政府開発援助
OECD	Organization for Economic Cooperation and Development 経済協力開発機構
P/O	Plan of Operation 実行計画
PCM	Project cycle Management プロジェクトサイクルマネジメント
PDM	Project Design Matrix プロジェクトデザインマトリックス
QHR	Quantum Hall Resistance 量子ホール抵抗標準
R/D	Record of Discussion 議事録
TICA	Thailand International Development Cooperation Agency タイ国際開発協力庁
TISTR	Thai Institute of Science and Technological Research タイ国科学技術研究所

1 評価調査の概要

1.1 評価調査の背景

タイ国家計量標準機関(NIMT)のプロジェクトは、日本の円借款で購入した機材を使用した技術移転を目的に計画された。2002年10月、国際協力機構(JICA)はNIMTの技術力の向上を目的に、産業技術総合研究所(AIST)計量標準総合センター(NMIJ)など日本の計量関連機関の協力を得てJICA-NIMTのプロジェクトフェーズ1を開始した。フェーズ2は2004年10月から開始され、プロジェクト全体の期間は5年間である。本プロジェクトは5年間で波長標準、硬さ標準などを含む40量目の技術移転を行うことを目的としており、終了時評価時点において、技術移転について全体の88%を、認定審査について全体の38%を終了している。

1.2 評価調査の目的

本プロジェクト終了を控え、プロジェクト目標の達成度、事業の効率性、今後の自立発展性の見通しなどの観点からプロジェクトを評価し、同結果を踏まえ、協力終了の適否や協力延長などフォローアップの必要性の有無を判断する。また、同評価結果を今後のJICAプロジェクトに対する提言として、フィードバックする。

1.3 評価調査の団員

本調査はタイ側との合同評価であり、以下のメンバーが団員として参加した。

表 1-1: 評価団メンバー

〈日本側〉

	名 前	役 職
1	八重樫 成寛 (団長)	JICAアジア地域支援事務所 次長
2	松井 洋二	経済産業省産業技術環境局知的基盤課工業標準専門職
3	瀬田 勝男	製品評価技術基盤機構 認定センター長
4	桧野 良穂	産業技術総合研究所 計量標準管理センター 国際計量室長
5	丸尾 和也	JICAタイ事務所 所員
6	Ms. Thanyatorn Singrueng	国際航業株式会社 研究員 (コンサルタント)

<タイ側>

	名 前	役 職
1	Dr. Pian Totarong	タイ国家計量標準機関(NIMT)所長
2	Mr. Veera Tulasombut	タイ国家計量標準機関(NIMT)機械計測部長
3	Ms. Ajchara Charoensook	タイ国家計量標準機関(NIMT)電気計測部長
4	Dr. Chainarong Cherdchu	タイ国家計量標準機関(NIMT)化学計測部長
5	Mr. Arkom Krachangmol	タイ国家計量標準機関(NIMT)光度計測部次長
6	Mr. Virat Plangsangmas	タイ国家計量標準機関(NIMT)音響・振動計測部次長
7	Ms. Nattanit Pongjeerakumchorn	タイ国家計量標準機関(NIMT)政策・立案部次長、 国際関係セクション長
8	Ms. Suthanone Fungtammasan	タイ国際協力機構 (TICA) プログラムオフィサー
9	Ms. Sunee Suthianun	タイ国際協力機構 (TICA) プログラムオフィサー

1.4 評価調査の日程

表 1-2: 調査日程

日付		活動	特記事項
6/11	月	キックオフミーティング、質問票配布	コンサルタント
6/12	火	TISTR、DSS聞き取り調査	コンサルタント
6/13	水	質問票回収、データ整理	コンサルタント
6/14	木	科学技術省聞き取り調査	コンサルタント
6/15	金	民間企業聞き取り調査	コンサルタント
6/16	土	データ整理・分析	コンサルタント
6/17	日	データ整理・分析	コンサルタント
6/18	月	午前	JICA事務所打ち合せ
		午後	キックオフミーティング 協議(1): プロジェクトの実績の発表
6/19	火	午前	協議(2): 実績の確認
		午後	協議(3): 実績の確認
6/20	水	午前	協議(4): 教訓・提言の確認
		午後	協議(5): 教訓・提言の確認
6/21	木	午前	合同調査討議録の修正
		午後	協議(6): 合同調査討議録の確認
6/22	金	午前	合同調整委員会 (JCC) の準備
		午後	第8回合同調整委員会 (合同調査討議録への署名)
			在タイ日本大使館へ報告

2 プロジェクトの概要

2.1 プロジェクトの背景

タイの産業は輸出を促進するためには競争力の向上が求められており、質の良い製品を製造しなければならない事態に直面している。タイ政府は輸出製品の信頼性を向上するために国家計量システムを整備することが必要であると考え、その必要性を第8 国家経済社会開発計画(1997-2001 年)でも述べている。

1997 年 8 月、政府は国内産業の国際的な競争力を強化するため、国家計量システム整備法を制定した。これを受けて1998 年 6 月、タイ国家計量標準機関(NIMT)を設立し国内の計量基盤整備に着手した。1999 年 5 月には国家計量システム整備マスタープランが閣議了承された。

こうした動きに対して日本政府は、NIMT の新施設建設・機材整備を目的として2000 年から国際協力銀行(JBIC)の有償資金協力で第24 次・第25 次円借款、国家計量標準整備計画事業を行っている。

これら一連の事柄を背景にして、タイ政府は1999 年、上記円借款で調達する機材を用いた国家計量標準の維持・供給のため、NIMT の技術者の育成を目的に日本政府に対して本プロジェクトの要請をした。

2.2 プロジェクトの要約

本プロジェクトは当初 5 年間で計画していたが、新施設の建設や資機材の調達に遅れがあったことから、2 つのフェーズに分けての実施となった。2002 年 9 月に R/D の署名が行われた後、フェーズ 1 は2002 年 10 月から2 年間実施された。フェーズ 1 の終了後、2004 年 10 月からフェーズ 2 が開始された。本プロジェクトは、フェーズ 1 と 2 を通して合計 8 分野 40 量目の計量標準について技術移転を行う計画である。

2.2.1 プロジェクト目標の概要

本プロジェクトの目標は、タイにおける国家計量システムの強化に資するため、国際的に承認されるレベルの正確さの国家計量標準の設定・維持が可能となることを目的としてタイの国家計量標準機関(NIMT)の技術者の育成を行うもの。

2.2.2 協力期間

2004 年 10 月～2007 年 10 月(3 年間)

2.2.3 協力総額(日本側)

3.3 億円

2.2.4 協力相手先機関

タイ国家計量標準機関（科学技術省所管）

2.2.5 国内協力機関

経済産業省産業技術環境局知的基盤課、産業技術総合研究所・計量標準総合センター（NMIJ）、日本品質保証機構（JQA）、日本電気計器検定所（JEMIC）、製品評価技術基盤機構（NITE）、化学物質評価研究機構（CERI）など

2.2.6 裨益対象者

a. 直接的裨益対象者

NIMT および NIMT 内技術者

b. 間接的裨益対象者

タイ科学技術研究所（TISTR）および科学技術省科学供給部（DSS）などの参照標準校正機関（産業界に標準を供給する NIMT の下部機関）、ならびにタイにおける国内作業で特に ISO9000 シリーズや ISO14000 シリーズを取得しようとしている産業・企業群

3 評価のプロセス

3.1 評価の方法

本評価はプロジェクト・サイクル・マネジメント(PCM)手法に基づいて行われた。評価には、次に説明する評価 5 項目(妥当性、効率性、有効性、インパクト、自立発展性)についてプロジェクトの計画と実績を比較する方法がとられた。プロジェクトの成果を計画と比較するために評価グリッドが作成された。

表 3-1: 評価 5 項目

妥当性	プロジェクト目標と上位目標が受益国やドナーの政策、受益国のニーズや優先度に対して妥当であるか。
有効性	プロジェクト目標が達成されているか。プロジェクトの成果がプロジェクト目標の達成に貢献しているか。
効率性	プロジェクトが投入に見合った成果を生み出しているか。
インパクト	プロジェクトの結果として直接的、間接的に発生するポジティブまたはネガティブなインパクトはあるか。
自立発展性	プロジェクトによって達成される良い成果がプロジェクト終了後も持続されるか。

3.2 調査手段

3.2.1 資料調査

プロジェクトの実績やプロセスを調査するために、プロジェクトの討議議事録(R/D)、プロジェクト・ドキュメント、ミニッツ、報告書などの関連資料の確認や WEB サイトからの情報収集を行った。

3.2.2 質問票による調査

日本人専門家と NIMT のカウンターパートを対象とした質問票による調査を行った。質問票はこれらの 2 グループに対し事前に配布し回収した。回答内容は集計・分析され、回答結果の傾向が調査された(Annex 36 参照)。

3.2.3 聞き取り調査

日本人専門家、カウンターパート、科学技術省、JICA、タイ科学技術研究所(TISTR)、科学技術省科学供給部(DSS)、JETRO、JBIC などの関連機関に対し、聞き取り調査を実施した。聞き取り調査は実績の評価だけでなく、プロジェクトの促進要因や阻害要因を確認することも目的とした(Annex 38 参照)。

3.2.4 調査手法上の制限

本プロジェクトの P/O は、円借款による NIMT の新庁舎建設や機材調達の実施予定と平行して策定されている。それ故、他プロジェクトの活動完了が、本プロジェクトの PDM (Annex 1 参照) では前提条件になっている。これは、本プロジェクトで管理できる範囲外であることを留意する必要がある。

4 プロジェクトの実績

4.1 投入実績

4.1.1 日本側投入

日本側投入実績について以下に集計する。

a. 長期専門家派遣

プロジェクト期間に派遣された長期専門家を表 4-1及び Annex 10 にまとめる。

表 4-1: 長期専門家

専門家氏名	指導科目	期間
秋元 義明	1. チーフアドバイザー	2002年10月16日 – 2007年10月15日
新関 郁子	2. 業務調整	2002年10月16日 – 2007年10月15日
松田 次郎	3. 物理標準	2002年10月16日 – 2006年10月15日
木下 攘止	4. 電気磁気標準	2002年10月16日 – 2006年12月30日
野村 明	5. 化学標準	2002年10月16日 – 2006年12月30日

b. 短期専門家派遣

プロジェクト開始より 2007 年 5 月までに 30 人の短期専門家が本プロジェクトに派遣された。プロジェクト終了時までには標準尺、圧力標準、温度定点、群管理抵抗標準、量子ホール抵抗標準量目について計 5 人の短期専門家の派遣が予定されている。また、認定手続きに関する短期専門家 1 名の派遣も予定されていることからプロジェクト終了時までの短期専門家派遣数は、合計で 36 名となる。専門家氏名や派遣期間等は、Annex 10 にて詳述する。

c. C/P 本邦研修

本プロジェクトでは、技術移転¹の一環として本邦研修を実施した。本プロジェクト期間中、本邦研修に参加した C/P 数は 16 名である。そのうち 11 名についてはプロジェクト実施当初より計画されていた本邦への派遣であるが、残りの 5 名については NIMT 側の要請に答えての追加的な本邦派遣であった。本邦研修受講者の氏名等は、Annex 11 に添付する。

d. 供与機材

本プロジェクトでの供与機材リストを Annex12 に示す。なお、円借款による機材調達については、2007 年 5 月末日時点で、387 品の機材が円借款により調達されているが、現時

¹ 本プロジェクトでは、C/P本邦研修、C/P自己研鑽、短期専門家によるC/Pフォローアップ研修を実施することでC/Pへの技術移転を目指している。

点では7品目の調達が完了していない。(Annex32)

e. 日本側負担の現地業務費

本プロジェクトでは、下表に示す金額をプロジェクト開始時から現地業務費として投入している。

表 4-2: 現地業務費

Unit: タイバーツ

年度	2004	2005	2006	2007
第一四半期		202,000	1,266,200	1,583,090
第二四半期		2,093,000	298,520	
第三四半期	366,000	0	489,930	
第四四半期	420,000	121,958	196,200	
合計	786,000	2,416,958	2,250,850	1,583,090

4.1.2 タイ側投入

タイ側投入実績について以下に集計する。

a. 建物・施設・機材提供

現在の NIMT 実験室が設置されている建物は、円借款で建設が実施されている。本プロジェクト期間中に音響・振動実験室を除く、全ての実験室は新庁舎に移転している。本プロジェクトは、主にその新庁舎内で実施された。専門家の事務所や必要な機材が NIMT から供与された。また、終了時評価時では NIMT 管理棟にある標準ガス準備室は補修中であった。

b. C/P の選任

本プロジェクトでは、認定作業やその他の管理業務に係わる技術移転の C/P として NIMT 所長、技術移転対象となる量目の C/P を 1 名を選定し、合計 36 人が C/P として選任された。更に、NIMT 側の窓口及びタイ側業務調整的な役割として追加的に 1 名が投入された。本プロジェクトの C/P リストを Annex 9 に添付する。

c. プロジェクト機材供与

タイ側からのプロジェクト機材は計画通りに実施され、終了時評価時点でも十分活用されていることが確認された。機材リストは、Annex 13 に添付する。

d. プロジェクト実施予算

本プロジェクト実施予算におけるタイ側の負担は、NIMT 及び TICA で拠出された。下

表にて内訳を示す。また、詳細は Annex 14 (NIMT) 及び Annex 15 (TICA) に添付する。

表 4-3: タイ側プロジェクト実施予算

Unit: THB

タイ予算年度	2005	2006	2007
NIMT	519,600	519,600	519,600
TICA	805,170	930,405	715,038

4.2 成果実績

4.2.1 成果1: 「プロジェクトの運営維持管理体制が強化される」

指標 1: プロジェクトに必要な人員と予算が配分される。

- Annex 9に示されるようにプロジェクトに必要なC/Pは計画通り配置された。
- 長期専門家の派遣は、計画通りに実施された。短期専門家の派遣は、円借款による機材調達遅延 (Annex 6, Annex 7参照) のために計画よりは遅れることとなったが、プロジェクト終了時までには計画通りの派遣が行なわれる見通しである (Annex 10参照)。
- 表 4-2及び表 4-3からプロジェクト実施に必要な予算は、日本側及びタイ側機関で負担されている。

プロジェクトに必要な C/P 配置、長期専門家の派遣は計画通りに実施され、短期専門家についても円借款機材調達が遅延したもの量目を除き、計画通り派遣されている。また、予算についても日本側及びタイ側機関で配分されており、調査結果を総合的に判断して、成果1は十分に発現していると評価できる。

4.2.2 成果2: 「機材が適切に操作・維持される」

指標 1: 国家計量標準がプロジェクトで技術移転を行なう40量目で導入される。

- プロジェクトでは42量目² (当初計画40量目+追加2量目: 密度標準, 交流電圧) に関する技術移転を計画していた。2007年5月時点で37量目の技術移転が終了、同量目について国家計量標準が設定された (Annex 17参照)。
- 技術移転の進捗は、P/Oと比べると遅れている (Annex 2, Annex 3参照)。
- 上記の遅れは、機材調達が遅れているためであるが、終了時評価時には機材納入予定 (Annex 32参照) が明確になっている。また、その予定に合わせて技術移転実施が既に計画されており、プロジェクト終了時までには技術移転及び国家計量標準の設定が修了する見込みである (現地調査結果)。

指標 2: 機材メンテナンス記録及び校正記録の記述

- 国家計量標準機器導入後は、そのガイダンスに沿って機材のメンテナンス記録及び校正記録が行なわれている (Annex 17参照)。
- 技術研修実施の際には、計量機器操作及びメンテナンス記録について技術移転が行なわれる (現地調査結果)。

指標 3: 機器操作及びメンテナンスマニュアルの整備

- 機器操作やメンテナンスに関連するマニュアルの整備や運用状況は良好であることが確認できた (Annex 17, Annex 22参照)。

² プロジェクト開始後、NIMTより2量目の追加要請があり、妥当と判断されたことから追加。(中間評価では当初計画の40量目で記載されている)

2007年5月時点で37量目の技術移転を終了しており、プロジェクト終了までには42量目で技術移転が完了する見込み。また、機器導入後は計量機器のメンテナンス記録が行われており、機器操作やメンテナンスに関するマニュアルについても整備され、その運用状況は良好である。

上記の結果により、成果2は技術移転の進捗と共に発現度合いを強めているものと評価が出来る。

4.2.3 成果3：「カウンターパートの技術能力が向上する」

指標 1: 技術協力プログラムの策定
<ul style="list-style-type: none"> ●本プロジェクト開始当初より技術協力プログラムは策定され、活用されている（Annex 4、Annex 5参照）。
指標 2: 適正なC/Pの配置
<ul style="list-style-type: none"> ●成果1：「プロジェクトの運営維持管理体制が強化される」参照
指標 3: 不確かさの向上
<ul style="list-style-type: none"> ●不確かさ見積もりシートは、認定申請の課程で整備される。 ●終了時評価時では、14量目で認定が済んでおり、それらの項目に関しては不確かさ見積もりシートが整備されている（Annex 18参照）。また、6量目に関して準備が進んでいることが確認できた（現地調査結果）。
指標 4: 研修後の技能向上 “Skill after training”.
<ul style="list-style-type: none"> ●技術移転評価シート（Annex 17参照）によると、複数の評価指標から評価すると全ての量目について研修後の技能は向上している。また、Annex 25で示されるNIMT計測技術の能力は、供与機材や技術移転により向上している。 ●残り5量目の技術移転が終了時までには終了すれば、同様に技能向上が期待される。
指標 5: セミナー及び合同研修実施回数
<ul style="list-style-type: none"> ●NIMTセミナー記録（Annex 20参照）によると、2003年2月から2007年4月までに本プロジェクトによるセミナーは、合計33回開催され、32量目をカバーしている。その内、7回はASEANセミナーとして開催され、同セミナーでは多くの量目について研修が行なわれている。 ●NIMTが独自で企画・開催する研修プログラムもあり、2006年を除くプロジェクト期間には多くの研修が実施されている（Annex 30参照）。 ●終了時評価時までに合同研修は、3回実施されている。参加者の多くはASEAN地域から参加している。Annex 33によると参加者数は、1回目25名、2回目23名、3回目34名である。

プロジェクト開始当初より、技術協力プログラムは策定され、活用されており、C/Pも適正に配置されている。また、終了時評価時点では14量目で不確かさ見積もりシートが整備されており、他の6量目においても準備が進んでいることが確認できた。また、技術移転評価シートにて複数の評価指標から評価した結果、全ての量目について技能は向上している。おり、さらに技術協力プログラムに沿いながらC/Pの技術能力向上を目的として様々な研修を実施している。さらにセミナーについても2007年4月までに33回開催され、32量目について研修が行われており、NIMTの総合的な技術能力向上がASEANセミナーを通して周辺国へ波及していることも確認が出来る。

上記の結果より、成果3を十分達成するだけでなく、NIMTが地域の技術的なハブとして活躍していると非常に高い評価をする。

4.2.4 成果4：「国家計量標準の正確さが向上する」

指標 1: 不確かさの向上
指標 2: 実験室の環境データの整備
•不確かさ見積もりシート（Annex 18参照）も環境データも認定申請の過程で整備されることになっている。つまり、14量目について既に整備がされている（Annex 26参照）。
指標 3: 国際比較の実施回数
•終了時評価時では、12量目について23回の国際比較が実施されている。一方、中間評価時では10量目について15回実施されている（Annex 35参照）。

不確かさおよび実験室の環境データ整備も、認定審査の過程で整備されることになっており、14量目については整備済みである。また、終了時評価時点において12量目において23回の国際比較が実施されている。

上記の調査結果より、本プロジェクトでは国家計量標準の正確さが向上するための活動を実施している。これにより、国家計量標準の正確さが向上していると判断されることから、成果4は十分に達成されていると判断できる。

4.2.5 成果5：「NIMTが国家計量標準を適切に供給する³」

指標 1: 校正技術の向上
•Annex 21で示すとおり、41量目に対してNIMTの校正技術の正確さを示すトレーサビリティチャートが整備された。
指標 2: 校正手順の整備数
•終了時評価時では、37量目について校正手順書の整備が完了している。また、17量目について整備途中であることが確認された（Annex 17参照）。 •校正手順書整備の遅れは、機材調達の遅れが影響している。しかし、プロジェクト終了までには完了する見込みである（Annex 32参照）。
指標 3: 品質システムの指摘事項及びその改善
•品質システムの評価は認定申請の際に行われ、システムの改善点を指摘されることがある。指摘された事項は、認定までに改善の必要があり、2007年5月時点では14量目の認定が終了しており（Annex 26参照）、今後も認定の申請が行われる見込みである。

41量目に対するトレーサビリティチャートの整備が完了しており、校正手順書も37量目について作成されており、うち17量目については整備を行っている状況である。また、品質システムの評価は認定審査時に行われ、システム改善を指摘されることがあるが、現在14量目が認定されており、今後も認定審査での指摘事項について改善する予定である。

上記の調査結果より、国家計量標準を供給するルートである国家計量標準ネットワークはタイ国におけるトレーサビリティが明確になると同時に整備状況が改善されている。また、NIMTの校正技能や正確さが向上していることから成果5の発現は高いと評価できるが、高いレベルでの成果5の発現には、認証の取得が重要である。

³ 中間評価時に、国際的なレベルの正確性を達成するために、プロジェクト目標を「認定審査」まで含めた。

4.3 プロジェクト目標の達成状況

上述したように期待された5つの成果は全て十分に発現しており、プロジェクト目標達成に貢献していると考えられる。しかし、技術移転に必要な円借款による機材の納入の遅れは、全体の活動工程の遅延を起し、更に高いレベルでの成果の発現とプロジェクト目標の達成を阻害してしまったと考えられる。

プロジェクト目標達成の評価は、5.2節「有効性」にて詳述する。

4.4 上位目標の達成状況

本プロジェクトによる成果や効果は、NIMTを頂点とする国家計量標準システムを通じて下部組織である二次校正機関や最終受益者であるタイの産業界にも波及していることが聞き取り調査等により確認できた。また、工業製品の国際的な競争激化により、タイ産業界からのNIMTへの一次校正機関としての期待が非常に高まりつつあることも同時に確認できた。

よって、プロジェクト成果の普及およびNIMTの国際的な知名度を高めることにより、上位目標の達成が可能であると判断される。

5 評価 5 項目に基づく評価

以下に評価 5 項目に基づく評価結果を述べる。

5.1 妥当性

5.1.1 調査結果

調査の視点	調査結果
タイ国家政策について	<ul style="list-style-type: none"> ●第10次国家経済社会開発計画で述べられている計量システムの重要性について中間評価時と比べて差異はなく、引き続きプロジェクト上位目標との整合性は高い（既存資料調査）。 ●タイ国と他国間での貿易に関する国際協定の締結により、工業製品輸出には一定の品質保証が求められるようになってきている。それ故、一次校正機関であるNIMTの役割も政策面から重要となってきている（既存資料調査）。 ●プロジェクト対象グループに対する質問表調査や聞き取り調査結果からも国際貿易環境の変化に対応すべく、NIMTの役割が重要になっているとの意見が確認できた（Annex 36、Annex 38参照）。
NIMT の政策について	<ul style="list-style-type: none"> ●国家計量制度整備法によりNIMTは、タイ国における計量システムの開発や国際的に通用するレベルでの国家計量標準の設定・供給を行なう機関として位置づけられている（既存資料調査）。
日本 ODA 政策と JICA 国別プログラムについて	<ul style="list-style-type: none"> ●日本のODA大綱では、開発途上国の自立的な発展を支援する目的で経済・社会基盤の整備を基本方針としている。特にASEAN地域での本方針実施を強調している（既存資料調査）。 ●ODA大綱では、タイ国に対する支援は技術協力プロジェクトを主なアプローチとして2国間及び多国間支援を掲げている（既存資料調査）。 ●タイ国のJICA国別アプローチは、科学及び工学分野の発展による民間セクター開発を重要項目としている（既存資料調査）。
C/P としての NIMT 選出の妥当性について	<ul style="list-style-type: none"> ●国家計量システム開発条例では、NIMTを頂点とする国家計量システムの構築を目指している（既存資料調査）。
日本の技術的な優位性について	<ul style="list-style-type: none"> ●日本側の協力機関である産業技術総合研究所は、1903年に発足しており100年以上の知見を蓄積している。一方NIMTは10年ほどであり、日本側の技術的な優位性は明白である（既存資料調査）。

5.1.2 結論

本プロジェクトは、タイ国における産業界からのニーズ、第 10 次国家経済社会開発計画における計量システムの重要性及び日本の援助方針の点から妥当性が高いと言える。

5.2 有効性

5.2.1 調査結果

調査の視点	調査結果
プロジェクト目標の達成度合い	<p>指標 1</p> <ul style="list-style-type: none"> ●技術移転は8分野42量目で実施される予定であったが、2007年5月時点では37量目について技術移転が完了している（Annex 17参照）。円借款による機材調達の遅れが技術移転の遅延に影響している。 <p>指標 2</p> <ul style="list-style-type: none"> ●機材の納入と併せて残りの5量目の技術移転についてもプロジェクト終了時までには完了する見込みである（Annex 17、Annex 23参照）。 ●プロジェクト終了時までには技術移転及び国家計量標準の設定が完了する見込みであるが、予定された全ての量目についての認定取得は完了しない見込みである（Annex 17、Annex 18参照）。 ●不確かさ見積もりシートは、既に認定がされた14量目で整備されている（Annex 18参照）。 <p>指標 3</p> <ul style="list-style-type: none"> ●一次標準物質の供給を含む校正サービス数及び範囲が向上している。また、校正の正確さもプロジェクト開始時と比べ改善されている（Annex 24参照）
成果及びプロジェクト目標の外部条件について	<p>成果の外部条件</p> <ul style="list-style-type: none"> ●中間評価時と終了時評価時のNIMT職員の雇用計画に変化はない（Annex 9、聞き取り調査結果）。 ●投入実績からプロジェクト実施予算配分や人員配置が計画通りに行なわれている（Annex 9、Annex 14、Annex 15、Annex 34参照）。 ●NIMTの上位組織である科学技術省の事務次官への聞き取り結果によると、NIMT活動に係わる政策に負の変化はないことが確認できた（Annex 38参照）。 ●終了時評価時では、7つの機材の設置が完了していないが、2007年7月には全ての機材の設置が完了する見込みである（Annex 32参照）。 ●本プロジェクトで研修に参加したC/Pは、終了時評価時において離職していない（Annex 9）。 <p>その他の要因</p> <ul style="list-style-type: none"> ●研修スケジュールの調整、本邦研修の参加者数を5人追加させることで技術移転の進捗が促進された（Annex 11参照）。 ●定期的な打ち合わせや合同協議会の開催が行なわれ、関係者間でのプロジェクト実施に関する相互理解が促進された（Annex 31参照）。 ●C/Pを対象に長期専門家が日本語講座をプロジェクト開始当初より提供している。これにより関係者間でのコミュニケーションが促進された（現地調査結果）。

5.2.2 結論

期待される成果の発現状況は、全ての成果で良好である。また、上記調査結果から成果とプロジェクト目標を関連付ける外部条件の有効性も確認された。この分析結果をPCM評価手法に沿って評価すると、プロジェクト目標は、概ね達成していると言えるが、本プロジェクトの前提条件でありコントロール不可能である「円借款機材の計画的な調達」の

部分での遅れが一部の量目の技術移転に影響する等、プロジェクト目標の阻害要因となっていることから、目標の達成度はある程度低く評価せざるを得ない。なお、円借款機材の調達を早めるために入札方法の変更などの対応を実施している。

5.3 効率性

5.3.1 調査結果

調査の視点	調査結果
活動実績の確認	指標 1 <ul style="list-style-type: none"> ●5つの量目担当の短期専門家派遣は、機材調達の遅延により計画より遅れている（Annex 10参照）。 ●終了時評価時には36人の短期専門家派遣が終了しており、調査結果によると派遣人数及びそのタイミングは効果的であると考えられる（Annex 36参照）。 ●タイ側C/Pの配置は、計画通りに行なわれている（Annex 9参照）。 ●既存資料の分析により、プロジェクト実施に必要な費用は計画通りに配分されている（Annex 14、Annex 15参照）。
	指標 2 <ul style="list-style-type: none"> ●2007年5月末までに387の機材が円借款でNIMTへ導入された。 ●7つの機材が、終了時評価時に配置されていないが、2007年7月に配置完了が見込まれている（Annex 32参照）。 ●調達された全ての機材は効果的に使用・維持されている（現地調査結果）。
	指標 3 <ul style="list-style-type: none"> ●技術協力プログラムが準備され、このプログラムに沿って活動が実施されている（Annex 4、Annex 5参照）。 ●不確かさ見積もりシートの整備数は、量目の認定申請の過程で準備されており、増加している（Annex 26参照）。 ●技術移転評価が実施されている（Annex 17参照）。
	指標 4 <ul style="list-style-type: none"> ●プロジェクト終了時には、計画された全ての量目で技術移転が終了し、国家計量標準が整備される見込みである（Annex 2、Annex 17参照）。 ●認定が取得された14量目について環境管理システムの導入が完了している（Annex 26参照） ●終了時評価の時点では、12量目について23回の国際比較が実施されている。中間評価時から2量目、8回増加している（Annex 35参照）。
	指標 5 <ul style="list-style-type: none"> ●技術移転を通じてトレーサビリティチャートが全ての量目について整備され、NIMTの校正技術は向上した（Annex 21参照）。
活動及び成果の外部条件について	活動の外部条件 <ul style="list-style-type: none"> ●NIMTと職員間で契約が交わされており、研修に参加したC/Pの離職防止に貢献している（Annex 36、Annex 38、Annex 9参照）。
	その他の条件 <ul style="list-style-type: none"> ●機材調達が遅れた事で、成果の発現が一部遅れている（阻害要因）。
成果の発現度合い	●4.2「成果実績」参照

5.3.2 結論

質問表調査や聞き取り調査結果を考察すると活動のタイミングや投入量は、非常に適切であったと評価できる。特に各量目の技術移転においては、本邦研修（3ヶ月）⇒カウンターパート自習（2ヶ月）⇒ 専門家派遣による Follow-Up 研修（1ヶ月）とカウンターパートが集中して技術習得できるよう計画され、短期専門家の派遣時期も、円借款での機材設置時期と同時期に行なわれるように調整されたことから、効果的な活動となり成果の発現が良好であったと考察できる。しかし、機材調達の遅れが発生した一部の量目で成果の発現を阻害してしまったことは、本プロジェクトでコントロールできる要因ではないことを考慮しても非常に残念なことである。

5.4 インパクト

5.4.1 調査結果

調査の視点	調査結果
上位目標の達成度合い	指標 1 ● NIMTは既に国際MRAに参加している。また、Appendix B及びAppendix Cに掲載されたNIMTで計量できる量目数は増加している（Annex 26参照）。 指標 2 ● 終了時評価時点のNIMTのホームページに紹介されている校正機関数は78であるが、NIMTが国家計量標準システム中に登録している校正機関数は130程度である（Annex 27、Annex 38参照）。 ● NIMTを頂点とするトレーサビリティの整備状況が向上している（Annex 29参照）。
プロジェクト目標及び上位目標の外部条件について	● 国家計量制度整備法に変更や更新事項は無く、NIMTを頂点とする国家計量標準システムは有効である（既存資料調査、Annex 29参照）。
予想外のインパクト	● 予想外のインパクトは特に調査期間中には確認できなかった。
プロジェクトの波及効果について	● 本プロジェクト開始時より定期的にASEAN地域の国家計量標準機関から参加者を参集するセミナーやワークショップを開催している。これによりASEAN地域でのNIMTの知名度が徐々に広がっている（Annex 20参照）。

5.4.2 結論

上位目標達成指標において、いくつかの分野での成果の発現が見られていることから、将来的には達成される見込みは概して高いと考えられ、上位目標の達成を実現するためにも、全ての量目において速やかに技術移転を完了し、出来るだけ多くの認定を受けることが肝要と考えられる。

また、波及効果として定期的に ASEAN 地域の国家計量標準機関から参加者を参集するセミナーやワークショップを開催しており、NIMT の ASEAN 地域での認知度は将来的にも徐々に高まると予想される。

5.5 自立発展性

5.5.1 調査結果

調査の視点	調査結果
技術的視点	<ul style="list-style-type: none">● セミナー記録によると本邦研修等にNIMT職員が参加した場合、当該職員は知識や経験を他の職員と共有することを目的とした発表の機会が与えられる（Annex 20参照）。● 質問表調査結果によると、NIMT職員は本プロジェクトで移転した技術や機材は、現在のNIMT技術レベルに見合っていると評価している（Annex 36参照）。● 各種のマニュアルが本プロジェクトで導入された（現地調査結果）。● 導入されたマニュアルは、認定取得に必要な計量手順等を示しており、NIMTでの計量や校正作業に十分活用されている（現地調査結果）。
組織的視点	<ul style="list-style-type: none">● NIMTと職員間で契約が交わされており、研修に参加したC/Pの離職防止に貢献している（Annex 38、Annex 9参照）。● 国家計量制度整備法に変更や更新事項は無く、NIMTを頂点とする国家計量標準システムは有効である（既存資料調査、Annex 29参照）。● プロジェクト対象グループに対する質問表調査や聞き取り調査結果からも国際貿易環境の変化に対応すべく、NIMTの役割が重要になっているとの意見が確認できた（Annex 36、Annex 38参照）。
政策的視点	<ul style="list-style-type: none">● 第10次国家経済社会開発計画では、計量システムの重要性について述べられており、計量標準分野の政策的に重要度は引き続き高い。（既存資料調査）。● 国家計量制度整備法によりNIMTは、タイ国における計量標準システムの開発や国際的に通用するレベルでの国家計量標準の設定・供給を行なう機関として位置づけられている（既存資料調査）。
財政的視点	<ul style="list-style-type: none">● 2004年から2006年間のNIMTに対する政府からの予算配分は、増加傾向である（Annex 34参照）。

5.5.2 結論

本プロジェクト成果の持続発展性は、タイ国内の組織的なNIMTの位置付けや政策・財政的な支援が得られている現状を勘案すれば高いと考えられる。しかし、NIMTが確固たる地位を築き、プロジェクト成果の持続を行なっていくには、国際的レベルの認定を取得することが重要である。

6 結論

円借款で実施された NIMT 新庁舎建設及び機材調達の遅れたものの、全量目の技術移転がプロジェクト終了までに完了する見込みである。しかしながら、前述の遅延により、NIMT が国際的に承認されるレベルの正確さを保有していることを証明するための認定審査については、プロジェクト期間内に完了することは困難である。

これまでの活動実績を分析すると、認定審査を受けるまでにプロジェクトで技術移転後、約 1 年を要していることから、ほとんどの量目での認定は、本プロジェクト期間終了後、約 1 年以内で取得可能と推察される。よって、当初のプロジェクト目標を達成するために、2008 年 10 月までのプロジェクト期間の延長が必要であると考えられる。

7 提言及び教訓

7.1 提言

上記評価調査結果及び評価団の現地調査結果（Annex 39 参照）に基づき以下の提案を行なう。

a. プロジェクト実施期間の延長

円借款による新庁舎建設、及び、機材調達の遅れにより、42 量目の技術移転はほぼ完了したものの、プロジェクト目標である「国際的なレベルの正確性」を達成するための認定については、37 量目中 14 量目の認定取得に留まっている。本プロジェクトの目標である技術移転の成果を国際的な承認を得られる認定という形で定着させるために、NIMT 側からの延長に対する要望もあり、ほとんどの量目で認定取得が可能な 1 年間の協力期間の延長が適切と考える。

b. 化学標準

化学系の、ガイド 34⁵の対象品目については、1 年間で認定取得までの達成は困難であり、認定取得のための品質システムの確立をこの期間内でめざすことが適切である。これを達成するためにガイド 34、及びガイド 35⁶についての適切な研修受講が必要である。

c. CIPM-MRA Appendix C⁷

NIMT が、技術移転が終了した量目について CIPM-MRA の Appendix C への登録作業を速やかに行なうよう要請する。

d. 持続的な人材育成

カウンターパートに対する技術移転終了直後における評価と比較し、ある程度の時間経過後の評価において、明らかな能力と意欲の向上が認められ、人材的な自立発展の基礎が築かれつつあると評価できる。今後とも、継続的な活動意欲の向上が図られるよう期待する。

e. 人材投資

少ない人数での健闘については敬意を表すものの、安定した計量標準の維持・供給には、NIMT における技術系人材を確保するとともに、今後の標準供給の重要性に応じた集中的な人材の投資を行うことを希望する。

⁵ ガイド34：「標準物質生産者の能力に関する一般要求事項」

⁶ ガイド35：「標準物質認証の指針」

⁷ 国際相互承認協定付属書C：国家計量機関の校正及び測定能力に関するデータベース

f. マネージメント体制の一貫性

本プロジェクトを通して NIMT の認定審査を受ける量目数は増加している。更に多くの量目について認定審査が効果的に行なわれるためには、品質管理システムを専属で担当する部署を設立し、各計量標準部の品質マニュアル（Department Quality Manual）と技術マニュアルの一貫性を確保することを勧める。特にラボ間の横断的な連絡体制を整え、共通的な品質管理や要求事項への対応体制を整える必要がある。

g. 施設

一部、既に装置が購入され、技術移転も終了しているにもかかわらず、これを収納する建屋が未完成のものがあつた。（標準ガス）タイ側での必要な措置を急ぐことを希望する。

h. 安全管理

高圧ガスボンベが支持無しで置かれているなど、安全管理への配慮に欠ける面がある。重大な事故を招く恐れがある事項であるので早急な改善を希望する。

i. 国内普及

NIMT は国内トレーサビリティ体系全体⁸について、二次校正機関⁹の能力向上にも貢献している。今後とも、認定機関との協力や、大手ユーザーへの直接校正等による、効率的な貢献の在り方についての検討を希望する。

j. 諸外国への普及

今後、本プロジェクトの成果を活用し、周辺の ASEAN 諸国への NIMT トレーサブルな計量標準の普及を図り、ASEAN 地域のハブ機関として活動することを期待する。

7.2 教訓

円借款により調達する機材を前提とした技術協力を同時並行的に実施する場合、機材調達に関するリスクを十分考慮した技術協力計画が必要である。

⁸ 測定器は標準器によって校正される。その標準器はより正確な（不確かさがより小さい）標準器によって校正される。この標準器もより正確な標準器によって校正される、というようにより正確な標準器をもとめていくと国家標準に辿り着く。このような体系をトレーサビリティ体系と言う。

⁹ 同一の量の一次標準と比較して値が決定された標準を保有する校正機関

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Minutes of Meeting (M/M)

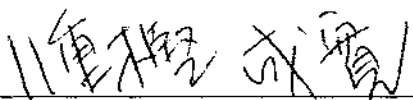
MINUTES OF MEETING
BETWEEN THE JAPANESE TERMINAL EVALUATION TEAM
AND
THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF THAILAND
ON
THE JAPANESE TECHNICAL COOPERATION FOR
THE PROJECT ON THE TECHNICAL STRENGTHENING OF
NATIONAL INSTITUTE OF METROLOGY (THAILAND) PHASE 2

The Japan International Cooperation Agency, together with National Institute of Metrology (Thailand), (hereinafter referred to as “the organizations concerned”) conducted the joint terminal evaluation for the Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase 2 from 16th October, 2004 to 15th October, 2007.

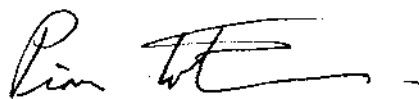
During this period, the organizations concerned had a series of discussions and exchanged views on the project, and jointly evaluated the achievements of the project.

As the result of the discussions, the organizations concerned agreed to record the matters in the documents attached hereto.

Bangkok, June 22, 2007



Mr. Narihiro Yaegashi
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Dr. Pian Totarong
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1 The Outline of the Terminal Evaluation Study

1.1 Background and the Purpose of the Study

The Project on technical strengthening of National Institute of Metrology Thailand (NIMT) (hereinafter referred to as the "Project") was designed for technology transfer with the equipment purchased by ODA loan of the Government of Japan.

In October 2002, the Japan International Cooperation Agency (JICA) started the JICA/NIMT Project (Phase 1) for technical strengthening of the NIMT, with the cooperation of the National Metrology Institute of Japan (NMIJ), National Institute of Advanced Industrial Science and Technology (AIST), and other Japanese metrology institutes. The Phase 2 of the Project was commenced in October 2004, and the total duration of cooperation is five years. The Project aims to provide technical transfer in 40 measurement standards in five years. The Project has already accomplished about 88% of the total technical transfer and 38% of the total accreditation review planned in the Project.

1.2 Objectives of the Evaluation Study

Before the completion of the Project, the Terminal Evaluation Study is conducted not only to evaluate the achievement in accordance with the five evaluation criteria, namely relevance, effectiveness, efficiency, impact, and sustainability, but also to assess the adequacy of termination and needs for the extension or follow-up of the project with considering above-mentioned results.

1.3 Members of the Evaluation Team

Table 1-1: Members of The Evaluation Team

<Japanese Side>

	Member's Name	Position
1	Mr. Narihiro YAEGASHI (Team Leader)	Deputy Resident Representative, JICA Regional Support Office for Asia
2	Mr. Yoji MATSUI	Deputy Director, Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry (METI)
3	Dr. Katsuo SETA	Chief Executive, International Accreditation Japan (IAJapan), National Institute of Technology and Evaluation (NITE)
4	Dr. Yoshio, HINO	Director, International Metrology Department, Metrology Standard Management Division, Advanced Industry Science and Technology (AIST)
5	Ms. Thanyatorn Singrueng	Researcher, Kokusai Kogyo (Thailand) Ltd. (Consultant)
6	Mr. Kazuya MARUO	Assistant Resident Representative, JICA Thailand Office

<Thai Side>

	Member's Name	Position
1	Dr. Pian Totarong	Director, National Institute of Metrology (Thailand), (NIMT)
2	Mr. Veera Tulasombat	Head of Mechanical Metrology Department, NIMT
3	Ms. Ajchara Charoensook	Head of Electrical Metrology Department, NIMT
4	Dr. Chainarong Cherdchu	Head of Chemical Metrology Department, NIMT
5	Mr. Arkom Krachangmol	Asst. Head of Photometry Metrology Department, NIMT
6	Mr. Virat Plangsangmas	Asst. Head of Acoustics & Vibration Metrology Department, NIMT
7	Ms. Nattanit Pongjeerakumchorn	Asst. Manager of Policy & Strategy Dept., Acting Int'l Relations Section Head, NIMT
8	Ms. Suthanone Fungtammasan	Programme Officer, Thailand International Development Cooperation Agency (TICA)
9	Ms. Sunee Suthianun	Programme Officer, TICA

1.4 Schedule of the Evaluation Study

Table 1-2: Schedule of the Evaluation Study

Date		Schedule		Remarks
6/11	Mon		Kick off meeting, Distribution of Questionnaire	Consultant
6/12	Tue		Interviews with TISTR, DSS	Consultant
6/13	Wed		Collection of Questionnaire, Compiling collected information	Consultant
6/14	Thu		Interviews with MOST	Consultant
6/15	Fri		Interviews with Private Sector	Consultant
6/16	Sat		Compiling and analyzing collected information	Consultant
6/17	Sun		Compiling and analyzing collected information	Consultant
6/18	Mon	AM	Meeting with JICA Thailand Office	Japanese members
		PM	Kick-off Meeting in NIMT Discussion (1): Presentation of the achievement and plan of the Project	All members
6/19	Tue	AM	Discussion (2): Confirming the Actual Results	Japanese team
		PM	Discussion (3): Confirming the Actual Results	All members
6/20	Wed	AM	Discussion (4): Confirming the Actual Results	Japanese team
		PM	Discussion (5): Confirming the Lessons Learned and Recommendations	All members
6/21	Thu	AM	Revision of the Joint Evaluation Report	Japanese team
		PM	Revision of the Joint Evaluation Report	T: Dr. Pian, Ms. Nattanit J: Mr. Maruo
6/22	Fri	AM	Preparation form JCC/ Discussion (7) (if necessary)	Japanese team
			8th JCC (Signing the Joint Evaluation Report)	All members
		PM	Report to EOJ	Japanese team

2 The Outline of the Project

2.1 Background of the Project

Thai industry has needed to produce goods of higher quality and improve their competitiveness for export promotion. In the 8th National Economic and Social Development Plan (1997-2001), the Government of Thailand expressed the necessity of development of the National Metrology System for enhancing the reliability of export goods of Thailand.

In August 1997, the Government enacted the National Metrology System Development Act to strengthen the international competitiveness of domestic industries. In accordance with this Act, the National Institute of Metrology, Thailand (NIMT), was established in June 1998 to commence the development of the National Measurement Standards in Thailand. The Cabinet approved the Master Plan on the National Metrology System Development in May 1999.

Responding to these efforts of the Thai Government, the Government of Japan decided to provide ODA Loans from 2000 (24th and 25th ODA Loans by JBIC) for the construction of the new NIMT building and the procurement of the necessary equipment.

The Government of Thailand requested the Government of Japan in 1999 to implement the Project for technical transfer, which is designed to strengthen the capability of NIMT to maintain and supply National Measurement Standards using equipment produced by the Japanese ODA Loans mentioned above.

2.2 Summary of the Project

The Project was planned for five years at the time of formulation. However, due to the delay in construction of a new building and procurement of machinery and equipment, the Project was divided into 2 phases. The Phase 1 was scheduled for 2 years and started in October 2002, after the Record of Discussion (R/D) was signed in September 2002. The Phase 2 started in October 2004, after the completion of the Phase 1. Throughout the Phases 1 and 2, the Project aims to provide technical transfer in 8 fields of measurement standard, in total of 40 quantities.

2.2.1 Narrative Summary of the Project

In order to contribute to the strengthening of the National Measurement System in Thailand, the Project aims to make NIMT capable of establishing and maintaining the National Measurement Standards with the internationally recognized level of accuracy through technical transfer to the staff of NIMT.

2.2.2 Project Period

From October 2004 to October 2007 (3 years)

2.2.3 Total Amount of Cooperation

330 million Japanese Yen



2.2.4 Counterpart Agency

National Institute of Metrology (Thailand) (also known as NIMT)

2.2.5 Japanese Supporting Bodies

- Measurement and Intellectual Infrastructure Division, Industrial Science Technology Policy and Environment Bureau, Ministry of Economy, Trade and Industry
- National Metrology Institute of Japan (NMIJ)
- Japan Quality Assurance Organization (JQA)
- Japan Electric Meters Inspection Corporation (JEMIC)
- National Institute of Technology and Evaluation (NITE)
- Chemicals Evaluation and Research Institute, Japan (CERI)

2.2.6 Beneficiaries of the Project

a. Direct Beneficiaries

NIMT and staff of NIMT

b. Indirect Beneficiaries

Calibration laboratories including the Thailand Institute of Scientific and Technological Research (TISTR) and the Department of Science Service (DSS), and domestic industries in Thailand (especially export industries and enterprises trying to acquire ISO9000s, ISO14000s).

3 Evaluation Process

3.1 Methodology of the Evaluation

The Project Cycle Management (PCM) method was applied to the evaluation. The five evaluation criteria are part of the basic evaluation method set by the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD) to evaluate the project achievements. All of the JICA projects are presently evaluated by this evaluation method. The five criteria as described in Table 3-1 are applied in the evaluation grid and consequently the questionnaire. The Evaluation Grid was produced to compare the outcomes of the Project with its design.

Table 3-1: Five Evaluation Criteria

Relevance	Relevance of the project plan is reviewed based on the validity of the project purpose and the overall goal in connection with the development policy of the Government of Thailand and the needs of the beneficiaries and also the logicity of the plan.
Effectiveness	Effectiveness is assessed by evaluating to what extent the project has achieved its purpose and clarifying the relationships between purpose and outputs
Efficiency	Efficiency of the project implementation was analyzed with emphasis on the relationship between outputs and inputs in terms of timing, quality and quantity.
Impact	Impact of the project was assessed by measuring either positive or negative influences generated by the project, which were not originally expected in the project plan.
Sustainability	Sustainability of the project was assessed from organizational, technical and financial aspects based on the extent to which the achievements of the project were sustained or expanded after the project was terminated.

3.2 Method of the Study

The objectives of this evaluation study mentioned in the previous chapter were examined mainly by literature review, questionnaire survey, interview survey, and field visit.

3.2.1 Literature Review

The study team initially started its survey with the collection of materials related to the project. The literature review covered not only existing reports and documents prepared in the project, but also other related materials from various information sources such as concerned parties and websites.

3.2.2 Questionnaire Survey

After confirming those through the collected materials, the study team went on to the works for the preparation of the evaluation grid and the questionnaire distributed to twelve NIMT staff who participated in the trainings in Japan. The evaluation grid was formulated focusing especially on the five evaluation criteria described above.

3.2.3 Interview Survey

The interviewees were selected principally from both direct and indirect beneficiaries of the Project which are NIMT, MOST, DSS, and TISTR. The purpose of interviews was to evaluate the achievement or underachievement of the Project. Moreover, the interviews were intended to explore the potential impacts and sustainability that contributed to the Thai society.

3.3 Limitation and Restrictions of the Study

The plan of operation was formulated in collaborating with the building construction and the procurement of machineries and equipments by Japanese loan scheme. It is essential for the Project if the nature of the Project is carefully considered. In fact it is included in the Project Design Matrix (PDM) as the precondition, which is accounted for an uncontrollable factor from the Project.



4 Achievement of the Project

4.1 Inputs

4.1.1 Inputs from Japanese Side

The inputs from the Japanese side are summarized in the following sections.

a. Dispatch of Long Term Japanese Experts

Five Long Term Japanese Experts shown in the Table 3-1 were dispatched to Thailand during the time of Project implementation.

Table 4-1: Summary of Long Term Japanese Experts Dispatch

Measurement Standard	Duration	Name of Long-term Expert
1. Chief Advisor	Oct. 16, 2002 – Oct. 15, 2007	Dr. Yoshiaki Akimoto
2. Coordinator	Oct. 16, 2002 – Oct. 15, 2007	Ms. Ikuko Niizeki
3. Physical Standards	Oct. 16, 2002 – Oct. 15, 2006	Mr. Jiro Matsuda
4. Electromagnetic Standards	Oct. 16, 2004 – Dec. 30, 2006	Dr. Joji Kinoshita
5. Chemical Standards	Oct. 16, 2004 – Dec. 30, 2006	Dr. Akira Nomura

b. Dispatch of Short Term Japanese Experts

Since the commencement of Phase 2 up to May 2007, 30 Short Term Japanese Experts were dispatched to Thailand during the respective project periods. In this number, 2 of them were supported by NMIJ and 1 from IAJapan. The dispatch has been delayed in 5 quantities explicitly Line Scale, Pressure, Fixed Point, Group Resistance, and QHR due to the delay of machinery and equipment procured by Japanese ODA loan.

However, the dispatch of short-term experts is confirmed in 3 quantities (Line Scale, Pressure, and Fixed Point), while the other 2 quantities (Group Resistance, and QHR) have not been confirmed yet. In short, the expectation of short-term experts dispatch is 36 including one more expert in Calibration Procedure by the time of the termination of the Project.

c. Counterpart Training in Japan

A series of trainings regarding to the content of technical transfer¹ were conducted in Japan during the project period. Since the commencement of Phase 2, the total number of C/Ps has been trained in Japan is 16 persons. The dispatch of 11 C/Ps was programmed in the schedule of technical transfer while the dispatch of 5 C/Ps was requested by NIMT. Those additional requested quantities are Environment Management Technology, Mass, Watt Hour, AC Voltage and Density.

¹ In this Project, the technical transfer consists of 3 types of activities namely 1) C/P training in Japan, 2) self-learning by C/P after the training in Japan, and 3) follow-up training by the short term experts. Although there are some exceptions, the technical transfer of each quantity is done through implementation of these 3 activities respectively.

d. Machinery and Equipment procured by ODA Loan

By the end of May 2007, the procurement of 387 machinery and equipment procured by ODA Loan are completed. There are 7 items have not been delivered yet. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for rest is in July 2007.

e. Supporting local cost

The supporting local cost by JICA from the commencement of Phase 2 up to the time of Terminal Evaluation is 7,036,898 THB as shown in detail in Table 4-2.

Table 4-2: Supporting Local Cost by JICA

JFY	2004	2005	2006	2007
1 st quarter		202,000	1,266,200	1,583,090
2 nd quarter		2,093,000	298,520	
3 rd quarter	366,000	0	489,930	
4 th quarter	420,000	121,958	196,200	
Total	786,000	2,416,958	2,250,850	1,583,090

Unit: THB

4.1.2 Inputs from Thai Side

The inputs from the Thai side since the commencement of the project are summarized in the following sections.

a. Building, facilities and space for the Project

The construction of the new building of NIMT by a Japanese ODA Loan was completed, and NIMT was already relocated to the new building except the Laboratory of Acoustics and Vibration which keep the station base in the DSS. The office space for the Project team was provided in the new building. In overall, the reconstruction and renovation of all laboratories are completed except the Standard Gas which has been constructed in the administrative building and now is under renovation.

b. C/P and administrative personnel

NIMT has allocated 1 administrative C/P, which is the director of NIMT, and 36 technical C/Ps responsible for every target quantity of the technical transfer in the Phase 2. Moreover, one more administrative C/P from International Relations Section has allocated to support for the communication and administration of the Project.

c. Maintenance of machinery and equipment

All machinery and equipment have been provided by Thai side as planned and operated properly.

d. Necessary budget for the implementation of the project

The necessary budget for the implementation of the Project came from 2 sources - NIMT and TICA. The total amount of budget is summarized as shown in Table 4-3.

Table 4-3: Necessary Budget for the Implementation of the Project

Unit: THB

Thai FY	2005	2006	2007
NIMT	519,600	519,600	519,600
TICA	805,170	930,405	715,038

4.2 Outputs

4.2.1 Output 1: The operation and administration of the project are enhanced

<p>Indicator 1: Staff and budget are allocated to the project</p> <ul style="list-style-type: none"> • The allocation of the C/P and staff for the Project was implemented as planned. • The long-term Japanese experts were also dispatched as planned while some short-term Japanese experts have not been dispatched yet due to the delay of machinery and equipment procured by ODA loan. • Regarding to the budget for the Project operation and administration, it was also allocated as shown in Table 4-2 and Table 4-3.
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Based on the confirmation of input status quantitatively and qualitatively from both Japanese and Thai sides, the input contributed enough to realize Output 1.

4.2.2 Output 2: The equipment is operated and maintained properly

<p>Indicator 1: National Measurement Standards are installed and established in the 40 quantities of the project.</p> <ul style="list-style-type: none"> • The Project was planned to finish the technical transfer in 42 quantities. However, the technical transfer has been completed in 37 quantities by the end of May 2007. • The current condition of the technical transfer shows the delay from P/O. • This was caused clearly by the delay of the procurement of machineries and equipments. Nonetheless, it was planned to completed technical transfer in other 5 quantities by the time of the completion of the Project since the schedule of deliverance of the rest machinery and equipment has been confirmed. • Consequently, it can expected that the National Measurement Standard will be installed and established successfully as planned
<p>Indicator 2: Registration of maintenance record and calibration record of equipment.</p> <ul style="list-style-type: none"> • After the installation and establishment of the national measurement standard, the registration of maintenance and calibration records of the equipment has been done. In the mean time, the operation and maintenance of those equipments are conducted through the technical transfer during the training period of the project.
<p>Indicator 3: Manuals of operation and maintenance management are provided and organized for reference.</p> <ul style="list-style-type: none"> • It was confirmed that the manuals of operation and maintenance management of existing machinery and equipment of the Project are provided and organized properly.

The degree of the realization of output 2 has been improved continuously as each program of the technical transfer was completed.

All technical transfer will be completed by the end of the Project and on a parallel with this the degree of output 2 is expected to reach the adequate level as planned.

4.2.3 Output 3: The technical capability of C/P is upgraded

Indicator 1: Technical Cooperation Program is created.
<ul style="list-style-type: none"> • NIMT has the technical cooperation program prepared at the beginning of the Project.
Indicator 2: C/Ps are appropriately assigned.
<ul style="list-style-type: none"> • Refer to Indicator 1 of Output 1
Indicator 3: Improvement in the uncertainty.
<ul style="list-style-type: none"> • The improvement in the uncertainty has been defined in the Uncertainty Budget Sheet which will be prepared after the accreditation process was done. • According to the result of technical transfer, it was confirmed that the budget of uncertainty has been improved in 14 quantities while 6 quantities was planned to be improved by the time of the termination of the Project.
Indicator 4: Point of the "Skill after training"
<ul style="list-style-type: none"> • Referring to the Point of the "Skill after training" in the Evaluation Sheet on Technical Transfer which has several criteria of the assessment on each quantity - installation, operation, calibration technology, calibration procedure, accreditation, etc., the result of assessment was demonstrated by the improvement of skill before and after training. • Since the evaluation of the "skill after training" was conducted in 30 quantities, the result defined that the point of the skill after training of all C/Ps has been increased. • It can predict that the tendency of the result of the improvement of C/Ps skill will be increased in other quantities as well.
Indicator 5: Number of seminars and joint training.
<ul style="list-style-type: none"> • The improvement of C/Ps technical capability can be indicated by the seminars arrangement in order to disseminate their knowledge to others. • According to the record of seminars, the number of seminars that were supported by the Project and implemented from February 2003 up to April 2007 is 33 times covering in 32 quantities. Among this number, 7 seminars was conducted as ASEAN seminar. Furthermore, The ASEAN seminars that covered several of quantities in were also implemented 4 times excluding 7 times mentioned above. • Moreover, there are many seminars were conducted by NIMT itself in every year as a trainer for trainee program since 2003 to 2007. • In terms of Joint Training, by the time of this Terminal Evaluation, NIMT has already conducted 3 times of Joint Training on Measurement Standards in Thailand. Participants came from ASEAN countries and other Asia-Pacific Developing countries. • According to the information from the questionnaire and interview survey, recently there is no system for regular internal training implementing in NIMT since the course is organized by case.

NIMT has been implementing technical upgrading activities by following the technical cooperation program prepared at the beginning of the Project, which enhances Output 3 realized with the great significance.

Assessing all facts and findings described above, it could be concluded that Output 3 has been realized properly.

4.2.4 Output 4: Accuracy of national measurement standards is improved.

Indicator 1: Improvement in
Indicator 2: Registration of environmental data for every laboratory
<ul style="list-style-type: none"> The Project was planned to finish the technical transfer in 42 quantities, and 37 quantities of the total 42 quantities have been completed by the end of May, 2007. The number of accreditation obtained during the Project reaches 14 quantities, which application procedure requires the preparation of uncertainty budget sheet and the registration of environmental data with internationally recognized standards.
Indicator 3: Number of international comparison implemented
<ul style="list-style-type: none"> Moreover, 23 comparisons in 12 different quantities have been implemented in the focus of accuracy improvement.

These facts and findings above contribute comprehensively to the improvement of National Measurement Standards by realizing Output 4 with high significance.

4.2.5 Output 5: NIMT disseminates national measurement standard properly.

Indicator 1: Improvement in calibration technology for reference standards
<ul style="list-style-type: none"> The traceability chart is prepared for all quantities at the time of the project formulation period in order to indicate the level of accuracy of the calibration technology that NIMT would be able to provide by using the machinery described in the chart. Consequently, the procurement plan of machinery and equipment was prepared based on these charts. For that reason, it can be said that there are 41 traceability charts for each quantity available in order to improve the calibration technology for reference standards of NIMT as planned.
Indicator 2: Number of calibration procedures created
<ul style="list-style-type: none"> The calibration procedure has been provided in 37 quantities while 17 quantities are in the process. As the result of the procurement of machinery and equipment has been delayed which affected to the schedule of technical transfer so the calibration procedure for 17 quantities has not yet been prepared.
Indicator 3: Items pointed by evaluation of quality system and the way to solve the items
<ul style="list-style-type: none"> The quality system is assessed by the accreditation process. As the result of assessment of the accreditation, items which were not adequate or did not meet the requirement are pointed out. By the end of May 2007, the Project has been applied and got assessed for the accreditation in 14 quantities and it has plan to apply further more in 6 quantities by the time of the termination of the Project.

National measurement network necessary for the proper dissemination of National Measurement Standards has been considerably expanding by the improvement of the traceability in Thailand. In this regard the realization of output 5 is high.

In order to achieve the higher realization of output 5, the attainment of accreditation in other quantities is essential.

4.3 Project Purpose

Based on the result of the detail assessment, it was confirmed that the adequate generation of outputs contributed to the achievement of the project purpose to a certain extent. There, however, were hindering factors influencing negatively on the level of its achievement.

4.4 Overall Goal

Potential impact derived from the Project reaches its extent widely from higher hierarchy of the National Measurement System to industrial communities in Thailand. Besides, the demand of NIMT as the primary calibration laboratory increases its significance since the international competitiveness of industrial products becomes severe.

It could be a reasonable assessment by the result of interview survey that the dissemination of the Project outcomes and the international recognition of NIMT will contribute to the further achievement of overall goal.



5 Evaluation Based on Five Criteria

5.1 Results of Evaluation Based on Five Criteria

The results of the analysis based on five evaluation criteria are described in the following sections.

5.1.1 Relevance

a. Facts and Findings

Focal Points	Results
Thai National Policy	<ul style="list-style-type: none"> In the 10th National Economic and Social Development Plan (2007-2011), there is no changed in the direction in the importance of metrology that described the significant of the metrology system development in Thai industry. It is confirmed that the overall goal of the Project still coincide with the Thai national policies. The result of questionnaire survey also illustrates high expectation of Thailand to maintain competitively in the global market and participation in the international economic agreements.
NIMT Policy	<ul style="list-style-type: none"> The National Metrological System Development Act defines NIMT as the key institute to develop metrology system, procure and maintain national standards and standard reference materials of the country for all fields of measurement in accordance with the international metrology system. The duty of NIMT shall include the supporting enhancement of efficiency of study and development of metrology technology to ensure the effectiveness of the metrology system of the country as reliable and acceptable to the international metrology system.
Japanese ODA Policy and JICA Country Program	<ul style="list-style-type: none"> The Japanese government states in its basic policies of ODA charter that supporting self-help effort of developing countries, which includes economic and social infrastructure building constituting the basis for these countries' development, is one of the most important philosophies. Besides, it also defines the target area as ASEAN countries. According to the country approach for Thailand in ODA charter, the technical cooperation is stipulated of the mean of approach for both bilateral and multilateral cooperation around the region. Private sector development is one of the key issues in JICA countries approach for Thailand, particularly the enhancement of science and technology.
Relevance of Selection of NIMT	<ul style="list-style-type: none"> The National Metrological System Development Act defines NIMT as the key institute to develop National Measurement Systems in Thailand. According to the National Metrological System Development Act, NIMT is only one institute.
Technical Advantage of Japan	<ul style="list-style-type: none"> The National Metrology Institute of Japan is established in 1903 while NIMT is established in 1998. It is indicated that Japan has far experiences in this field than Thailand almost 100 years.

b. Conclusion

The relevance of the Project is assessed still high based on the consistency of Thai and Japanese policies and the demands from target groups.

5.1.2 Effectiveness

a. Facts and Findings

Focal Points	Results
Degree of Achievement of Project Purpose	<ul style="list-style-type: none"> • The technical transfer was planned to be achieved in 42 quantities in 8 fields. In fact, it has been completed in 37 quantities up to the end of May 2007. The main obstacle that hinders the completion of the process is the delay in machinery and equipment procurement. (Indicator 1; Project Purpose) • The Project team has conducted the internal survey to verify the NIMT's activities (Indicator 1; Project Purpose). • It was planned to completed technical transfer in other 5 quantities by the time of the termination of the Project since the schedule of deliverance of the rest of machinery and equipment has been confirmed already. (Indicator 2; Project Purpose) • Consequently, it can be expected that the National Measurement Standard will be installed and established as planned but the process of accreditation ensuring the internationally recognized level of accuracy has not yet be completed by the time of the termination of the Project. (Indicator 2; Project Purpose) • In order to achieve the attainment of accreditation, the budget of uncertainty should be prepared. For time being it was completed in 14 quantities. (Indicator 2; Project Purpose) • The number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project. (Indicator 3; Project Purpose)

Focal Points	Results
<p>Assessment of Relation between Outputs and Project Purpose</p>	<ul style="list-style-type: none"> • There is no changed in C/P employment plan during the time of Project evaluation. (Important Assumption a; Project Purpose) • Referring to the result of input analysis, there is no significant change in the budget allocation and policy during the Project. (Important Assumption a- Project Purpose) • Referring to the result of input analysis; there is no significant change in the budget allocation and policy during the Project. (Important Assumption b; Project Purpose) • It was also confirmed with the Permanent Secretary of Ministry of Science and Technology that there is no negative change, respectively. (Important Assumption c- Project Purpose) • Referring to the result of input analysis, the procurement and installation of 10 machineries have not yet been completed. The tentative schedule of the deliverance of 4 items is the end of June 2007 while the rest is July 2007. (Important Assumption d- Project Purpose & Preconditions of the Project) • All NIMT staffs trained by the Project have been working in NIMT at the time of Terminal Evaluation. (Important Assumption e- Project Purpose) • The project made their enormous efforts to catch up the progress by making their training schedule flexible and dispatch additional 5 persons to be trained in Japan as requested by NIMT. (Positive influence) • The monitoring system was set up to evaluate the progress of the Project continually. (Positive Influence) • A series of meetings was conducted every month since the beginning of the Project. Additionally, the JCC meeting is also conducted twice a year in order to maintain the mutual understanding between Japanese side and Thai side. (Positive Influence) • From the filed survey, long term experts have been providing Japanese Language Course for NIMT staffs, which supports the better communication between Japanese experts and Thai C/Ps. (Positive Influence)

b. Conclusion

The result of assessment on Outputs indicates that the degree of realization of Outputs is considerably high. Besides, the relevance of the important assumptions is confirmed as effective as before.

The project purpose has been generally achieved due to the adequate outputs generated by the inputs planned in the Project and enormous efforts from Japanese and Thai sides.

It, however, is notable that unfortunately the delay of new building construction and procurement of equipments worked as a hindering factor to lower the achievement of the project purpose to a certain extent. This factor has been identified as a precondition of the Project, which is known as uncontrollable by the Project according to the evaluation methodology.

5.1.3 Efficiency

a. Facts and Findings

Focal Points	Results
Degree of Achievement of Inputs	<ul style="list-style-type: none"> • Referring to the result of input analysis, the allocation of short term experts has been delayed in 5 quantities due to the delay of machinery and equipment procured by ODA loan. (Indicator 1-1; Outputs) • Nonetheless, for time being 36 short terms experts were dispatched and it is considered that the allocation is appropriate in terms of number and timing. (Indicator 1-1; Outputs) • The allocation of Thai C/Ps is considered appropriate in both administrative and technical staff. (Indicator 1-1; Outputs) • According to the result of the budget analysis for the implementation of the Project, it is confirmed that the budget was allocated as planned. (Indicator 1-1; Outputs) <hr/> <ul style="list-style-type: none"> • By the end of May 2007, the installation of 384 machinery and equipment procured by ODA loan are completed. (Indicator 2-1-1; Outputs) • There are 10 items have not been delivered yet. Anyhow, the tentative schedule of the deliverance has been confirmed. Consequently, the rest items will be delivered within July 2007. (Indicator 2-1-1; Outputs) • It is confirmed that all procured equipments are utilized effectively since these equipments are the important component for their performance. (Indicator 2-1-1; Outputs) <hr/> <ul style="list-style-type: none"> • Technical cooperation program has been prepared and components are implemented by the Project (Indicator 3-1; Outputs) • Allocation of C/P has been properly done. (Indicator 3-2; Outputs) • Budget sheet of uncertainty has been prepared increasingly as accreditation in quantities was attained. (Indicator 3-3; Outputs) • Evaluation sheet of technical transfer was prepared by the Project (Indicator 3-4; Outputs) • Regarding to the information from the questionnaire and interview survey, there is no particular system for internal training in NIMT. The course is organized irregularly. (Indicator 3-5; Outputs) <hr/> <ul style="list-style-type: none"> • Based on the fact that the process of technical transfer and accreditation have not yet been completed in all quantities; it is fair to say that the establishment and maintain of measurement standards have not yet achieved as planned. (Indicator 4-1; Outputs) • The environmental management system will be established after the completion of accreditation process. (Indicator 4-2; Outputs) • The accreditation process has been completed in 14 quantities. This means the environmental management of some laboratories has been improved. (Indicator 4-2; Outputs) • At the time of the terminal evaluation, it was confirmed that it has participated in 23 international comparisons as to 12 different quantities, which increased 8 comparisons in 2 quantities from the time of Mid-term evaluation. (Indicator 4-3; Outputs) <hr/> <ul style="list-style-type: none"> • The improvement of calibration technology is referred to the traceability chart of NIMT. It is confirmed that this chart is available in all quantities of technical transfer which automatically lead to the improvement of calibration technology. (Indicator 5-1, 5-2, 5-3; Outputs)

Focal Points	Results
Assessment of Relation between Inputs and Outputs	<ul style="list-style-type: none"> • Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation. (<u>Important Assumption; Outputs</u>) • The countermeasure to prevent the resignation of skillful NIMT staff trained by the Project could secure the adequate generation of outputs comprehensively. (<u>Positive Influence & Important Assumption; Outputs</u>) • The delay of the procurement of machinery and equipment might have hindered the achievement of Project outputs. (<u>Negative Influence; Precondition</u>)
Degree of Achievement of Outputs	<ul style="list-style-type: none"> • The result of output analysis, the enhancement of the operation and administration of the Project is satisfactory. (<u>Output 1</u>) • According to the result of questionnaire survey, the most of answers from respondents indicates more than fairly. (<u>Output 1</u>) • The result of output analysis, all equipment are operated and maintained properly. (<u>Output 2</u>) • According to the result of questionnaire survey, most of respondents rate very much and much. (<u>Output 2</u>) • The technical capability of C/P is assessed with the satisfactory level. (<u>Output 3</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 3</u>) • The accuracy of measurement standards is obviously improved in some quantities which accreditation processes have been completed. (<u>Output 4</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 4</u>) • The dissemination of national measurement standards has been conducted properly in some quantities which accreditation processes have been completed. (<u>Output 5</u>) • According to the result of questionnaire survey, the answer from most respondents is very much or much. (<u>Output 5</u>)

b. Conclusion

The timing of various inputs can be evaluated highly adequate due to its flexibility in accordance with the schedule of procurement. Moreover, the management of the Project has been remarkably well done under the collaboration of Japanese loan scheme.

However, most of expected outputs could be generated with the appropriate practice of equipments and machineries. So far, the delay of procurement influenced slightly negatively on the generation of outputs also in this aspect.

Under such a difficult situation the generation of outputs has been achieved with the certain level of satisfactory. This can prove that the efficiency of the Project is high.

5.1.4 Impact

a. Facts and Findings

Focal Points	Results
Degree of Achievement of Overall Goal	<ul style="list-style-type: none"> • NIMT has already participated in the Global MRA and quantities are increasingly listed in Appendix B and C of the Global MRA. However new registration to appendix C for transferred quantities have not been finalized yet. (Indicator 1-1, 1-2; Overall Goal) • The number of calibration laboratories that available on NIMT's website by the time of the evaluation is 78. (Indicator 2-1; Overall Goal) • The traceability charts for quantities shall describe the measurement network in Thailand and have been established increasingly as their accreditation was obtained. • The National Measurement Network with NIMT as its top has already encompassed more than 130 laboratories in its network according to the interview result from a director of NIMT. (Indicator 2-2; Overall Goal)
Assessment of Relation between Project purpose and Overall goal	<ul style="list-style-type: none"> • The National Metrological System Development Act stipulates NIMT to play their roles and responsibilities as the institute to develop metrology system, procure and maintain national standards and still effective (Important Assumption; Overall Goal) • This important assumption is assessed as applicable as before. (Important Assumption; Overall Goal)
Assessment of Unexpected Factors	<ul style="list-style-type: none"> • No particular unexpected factor has been identified through the evaluation.
Assessment of Ripple Effect from the Project	<ul style="list-style-type: none"> • NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training as well. The recognition of NIMT in the ASEAN region has been growing gradually since the Project started.

b. Conclusion

Indicators verifying the achievement of the project overall goal have emerged in some fields according to the result of the evaluation survey of document review, interview, etc. However, it may be reasonable that the level of this achievement is assessed under the satisfactory level because of the degree of the achievement of the project purpose.

The current status of the impact could be considered quite positive and makes us expect the real achievement of overall goal in future if the project purpose is achieved with much higher level of satisfaction. This could imply directly the attainment of accreditation as in many quantities would promise the achievement of the project purpose and consequently project overall goal.

5.1.5 Sustainability

a. Facts and Findings

Focal Points	Results
Technical Aspect	<ul style="list-style-type: none"> • After the process of technical transfer and accreditation process were completed, NIMT staffs were given the opportunity to share their knowledge and experience with others staffs by assessing the record of seminars conducted by the Project. (<u>Indicator 3-5; Outputs</u>) • Most of respondents in the questionnaire survey evaluated that the technology of equipments and knowledge transferred thought the Project were appropriate. (<u>Positive Factor of Sustainability</u>) • The technical and maintenance manuals have been prepared in the Project. (<u>Positive Factor of Sustainability</u>) • It was confirmed by the field observation that those manuals are utilized very much because of the guidance of accreditation. (<u>Positive Factor of Sustainability</u>)
Organizational Aspect	<ul style="list-style-type: none"> • Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation. (<u>Important Assumption; Outputs</u>) • Given that NIMT was established in accordance with the National Metrology System Development Act, and it has become more important as a core body of national measurement standard development of Thailand. (<u>Assessment of Effectiveness and Efficiency</u>) • According to the result of the interview survey, some it was revealed that the Quality System plays an important part to promote the competitiveness of Thai industry toward the international trading. NIMT is expected as a core organization to strengthen the national measurement system with the recognition of the international level. (<u>Interview Survey</u>)
Political Aspect	<ul style="list-style-type: none"> • The 10th national Economic and Social Development Plan described the importance of enhancing the competitiveness of Thai industry to the global market. In term of the international trading, the Quality System is required to build up consumers' confidence in the products. As a result, the measurement standard activity becomes a part of the system to ensure the quality of the products. (<u>Assessment of Relevance</u>) • Considering the roles and responsibilities of NIMT, the National Metrology System Development Act is still effective to encourage the activity of NIMT to play its role as the primary measurement standard organization and contribute to the firmly establishment of traceability system in Thailand ultimately. (<u>Assessment of Relevance</u>)
Financial Aspect	<ul style="list-style-type: none"> • Considering the annual government budget allocated to NIMT from 2004-2006, the trend is predicted as increasing. (<u>Input Analysis</u>)

b. Conclusion

Assessing comprehensively the facts and findings above, it could be concluded that the sustainability of the Project depends primarily on the firm establishment of National Measurement System with NIMT as its top organization and technical advantage of NIMT in this system under the corresponding of the current political support.

Once the improvement of mentioned aspects above reaches the certain level, the financial stability of NIMT would be promised because NIMT becomes indispensable among the system.

In order to confirm the sustainability of the Project, the accreditation should be attained by all means since it assures the accuracy of calibration and the traceability of quantities in the system.



6 Conclusion

Technical transfer of all quantities will be completed by the end of the Project, although the construction of new NIMT building and procurement of equipment were delayed in Japanese ODA loan. However, some accreditation assessment will not be accomplished within the Project term due to the above-mentioned delay.

It is assessed based on the actual result that most of quantities targeted in the Project can be accredited within one year after the termination of the Project. To achieve the initial Project purpose, the term of Project shall be extended by October, 2008.



7 Recommendation and Lesson Learned

7.1 Recommendation

1. Extension of project term

In this project, the technical transfer part is almost completed, however only 14 quantities of a total of 37 quantities for accreditation assessment have accomplished at present, due to the delay of construction of new NIMT building and procurement of equipment by Japanese ODA loan. To firmly establish the result of this technical transfer in the form of accreditation in gaining international approval, and considering the request of the Project extension from NIMT, one year extension of the Project term would be appropriate, because most of quantity can be accredited during the extension periods.

2. Chemical standard

Regarding items of measurement standard for GUIDE 34² in chemistry, it is rather difficult to obtain accreditation within one year extension periods. Therefore, to establish the quality system for gaining accreditation in the extension periods is preferable. To achieve this goal, it is needed for engineers in NIMT to participate in the training course on GUIDE 34 and GUIDE 35³.

3. CIPM-MRA appendix C

NIMT should accelerate to register the transferred quantities on Appendix C of CIPM-MRA to be recognized internationally for the improvement of technical competence.

4. Sustainable human resource development

Comparing the evaluation of C/P between just after finishing technical transfer and some months later, the skill development and self motivation were found. Therefore the foundation of their self-sustaining human resource development was built. We hope that this continuous motivation is maintained in the future.

5. Human resource

The effort by minimum number of staff is definitely deserved, however to secure maintenance and dissemination of measurement standard, it is preferable to ensure the necessary number of engineers and to intensive staff deployment in accordance with the future importance of measurement standard.

6. Consistency and conformance in management system

Through the Project, NIMT has increasing number of quantities getting assessed for the accreditation. In order to implement the accreditation in many quantities effectively, it is highly recommendable to set up a section which deals with the quality system as its specialty and secures the consistency and conformance of DQM (Department Quality Manual) and technical manual. It is important to establish a cross-sectional communication system

² General Requirements for the competence of reference material producers

³ Certification of reference materials – General and statistical principle

between the each department, and prepare a system to deal with management system and required items which are in common among the departments.

7. Facility

In case of standard gas, although the installation of equipment and technical transfer was completed, the storage facility is unfinished. It is preferable to implement required measures as soon as possible.

8. Safety control

The lack of safety control, such as untied high pressured gas tanks, was observed. It is highly recommended to avoid this pre-accident situation immediately.

9. Domestic dissemination

The NIMT contributes to secondary calibration organizations in domestic traceability system. It is preferable to review the modalities of efficient contribution on the cooperation with accreditation body and calibration service to major users.

10. International dissemination

In the future, it is expected that NIMT can promote NIMT-traceable measurement standard and become hub-organization in the ASEAN countries by utilizing the result of the Project.

7.2 Lessons Learned

Regarding the project collaborated with Japanese ODA loan, the possibility of the schedule delay (ex. The procurement of equipment is not proceed smoothly) shall be taken into the consideration in the planning stage of the Project.

List of Abbreviation

AIST	National Institute of Advance Industrial Science and Technology
C/P	Counterpart
CERI	Chemicals Evaluation and Research Institute, Japan
DAC	Development Assistance Committee
DQM	Department of Quality Manual
DSS	Department of Science Service
EOJ	Embassy of Japan
IAJapan	International Accreditation Japan
JBIC	Japan Bank for International Cooperation
JCC	Joint Coordinating Committee
JEMIC	Japan Electric Meters Inspection Corporation
JICA	Japan International Cooperation Agency
JQA	Japan Quality Assurance Organization
METI	Ministry of Economy, Trade and Industry
MOST	Ministry of Science Technology
NIMT	National Institute of Metrology (Thailand)
NITE	National Institute of Technology and Evaluation
NMIJ	National Metrology Institute of Japan
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
P/O	Plan of Operation
PCM	Project cycle Management
PDM	Project Design Matrix
QHR	Quantum Hall Resistance
R/D	Record of Discussion
TICA	Thailand International Development Cooperation Agency
TISTR	Thai Institute of Science and Technological Research

Annex 1: Project Design Matrix (PDM)

Annex 1: PDM (after the revision)

Project Design Matrix (PDM)

Project on Technical Strengthening of National Institute of Metrology (Thailand) Phase II

Target group:

- Calibration Services Agencies such as TISTR and DSS
 - Domestic Industries in Thailand (especially export industries and enterprises trying to acquire ISO9000s, ISO14000s)
(According to the data of TISI in Ministry of Industry, 1,212 factories acquired ISO9000s, as of August 1999, and 4,736 factories acquired ISO9000s, as of September 2006)
- Project Period: October 16, 2004 - October 15, 2007

Narrative Summary	Verifiable Indicators	Means of Verifications	Important Assumptions
Overall Goal To Strengthen the national measurement system in Thailand	1 NIMT actively participates in the Global MRA. 2 The traceability system of Thailand is firmly established.	1-1 Survey and verify NIMT's activities 1-2 List in Appendix B and C of Global MRA 2-1 Calibration laboratories list of NIMT 2-2 The charts of measurement network in Thailand	a There is no drastic change in political and economic situation in Thailand. b The policy in Thai Government on the role or assignment of NIMT and reference standard calibration services agencies remain unchanged.
Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accuracy	1 The technical ability of counterparts in 8 fields of measurement standards(*) in NIMT is strengthened. 2 Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 3-2 The accuracy of calibration services is enhanced. 3-3 The range of calibration services is widened.	1 Survey and verify NIMT's activities 2 Uncertainty budget sheet 3-1 Price List of calibration service 3-2 Price List of calibration service 3-3 Price List of calibration service	a There is no change in the role of NIMT as the institute for maintaining national measurement standard.
Outputs 1 The operation and administration of the Project are enhanced. 2 The equipment is operated and maintained properly. 3 The technical capability of C/P is upgraded. 4 Accuracy of national measurement standards is improved. 5 NIMT disseminates national measurement standards properly.	1-1 Staff and budget are allocated to the Project. 2-1 National Measurement Standards are installed and established in the 40 quantities of the Project. 2-2 Registration of maintenance record and calibration record of equipment. 2-3 Manuals of operation and maintenance management are provided and organized for reference. 3-1 Technical Cooperation Program is created. 3-2 Counterparts are appropriately assigned. 3-3 Improvement in the uncertainty. 3-4 Point of the "Skill after training". 3-5 Number of Seminars and Joint training. 4-1 Improvement in uncertainty. 4-2 Registration of environmental data for every laboratory. 4-3 Number of International Comparison implemented. 5-1 Improvement in calibration technology for reference standards. 5-2 Number of Calibration procedures created. 5-3 Items pointed by evaluation of Quality System and the way to solve the Items.	1-1 Staff allocated list, budget, organization chart. 2-1-1 Equipment inventory. 2-1-2 Equipment manuals and their list. 2-2 Maintenance records or calibration record of equipment. 2-3 Operation manual and maintenance management manual. 3-1 Technical Cooperation Program sheet. 3-2 Allocation list of counterparts by field. 3-3 Budget sheet on uncertainty. 3-4 Evaluation sheet of technical transfer. 3-5 Records of seminar and in-house technical presentation. 4-1 Records of the accuracy of national measurement standards. 4-2 File of environmental management sheet for every laboratory. 4-3 Record of implementing International-comparison. 5-1-1 Traceability charts of NIMT. 5-1-2 Calibration certificate. 5-2-1 Calibration procedure and their list. 5-3 List of the Items pointed by evaluation and the list of the way to solve them.	a There is no change in C/P employment plan which has had influence on the Project. b There is no change in budget allocation and policy which has had influence on the Project. c There is no change in organization which influence directly to the Project. d Procurement, installation and setting up of all machineries are properly completed. e NIMT takes preventive measures against resign of counterparts trained in the Project.
Activities	Inputs <Japanese side>	<Thai side>	NIMT takes prevent measure against resign of counterparts trained in the Project.
1-1 To allocate necessary personnel as planned. 1-2 To make budget plan and execute properly. 1-3 To make action plan and implement as planned. 2-1 To install and commit equipment properly (mainly procured by ODA Loan). 2-2 To operate and maintain equipment. 2-3 To make manuals of operation and maintenance management. 3-1 To make Technical Cooperation Program. 3-2 To assess existing level of basic technical capability of counterpart personnel. 3-3 To evaluate technical capability of counterpart after technical transfer. 4-1 To establish and maintain measurement standards. 4-2 To improve environmental management technology of calibration laboratories. 4-3 To implement International-comparison. 5-1 To improve the calibration technology for reference standards based on national standard. 5-2 To make calibration procedure. 5-3 To establish Quality System.	1 (1) Dispatch of Japanese Experts Long Term Experts a Chief Advisor b Project Coordinator c Physical Standards d Electromagnetic Standards e Chemical Standards (2) Short Term Experts Necessary number of Short Term Experts will be dispatched. (Approximately 35) 2 C/P training in Japan - Approximately 10 persons during the Project 3 - Equipment is provided by ODA Loan 4 Supporting Local Cost	1 Provision of building, facilities and space for the Project. 2 Allocation of the C/P and administrative personnel (1) Administrative C/P (2) Technical C/P (3) Staff in charge of the Project Maintenance of machinery and equipment 3 Necessary budget for the implementation of the Project. 4	Preconditions a Equipment by ODA Loan for the Project is procured as planned.

*1 8 fields of measurement standards
 a Electricity and Magnetism (EM)
 b Thermometry (T)
 c Length (L)
 d Time and Frequency (TF)
 e Mass and Weights (M)
 f Mass and Volume (MV)
 g Mass and Density (MD)
 h Radiance Spectrometry (RS)
 i Term of Surface VIMC.

Annex 2: Plan of Operation (PO)

Annex 2 Progress of Plan of Operations (PO)

Calendar Year	2004				2005				2006				2007		
Japanese Fiscal Year	2004				2005				2006				2007		
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III
Term of Technical Cooperation	Term of Technical Cooperation														
1-1 To allocate necessary personnel as planned.															
1-2 To make budget plan and execute properly.															
1-3 To make action plan and implement as planned.															
2-1 To install and commit equipment properly.															
2-2 To operate and maintain equipment.															
2-3 To make manuals of operation and maintenance management.															
3-1 To make Technical Cooperation Program.															
3-2 To assess existing level of basic technical capability of counterpart personnel.															
3-3 To evaluate technical capability of counterpart after technical transfer.															
4-1 To establish and maintain measurement standards.															
4-2 To improve environmental management technology of calibration laboratories.															
5-1 To improve the calibration technology for reference standards based on national standard.															
5-2 To make calibration procedure.															
5-3 To establish Quality System.															

□ : Plan
 ■ : Implemented




Annex 3: Annual Plan of Operation (APO)



Annex 3 Progress of Annual Plan of Operation (APO) for 2004^{IF}








Calendar Year	2004						2005		
Japanese Fiscal Year	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation	Actual								
1. The operation and administration of the Project are enhanced.									
1-1 To allocate necessary personnel as planned	Advice by long term expert								
	Implement								
	Actual								
1-2 To make budget plan and execute properly.	Advice by long term expert								
	Implement								
	Actual								
1-3 To make action plan and implement as planned.	Advice by long term expert								
	Implement								
	Actual								
2. The equipment is operated and maintained properly.									
2-1 To install and commission equipment.	Advice by long term expert								
	Implement								
	Actual								
2-2 To operate and maintain equipment.	Advice by long term expert								
	Implement								
	Actual								
2-3 To make manuals of operation and maintenance management.									
(1) RF Attenuation	Advice						DoE		
	Documentation						CoM		
	Self Study						DoE		
(2) Group Resistance	Advice								
	Documentation						CoM		
	DoE								
(3) Angle	Advice								
	Documentation						CoM		
	Self Study						DoE		
(4) Flatness	Advice						DoE		
	Documentation						CoM		
	Self Study								
3. The technical capability of C/P is upgraded.									
3-1 To make Technical Cooperation Program.									
3-2 To asses existing level of basic technical capability of Counterpart personel.	Assessment								
	Nominate								
	Evaluation								
	Evaluation								
3-3 To evaluate of technical capability of counterpart personel after technical transfer.									
4. Accuracy of National measurement standards is improved.									
4-1 To establish and maintain measurement standards.									
(1) RF Attenuation	Advice						DoE		
	Self Study						IEM		
	Self Study						DoE		
(2) Group Resistance	Advice								
	Self Study						IEM		
	DoE								
(3) Angle	Advice								
	Self Study						IEM		
	Self Study						DoE		
(4) Flatness	Advice						DoE		
	Self Study						IEM		
	Self Study								

Annex 3 Progress of Annual Plan of Operation (APO) for 2004^{JFY}

Calendar Year	2004						2005		
Japanese Fiscal Year	2005								
	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation									
4. Accuracy of National measurement standards is improved.									
4-2 To improve environmental management technology of calibration laboratories.									
4-3 To implement International comparison.									
5. NIMT disseminates national measurement standards properly.									
5-1 To improve the calibration technology for reference standards based on national standard.									
(1) RF Attenuation							Advice	DoE	
							Self Study	ICT	
							Self Study	DoE	
(2) Group Resistance							Advice		
							Self Study	ICT	
							DoE		
(3) Angle							Advice		
							Self Study	ICT	
							Self Study	DoE	
(4) Flatness							Advice	DoE	
							Self Study	ICT	
							Self Study		
5-2 To make calibration procedure.									
(1) RF Attenuation							Advice	DoE	
							Documentation	CCP	
							Self Study	DoE	
(2) Group Resistance							Advice		
							Documentation	CCP	
							DoE		
(3) Angle							Advice		
							Documentation	CCP	
							Self Study	DoE	
(4) Flatness							Advice	DoE	
							Documentation	CCP	
							Self Study		
5-3 To establish Quality System.									
							Advice by long term expert		
							Implement		
							Actual		

 : Japanese side
 : Thail side
 : Actual

 : Counterpart training in Japan
 : Confirmation of Calibration Procedure

 : Advice
 : Documentation
 : Dispatch of Expert
 : Confirmation of Maintenance Management Manual
 : Self Study
 : Implement of Establish and Maintaining
 : Improvement of Calibration Technology

Annex 3 Progress of Annual Plan of Operations (APO) for 2005^{JFY}

Calendar Year (Thailand) Japanese Fiscal Year	2005						2006																	
	4	5	6	7	8	9	10	11	12	1	2	3												
Term of Technical Cooperation	Actual																							
1. The operation and administration of the Project are enhanced.																								
1-1 To allocate necessary personnel as planned	Advice by long term expert Implement Actual																							
1-2 To make budget plan and execute properly.	Advice by long term expert Implement Actual																							
1-3 To make action plan and implement as planned.	Advice by long term expert Implement Actual																							
2. The equipment is operated and maintained properly.																								
2-1 To install and commission equipment.	Advice by long term expert Implement Actual																							
2-2 To operate and maintain equipment.	Advice by long term expert Implement Actual																							
2-3 To make manuals of operation and																								
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C/P	Self study		DoE																					
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Training in	Advice																							
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C/P	Self study																							
(4) <u>Vickers Hardness</u>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Training</td> <td style="width: 25%;">Advice</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td>Trained</td> <td>Documentation</td> <td></td> <td></td> </tr> <tr> <td>C/P</td> <td colspan="2">Self study</td> <td></td> </tr> </table>												Training	Advice			Trained	Documentation			C/P	Self study		
Training	Advice																							
Trained	Documentation																							
C/P	Self study																							
(5) Chemical Analysis	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Training in</td> <td style="width: 25%;">Advice</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td>Trained in</td> <td>Documentation</td> <td></td> <td></td> </tr> </table>												Training in	Advice			Trained in	Documentation						
Training in	Advice																							
Trained in	Documentation																							
(6) Laser Power	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Training in</td> <td style="width: 25%;">Advice</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td>Trained in</td> <td>Documentation</td> <td></td> <td></td> </tr> <tr> <td>C/P</td> <td colspan="2">Self study</td> <td></td> </tr> </table>												Training in	Advice			Trained in	Documentation			C/P	Self study		
Training in	Advice																							
Trained in	Documentation																							
C/P	Self study																							
(7) <u>Environment Management</u>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">T in J</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td>F in J</td> <td></td> <td></td> <td>C/P</td> </tr> </table>												T in J				F in J			C/P				
T in J																								
F in J			C/P																					
(8) Magnetic	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Training in</td> <td style="width: 25%;">Advice</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td>Trained in</td> <td>Doc</td> <td></td> <td></td> </tr> <tr> <td>C/P</td> <td colspan="2">Self study</td> <td></td> </tr> </table>												Training in	Advice			Trained in	Doc			C/P	Self study		
Training in	Advice																							
Trained in	Doc																							
C/P	Self study																							
(9) Spectral Irradiance	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Training in</td> <td style="width: 25%;">Advice</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> <tr> <td>Trained in</td> <td>Doc</td> <td></td> <td></td> </tr> <tr> <td>C/P</td> <td colspan="2">Self study</td> <td></td> </tr> </table>												Training in	Advice			Trained in	Doc			C/P	Self study		
Training in	Advice																							
Trained in	Doc																							
C/P	Self study																							

Calendar Year (Thailand)	2005												2006		
	Japanese Fiscal Year												2005		
	4	5	6	7	8	9	10	11	12	1	2	3			
(10) Flux/Intensity							Training in	A	DoE						
							Trained in	Doc	CoM						
							C/P	Self study							
(11) QHR										Training in	A				
										Trained in	Doc				
										C/P	SS				
(12) Mass										Training					
										Trained					
										C/P	SS				
(13) Destructive Inspection										Training					
										Trained					
(14) Flatness				Advice	DoE										
				Documentation	CoM										
				Self study	DoE										
(15) Acceleration of Vibration				Advice			DoE								
				Documentation			CoM								
				Self study				Do							
(16) Time and Frequency				Advice				Do							
				Documentation				Co							
				Self study					DoE						
(17) Force				Advice				Do							
				Documentation				Co							
				Self Study							DoE				
(18) Humidity				Advice						DoE					
				Documentation						CoM					
				Self Study							DoE				
(19) Inorganic				Advice						DoE					
				Documentation						CoM					
				Self Study											
(20) Standard Solution				Advice						DoE					
				Documentation						CoM					
				Self Study											
(21) Fixed Point				Advice						DoE					
				Documentation						CoM					
				Self Study											
3. The technical capability of C/P is upgraded.															
3-1 To make Technical Cooperation Program.															
3-2 To assess existing level of basic technical capability of Counterpart personnel.				Nominate		Assessment		Assessment							
								Evaluation							
3-3 To evaluate of technical capability of counterpart personnel after technical transfer.											Evaluation				
4. Accuracy of National measurement standards is improved.															
4-1 To establish and maintain measurement standards.															
(1) Large Weight							Trained in J	Advice	Do						
							Trained in J	SS	IE						
							C/P	Self study					DoE		
(2) Pressure							Training in Japan	Advice							
							Trained in Japan	Self Study							
							C/P	Self study							

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005												1	2	3
	4	5	6	7	8	9	10	11	12						
(3) Standard Gass				Training in											
				Trained in											
				C/P											
(4) <u>Vickers Hardness</u>				Training											
				Trained											
				C/P											
(5) <u>Chemical Analysis</u>															
(6) <u>Laser Power</u>															
(7) <u>Environment Management</u>															
(8) <u>Magnetic</u>															
(9) <u>Spectral Irradiance</u>															
(10) <u>Flux/Intensity</u>															
(11) <u>QHR</u>															
(12) <u>Mass</u>															
(13) <u>Destructive Inspection</u>															
(14) <u>Flatness</u>															
(15) <u>Acceleration of Vibration</u>															
(16) <u>Time and Frequency</u>															
(17) <u>Force</u>															
(18) <u>Humidity</u>															
(19) <u>Inorganic</u>															
(20) <u>Standard Solution</u>															

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
(21) Fixed Point	Advice												DoE		
	Self Study												IEM		
	Self Study														
4.2 To improve environmental management Technology of calibration laboratories	Advice by long term expert														
	Implement														
	Actual														
4.3 To implement International comparison.	Advice by long term expert														
	Implement														
	Actual														
5. NIMT disseminates national measurement standards properly.															
5-1 To improve the calibration technology for reference standards based on national															
(1) Large Weight	Training			Advice			Do								
	Trained			Self Study			IC								
	C/P			Self study									DoE		
(2) Pressure	Training in			Advice											
	Trained in			Documentation											
	C/P			Self study											
(3) Standard Gass	Training in			Advice											
	Trained in Japan			Documentation											
	C/P			Self study											
(4) <u>Vickers Hardness</u>	Training			Advice											
	Trained			Documentation											
	C/P			Self study											
(5) Chemical Analysis	Training in			Advice											
	Trained in			Self study											
(6) Laser Power	Training in			Advice											
	Trained in			Self Study											
	C/P			Self study											
(7) <u>Environment Management</u>	T in J														
	T in J												C/P		
(8) Magnetic	Training in			Advice											
	Trained in			Self Study											
	C/P			Self study											
(9) Spectral Irradiance	Traing in			Advice											
	Trained in			Self Study											
	C/P			Self study											
(10) Flux/Intensity	Training in			A			DoE								
	Trained in			SS			ICT								
	C/P			Self study											
(11) QHR				Training			A								
				Trained			SS								
				C/P			SS								
(12) <u>Mass</u>				Training in J											
				Trained in J											
				C/P			SS								
(13) <u>Destructive Inspection</u>				Training in J											
				Trained in J											

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
(14) Flatness			Advice	DoE											
			Self Study	ICT											
			Self Study	DoE											
(15) Acceleration of Vibration				Advice					DoE						
				Self Study					ICT						
				Self Study						DoE					
(16) Time and Frequency				Advice						Do					
				Self Study						IC					
				Self Study							DoE				
(17) Force				Advice						Do					
				Self Study						IC					
				Self Study								DoE			
(18) Humidity				Advice							DoE				
				Self Study							ICT				
				Self Study									DoE		
(19) Inorganic				Advice							DoE				
				Self Study							ICT				
				Self Study											
(20) Standard Solution				Advice								DoE			
				Self Study								ICT			
				Self Study											
(21) Fixed Point				Advice									DoE		
				Self Study										ICT	
				Self Study											
5-2 To make calibration procedure.															
(1) Large Weight				Training	Advice	Do									
				Trained	Documentation	CC									
				C/P	Self study							DoE			
(2) Pressure				Training in	Advice										
				Trained in	Documentation										
				C/P	Self study										
(3) Standard Gass				Training in	Advice										
				Trained in	Documentation										
				C/P	Self study										
(4) Vickers Hardness				Training	Advice										
				Trained	Documentation										
				C/P	Self study										
(5) Chemical Analysis				Training in	Advice										
				Trained in	Documentation										
(6) Laser Power				Training in	Advice										
				Trained in	Documentation										
				C/P	Self study										
(7) Environment Management				T in J											
				T in J											
													C/P		
(8) Magnetic				Training in	Advice										
				Trained in	Doc										
				C/P	Self study										
(9) Spectral Irradiance				Training in	Advice										
				Trained in	Doc										
				C/P	Self study										
(10) Flux/Intensity				Training in	A	DoE									
				Trained in	Doc	CCP									
				C/P	Self study										

Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005												1	2	3
	4	5	6	7	8	9	10	11	12						
(11) QHR													Training	A	
													Trained	Doc	
													C/P	SS	
(12) Mass													Training		
													Trained		
													C/P	SS	
(13) Destructive Inspection													Training		
													Trained		
(14) Flatness													Advice	DoE	
													Doc	CCP	
													Self Study	DoE	
													Advice	DoE	
(15) Acceleration of Vibration													Documentation	CCP	
													Self Study		Do
													Advice		Do
(16) Time and Frequency													Documentation		CC
													Self Study		DoE
													Advice		Do
(17) Force													Documentation		CC
													Self Study		DoE
													Advice		DoE
(18) Humidity													Documentation		CCP
													Self Study		DoE
													Advice		DoE
(19) Inorganic													Documentation		CCP
													Self Study		
													Advice		DoE
(20) Standard Solution													Documentation		CCP
													Self Study		
													Advice		DoE
(21) Fixed Point													Documentation		CCP
													Self Study		
5-3 To establish Quality System.													Advice by long term expert		
													Implement		
													Actual		

Japanese side
Thai side
Actual

- A : Advice
- Doc : Documentation
- DoE : Dispatch of Expert
- CoM : Confirmation of Maintenance Management Manual
- SS : Self Study
- IEM : Implement of Establish and Maintaining
- ICT : Improvement of Calibration Technology
- CCP : Confirmation of Calibration Procedure
- C/P : Counterpart training in Japan

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand)	2006												2007		
Japanese Fiscal Year	2006														
	4	5	6	7	8	9	10	11	12	1	2	3			
Term of Technical Cooperation															
1. The operation and administration of the Project are enhanced.															
1-1 To allocate necessary personnel as planned	Advice by long term expert												Implement		
1-2 To make budget plan and execute properly.	Advice by long term expert												Implement		
1-3 To make action plan and implement as planned.	Advice by long term expert												Implement		
2. The equipment is operated and maintained properly.															
2-1 To install and commission equipment.	Advice by long term expert												Implement		
2-2 To operate and maintain equipment.	Advice by long term expert												Implement		
2-3 To make manuals of operation and maintenance management.															
(1) Fixed Point	Advice												Documentation		
(2) Photometry	Advice												Do		
	Documentation												Co		
(3) Radiometry	Advice												Do		
	Documentation												Co		
(4) Pressure	Advice												Documentation		
(5) Magnetics	Advice												DoE		
	Documentation												Co		
(6) Laser Power	Advice												DoE		
	Documentation												Co		
(7) QHR	Advice												Documentation		
(8) Inorganic	Advice			DoE											
	Documentation			Co											
(9) Standard Solution	Advice			DoE											
	Documentation			CoM											
(10) Standard Gas	Advice												DoE		
	Documentation												Co		
(11) Chemical Analysis	Traing in			Advice											
	Trained in			Documentation											
(12) Watt Hour	Traing in			Advice											
	Trained in			Documentation											
(13) Standard Scale	Training in			Advice											
	Trained in			Documentation											

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand)	2006						2007					
Japanese Fiscal Year	2006											
	4	5	6	7	8	9	10	11	12	1	2	3
(13) Standard Scale												
							Training in	Advice				
							Trained in	Documentation				
(14) AC Voltage										Training	Trained	
(15) Density										Traini	Train	
4.2 To improve environmental management Technology of calibration laboratories	Advice by long term expert											
	Implement											
4-3 To implement International comparison.	Advice by long term expert											
	Implement											
5. NIMT disseminates national measurement standards properly.												
5-1 To improve the calibration technology for reference standards based on national												
(1) Fixed Point	Advice											
	Documentation											
(2) Photometry	Advice										Do	
	Documentation										Co	
(3) Radiometry	Advice										Do	
	Documentation										Co	
(4) Pressure	Advice											
	Documentation											
(5) Magnetics	Advice										Do	
	Documentation										Co	
(6) Laser Power	Advice										DoE	
	Documentation										Co	
(7) QHR	Advice											
	Documentation											
(8) Inorganic	Advice		DoE									
	Documentation		CoM									
(9) Standard Solution	Advice		DoE									
	Documentation		CoM									
(10) Standard Gas	Advice										DoE	
	Documentation										Co	
(11) Chemical Analysis	Traing in		Advice									
	Trained in		Documentation									

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand) Japanese Fiscal Year	2006												2007		
	2006														
	4	5	6	7	8	9	10	11	12	1	2	3			
(12) Watt Hour			Training in Trained in												
(13) Standard Scale							Training Trained		Advice Documentation						
(14) AC Voltage										Training Trained					
(15) Density										Train Train					
5-2 To make calibration procedure.															
(1) Fixed Point									Advice Documentation						
(2) Photometry											Do Co				
(3) Radiometry											Do Co				
(4) Pressure									Advice Documentation						
(5) Magnetics											Do Co				
(6) Laser Power											DoE Co				
(7) QHR									Advice Documentation						
(8) Inorganic											DoE Co				
(9) Standard Solution											DoE CoM				
(10) Standard Gas											DoE Co				
(11) Chemical Analysis				Training in Trained in					Advice Documentation						
(12) Watt Hour				Training in Trained in											
(13) Standard Scale							Training in Trained in		Advice Documentation						
(14) AC Voltage										Training Trained					

Annex 3 Annual Plan of Operations (APO) for 2006^{JFY}

Calendar Year (Thailand)	2006									2007		
Japanese Fiscal Year	2006											
	4	5	6	7	8	9	10	11	12	1	2	3
(15) Density											Traini	Train
5-3 To establish Quality System.	Advice by long term expert											
	Implement											

Japanese side
Thai side

A	: Advice
Doc	: Documentation
DoE	: Dispatch of Expert
CoM	: Confirmation of Maintenance Management Manual
SS	: Self Study
IEM	: Implement of Establish and Maintaining
ICT	: Improvement of Calibration Technology
CCP	: Confirmation of Calibration Procedure
C/P	: Counterpart training in Japan

Annex 3 Annual Plan of Operations (APO) for 2007^{JFY}

Calendar Year (Thailand)	2007											
Japanese Fiscal Year	2007											
	4	5	6	7	8	9	10	11	12			
5. NIMT disseminates national measurement standards properly.												
5-1 To improve the calibration technology for reference standards based on national												
(1) Fixed Point	Advice		D									
	Documentation		Co									
(2) Pressure	Advice		Do									
	Documentation		Co									
(3) Standard Scale	Advice		Do									
	Documentation		Co									
(4) QHR	Advice		D									
	Documentation		Co									
5-2 To make calibration procedure.												
(1) Fixed Point	Advice		D									
	Documentation		Co									
(2) Pressure	Advice		Do									
	Documentation		Co									
(3) Standard Scale	Advice		Do									
	Documentation		Co									
(4) QHR	Advice		D									
	Documentation		Co									
5-3 To establish Quality System.	Advice by long term expert											
	Implement											

Japanese side
Thai side

A	: Advice
Doc	: Documentation
DoE	: Dispatch of Expert
CoM	: Confirmation of Maintenance Management Manual
SS	: Self Study
IEM	: Implement of Establish and Maintaining
ICT	: Improvement of Calibration Technology
CCP	: Confirmation of Calibration Procedure
C/P	: Counterpart training in Japan





Annex 4: Technical Cooperation Program (TCP)

Annex 4 Progress of Technical Cooperation Program (TCP)

Calendar Year	2004				2005				2006				2007				2008
Japanese Fiscal Year	2004		2005		2006		2007		2007		2007		2007		I		
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I
Term of Technical Cooperation	Term of Technical Cooperation																
1. Acoustics and Vibration																	
(1) Vibration																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) Acceleration of Vibration																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
2-1 Electricity and Magnetism (Low Frequency)																	
(1) Group Resistance																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) QHR																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(3) Magnetics Flux/Intensity																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
2-2 Electricity and Magnetism (High Frequency)																	
(1) Laser Power																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) RF Standard (Attenuation)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(3) RF Standard (Power)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(4) RF Standard (Voltage)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(5) Time and Frequency																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
3. Hardness																	
(1) Hardness																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	

Calendar Year	2004				2005				2006				2007				2008
Japanese Fiscal Year	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I
Term of Technical Cooperation	Term of Technical Cooperation																
4. Length Related Standard																	
(1) Form																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) Flatness																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(3) Angle																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(4) CMM																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(5) GB/Scale																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
5. Mass and Related Standard																	
(1) Force																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) Large Weight																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(3) Pressure																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
6. Photometry and Radiometry																	
(1) Photometry (Flux/Intensity)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
(2) Photometry (Spectral Irradiance)																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	
7. Reference Material																	
(1) Inorganic																	
Establishment of Measurement Standard																	
Calibration Technology																	
Accreditation																	

Calendar Year	2004				2005				2006				2007				2008
Japanese Fiscal Year	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I
Term of Technical Cooperation	Term of Technical Cooperation																
(2) Inorganic (Hydrogen ion activity)																	
Establishment of Measurement Standard	[Bar from FY2004 Q3 to FY2006 Q3]																
Calibration Technology	[Bar from FY2004 Q3 to FY2006 Q3]																
Accreditation	[Bar from FY2004 Q3 to FY2006 Q3]																
(3) Organic (Standard Gas)																	
Establishment of Measurement Standard	[Bar from FY2005 Q2 to FY2007 Q1]																
Calibration Technology	[Bar from FY2005 Q2 to FY2007 Q1]																
Accreditation	[Bar from FY2005 Q2 to FY2007 Q1]																
(4) Organic (Standard Solution)																	
Establishment of Measurement Standard	[Bar from FY2004 Q3 to FY2005 Q2]																
Calibration Technology	[Bar from FY2004 Q3 to FY2005 Q2]																
Accreditation	[Bar from FY2004 Q3 to FY2006 Q3]																
8. Thermometry																	
(1) Thermometry (Fixed Point)																	
Establishment of Measurement Standard	[Bar from FY2004 Q3 to FY2005 Q2]																
Calibration Technology	[Bar from FY2004 Q3 to FY2005 Q2]																
Accreditation	[Bar from FY2004 Q3 to FY2007 Q1]																
(2) Humidity																	
Establishment of Measurement Standard	[Bar from FY2004 Q3 to FY2006 Q3]																
Calibration Technology	[Bar from FY2004 Q3 to FY2006 Q3]																
Accreditation	[Bar from FY2004 Q3 to FY2006 Q3]																
(3) Radiation																	
Establishment of Measurement Standard	[Bar from FY2004 Q3 to FY2006 Q3]																
Calibration Technology	[Bar from FY2004 Q3 to FY2006 Q3]																
Accreditation	[Bar from FY2004 Q3 to FY2006 Q3]																

-  : Counterpart training in Japan
-  : Self Study
-  : Dispatch of Expert
-  : Assessment

Annex 5: Annual Technical Cooperation Program (ATCP)

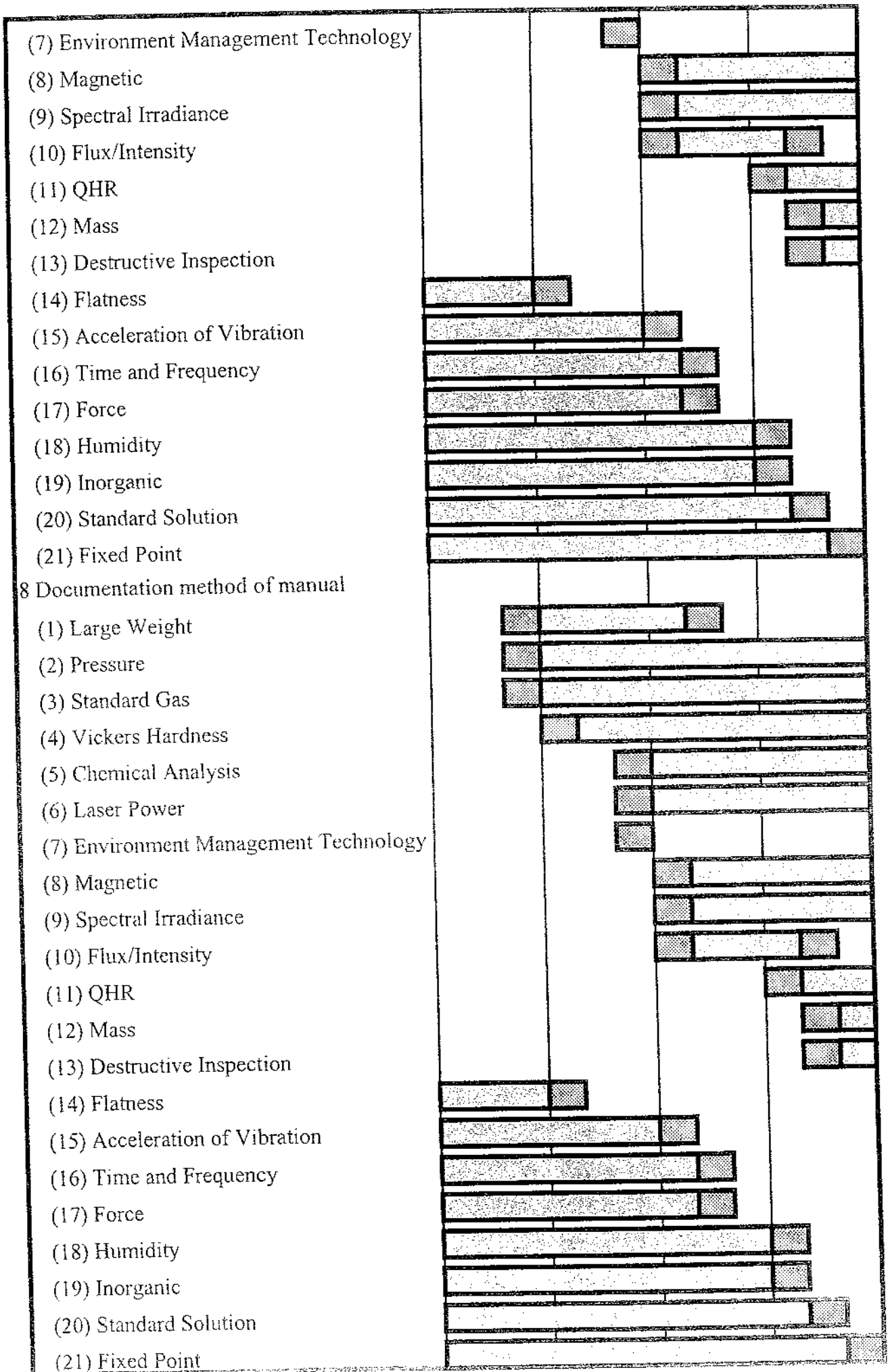
Annex 5 Annual Technical Cooperation Program (ATCP) for 2004

Calendar Year	2004						2005		
Japanese Fiscal Year	2004								
	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation									
1 Installation technique of equipment									
(1) Acceleration of Vibration									
(2) RF Attenuation									
(3) Group Resistance									
(4) Angle									
(5) Flatness									
(6) Fixed Point									
2 Commission technique of equipment									
(1) Acceleration of Vibration									
(2) RF Attenuation									
(3) Group Resistance									
(4) Angle									
(5) Flatness									
(6) Fixed Point									
3 Operation technique of equipment									
(1) Acceleration of Vibration									
(2) RF Attenuation									
(3) Group Resistance									
(4) Angle									
(5) Flatness									
(6) Fixed Point									
4 Maintenance method of equipment									
(1) Acceleration of Vibration									
(2) RF Attenuation									
(3) Group Resistance									
(4) Angle									
(5) Flatness									
(6) Fixed Point									

5 Establishment of Measurement Standard			
(1) Acceleration of Vibration			
(2) RF Attenuation			
(3) Group Resistance			
(4) Angle			
(5) Flatness			
(6) Fixed Point			
6 Maintaining of measurement standard			
(1) Acceleration of Vibration			
(2) RF Attenuation			
(3) Group Resistance			
(4) Angle			
(5) Flatness			
(6) Fixed Point			
7 Calibration Technology			
(1) Acceleration of Vibration			
(2) RF Attenuation			
(3) Group Resistance			
(4) Angle			
(5) Flatness			
(6) Fixed Point			
8 Documentation method of manual			
(1) Acceleration of Vibration			
(2) RF Attenuation			
(3) Group Resistance			
(4) Angle			
(5) Flatness			
(6) Fixed Point			
9 Estimation of Measurement uncertainty			
(1) Acceleration of Vibration			
(2) RF Attenuation			
(3) Group Resistance			
(4) Angle			
(5) Flatness			
(6) Fixed Point			

Annex 5 Annual Technical Cooperation Program (ATCP) for 2005

Calendar Year	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
Term of Technical Cooperation															
1 Installation technique of equipment															
(1) Large Weight															
(2) Pressure															
(3) Standard Gas															
(4) Vickers Hardness															
(5) Chemical Analysis															
(6) Laser Power															
(7) Environment Management Technology															
(8) Magnetic															
(9) Spectral Irradiance															
(10) Flux/Intensity															
(11) QHR															
(12) Mass															
(13) Destructive Inspection															
(14) Flatness															
(15) Acceleration of Vibration															
(16) Time and Frequency															
(17) Force															
(18) Humidity															
(19) Inorganic															
(20) Standard Solution															
(21) Fixed Point															
2 Commission technique of equipment															
(1) Large Weight															
(2) Pressure															
(3) Standard Gas															
(4) Vickers Hardness															
(5) Chemical Analysis															
(6) Laser Power															
(7) Environment Management Technology															



9 Estimation of Measurement uncertainty					
(1) Large Weight	■	■	■	■	■
(2) Pressure	■	■	■	■	■
(3) Standard Gas	■	■	■	■	■
(4) Vickers Hardness	■	■	■	■	■
(5) Chemical Analysis		■	■	■	■
(6) Laser Power		■	■	■	■
(7) Environment Management Technology		■	■	■	■
(8) Magnetic		■	■	■	■
(9) Spectral Irradiance		■	■	■	■
(10) Flux/Intensity		■	■	■	■
(11) QHR			■	■	■
(12) Mass				■	■
(13) Destructive Inspection				■	■
(14) Flatness	■	■	■	■	■
(15) Acceleration of Vibration	■	■	■	■	■
(16) Time and Frequency	■	■	■	■	■
(17) Force	■	■	■	■	■
(18) Humidity	■	■	■	■	■
(19) Inorganic	■	■	■	■	■
(20) Standard Solution	■	■	■	■	■
(21) Fixed Point	■	■	■	■	■

Annex 5 Annual Technical Cooperation Program (ATCP) for 2006

Calendar Year	2006												2007			
Japanese Fiscal Year	2006															
	4	5	6	7	8	9	10	11	12	1	2	3				
Term of Technical Cooperation																
1 Installation technique of equipment																
(1) Fixed Point																
(2) Photometry																
(3) Radiometry																
(4) Pressure																
(5) Magnetics																
(6) Laser Power																
(7) QHR																
(8) Inorganic																
(9) Standard Solution																
(10) Standard Gas																
(11) Chemical Analysis																
(12) Watt Hour																
(13) Standard Scale																
2 Commission technique of equipment																
(1) Fixed Point																
(2) Photometry																
(3) Radiometry																
(4) Pressure																
(5) Magnetics																
(6) Laser Power																
(7) QHR																
(8) Inorganic																
(9) Standard Solution																
(10) Standard Gas																
(11) Chemical Analysis																
(12) Watt Hour																
(13) Standard Scale																
3 Operation technique of equipment																
(1) Fixed Point																

(2) Photometry				
(3) Radiometry				
(4) Pressure				
(5) Magnetics				
(6) Laser Power				
(7) QHR				
(8) Inorganic				
(9) Standard Solution				
(10) Standard Gas				
(11) Chemical Analysis				
(12) Watt Hour				
(13) Standard Scale				
4 Maintenance method of equipment				
(1) Fixed Point				
(2) Photometry				
(3) Radiometry				
(4) Pressure				
(5) Magnetics				
(6) Laser Power				
(7) QHR				
(8) Inorganic				
(9) Standard Solution				
(10) Standard Gas				
(11) Chemical Analysis				
(12) Watt Hour				
(13) Standard Scale				
5 Establishment of Measurement Standard				
(1) Fixed Point				
(2) Photometry				
(3) Radiometry				
(4) Pressure				
(5) Magnetics				
(6) Laser Power				
(7) QHR				
(8) Inorganic				
(9) Standard Solution				

Annex 5 Annual Technical Cooperation Program (ATCP) for 2007

Calendar Year	2007											
Japanese Fiscal Year	2007											
	4	5	6	7	8	9	10	11	12			
Term of Technical Cooperation	[Bar chart showing duration from month 4 to 11]											
1 Installation technique of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
2 Commission technique of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
3 Operation technique of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
4 Maintenance method of equipment	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
5 Establishment of Measurement Standard	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											
6 Maintaining of measurement standard	[Bar chart showing duration from month 4 to 8]											
(1) Fixed Point	[Bar chart showing duration from month 4 to 7]											
(2) Pressure	[Bar chart showing duration from month 4 to 6]											
(3) Standard Scale	[Bar chart showing duration from month 4 to 7]											
(4) QHR	[Bar chart showing duration from month 4 to 8]											

7 Calibration Technology			
(1) Fixed Point			
(2) Pressure			
(3) Standard Scale			
(4) QHR			
8 Documentation method of manual			
(1) Fixed Point			
(2) Pressure			
(3) Standard Scale			
(4) QHR			
9 Estimation of Measurement uncertainty			
(1) Fixed Point			
(2) Pressure			
(3) Standard Scale			
(4) QHR			

Annex 6: Tentative Schedule of Implementation (TSI)

Annex 6 Progress of Tentative Schedule of Implementation (TSI)

Calendar Year	2004			2005			2006				2007			2008	
Japanese Fiscal Year	2004			2005			2006				2007				
	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Term of Technical Cooperation	Term of Technical Cooperation														
Japanese Side															
I. Dispatch of Mission															
(1) Mid-Term Evaluation															
(2) Final Evaluation (Management Consultation Team will be dispatched, if necessary)															
II. Dispatch of Long-Term Experts															
(1) Chief Advisor	Chief Advisor														
(2) Coordinator	Coordinator														
(3) Physical Standards	Physical Standards														
(4) Electromagnetic Standards	Electromagnetic Standards														
(5) Chemical Standards	Chemical Standards														
III. Dispatch of short-term Expert	Necessary Number of Short-term Experts (Approximately 35)														
(1) Electromagnetic															
(2) Environmental Management Technology															
(3) Acceleration of Vibration															
(4) RF Attenuation															
(5) Flatness															
(6) Fixed Point															
(7) QHR															
(8) Time and Frequency															
(9) GB/Scale															
(10) Force															
(11) Large Weight															
(12) Flux/Intensity															
(13) Inorganic															
(14) Standard Solution															
(15) Magnetic Flux															
(16) Magnetic Intensity															
(17) Laser Power															
(18) Pressure															
(19) Spectral Irradiance															
(20) Hydrogen ion Activity															
(21) Humidity*															
(22) Calibration Procedure															

Calendar Year	2004			2005			2006				2007				2008
Japanese Fiscal Year	2004			2005			2006				2007				
	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Term of Technical Cooperation	Term of Technical Cooperation														
(23) Accreditation															
- Form															
- Thermometry															
- Time and Frequency															
- Vibration															
- Dimension															
- Resistance															
- RF Standard															
- Photometry															
- Force															
- Pressure															
- pH Standard*															
- DC High Voltage*															
IV. Training of C/P Personnel in Japan	Max. 10 persons during the Project														
(1) QHR															
(2) GB/Scale															
(3) Large Weight															
(4) Flux/Intensity															
(5) Spectral Irradiance															
(6) Pressure															
(7) Magnetic															
(8) Laser Power															
(9) Standard Gas															
(10) Chemical Analysis															
(11) Environment Management Technology*															
(12) Mass*															
(13) Watt Hour*															
(14) AC Voltage*															
(15) Density*															
Thai side															
I. Building and Facilities															
II. Machinery and Equipment															
III. Allocation of C/P Personnel and Necessary Staff															
IV. Allocation of Budget															

□ : Plan
 ▨ : Actual

Note : *Additional quantities by NIMT's request

**Annex 7: Annual Tentative Schedule of Implementation
(ATSI)**

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2005^{JFY}

Calendar Year (Thailand)	2005									2006		
Japanese Fiscal Year	2005											
	4	5	6	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation												
Japanese Side												
I. Dispatch of Mission												
II. Dispatch of Long-Term Experts												
(1) Chief Advisor												
(2) Coordinator												
(3) Physical Standards												
(4) Electro-magnetic Standards												
(5) Chemical Standards												
III. Dispatch of short-term Expert												
(1) Surveillance			==									
(2) Flatness				=====								
(3) Calibration Procedure						=====						
(4) Acceleration of Vibration							=====					
(5) Time and Frequency								=====				
(6) Accreditation (Form)									=====			
(7) Large Weight												=====
(8) Force												=====
(9) Humidity											=====	
(10) Inorganic											=====	
(11) Flux/Intensity												=====
(12) Standard Solution												=====
(13) Fixed Point												=====
(14) Hydrogen Ion Activity*												=====
Note: *Planned for 2006 ^{JFY}												
IV. Training of C/P personnel in Japan												
(1) Large Weight												=====


Calendar Year (Thailand)	2005												2006		
Japanese Fiscal Year	2005														
	4	5	6	7	8	9	10	11	12	1	2	3			
Term of Technical Cooperation															
(2) Pressure			=====	=====											
(3) Standard Gas			=====	=====											
(4) <u>Vickers Hardness</u>				=====	=====										
(5) Chemical Analysis							=====	=====							
(6) Laser Power							=====	=====							
(7) <u>Environment Management</u>											=====				
(8) Magnetic							=====	=====							
(9) Spectral Irradiance							=====	=====							
(10) Flux/Intensity							=====	=====							
(11) QHR											=====				
(12) <u>Mass</u>												=====			
(13) <u>Destructive Inspection</u>												=====			
Note: Standard Scale is postponed to 2006.															
Thailand side															
I. Building and Facilities															
II. Machinery and Equipment															
III. Allocation of C/P Personnel and necessary staff															
IV. Allocation of Budget															

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2006^{JFY}

Calendar Year (Thailand)	2005			2006									2007		
Japanese Fiscal Year	2005			2006									2007		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation															
Japanese Side															
I. Dispatch of Mission															
Mid-term Review															
II. Dispatch of Long-Term Experts															
(1) Chief Advisor															
(2) Coordinator															
(3) Physical Standards															
(4) Electro-magnetic Standards															
(5) Chemical Standards															
III. Dispatch of short-term Expert															
(1) Fixed Point															
(2) Photometry															
(3) Radiometry															
(4) Pressure															
(5) Magnetism															
(6) Laser Power															
(7) Inorganic															
(8) Standard Solution															
(9) Standard Gas															
(10) Calibration Procedure															
(11) Accreditation (Quality System)															
(12) Accreditation (Time and Frequency)															
(13) Accreditation (Vibration)															
(14) Accreditation (pH Standard)															
(15) Accreditation (DC High Voltage)															
IV. Training of C/P personel in Japan															
(1) Chemical Analysis															
(2) Watt Hour*															

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2006^{JPY}


Calendar Year (Thailand)	2006												2007			
Japanese Fiscal Year	2005			2006									2007			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
Term of Technical Cooperation																
(3) Standard Scale																
(4) AC Voltage*																
(5) Density*																
Thailand side																
I. Building and Facilities																
II. Machinery and Equipment																
III. Allocation of C/P Personnel and necessary staff																
IV. Allocation of Budget																

 : Actual

Note : *Additional quantities by NIMT's request

Annex 7 Progress of Annual Tentative Schedule of Implementation (ATSI) for 2007^{JFY}

Calendar Year (Thailand)	2007											
Japanese Fiscal Year	2006			2007								
	1	2	3	4	5	6	7	8	9	10	11	12
Term of Technical Cooperation												
Japanese Side												
I. Dispatch of Mission												
Final Evaluation												
II. Dispatch of Long-Term Experts												
(1) Chief Advisor												
(2) Coordinator												
III. Dispatch of short-term Expert												
(1) Fixed Point												
(2) Pressure												
(3) Standard Scale												
(4) QHR												
(5) Chemical												
(6) Electro-magnetic												
(7) Calibration Procedure												
(8) Accreditation (Quality System)												
(9) Accreditation (AC Power)												
(10) Accreditation (RF - Power, Voltage, Attenuation)												
(11) Accreditation (CMM)												
(12) Accreditation (Humidity)												
Thailand side												
I. Building and Facilities												
II. Machinery and Equipment												
III. Allocation of C/P Personnel and necessary staff												
IV. Allocation of Budget												

 : Actual

Annex 8: Table of Achievement & Evaluation Grid

Table of Achievement

(The Project for Strengthening the National Institute of Metrology (Thailand) Phase 2

Target Group:

- Thai Institute of Science and Technological Research (TISTR) and Department of Science Service (DSS) as Calibration Service Agencies
- Domestic Industries in Thailand (Especially export industries and enterprises applying for ISO9001, and ISO14001)

Project Period: October 16, 2004 – October 15, 2007

Narrative summary	Objectively verifiable indicators	Achievements
<p>Overall Goal To strengthen the national measurement system in Thailand</p>	<ol style="list-style-type: none"> 1. NIMT actively participates in the Global MRA. 2. The traceability system of Thailand is firmly established. 	<ul style="list-style-type: none"> • According to the report of “Survey and verify NIMT’s activities” and “List in Appendix B and C of Global MRA”, NIMT has already participated in the Global MRA and quantities are increasingly. However new registration to appendix C for transferred quantities have not been finalized yet. • The traceability chain and roles of respective organization of measurement network in Thailand have been established, and to make each organization function under this system, it is necessary to strengthen each organization to play each role. • According to the number of calibration laboratories directory on NIMT’s website, the National Measurement Network with NIMT as its top has already encompassed among 78 laboratories. However, there have been more than 130 laboratories in its network according to the interview result from a director of NIMT.
<p>Project Purpose NIMT establishes and manages National Measurement Standards with Internationally recognized level of accuracy</p>	<ol style="list-style-type: none"> 1. The technical ability of counterparts in 8 fields of measurement standards in NIMT is strengthened. 	<ul style="list-style-type: none"> • The technical transfer was planned to be achieved in 42 quantities in 8 fields. In fact, it has been completed in 37 quantities up to the end of May 2007. The main obstacle that hinders the completion of the process is the delay in machinery and equipment procurement. The Project team has conducted the internal survey to verify the NIMT’s activities. • It was planned to completed technical transfer in other 5 quantities by the time of the termination of the Project since the schedule of deliverance of the rest of machinery and equipment has been confirmed already. • Consequently, it can be expected that the National Measurement Standard will be installed and established as planned but the process of accreditation ensuring the internationally recognized level of accuracy has not yet be completed by the time of the termination of the Project.
	<ol style="list-style-type: none"> 2. Calibration measurement capability is enhanced. 3-1 The quantities of calibration services are increased. 	<ul style="list-style-type: none"> • According to the Interview and Questionnaire Survey, it was confirmed that the number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project.

Narrative summary	Objectively verifiable indicators	Achievements
	<p>3-2 The quantities of calibration services are increased.</p> <p>3-3 The range of calibration services is widened.</p>	
<p>Inputs: Thai side</p>	<p>1. Building, facilities and space for the Project</p> <p>2. C/P and administrative personnel</p> <p>3. Maintenance of machinery and equipments</p> <p>4. Necessary budget for the implementation of the project</p>	<ul style="list-style-type: none"> • The construction of the new NIMT building by a Japanese ODA Loan was completed, and NIMT has already relocated to the new building except for the Laboratory of Acoustics and Vibration, which keeps a station based in the Department of Science Service. Office space for the Project team was provided in the new building. Overall, the reconstruction and renovation of all laboratories are complete, except Standard Gas, which has been constructed in the administrative building and is now being renovated. • NIMT has assigned the director of NIMT as the administrative C/P, and 36 technical C/Ps responsible for every target quantity of the technical transfer in Phase 2. Moreover, one more administrative C/P from the International Relations Section was assigned to the Project. • There have been no technical C/P resignations since the Mid-Term Evaluation. • All machinery and equipment have been provided as planned and operated properly.
<p>Inputs: Japanese side</p>	<p>1. Experts</p>	<ul style="list-style-type: none"> • Annual budget allocation for the Project from NIMT for each Thai fiscal year of 2005, 2006 and 2007 is 519,600 THB. • Annual budget allocation for the Project from TICA is 805,170 THB for the Thai fiscal year of 2005; 930,405 THB in 2006 and 715,038 THB in 2007. • 5 long-term experts - namely Chief Advisor, Coordinator, Physical Standards, Electromagnetic Standards and Chemical Standards - have been dispatched as planned. • Since the beginning of Phase 2 until May 2007, 30 short-term experts were dispatched. The dispatch of 5 quantities has been delayed, explicitly Group Resistance, QHR, Line Scale, Pressure and Fixed Point, due to the delay of machinery and equipment procured by the Japanese ODA loan. • However, the dispatch of short-term experts is confirmed in 3 quantities (Line Scale, Pressure, and Fixed Point), while the other 2 quantities (Group Resistance, and QHR) have not been confirmed yet. In short, the expectation of short-term experts dispatch is 36 including one more expert in Calibration Procedure by the time of the termination of the Project.

Narrative summary	Objectively verifiable indicators	Achievements
	2. C/Ps training in Japan	<ul style="list-style-type: none"> • A series of trainings regarding to the content of technical transfer¹ were conducted in Japan during the project period. Since the commencement of Phase 2, the total number of C/Ps has been trained in Japan is 16 persons. The dispatch of 11 C/Ps was programmed in the schedule of technical transfer while the dispatch of 5 C/Ps was requested by NIMT. Those additional requested quantities are Environment Management Technology, Mass, Watt Hour, AC Voltage and Density.
	3. Machinery and Equipment procured by ODA Loan	<ul style="list-style-type: none"> • By the end of May 2007, the procurement of 387 machinery and equipment procured by ODA Loan are completed. There are 7 items that have not yet been delivered. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for the remainder will be in July 2007.
	4. Supporting local cost	<ul style="list-style-type: none"> • The supporting local cost by JICA from the commencement of Phase 2 up to the time of Terminal Evaluation is 7,036,898 THB.

¹ In this Project, the technical transfer consists of 3 types of activities namely 1) C/P training in Japan, 2) self-learning by C/P after the training in Japan, and 3) follow-up training by the short term experts. Although there are some exceptions, the technical transfer of each quantity is done through implementation of these 3 activities respectively.

Narrative summary	Objectively verifiable indicators	Achievements	Important assumptions
<p>Outputs</p> <p>1. The operation and administration of the project are enhanced</p>	<p>1-1 Staff and budget are allocated to the project.</p>	<ul style="list-style-type: none"> - The allocation of C/Ps was implemented as planned. NIMT requested additional technical transfer in 5 quantities so that several persons were allocated in this regard. From the beginning of Phase 2 to present, there have been no technical C/P resignations. - The long-term Japanese experts were also dispatched as planned, while some short-term Japanese experts have not yet been dispatched due to the delay of machinery and equipment procured by ODA loans. - The budget for Project operation and administration was allocated as planned. 	<ul style="list-style-type: none"> a. There is no change in the C/P employment plan, which would have a negative influence on the project. b. There is no change in budget allocation and policy which would have a negative influence on the project. c. There is no change in organization which would have a direct influence on the project.
<p>2. The equipment is properly operated and maintained.</p>	<p>2.1 National Measurement Standards are installed and established in the 40 quantities of the project.</p>	<ul style="list-style-type: none"> - In this Project, the technical transfer of 42 quantities was planned for completion. In fact, the technical transfer for 37 quantities was completed as of the end of May 2007. There was a slightly effect from the delay in the schedule of the dispatch of short-term experts in a few quantities, but the main cause for incomplete technical transfer was the delay of machinery and equipment procurement. <p>However, the technical transfer in the other 5 quantities is planned for completion by the time the Project concludes since the delivery schedule for the remainder of the machinery and equipment has been confirmed. Consequently, it can be expected that the National Measurement Standard will be installed and established successfully as planned.</p>	<ul style="list-style-type: none"> d. Procurement, installation and setting up of all machines are properly completed. e. NIMT takes preventive measures against the resignation of C/Ps trained in the project.
<p>3. The technical capability of C/P is upgraded.</p>	<p>2.2 Registration of maintenance record and calibration record of equipment.</p> <p>2.3 Manuals of operation and maintenance management are provided and organized for reference.</p> <p>3.1 Technical Cooperation Program is created.</p> <p>3.2 C/Ps are appropriately assigned.</p>	<ul style="list-style-type: none"> - After the installation and establishment of the National Measurement Standard, operation and maintenance are implemented and trained by means of the technical transfer. It was confirmed that the manuals of operation and maintenance management of existing machinery and equipment of the Project are provided and organized properly. - The technical cooperation program is created since the beginning of the Project. - It was confirmed that the C/Ps are appropriately assigned based on the program. 	

Narrative summary	Objectively verifiable indicators	Achievements	Important assumptions
	<p>3.3 Improvement in the uncertainty.</p> <p>3.4 Skill after training</p> <p>3.5 Number of seminars and joint training.</p>	<ul style="list-style-type: none"> - The improvement in the uncertainty has been defined in the Uncertainty Budget Sheet, which will be created after the accreditation process has been done. According to the result of technical transfer, it was confirmed that the budget of uncertainty has been improved in 14 quantities, while 6 more quantities were planned to be improved by the time of Project termination and 5 quantities cannot be implemented due to the lack of adequate facilities of NIMT to apply for the accreditation process. - Referring to “Skill after training” in the Evaluation Sheet on Technical Transfer, which contains several criteria of the assessment on each quantity - installation, operation, calibration technology, calibration procedure, accreditation, etc - the result of assessment was demonstrated by the improvement of skill before and after training. Evaluation of the “skill after training” was conducted in 23 quantities, resulting in the assessment that skill of all C/Ps had increased after training. It can predict that the tendency of the result of the improvement of C/Ps skill will be increased in other quantities as well. - The improvement of C/Ps technical capability is indicated by the seminars arranged in order to disseminate knowledge to others. According to the record of seminars, there were 33 seminars supported by the Project and implemented from February 2003 up to April 2007 covering in 32 quantities. Among this number, 7 seminars was conducted as ASEAN seminar. Furthermore, the ASEAN seminars that covered several of quantities were also implemented 4 times excluding 7 times mentioned above. - There are many seminars were conducted by NIMT itself in every year as a trainer for trainee program since 2003 to 2007 except 2006 because there were many internal affairs that NIMT staff have to manage due to the relocation to the new building. - In terms of Joint Training, by the time of this Terminal Evaluation, NIMT has already conducted 3 times of Joint Training on Measurement Standards in Thailand. Most participants came from ASEAN countries. - According to the information from the questionnaire and interview survey, recently there is no system for regular internal training implementing in NIMT since the course is organized by case. 	

Narrative summary	Objectively verifiable indicators	Achievements	Important assumptions
4. Accuracy of national measurement standards is improved.	<p>4-1. Improvement in uncertainty.</p> <p>4-2. Registration of environmental data for every laboratory.</p> <p>4-3. Number of international comparison implemented.</p>	<ul style="list-style-type: none"> - The Project was planned to finish the technical transfer in 42 quantities, and 37 quantities of the total 42 quantities have been completed by the end of May, 2007. The number of accreditation obtained during the Project reaches 14 quantities, which application procedure requires the preparation of uncertainty budget sheet and the registration of environmental data with internationally recognized standards. - The number of international comparison is 23 as to 12 different quantities have been implemented in the focus of accuracy improvement. 	
5. NIMT disseminates national measurement standards properly.	<p>5-1 Improvement in calibration technology for reference standards.</p> <p>5-2 Number of calibration procedures created.</p> <p>5-3 Items pointed by evaluation of quality system and the way to solve the items.</p>	<ul style="list-style-type: none"> - The traceability chart is prepared for all quantities at the time the Project plan was formulated in order to indicate the level of accuracy of the calibration technology that NIMT can provide by using the machinery described in the chart. Consequently, the procurement plan of machinery and equipment was prepared based on these charts. For that reason, it can be said that there are 41 traceability charts for each quantity available in order to improve the calibration technology for reference standards of NIMT, as planned. - The calibration procedure has been provided in 37 quantities, while 17 quantities are in progress. The delay in the procurement of machinery and equipment affected the schedule of technical transfer, so the calibration procedure for 17 quantities has not yet been prepared. - The quality system is assessed by the accreditation process. As the result of assessment of the accreditation, items which were not adequate or did not meet the requirement are pointed out. By the end of May 2007, the Project has been applied and got assessed for the accreditation in 14 quantities and it has plan to apply further more in 6 quantities by the time of the termination of the Project. 	

Evaluation Grid

(The Project for Strengthening for National Institute of Metrology (Thailand) Phase 2

Target Group:

- Thai Institute of Science and Technological Research (TISTR) and Department of Science Service (DSS) as Calibration Service Agencies
- Domestic Industries in Thailand (Especially export industries and enterprises trying to acquire ISO 9000s, ISO14000s)

Project Period: October 16, 2004 – October 15, 2007

Relevance

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Does the project match the needs of Thailand?	Does the overall project goal coincide with the Thai national policies?	Survey and verify the Thai national policies and guidelines on measurement standards from the industrial and scientific aspects.	<ol style="list-style-type: none"> 1. 10th National Economic and Social Development Plan 2. National Metrology System Development Act of Thailand 3. Comments from C/P 	<p>In the 10th National Economic and Social Development Plan (2007-2011), there is no change in the direction in the importance of metrology that described the significance of the metrology system development in Thai industry. It is confirmed that the overall goal of the Project still coincide with the Thai national policies.</p> <p>The result of questionnaire survey also illustrates high expectation of Thailand to maintain competitively in the global market and participation in the international economic agreements.</p> <p>The National Metrological System Development Act defines NIMT as the key institute to develop metrology system, procure and maintain national standards and standard reference materials of the country for all fields of measurement in accordance with the international metrology system.</p> <p>The duty of NIMT shall include the supporting enhancement of efficiency of study and development of metrology technology to ensure the effectiveness of the metrology system of the country as reliable and acceptable to the international metrology system.</p> <p>The Project activities are programmed similarly to the contents of global MRA. Therefore, the implementation of the project activities directly supports NIMT's performance in comparison with international level of accuracy.</p>
Is the project consistent with the needs of NIMT?	Is the project purpose consistent with the policy of NIMT?	Survey and verify the NIMT's activities.	<ol style="list-style-type: none"> 1. NIMT report of Activities 2. List of Global MRA 3. Comments from C/P 	
	Did the contents (activities) of the project support NIMT's performances in comparison with international level of accuracy?			

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Is the project consistent with Japanese ODA policy and JICA's country programs?	Is the project consistent with Japanese ODA policy?	Survey and verify the Japanese ODA policy and JICA country program.	<ol style="list-style-type: none"> 1. Japanese ODA policy 2. JICA's country programs 	<p>The Japanese government states in its basic policies of ODA charter that supporting self-help effort of developing countries, which includes economic and social infrastructure building constituting the basis for these countries' development, is one of the most important philosophies. Besides, it also defines the target area as ASEAN countries.</p> <p>According to the country approach for Thailand in ODA charter, the technical cooperation is stipulated of the mean of approach for both bilateral and multilateral cooperation around the region.</p> <p>Private sector development is one of the key issues in JICA countries approach for Thailand, particularly the enhancement of science and technology.</p>
	Is the project consistent with the field of assistant in JICA's country programs?			
Is the selection of C/P organization for the project appropriate?	Is there any other institute/ organization which should correspond to National Measurement Systems in Thailand?	Survey and verify the current situation of measurement and calibration standard activities.	<ol style="list-style-type: none"> 1. Existing documents 2. Comments from C/P 3. Comments from experts 	<p>The National Metrological System Development Act defines NIMT as the key institute to develop National Measurement Systems in Thailand.</p> <p>According to the National Metrological System Development Act, NIMT is only one institute.</p>
	Is there any other institute/ organization involved consequently in the project?			
Does Japan have an advantage in extending technical cooperation in the related sector or sub-sector?	Is there any other donor or supporting agency cooperating in the field of the national measurement systems?			<p>The National Metrology Institute of Japan is established in 1903 while NIMT is established in 1998. It is indicated that Japan has far experiences in this field than Thailand almost 100 years.</p>

Effectiveness

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Has the project purpose been achieved?	Is the set up of the project purpose appropriate in accordance with the nature of NIMT?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. NIMT reports of activities 2. Project reports 3. Comments from C/P 	<p>The objectives of the establishment of NIMT are quite consistent of the project purpose.</p>
	Did NIMT staff have trainings in 8 fields of measurement standards sufficiently?			
Did the expected outputs contribute to the achievement of the project purpose?	Are the number, accuracy and range of calibration services improved by the project?		<ol style="list-style-type: none"> 1. NIMT report of activities 2. Comments from C/P 	<p>The number and range of calibration service have been widened and the accuracy has been improved compared to the time before the initiation of the Project.</p>
	Is there any change in C/P employment plan during the project?			
	Is there any significant change in budget allocation and policy during the project?		<ol style="list-style-type: none"> 1. Financial operation report of NIMT 2. NIMT report of activities 3. Comments from C/P 	<p>Referring to the result of input analysis, there is no significant change in the budget allocation and policy during the Project.</p> <p>Referring to the result of input analysis; there is no significant change in the budget allocation and policy during the Project.</p>

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
	<p>Is there any change in organizational structure?</p> <p>Are procurement and installation of the all machineries properly completed?</p> <p>Are NIMT staffs trained by the project still working in NIMT?</p> <p>Is there any incident positively/ negatively influencing the achievement of the project purpose?</p>		<ol style="list-style-type: none"> 1. NIMT report of activities 2. Comments from C/P 3. Project reports 	<p>It was also confirmed with the Permanent Secretary of Ministry of Science and Technology that there is no negative change, respectively.</p> <p>There are 7 items that have not yet been delivered. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for the remainder will be in July 2007.</p> <p>All NIMT staffs trained by the Project have been working in NIMT at the time of Terminal Evaluation.</p> <p>The project made their enormous efforts to catch up the progress by making their training schedule flexible and dispatch additional 5 persons to be trained in Japan as requested by NIMT.</p> <p>A series of meetings was conducted every month since the beginning of the Project. Additionally, the JCC meeting is also conducted twice a year in order to maintain the mutual understanding between Japanese side and Thai side.</p> <p>From the filed survey, long term experts have been providing Japanese Language Course for NIMT staffs, which supports the better communication between Japanese experts and Thai C/Ps.</p>

Efficiency

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results		
Main Questions	Sub-Questions					
Are all activities implemented properly?	Is the allocation of Japanese experts and Thai C/P sufficient in terms of number and timing?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Comments from C/P 	<p>Referring to the result of input analysis, the allocation of short term experts has been delayed in 5 quantities due to the delay of machinery and equipment procured by ODA loan.</p> <p>Nonetheless, for time being 30 short terms experts were dispatched and it is considered that the allocation is appropriate in terms of number and timing.</p> <p>The allocation of Thai C/Ps is considered appropriate in both administrative and technical staff.</p>		
	Is the budget for O&M of the project allocated as planned?				<ol style="list-style-type: none"> 1. Financial operation report of NIMT 2. Comments from C/P 	<p>According to the result of the budget analysis for the implementation of the Project, it is confirmed that the budget was allocated as planned.</p>
	Are all equipment, which are mainly procured by ODA loan, installed as planned?				<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Price list of calibration service 4. Field survey 5. Comments from C/P 	<p>By the end of May 2007, the procurement of 387 machinery and equipment procured by ODA Loan are completed. There are 7 items that have not yet been delivered. Among these 4 items will be delivered by the end of June 2007 and the delivery plan for the remainder will be in July 2007.</p>
	Are these equipment utilized effectively?					<p>It is confirmed that all procured equipments are utilized effectively since these equipments are the important component for their performance.</p>
	Is there any internal training system in NIMT?					<p>Technical cooperation program has been prepared and components are implemented by the Project.</p>
	Are measurement standards established and maintained as planned?					<p>Based on the fact that the process of technical transfer and accreditation have not yet been completed in all quantities; it is fair to say that the establishment and maintain of measurement standards have not yet achieved as planned.</p>
	Is the environmental management of laboratories improved during the project?					<p>The environmental management system will be established after the completion of accreditation process.</p> <p>The accreditation process has been completed in 14 quantities. This means the environmental management of some laboratories has been improved.</p>
						<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Training documents 4. Comments from C/P
		<ol style="list-style-type: none"> 1. File of environmental management sheet 2. Project reports 3. NIMT reports of activities 4. Comments from C/P 	<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Results of equipment inventory 4. Comments from C/P 			

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
	How many international comparisons were conducted?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Record of international comparison on measurement standards 2. Project reports 3. NIMT reports of activities 4. Comments from C/P 	<p>At the time of the terminal evaluation, it was confirmed that it has participated in 23 international comparisons as to 12 different quantities, which increased 8 comparisons in 2 quantities from the time of Mid-term evaluation.</p> <p>The improvement of calibration technology is referred to the traceability chart of NIMT. It is confirmed that this chart is available in all quantities of technical transfer which automatically lead to the improvement of calibration technology.</p>
	Is the calibration technology for reference standard improved?			
Is the set up of important assumption adequate?	Did NIMT take any countermeasure to prevent the resignation of C/P trained in the project?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Policy of employment in NIMT 2. Project reports 3. Comments of C/P 	<p>Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation.</p>
	Is there any factor enhancing/ hindering the project outputs?			
Is the output generation adequate?	Are the operation and administration of the project enhanced?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Project reports 2. Comments of C/P 	<p>The countermeasure to prevent the resignation of skillful NIMT staff trained by the Project could secure the adequate generation of outputs comprehensively.</p> <p>The delay of the procurement of machinery and equipment might have hindered the achievement of Project outputs.</p>
	Are the equipment operated and maintained properly?			
	Is the technical capability of C/P upgraded?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Staff allocation list 2. Budget chart 3. Organizational chart 4. Comments from C/P 	<p>The result of output analysis, the enhancement of the operation and administration of the Project is satisfactory.</p> <p>According to the result of questionnaire survey, the most of answers from respondents indicates more than fairly.</p>
			<ol style="list-style-type: none"> 1. Project reports 2. NIMT reports of activities 3. Result of equipment inventory 4. Comments from C/P 	<p>The result of output analysis, all equipment are operated and maintained properly.</p> <p>According to the result of questionnaire survey, most of respondents rate very much and much.</p>
			<ol style="list-style-type: none"> 1. Evaluation sheet of technical transfer 2. Project reports 3. Comments from C/P 	<p>The technical capability of C/P is assessed with the satisfactory level.</p> <p>According to the result of questionnaire survey, the answer from most respondents is very much or much.</p>

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
	Is the accuracy of measurement standards improved?		<ol style="list-style-type: none"> 1. Records of the accuracy of national measurement standards 2. Project reports 3. Comments from C/P 4. File of environmental management sheet 5. Project report 6. Comments from C/P 	<p>The accuracy of measurement standards is obviously improved in some quantities which accreditation processes have been completed.</p> <p>According to the result of questionnaire survey, the answer from most respondents is very much or much.</p>
	Does NIMT disseminate national measurement standards properly?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Traceability charts of NIMT 2. Calibration certificate 3. Manual or guideline of calibration procedure 4. Project report 5. Project reports 6. NIMT report of activities 7. Comments from C/P 	<p>The dissemination of national measurement standards has been conducted properly in some quantities which accreditation processes have been completed.</p> <p>According to the result of questionnaire survey, the answer from most respondents is very much or much.</p>

Impact

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Is the national measurement systems of Thailand established nationwide?	How many were calibration laboratories increasingly registered during the project?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> List of laboratories Project reports Comments from C/P 	<p>NIMT has already participated in the Global MRA and quantities are increasingly listed in Appendix B and C of the Global MRA. However new registration to appendix C for transferred quantities have not been finalized yet. The number of calibration laboratories that available on NIMT's website by the time of the evaluation is 78.</p> <p>The traceability chain and roles of respective organization of measurement network in Thailand have been established.</p> <p>The National Measurement Network with NIMT as its top has already encompassed more than 130 laboratories in its network according to the interview result from a director of NIMT.</p>
	How much is the measurement network in Thailand established?			
Did the achievement of the overall goal result from the project purpose?	Is there any change in the role of NIMT as the institute for maintaining national measurement standard?		<ol style="list-style-type: none"> 10th National Economic and Social Development Plan Organizational structure of Ministry of Science and Technology Project reports Comments from C/P 	<p>The National Metrological System Development Act stipulates NIMT to play their roles and responsibilities as the institute to develop metrology system, procure and maintain national standards and still effective.</p> <p>This important assumption is assessed as applicable as before.</p>
	Is there any unexpected factor on attainment of the overall goal, either positively or negatively?			
Is there any unexpected positive or negative influences including ripple effects?	Is there any unexpected positive or negative influences including ripple effects?			NIMT has been holding the ASEAN seminar and workshops continuously, and the Joint Training as well. The recognition of NIMT in the ASEAN region has been growing gradually since the Project started.

Sustainability

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results
Main Questions	Sub-Questions			
Is the achievement of the project going to be sustained after the termination of the project?	Is the technology of equipments and knowledge installed by the project appropriate for the technical capacity of C/P?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. Project report 2. NIMT reports of activities 3. Comments from C/P 	After the process of technical transfer and accreditation process were completed, NIMT staffs were given the opportunity to share their knowledge and experience with others staffs by assessing the record of seminars conducted by the Project. Most of respondents in the questionnaire survey evaluated that the technology of equipments and knowledge transferred thought the Project were appropriate.
	Are the technical and maintenance manuals prepared in the project utilized effectively?		<ol style="list-style-type: none"> 1. Evaluation sheet of technical transfer 2. Project reports 3. Comments from C/P 	The technical and maintenance manuals have been prepared in the Project. It was confirmed by the field observation that those manuals are utilized very much because of the guidance of accreditation.
	Did NIMT take any countermeasure to prevent the resignation of C/P trained in the project?		<ol style="list-style-type: none"> 1. Policy of employment in NIMT 2. Project reports 3. Comments from C/P 	Regarding to the measure against resignation of C/P trained in the Project, NIMT and C/P have signed a contract to prevent the resignation for a certain period. This employment policy has not been changed at the time of the evaluation.
	Does the 10 th National Economic and Social Development Plan still emphasize the significance of the metrology system in Thai industry?		<ol style="list-style-type: none"> 1. 10th National Economic and Social Development Plan 2. Project reports 3. Comments from C/P 	The 10 th national Economic and Social Development Plan described the importance of enhancing the competitiveness of Thai industry to the global market. In term of the international trading, the Quality System is required to build up consumers' confidence in the products. As a result, the measurement standard activity becomes a part of the system to ensure the quality of the products.

Evaluation Questions		Criteria and Method for Judgment	Required Data	Results		
Main Questions	Sub-Questions					
	Is the National Metrology System Development Act (1995, enacted in 1997) still effective to encourage the activities of NIMT?	Survey and verify NIMT's activities	<ol style="list-style-type: none"> 1. National Metrology System Development Act 2. Project reports 3. Comments from C/P 	<p>Considering the roles and responsibilities of NIMT, the National Metrology System Development Act is still effective to encourage the activity of NIMT to play its role as the primary measurement standard organization and contribute to the firmly establishment of traceability system in Thailand ultimately.</p>		
	Is the financial assistant from Thai Government to NIMT for the coming years secured enough to operate and maintain the facilities?				<ol style="list-style-type: none"> 1. Financial operation report of NIMT 2. Price list of calibration services 3. Project reports 4. Comments from C/P 	<p>Considering the annual government budget allocated to NIMT from 2004–2006, the trend is predicted as increasing.</p>
	Is the status of revenue from the calibration services improving?					<p>According the interview result of the director of NIMT, it indicated that NIMT does not have a policy to raise its own funds by providing more calibration services at this moment. It is shown that NIMT emphasis its role on the improvement of the development of measurement standard as the primary standard organization of Thailand.</p>
	Does the community of the Thai industry still need NIMT as the high level measurement standards as before?		<ol style="list-style-type: none"> 1. Project reports 2. Comments from C/P 3. Others 	<p>Given that NIMT was established in accordance with the National Metrology System Development Act, and it has become more important as a core body of national measurement standard development of Thailand.</p>		

Annex 9: Allocation of the C/P and Staff for the Project

Annex 9 Allocation of the C/P and Staff for the Project

Name of C/P	JFY												Remarks												
	2002			2003			2004			2005				2006											
	4	5	6	7	8	9	10	11	12	1	2	3		4	5	6	7	8	9	10	11	12	1	2	3
Term of Technical Cooperation																									
Term of Technology Transfer																									
(18) Fixed Point																									
Ms. Charuyrat Yaokulbodee																									
(19) Angle Standard																									
Mr. Watcharin Samit																									
(20) Standard Solution																									
Dr. Preeyaporn Pookrod																									
(21) Standard Gas																									
Mr. Bunthoon Loangsri																									
(22) Pressure Standard																									
Mr. Likit Sainoo																									
(23) Large Weight Standard																									
Mr. Wirun Laopompichayanuwat																									
(24) Vickers Hardness Standard																									
Ms. Rugkanawan Kongkavitool																									
(25) Magnetic Standard																									
Mr. Thapbodin Borerakarawin																									
(26) Laser Power																									
Mr. Narat Rujirat																									
(27) Flux/Intensity																									
Mr. Arkom Krachangmol																									
(28) Spectral Irradiance																									
Ms. Rojana Leccharoen																									
(29) Environment Management																									
Mr. Chusak Chusai																									
(30) QHR Standard																									
Mr. Chaiwat Jessadajin																									

Annex 10: List of the Dispatched Japanese experts

Annex 10 List of the Dispatched Japanese Experts

Japanese Fiscal Year Month	2003												2004												2005												2006												2007											
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10								
Term of Cooperation																																																												
Term of Technology Transfer																																																												
Improving the confidence of National Measurement Standards	<p>Ms. Hironori Murata (Jan.18, 2004-Jan.24, 2004)</p> <p>Mr. Yuji Negami (Jan. 18, 2004-Jan.24, 2004) (IAJapan Budget)</p> <p>Dr. Atsushi Onoe (Jan.18, 2004-Jan.28, 2004)</p> <p>Mr. Takeshi Fujimori (Jan. 18, 2004-Jan.30,</p> <p>Mr. Toméji Iguchi (Feb. 2, 2004-Feb. 27, 2004)</p> <p>Mr. Ichiro Fujima (Feb. 15, 2004-Feb. 21,</p> <p>Dr. Sonko Osawa (Feb. 22, 2004-Mar. 20,</p> <p>Ms. Keiko Sako (Mar. 7, 2004-Apr.24, 2004)</p> <p>Dr. Chiharu Takahashi (Apr. 4, 2004-Apr.12,</p> <p>Dr. Kazuya Naoi (Aug. 3, 2004-Aug.24, 2004)</p> <p>Mr. Keisaburo Kanb (Sep. 1, 2004-Sep.30, 2004)</p> <p>Mr. Eizo Yamasaki (Sep. 27, 2004-Oct.1, 2004)</p> <p>Dr. Koichiro Hattori (Sep. 27, 2004-Oct.1, 2004)</p> <p>Mr. Joichi Yokota (Dec.16, 2004-Apr.15, 2005)</p> <p>Dr. Tsukasa Watanabe (Jan. 19, 2005-Feb. 18, 2005)</p> <p>Mr. Shigeru Igarashi (Feb. 28, 2005-Mar. 30, 2005)</p> <p>Mr. Hiromi Ishige (Jun. 9, 2005-Jun.17, 2005)</p> <p>Dr. Toshiyuki Takatsuji (Jun. 26, 2005-Jul.21, 2005)</p> <p>Dr. Tsukasa Watanabe (Sep. 12, 2005-Oct.1, 2005)</p>																																																											
DC High Voltage																																																												
Calibration Procedure																																																												
CMM																																																												
RF Power/Voltage																																																												
Humidity																																																												
Roughness																																																												
Calibration Procedure																																																												
Improving the confidence of National Measurement Standards																																																												
Environment Management																																																												
Angle Standard																																																												
RF Attenuation																																																												
Surveillance on Wavelength Standard and Acoustics Standard																																																												
Flatness Standard																																																												
Calibration Procedure																																																												

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