3-3 相手国側分担事業の概要

日本国の無償資金協力による本プロジェクトの実施にあたり、ベトナム国政府等に要求する負担範囲は、JICA の無償資金協力のガイドラインに従い、次のとおりである。

(1) 無償資金によってカバーされないベトナム国負担事項

1)入札前

No.	項目
1	銀行口座を開設すること(B/A)
2	コンサルタントへの支払いのために日本の銀行(Agent Bank)に対して支払い許可(A/P)を発行する
3	以下の土地等を確保すること (1) X バンドレーダ雨量計のためのサイト (2) 水文観測所のためのサイト (3) 通信中継局のためのサイト (4) Hue PCC-NDPCSR に機器を設置するのに十分なスペース (5) MARD の DNDPC に機器を設置するのに十分なスペース (6) フンディエン・ビンディエン・ターチャック各ダムのオペレーションルームに機器を設置するのに十分なスペース (7) 施工者の事務所、作業場、資材置場等の一時的設備のための十分なスペース
4	X バンドレーダ雨量計、水文観測所及び無線基地局のための建築物について、建築許可を得ること
5	X バンドレーダ雨量計、水文観測所、テレメータ及び多重無線に必要な周波数の許可を得ること
6	X バンドレーダ雨量計及び多重無線設備の高さの高い建築物の安全性について必要な許可を得ること
7	LiDAR 測量の実施に必要な許可を得ること（航空機の利用、撮影許可及び解析のためのデータの国外持ち出し可能性）
8	中央政府レベルにおけるプロジェクト管理業務に必要な予算を確保すること
9	フエ省におけるプロジェクト管理業務に必要な予算を確保すること

2)プロジェクト実施中

No.	項目
1	納入業者への支払いのため、日本の銀行に A/P を発行すること
2	B/A に基づく銀行サービスについて、日本の銀行に支払う以下の手数料を負担する (1) A/P の助言手数料 (2) A/P の支払手数料 (3) A/P の修正のための手数料
3	荷おろし港における迅速何卸や通関手続きを確保するとともに、ベトナム国内での納入業者による陸送を支援すること
4	契約に基づく機材の供給やサービスの提供のために必要な、日本人もしくは外国人とその家族に、ベトナムに入国し滞在する許可を与えること
5	日本の無償資金協力の規則により、無償資金は、関税、内国税を一切カバーしない。

	ベトナムにおける製品やサービスの購入に対して課される関税、内国税、その他の税金が免除されるもしくはベトナム側機関が負担することにより無償資金ではカバーされないことをベトナム側が保証すること。上述の税金には付加価値税、商業税、所得税、法人税、住民税、燃料税及びそれ以外の税金が含まれる。これに限定されず、契約に基づく製品およびサービスの供給に関して受領国に課されることがある。
6	資金協力により負担される費用以外で、プロジェクトに必要なすべての費用を負担すること
7	(1) 契約に基づく船積み、引き渡し、据付及び運用指導などのタイミングで、コンサルタントの草案を利用して、プロジェクト進捗レポートを提出すること (2) コンサルタントの草案を利用して、プロジェクトの進捗報告書(最終)を提出すること
8	コンサルタントの草案を利用して、プロジェクトの完了報告書を提出すること
9	プロジェクトの実施に必要な、インターネット接続環境の整った仕事スペースを提供すること
10	主要電線からレーダ雨量計タワーのサイトまでの電柱・電線等及び商用電源を提供すること
11	Hue PCC-NDPCSR、MARD の DNDPC、フンディエン・ビンディエン・ターチャック各ダムのオペレーションルームに設置する情報処理･表示機器のために必要な電柱、電線及び商用電源を提供すること
12	電気配分設備、水供給、排水、その他の付帯的設備を提供すること
13	主電源線から無線基地局までの電線・電線等及び商用電源を提供すること
14	ガード小屋、植栽、フェンス、ゲート、境界壁、屋外照明などの付帯的屋外仕事の責任を負い、観測所の既存の建物や設備を改修すること
15	MARD 本省と予定されている各プロジェクトサイトにおいて信頼できる高速度のインターネット環境を提供すること
16	トレーニングサイトへ研修生を派遣するために必要な移動手段を確保するとともに、日当や宿泊施設などの費用を負担すること
17	中央政府レベルにおけるプロジェクト管理業務に必要な予算を確保すること。
18	フエ省におけるプロジェクト管理業務に必要な予算を確保すること。

3) プロジェクト実施後

No.	項目
1	機器の円滑な運用と維持管理に必要なスペアパーツと消耗品を調達すること（※このコストの詳細な内訳については 5 章 5-2 に示す)
2	機器の円滑な運用と維持管理に必要なスタッフを割り当てること
3	プロジェクトで整備した機器が長期的に継続して効果的に機能するように適切な維持管理を行うこと
4	プロジェクトで建設された設備及び調達・設置された機器を有効に活用すること
5	プロジェクトで整備されたシステムを円滑に運用・管理するのに必要な予算を確保すること

(B/A: Banking Arrangement **銀行口座の開設**, A/P: Authorization to pay, **支払い許可**)

(注記) ベトナム国政府の負担事項の進捗状況については、無償資金協力合意文書(G/A)の修正以外の形で、JICA とベトナム国政府間の文書による合意をもって時々確認され更新される。

(2) 無償資金によってカバーされるベトナム国側の負担事項

No.	項目
1	(1) 下記の輸送の実施 a) 日本がベトナム国まで製品を海上輸送もしくは空輸 b) 荷下ろしと港からプロジェクトサイトまでの陸送 (2) 据付、調整を含めた機材の調達
2	詳細設計、入札支援及び調達管理の実施（コンサルタント業務）

3-4 プロジェクトの運営・維持管理計画

3-4-1 必要な運用･維持管理

本プロジェクトは、流域の降雨状況、河川の主要地点の水位･流量を観測し、3 つの大ダムの貯留･放流状況等のデータを収集し、それらのデータを解析することで、現状の流出状況の把握と洪水と浸水の予測を行い、的確なダム操作のための情報を得るとともに、関係機関と住民に情報伝達する、総合的な水防災情報システムを構築するものである。

これらの機能を発揮し、効果的な水害の軽減を図るためには、的確な運用と必要な維持管理が行われることが不可欠である。

各機関ごとの、必要な運用操作と維持管理の内容、体制は以下のとおりである。

表 3-30　各機関ごとの運用操作と維持管理

1) フエ省 PCC-NDPCSR

必要な操作･維持管理		目的	実施期間	人員
システムの操作 データの監視		･降雨･河川･ダムの状況把握 ･システムの表示操作 ･各ダムへの連絡 ･予警報の発信 ･異常値発見、原因調査、対応など	･通年 ･大雨･洪水警戒時は 24hr 体制	･平常時 2 名以上 ･警戒時は交代要員も(2～4 名)(水文･河川等の知識のある人が望ましい)
データの収集･整理(システムパラメータ改善など)				
	高水流観	･観測水位から流量を算出するための HQ 曲線作成（P2,P4,P6,P8,N7,N11）	･毎年、洪水時（主要地点は全洪水時）	測量業者に外部委託（浮子観測は 1 箇所 5 名）
	レーダパラメータ	･地上雨量観測データとのキャリブレーション	･毎年 1 回 ･初期は各洪水後	･2 名（水文･河川等の知識のある人が望ましい）
	モデル定数	･解析モデルパラメータの実洪水での検証と更新	･毎年 1 回 ･初期は各洪水後	
	蓄積データの整理･評価	･各種データの整理と今後の水害対策の検討	･通年	
トラブル対応		･データ欠測･データ異常値発生･画面表示不能などのトラブルへの対処 →原因調査（機器･ソフト･入力ミス･アクセス集中など）	･トラブル発生時	･2 名（水文･河川等の知識） ･2 名（電気通信の知識）

	と解決策検討 ・観測・通信・システムの各機器の故障への対応		
機器点検	・33 箇所（水位・雨量観測所 11、フエ 1、ハノイ 1、ダム 3、中継所 3、CCTV14） ・レーダ	・毎年 1 回	
機器修理	・修理委託のための資料作成	・随時	

2) CSC-NDPC（ハノイ）

必要な操作・維持管理	目的	実施期間	人員
表示システムの操作	・システムの表示操作 ・洪水の状況、ダム操作状況の把握 ・CSC-NDPC としてのダム操作等への指示	・通年 ・大雨・洪水警戒時は 24hr 体制	・2 名（現状の CSC-NDPC の体制で対応できれば、増員は不要） ・警戒時は交代要員も
蓄積データの整理・評価	・各種データの整理と今後の水害対策の検討	・通年	・2 名（水文・河川等の知識） ・2 名（電気通信の知識） （現状の CSC-NDPC の体制で対応できれば、増員は不要）
トラブル対応	・データ欠測・データ異常値発生・画面表示不能などのトラブルへの対処 →原因調査（機器・ソフト・入力ミス・アクセス集中など）と解決策検討 ・ハノイ部分のシステムの各機器の故障への対応	・トラブル発生時	
機器点検	・ハノイ部分のシステム等	・毎年 1 回	
機器修理	・修理委託のための資料作成	・随時	

3) 3 ダム管理所

必要な操作・維持管理	目的	実施期間	人員
表示システムの操作 PCC-NDPCSR との連絡 トラブル時の対応	・降雨・河川・ダムの状況把握 ・システムの表示操作 ・PCC-NDPCSR への連絡 ・ダム操作判断 ・トラブル時の PCC-NDPCSR との連絡	・通年 ・大雨・洪水警戒時は 24hr 体制	・2 名（現状のダム・発電所管理体制の中で対応できれば、増員は不要）

3-4-2 大雨や洪水時の情報運用の留意点

大雨やそれによる河川の増水時には、河川水位上昇や流量増が起こるだけでなく、河道の状況なども時々刻々と変化する。そのため、情報システムの数値を見ているだけでなく、全体状況を把握しつつ、特に以下のような点について注意して運用操作することが重要である。なお、これらについてはソフトコンポーネントの中で、的確な

技術移転を図る。

- 河道の形状変化や流木等による影響で、観測値に異常値が発生することがあるため、必ず交替で観測データ等の常時監視を行うことが重要である。カメラ画像なども活用し、仮に異常値と認められた場合には、当該データを欠測扱いとするなどの、機敏な対応が必要である。
- 洪水予測や浸水予測は、今後の降雨予測を基にシミュレーションしたものである。自然現象である降雨は必ずしも予測どおりとはならず、洪水予測などもある程度の誤差を持っている。そのため、ある程度の誤差を含んだ理解と判断が重要であり、ダム操作や住民への伝達においてもそのことを十分踏まえたものでなければならない。
- 水防災情報システムの情報を基にダム操作を行う場合には、必ず操作後の状況を本システムで確認するとともに、カメラ画像などでも確認することが重要である。

3-4-3 情報システムのモデル定数、HQ 曲線データ、レーダ定数の毎年の更新

水防災情報システムにおいて、正確な流出解析による河川流量算出や洪水予測を行うためには、降雨量・河川水位・河川流量の実際の観測データを入力して検証し、毎年、モデルの定数をより適合性の高いものに更新することが重要である。フォン川流域については、過去の観測データが不足しており、これまで観測密度もまばらであったために、新たな観測体制での観測データによる定数の更新が不可欠である。

また、このときの河川流量については、一般的には直接に常時観測できないので、主要な出水時に高水流量観測を行って水位と流量の関係を HQ 曲線として作成し、その曲線データを情報システムにプログラミングすることで算出している。このため、毎年の高水流量観測と HQ 曲線データの更新が不可欠である。なお、高水流量観測は、浮子測法の場合は 1 箇所あたり 5～6 名、電波流速計の場合は 1 箇所あたり 2 名必要であり、4 箇所の観測に合計 20 名から 8 名が必要となる。これらの人数は、常時必要なわけではないので、外注するか他の部署からの応援による体制を確保する必要がある。また、Kim Long と Phu Oc については、NHMS の水位観測所であり、NHMS で高水流量観測することが必要である。

正確なレーダ雨量データを得るため、地上の雨量観測データと JAXA の衛星雨量データ等を用いて検証し、毎年、レーダの定数を更新する必要がある。

以上については、ソフトコンポーネントの中で的確な技術移転を図る。

3-4-4 迅速で的確なトラブル対応

4-2 に記述したように、観測データやシミュレーションデータの常時監視の体制が重要であるが、異常が発見されたときの迅速で的確な対応が重要であり、そのための体制も確保しておく必要がある。また、修理等を行うための資料作成などの事務を行う体制も必要である。

台風来襲時などでは、観測機器や通信機器周辺の樹木が倒れ正常作動ができなくなったり、河道形状が変化して観測不能になったり、停電がシステム作動に影響したりなど、予期しない状況が発生することもある。

日本でも、トラブルがまったく発生しない前提での情報システムの運用を考えるのは正しくないとしており、万が一トラブルが発生した場合でも迅速で的確な対応をできるようにすることを重要視している。観測データの異常値発見、通信障害、システムダウンなどのトラブルが発生した場合に、①的確なバックアップによる情報サービスの継続と、②トラブルの原因究明と改善、が迅速に行われる必要がある。

これらについては、部分的にデータが欠測しても周辺データ等で補完するシステムとしておくほか、トラブル時の対応についてソフトコンポーネントの中で的確な技術移転を図る。

3-5 プロジェクトの概略事業費

3-5-1 協力対象事業の概略事業費

(1) 日本側負担経費

概略総事業費　約 1,818 百万円

費　目		概略事業費（百万円）	
機材	水文観測所	47	1,675
	CCTV 設備	141	
	レーダ設備	241	
	多重無線装置	282	
	テレメータ設備	261	
	情報処理・表示設備	484	
	ダム水位計設備	23	
	ダムゲート開度測定装置	25	
	LiDAR 測量	171	
実施設計・調達監理・技術指導		143	

(2) ベトナム国負担経費

1,500 百万 VND（約 7,230 千円）

項目	VND	円	備考
1)銀行支払手数料等	850 百万 VND	4,080 千円	
2)土地取得	0 VND	0 円	すべて公有地のため
3)電気引込費	375 百万 VND	1,800 千円	
4)デジタル回線（VPN）引き込み費用	68.4 百万 VND	330 千円	

5)携帯 SIM カードの調達	0.1 百万 VND	0.5 千円	
6)周波数取得費用	0 VND	0 円	防災目的のため免除
7) インターネット回線敷設費用	211 百万 VND	1,014 千円	

※VND：ベトナムドン

(3) 積算条件

1)積算時点 ：平成 28 年 8 月

2)為替交換レート：1US＄＝107.2 円

：1VND＝0.0048 円

3)施工・調達期間：詳細設計、機材調達の期間は、施工工程に示したとおり。

4)その他 ：積算は、日本国政府の無償資金協力の制度を踏まえて行うこととする。

なお、本事業は予備的経費を想定した案件となっている。

但し、予備的経費の適用及び経費率については外務省によって別途決定される。

3-5-2 運営・維持管理費

(1) 本プロジェクトの実施により発生するベトナム国側の運用維持管理費

本プロジェクトが無償資金協力によって実施される場合の、プロジェクト完工後 1 年目から 10 年目までの運用維持管理コストを算出した。

運用・維持管理コストは、以下の状況下での概算である。

- フエ省 PPC、3 ダム、MARD による運用･維持管理の実施
- 運用マニュアルに従い適切な運用の実施
- マニュアルに従い定期的かつ適切な維持管理の実施

Hue 省 PCC-NDPCSR、MARD の CSC-NDPC、フォン川流域の 3 ダム管理所の運用・維持管理コストを以下に示す。

表 3-31～33 の金額は、本プロジェクトで整備するのと同種の機材についての、日本での実績の平均値を基に推定したものであり、日頃のメンテナンスや機材の状況により異なり、必ずしも同じ金額になるものではない。

(2) 予算の推移の傾向と本プロジェクトの運用・維持管理費

試算した年平均の運用･維持管理費は、フエ省 DARD 及びフォン川流域 3 ダム管理会社等の年間全体予算の約 4%程度であり、問題なく必要な予算が確保できるものと判断した。また、各機関は準備調査団に対して必要な予算を手当てする旨を確約している。

表 3-31　運営・維持管理費（フエ省 PCC-NDPCSR）

(a)機器費用　　(VND)

	Item	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Rematk
1	水文観測所	10	0	0	0	0	469,791,667	0	0	0	0	469,791,667	
2	CCTV設備	14	0	0	0	0	1,447,916,667	0	0	0	0	1,447,916,667	
3	レーダ設備	1	0	0	0	0	1,956,458,333	0	0	0	0	1,956,458,333	
4	多重無線設備	1	0	0	0	0	844,270,833	0	0	0	0	844,270,833	
5	観測所通信設備	10	0	0	0	0	1,470,000,000	0	0	0	0	1,470,000,000	
6	情報処理・表示設備	1	0	0	0	0	1,618,229,167	0	0	0	0	1,618,229,167	
7	ダム水位計設備	3	0	0	0	0	238,125,000	0	0	0	0	238,125,000	
8	ダムゲート開度測定装置	2	0	0	0	0	117,291,667	0	0	0	0	117,291,667	
	Sub total(a)　(VND)	1	0	0	0	0	8,162,083,333	0	0	0	0	8,162,083,333	ー

(b)その他必要経費　　(VND)

	Item	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Rematk
1	土地取得(借用)・設備費	1	0	0	0	0	0	0	0	0	0	0	
2	電気使用料	1	47,892	47,892	47,892	47,892	47,892	47,892	47,892	47,892	47,892	47,892	T6電気利用料
3	デジタル回線(VPN)使用料	3	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	Hue,DaNang,NHMS VPN利用料
4	携帯SIMカード使用料	2	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	P7,ALUOI発電所 携帯網利用料
	Sub total(b) (VND)	1	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	ー

(VND)

	Total(1) VND	1	160,247,892	160,247,892	160,247,892	160,247,892	8,322,331,225	160,247,892	160,247,892	160,247,892	160,247,892	8,322,331,225	**17,926,645,587**

(JPY)

	Total(1) JPY	1	769,190	769,190	769,190	769,190	39,947,190	769,190	769,190	769,190	769,190	39,947,190	**86,047,899**

表 3-32　運用・維持管理費（MARD　CSC-NDPC）

(a)機器費用　　（VND）

	Item	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Rematk
1	情報処理・表示設備	1	0	0	0	0	62,500,000	0	0	0	0	62,500,000	
	Sub total(a)　（VND）	1	0	0	0	0	62,500,000	0	0	0	0	62,500,000	ー

(b)その他必要経費　　（VND）

	Item	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Rematk
1	電気使用料	1	0	0	0	0	0	0	0	0	0	0	事務所からの電源を分配して使用する。
2	デジタル回線(VPN)使用料	1	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	HANOI VPN利用料金
	Sub total(b)　（VND）	1	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	ー

（VND）

	Total(2)　（VND）	1	52,800,000	52,800,000	52,800,000	52,800,000	115,300,000	52,800,000	52,800,000	52,800,000	52,800,000	115,300,000	**653,000,000**

（JPY）

	Total(2)　（JPY）	1	253,440	253,440	253,440	253,440	553,440	253,440	253,440	253,440	253,440	553,440	**3,134,400**

表 3-33　運用・維持管理費（Huong 川流域 3 ダム管理所）

(a)機器費用　　（VND）

	Item	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Rematk
1	情報処理・表示設備	1	0	0	0	0	348,229,167	0	0	0	0	348,229,167	
	Sub total(a) （VND）	1	0	0	0	0	348,229,167	0	0	0	0	348,229,167	ー

(b)その他必要経費　　（VND）

	Item	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Rematk
1	電気使用料	1	0	0	0	0	0	0	0	0	0	0	ダムからの電源を分配して使用する。
	Sub total(b) （VND）	1	0	0	0	0	0	0	0	0	0	0	ー

（VND）

	Total(3) （VND）	1	0	0	0	0	348,229,167	0	0	0	0	348,229,167	**696,458,333**

（JPY）

	Total(3) （JPY）	1	0	0	0	0	1,671,500	0	0	0	0	1,671,500	**3,343,000**

4. プロジェクトの評価

4-1 事業実施のための前提条件

本プロジェクトの実施にあたっては、ベトナム国の負担により下記のような手続きが円滑になされることが前提条件である。

(1) 以下の土地等を確保すること
  1) X バンドレーダ雨量計のためのサイト
  2) 水文観測所のためのサイト
  3) 通信中継局のためのサイト
  4) Hue PCC-NDPCSR に機器を設置するのに十分なスペース
  5) MARD の DNDPC に機器を設置するのに十分なスペース
  6) フンディエン・ビンディエン・ターチャック各ダムのオペレーションルームに機器を設置するのに十分なスペース
  7) 施工者の事務所、作業場、資材置場等の一時的設備のための十分なスペース
(2) X バンドレーダ雨量計、水文観測所及び無線基地局のための建築物について、建築許可を得ること
(3) X バンドレーダ雨量計、水文観測所、テレメータ及び多重無線に必要な周波数の許可を得ること
(4) X バンドレーダ雨量計及び多重無線設備の高さの高い建築物の安全性について必要な許可を得ること
(5) LiDAR 測量の実施に必要な許可を得ること（航空機の利用、撮影許可及び解析のためのデータの国外持ち出し可能性
(6) 中央政府レベルにおけるプロジェクト管理業務に必要な予算を確保すること
(7) 地方政府レベルにおけるプロジェクト管理業務に必要な予算を確保すること

4-2 プロジェクト全体計画達成のために必要な相手方投入(負担)事項

プロジェクトの全体計画を達成するために、ベトナム国側が投入（負担）すべき事項は下記のとおりである。

(1) 人的資源開発
  1) 必要な人材を継続的に雇用する
  2) 研修や人的資源開発計画を通じて、より優れた人材の育成を行う
(2) 水災害管理の推進
  1) 効果的な水災害防止・軽減のために、関係機関相互の連携を強化する
  2) 水防災情報システムの有効活用等により、関係機関や流域住民への的確かつ迅速な防災情報伝達を行う
(3) プロジェクトによって調達された機材及びシステム等の長期有効活用
  1) 機材やシステムの運用や定期的な保守点検に必要な予算を確保し、必要な交換部品や消耗品の調達を行う（3-4 プロジェクトの運営・維持管理計画 を参照）
  2) 機材やシステムの盗難や破損を防止する
  3) 水防災情報システムのモデル定数、HQ 曲線データ及びレーダ定数について定期的に検証・更新するとともに、必要に応じてシステムの改善を行う

4-3 外部条件

本プロジェクトの実施に際しての外部条件として、下記の諸事項を前提としている。

(1) ベトナム国政府の水災害防止・軽減にかかる政策の変更がない。

(2) ベトナム国農業農村開発省、同天然資源環境省、フエ省人民委員会及びフォン川流域のダム管理会社等関連機関相互の連携協力体制が維持される。

(3) 水防災情報システムの運用・維持管理に必要な人員と予算が確保され、長期にわたって継続的にシステムの有効活用及び必要に応じて改善が図られる。

4-4 プロジェクトの評価

4-4-1 妥当性

本プロジェクトは、水文観測機材、ダム管理用機材、水防災情報システムの設置により、中部地域の洪水被害の軽減に資するものであり、ベトナム国の開発政策、わが国及び JICA の協力方針・分析に合致し、SDGs の「ゴール 1　あらゆる形態の貧困の撲滅」及び「ゴール 11　包摂的、安全、強靭な都市及び人間居住の構築」に貢献すると考えられる。また、自然災害への対応は人道上の観点からニーズが高いこと、2015 年 3 月の国連防災世界会議で発表した「仙台防災協力イニシアティブ」において、わが国は自国の知見と技術を活かした国際貢献を表明していることから、外交的観点からも本事業の実施を支援する必要性は高く、妥当であると判断される。

4-4-2 有効性

本プロジェクトの実施による定量的な効果として、下表に示すように、水文観測密度の向上、ダムによる下流部洪水低減量向上及び雨量・水位情報伝達速度の向上が挙げられる。

表 4-1　定量的効果一覧表

指標名		基準値 (2016 年実績値)	目標値 (2022 年) 【事業完成 3 年後】
水文データの密度	システムに利用できる雨量データ (地点数/km^2)	1/400	1/0.1
	河川水位・流量観測地点 (個所)	6	16
ダムによる下流部洪水低減量 (m^3/s)		-1,480 (25%低減) *	-3,130 (55%低減) *
雨量、水位の情報伝達頻度 (間隔)		60 分	10 分

* 記録的大洪水である 2009 年 9 月洪水と同規模洪水の場合のフエ市中心部 (Kim Long) での推計値

また、定性的な効果としては、下記のような事項が挙げられる。

① フォン川流域のダムの適切な管理・運用能力の向上に寄与する

② フォン川流域全体の水関連災害の予防・軽減に寄与する

③ フォン川流域の浸水範囲予測情報を提供し、適切な住民の避難等に寄与する

5. 資料

5.1 調査団員・氏名

(1) 第一次現地調査

No.	氏　名	担当業務	所　属
1	井上　陽一	総括	JICA 地球環境部 防災第一チーム
2	中臺　銀河	評価企画	JICA 地球環境部 防災第一チーム
3	布村　明彦	業務主任/洪水対策	(一財)河川情報センター
4	上米良秀行	副業務主任/洪水対策/レーダ機材計画	(一財)河川情報センター
5	遠山　正人	水文観測機材・レーダ機材計画/積算	(株)建設技術研究所
6	有村　真二	通信機器計画/機材計画	(一財)河川情報センター
7	寺川　　陽	防災情報システム計画	(一財)河川情報センター
8	小牧　健二	地形情報/既存ダム調査	(独)水資源機構
9	鈴木　正弘	施工計画	(一財)河川情報センター
10	柴田　眞利	調達計画/積算	(株)建設技研インターナショナル

(2) 第二次現地調査

No.	氏　名	担当業務	所　属
1	井上　陽一	総括	JICA 地球環境部 防災第一チーム
2	布村　明彦	業務主任/洪水対策	(一財)河川情報センター
3	上米良秀行	副業務主任/洪水対策/レーダ機材計画	(一財)河川情報センター
4	遠山　正人	水文観測機材・レーダ機材計画/積算	(株)建設技術研究所
5	有村　真二	通信機器計画/機材計画	(一財)河川情報センター
6	鈴木　正弘	施工計画	(一財)河川情報センター
7	柴田　眞利	調達計画/積算	(株)建設技研インターナショナル
8	岩佐　泰治	通信機器計画/機材計画	(株)クイックフォックス

(3) 第三次現地調査（概略設計概要書説明調査）

No.	氏　名	担当業務	所　属
1	井上　陽一	総括	JICA 地球環境部 防災第一チーム
2	布村　明彦	業務主任/洪水対策	(一財)河川情報センター
3	上米良秀行	副業務主任/洪水対策/レーダ機材計画	(一財)河川情報センター
4	有村　真二	通信機器計画/機材計画	(一財)河川情報センター

5.2 調査行程

(1) 第一次現地調査

No.	日付・曜日 2016 年	JICA	コンサルタント	
		井上・中臺	布村・寺川	他
1	3 月 8 日(火)		布村：東京→ハノイ	
2	3 月 9 日(水)	井上・中臺・上米良・有村：東京→ハノイ、打合せ		
3	3 月 10 日(木)	インセプションレポート説明協議、ハノイ→フエ		
4	3 月 11 日(金)	インセプションレポート説明協議		遠山・鈴木：東京→ハノイ→フエ
5	3 月 12 日(土)	現地調査		
6	3 月 13 日(日)	打合せ		小牧：東京→ハノイ→ダナン→フエ
7	3 月 14 日(月)	現地調査	寺川：東京→ハノイ→フエ	
8	3 月 15 日(火)	ミニッツ協議、井上・中臺・布村・寺川：フエ→ハノイ		
9	3 月 16 日(水)	ミニッツ協議		現地調査
10	3 月 17 日(木)	打合せ		現地調査
11	3 月 18 日(金)	ミニッツ署名、井上・中臺：ハノイ→		現地調査
12	3 月 19 日(土)	→東京	布村：ハノイ→フエ、打合せ、フエ→ハノイ 寺川：ハノイ→東京	小牧：フエ→ハノイ→
13	3 月 20 日(日)		布村：ハノイ→東京	打合せ、小牧：→東京、柴田：東京→ハノイ
14	3 月 21 日(月)			現地調査、柴田：現地調整
15	3 月 22 日(火)			現地調査、柴田：ハノイ→フエ
16	3 月 23 日(水)			打合せ、遠山：フエ→ハノイ→
17	3 月 24 日(木)			現地調整、遠山：→東京
18	3 月 25 日(金)			現地調整
19	3 月 26 日(土)			現地調整・調査
20	3 月 27 日(日)			資料整理、上米良：フエ→ダナン、鈴木：フエ→ハノイ→
21	3 月 28 日(月)			現地調整、ダナン→ハノイ、有村：フエ→ハノイ→東京、鈴木：→東京、柴田：フエ→ハノイ
22	3 月 29 日(火)			現地調整
23	3 月 30 日(水)			現地調整、上米良：ハノイ→
24	3 月 31 日(木)			上米良：→東京、柴田：ハノイ→東京

(2) 第一次現地調査補足調査 1

No.	日付・曜日 2016 年	コンサルタント	
		布村	上米良
1	4 月 22 日(金)		東京→ハノイ、打合せ(野中専門家)
2	4 月 23 日(土)	東京→ハノイ	ハノイ→ダナン、打合せ(ダナン HMC)
3	4 月 24 日(日)	資料作成	ダナン→ハノイ、資料作成
4	4 月 25 日(月)	首相決定ガイドライン及びターチャックダム水理計算について打合せ(HEC)	
5	4 月 26 日(火)	技術的支援内容の打合せ(VAWR)	
6	4 月 27 日(水)	周波数使用許認可の打合せ(ARFM)	
7	4 月 28 日(木)	河川水位警報基準の打合せ(NHMS)	
8	4 月 29 日(金)	ハノイ→東京	資料整理
9	4 月 30 日(土)		打合せ(DWR)
10	5 月 1 日(日)		ハノイ→東京

(3) 第一次現地調査補足調査 2

No.	日付・曜日 2016 年	コンサルタント 上米良
1	5 月 22 日(日)	東京→ハノイ
2	5 月 23 日(月)	LiDAR 測量の打合せ(SAMCOM)
3	5 月 24 日(火)	午前: LiDAR 測量の打合せ(TMV)、午後: レーダー設置許認可の打合せ(AMO)
4	5 月 25 日(水)	ハノイ→フエ、現地調査(フオン川下流域)
5	5 月 26 日(木)	打合せ(DARD 支局)
6	5 月 27 日(金)	CCTV 設置/LiDAR 測量の現地調査(ダム)
7	5 月 28 日(土)	CCTV 設置/LiDAR 測量の現地調査(ダム)、フエ→ハノイ
8	5 月 29 日(日)	ハノイ→東京

(4) 第二次現地調査（ミニッツ協議・現地調査）

No.	日付・曜日 2016 年	JICA	コンサルタント	
		井上	布村・遠山	上米良・有村
1	7 月 3 日(日)	井上・布村・上米良・有村：東京→ハノイ、打合せ		
2	7 月 4 日(月)	ミニッツ協議		
3	7 月 5 日(火)	ハノイ→フエ、ミニッツ協議		
4	7 月 6 日(水)	ミニッツ協議、フエ→ハノイ		
5	7 月 7 日(木)	ミニッツ協議		
6	7 月 8 日(金)	ミニッツ協議		
7	7 月 9 日(土)	資料収集		
8	7 月 10 日(日)	ハノイ→フエ、ミニッツ協議		
9	7 月 11 日(月)	フエ→ハノイ、ミニッツ協議		現地調査、上米良：フエ→ハノイ
10	7 月 12 日(火)	ミニッツ署名、井上：ハノイ→東京		現地調査、上米良：ハノイ→フエ
11	7 月 13 日(水)		布村：ハノイ→東京	現地調査、上米良：フエ→ハノイ、現地調整
12	7 月 14 日(木)			現地調査、上米良：ハノイ→フエ
13	7 月 15 日(金)			現地調査
14	7 月 16 日(土)			資料作成
15	7 月 17 日(日)			資料作成
16	7 月 18 日(月)		遠山：東京→ハノイ→フエ	フエ→ダナン、現地調査
17	7 月 19 日(火)		現地調査	現地調査、ダナン→フエ
18	7 月 20 日(水)		現地調査	現地調査
19	7 月 21 日(木)		現地調査	現地調査
20	7 月 22 日(金)		現地調査	現地調査
21	7 月 23 日(土)		フエ→ハノイ	資料作成
22	7 月 24 日(日)		ハノイ→東京	資料作成
23	7 月 25 日(月)			現地調整
24	7 月 26 日(火)			現地調整
25	7 月 27 日(水)			フエ→ハノイ
26	7 月 28 日(木)			ハノイ→東京

(5) 第二次現地調査（電波試験・積算関連）

No.	日付・曜日 2016 年	コンサルタント	
		鈴木・岩佐	柴田
1	6 月 19 日(日)		東京→ハノイ→フエ
2	6 月 20 日(月)		現地調整
3	6 月 21 日(火)		現地調整
4	6 月 22 日(水)		現地調整
5	6 月 23 日(木)		現地調整
6	6 月 24 日(金)		現地調整
7	6 月 25 日(土)		
8	6 月 26 日(日)		
9	6 月 27 日(月)		現地調整
10	6 月 28 日(火)		積算資料収集
11	6 月 29 日(水)		積算資料収集

No.	日付・曜日 2016 年	コンサルタント	
		鈴木・岩佐	柴田
12	6 月 30 日(木)		積算資料収集
13	7 月 1 日(金)		積算資料収集
14	7 月 2 日(土)		
15	7 月 3 日(日)		
16	7 月 4 日(月)		積算資料収集
17	7 月 5 日(火)		フエ→ハノイ
18	7 月 6 日(水)		積算資料収集
19	7 月 7 日(木)		積算資料収集、ハノイ→東京
20	7 月 8 日(金)		
21	7 月 9 日(土)		
22	7 月 10 日(日)	東京→ハノイ→フエ	
23	7 月 11 日(月)	現地調査	
24	7 月 12 日(火)	現地調査	
25	7 月 13 日(水)	現地調査	
26	7 月 14 日(木)	現地調査	
27	7 月 15 日(金)	現地調査	
28	7 月 16 日(土)	資料作成	
29	7 月 17 日(日)	資料作成	
30	7 月 18 日(月)	電波試験準備	
31	7 月 19 日(火)	電波試験準備	
32	7 月 20 日(水)	電波試験準備	
33	7 月 21 日(木)	電波試験準備	
34	7 月 22 日(金)	電波試験準備	
35	7 月 23 日(土)	資料作成	
36	7 月 24 日(日)	資料作成	
37	7 月 25 日(月)	電波試験	
38	7 月 26 日(火)	電波試験	
39	7 月 27 日(水)	電波試験	
40	7 月 28 日(木)	電波試験	
41	7 月 29 日(金)	電波試験	
42	7 月 30 日(土)		
43	7 月 31 日(日)		
44	8 月 1 日(月)	現地調整	
45	8 月 2 日(火)	現地調整	
46	8 月 3 日(水)	現地調整	
47	8 月 4 日(木)	現地調整	
48	8 月 5 日(金)	現地調整	
49	8 月 6 日(土)		
50	8 月 7 日(日)		
51	8 月 8 日(月)	現地調整	
52	8 月 9 日(火)	現地調整	
53	8 月 10 日(水)	現地調整	
54	8 月 11 日(木)	フエ→ハノイ、現地調整	
55	8 月 12 日(金)	現地調整、ハノイ→フエ	
56	8 月 13 日(土)		
57	8 月 14 日(日)		
58	8 月 15 日(月)	電波試験準備	
59	8 月 16 日(火)	電波試験準備	
60	8 月 17 日(水)	電波試験準備	
61	8 月 18 日(木)	電波試験	
62	8 月 19 日(金)	電波試験	
63	8 月 20 日(土)	電波試験	
64	8 月 21 日(日)		
65	8 月 22 日(月)	電波試験	
66	8 月 23 日(火)	電波試験	
67	8 月 24 日(水)	電波試験	
68	8 月 25 日(木)	電波試験	
69	8 月 26 日(金)	フエ→ハノイ	
70	8 月 27 日(土)	ハノイ→東京	

(6) 第二次現地調査補足調査 1

No.	日付・曜日 2016 年	コンサルタント	
		布村	上米良
1	9 月 4 日(日)	東京→ハノイ→フエ	
2	9 月 5 日(月)	許認可関係の打合せ(DARD)、フエ→ハノイ	
3	9 月 6 日(火)	許認可関係の打合せ(PMU)	
4	9 月 7 日(水)	ハノイ→東京	資料作成
5	9 月 8 日(木)		許認可関係の打合せ(DWR)
6	9 月 9 日(金)		午前：打合せ(JICA 事務所)、午後：打合せ(DWR)
7	9 月 10 日(土)		ハノイ→東京

(7) 第二次現地調査補足調査 2

No.	日付・曜日 2016 年	コンサルタント
		布村・上米良
1	10 月 18 日(火)	東京→ハノイ
2	10 月 19 日(水)	調整要望事項の打合せ(PMU)
3	10 月 20 日(木)	午前：打合せ(VAWR)、午後：打合せ(DWR)
4	10 月 21 日(金)	ハノイ→東京

(8) 第二次現地調査補足調査 3

No.	日付・曜日 2016 年	コンサルタント
		布村・上米良・有村
1	10 月 24 日(月)	東京→ハノイ
2	10 月 25 日(火)	周波数使用許認可の打合せ(ARFM)
3	10 月 26 日(水)	レーダー・維持管理・データ共有等の打合せ(PMU)、ハノイ→フエ
4	10 月 27 日(木)	レーダー・維持管理・データ共有等の打合せ(DARD 支局)、フエ→ハノイ
5	10 月 28 日(金)	午前：レーダー・維持管理・データ共有等の打合せ(PMU)、午後：技術的支援内容の打合せ(VAWR)
6	10 月 29 日(土)	ハノイ→東京

(9) 第三次現地調査（概略設計概要書説明調査）

No.	日付・曜日 2016 年	JICA	コンサルタント
		井上	布村・上米良・有村
1	11 月 16 日(水)	井上・布村・有村：東京→ハノイ	
2	11 月 17 日(木)	ミニッツ協議、上米良：東京→ハノイ	
3	11 月 18 日(金)	ミニッツ協議	
4	11 月 19 日(土)	資料収集	
5	11 月 20 日(日)	ハノイ→フエ	
6	11 月 21 日(月)	ミニッツ協議	
7	11 月 22 日(火)	ミニッツ協議、フエ→ハノイ	
8	11 月 23 日(水)	ミニッツ協議	
9	11 月 24 日(木)	ミニッツ協議	
10	11 月 25 日(金)	ミニッツ署名	
11	11 月 26 日(土)	ハノイ→東京	

5.3 関係者(面会者)リスト

■農業農村開発省(MARD) 水資源総局(DWR)（ハノイ）

Mr. Hoang Van Thang	副大臣・水資源総局長
Mr. Tran Quang Hoai	水資源総局副局長
Mr. Van Phu Chinh	自然災害防止管理局長
Mr. Nguyen Duc Quang	自然災害防止管理局副局長・プロジェクト管理ユニット長
Mr. Ta Ngoc Tan	自然災害防止管理局
Mr. Vu Kien Trung	災害管理センター副センター長・プロジェクト管理ユニット副ユニット長(現所属:VUSTA 自然災害環境研究所)
Ms. Doan Thi Tuyet Nga	科学技術国際協力局副局長
Ms. Nguyen Thi Xuan Hong	科学技術国際協力局
Ms. Do Thi Phuong Thao	科学技術国際協力局
Mr. Nguyen Van Vy	中部・高原地域自然災害防止管理支局副局長(ダナン)

■農業農村開発省(MARD) ベトナム水資源研究院(VAWR)（ハノイ）

Mr. Tran Dinh Hoa	ベトナム水資源研究院副院長
Mr. Duong Quoc Huy	トレーニング国際協力センター副センター長
Mr. Nguyen Quoc Hiep	水資源ソフトウェアセンター副センター長
Mr. Nguyen Ngoc Tuan	水資源ソフトウェアセンター
Mr. Nguyen Thanh Hung	河川海岸工学研究室副室長
Mr. Do Hoai Nam	
Ms. Le Hanh Chi	

■天然資源環境省(MoNRE) 水文気象局(DWR)（ハノイ）

Mr. Le Thanh Hai	水文気象局副長官
Mr. Duong Van Khanh	水文気象観測網センター長
Mr. Nguyen Ngoc Quy	水文気象観測網センター 度量衡検定部長
Ms. Dang Thanh Mai	水文気象予報センター副センター長
Mr. Vu Duc Long	水文気象予報センター 水文予報部次長
Mr. Dinh Thai Hung	科学技術国際協力局長
Mr. Hoang Gia Hiep	高層気象台長
Mr. Nguyen Tuan Tai	高層気象台副台長
Mr. Nguyen Vinh Thu	高層気象台副台長
Mr. Dinh Phung Bao	中部中央管区水文気象台長(ダナン)
Mr. Le Viet Xe	中部中央管区水文気象台副台長(ダナン)
Mr. Pham Van Chien	中部中央管区水文気象台副台長(ダナン)
Mr. Nguyen Van Hung	フエ省水文気象台長(フエ)
Mr. Van Minh Trien	フエ気象観測所長(フエ)

■フエ省（フエ）

Mr. Dinh Khac Dinh	人民委員会副委員長
Mr. Nguyen Van Phuong	人民委員会副委員長
Mr. Ho Sy Nguyen	農業農村開発局長
Mr. Phan Thanh Hung	農業農村開発局 水資源支局長
Mr. Dang Van Hoa	農業農村開発局 水資源支局副局長
Mr. Le Dien Minh	農業農村開発局 水資源支局
Mr. Tran Thanh Quang	農業農村開発局 水資源支局
Mr. Tran Trung Dung	農業農村開発局 水資源支局

■ビンディエン水力発電共同出資会社（フエ）

Mr. Nguyen Quang Hai	所長

■共同出資会社フォンディエン水力発電所（フエ）

Mr. Trinh Xuan Khoa	副所長
Mr. Cao Huu Thuy	管理総務長

5.4 討議議事録

ミニッツ

(1) Minutesof Discussions, Hanoi, 18th March, 2016
(2) Minutesof Discussions, Hanoi, 12th July, 2016
(3) Minutesof Discussions, Hanoi, 25th November, 2016

テクニカルノート

(4) Technical Notes, Hue, 25th March, 2016
(5) Technical Notes, Hue, 26th March, 2016
(6) Technical Notes, Da Nang, 28th March, 2016
(7) Technical Notes, Ha Noi, 29th March, 2016
(8) Technical Notes, Ha Noi, 30th March, 2016
(9) Technical Notes, Hue, 27th May, 2016
(10)Technical Notes, Hue, 27th July, 2016
(11)Technical Notes, Ha Noi, 9th September, 2016
(12)Technical Notes, Ha Noi, 28th October, 2016

Minutes of Discussions
on
the Preparatory Survey
for
the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System

In response to the request from the Government of the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam"), the Government of Japan decided to conduct a Preparatory Survey for the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") to Vietnam, headed by Mr. Yoichi Inoue, Acting Director of Disaster Risk Reduction Team 1, Global Environment Department, and is scheduled to stay in the country from 9th March to 31st March, 2016.

The Team held a series of discussions with the officials concerned of the Government of Vietnam and conducted a field survey in the Project area. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Hanoi, 18th March, 2016

Mr. Yoichi Inoue
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Tran Quang Hoai
Deputy Director General
Directorate of Water Resources
Ministry of Agriculture and Rural Development
The Socialist Republic of Vietnam

Mr. Dinh Khac Dinh
Vice Chairman
Thua Thien Hue Provincial People's Committee
The Socialist Republic of Vietnam

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve the capacities of emergency operation of three reservoirs in Huong river basin in Thua Thien Hue (hereinafter referred to as T.T. Hue) Province through establishing the water related disaster management information system as well as timely rainfall and water level observation system in the basin, thereby contributing to mitigation of damages by flood.

2. Title of the Preparatory Survey

Both sides proposed the title of the Preparatory Survey as "the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" which was modified from the original title "the Project for Emergency Reservoir Operation and Effective Flood Management using Comprehensive Disaster Management Information System" in accordance with the objective of the Project.

3. Project Site

Both sides confirmed that the sites of the Project are Hue and Hanoi. Concrete sites will be decided by Hue PPC and MARD by the end of March 2016. Candidate sites are three reservoir offices in Ta Trach reservoir, Binh Dien reservoir and Huong Dien reservoir, Hydrological observation stations in Huong river basin, office of Provincial Commanding Committee for Natural Disaster Prevention and Control, Search and Rescue (hereinafter referred to as "PCC-NDPCSR") in T.T. Hue Province and office of Central Steering Committee for disaster prevention and control (hereinafter referred to as "CSC-NDPC") in Hanoi which are shown in Annex 1.

4. Line Agency and Executing Agency

Both sides confirmed the line agency and executing agency as follows:

4-1. The line agency is Ministry of Agriculture and Rural Development (hereinafter referred to as "MARD"), which would be the agency to supervise the executing agency.

4-2. It is proposed that the executing agencies are Directorate of Water Resources (hereinafter referred to as "DWR"), MARD and T.T Hue PCC. DWR - MARD shall coordinate with all the relevant agencies to ensure smooth, implementation of the Project and ensure that the Undertakings are taken by relevant agencies properly and on time. The organization charts are shown in Annex 2.

5. Items requested by the Government of Vietnam

5-1. As a result of discussions, both sides confirmed that the items requested by the Government of Vietnam and its ownership and responsibility are as shown in Annex 3.

5-2. JICA will assess the appropriateness of the above requested items through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.

6. Japanese Grant Aid Scheme

6-1. The Vietnamese side understands the Japanese Grant Scheme and its procedures as described in Annex 4, Annex 5 and Annex 6, and necessary measures to be taken by the Government of Vietnam.

6-2. The Vietnamese side understands to take the necessary measures, as described in Annex 7, for smooth implementation of the Project, as a condition for the Japanese Grant to be implemented. The detailed contents of the Annex 7 will be worked out during the survey and shall be agreed no later than by the Explanation of the Draft Preparatory Survey Report.

The contents of Annex 7 will be used to determine the following:
(1) The scope of the Project.
(2) The timing of the Project implementation.
(3) Timing and possibility of budget allocation.
Contents of Annex 7 will be updated as the Preparatory Survey progresses, and will finally be the Attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Vietnam until 31st March 2016.
7-2. JICA will dispatch the 2nd Preparatory Survey mission in the middle of May 2016.
7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Vietnam in order to explain its contents in early September 2016.
7-4. If the contents of the draft Preparatory Survey Report is accepted in principle and the Undertakings are fully agreed by the Vietnamese side, JICA will complete the final report in English and send it to the Government of Vietnam around December 2016.
7-5. The above schedule is tentative and subject to change.

8. Other Relevant Issues

8-1. Emergency Reservoir Operation in accordance with the Decision of the Prime Minister
Both sides confirmed that 3 reservoirs in Huong River Basin will be operated in accordance with the Decision on Operation Rules in Huong River Basin (PM – Decision 2482/QĐ-TTg dated 30/12/2015) utilizing the system and equipment to be provided in the Project. The roles of each organization are attached in Annex 8 as provisional translation and the Vietnamese side will check and correct the provisional translation by the end of March 2016.
The both sides also confirmed that the system and equipment to be procured in the Project will be utilized in accordance with Law on Natural Disaster Prevention and Control as well as Law on Hydro-Meteorology.
The Team will further study protocols of reservoir operations in Huong River Basin for smooth and effective operation and maintenance of the equipment and system.
The roles and duties of organizations in the Project including Vietnam Academy for Water Resources will be further studied by the Team and explained to the Vietnamese side.

8-2. Steering Committee for the Project
The Vietnamese side explained that they will formulate Steering committee among related organizations for smooth implementation of the Project.
Constitution of Steering Committee will be proposed and consulted to the Team by the end of March 2016 and will be further discussed and confirmed in the 2nd Preparatory Survey Mission.
The Vietnamese side proposed to assign Vietnam Academy for Water Resources as technical counterpart agency.

8-3. Ownership and Responsibility, Operation and Maintenance
Both sides confirmed organizations with ownerships and responsibilities of the system and equipment as shown in Annex-3.
The Japanese side explained that necessary budget and number of staff for operation and maintenance of the Project after the completion of the Project will be estimated through the Survey. The Team will further survey on maintenance structure of the equipment to be procured in the Project. The Vietnamese side promised to allocate necessary budget and staff for proper and effective operation and maintenance of the system and equipment.

8-4. Purpose of missions
The Japanese side explained the purpose of missions as follows;
(1) The 1st Preparatory Survey Mission
To collect data and hold meetings with relevant organizations for outline design and to confirm necessary number and candidate locations of Hydrological observation stations

(2) The 2nd Preparatory Survey Mission
To implement measurement works and radio transmission test for X band radar and Hydrological observation stations and to explain and discuss on draft outline of the Project (items to be procured, locations of X band radar and Hydrological observation stations, concept of the water related disaster management information system etc.)

(3) The Draft Report Explanation Mission
To explain on a draft Preparatory Survey Report including necessary budget and number of staff for operation and maintenance as well as undertakings by the Vietnamese side for implementation of the Project

8-5. Data sharing of the project

Both sides confirmed in accordance with the Law on Hydro-Meteorology, hydro-meteorological data to be observed by equipment of the Project will be shared in real time among related organizations and hydro-meteorological data of NHMS observations in Huong River Basin will be also shared for implementation of the project.

Hydro-meteorological observation data of the Project will be archived in the water related disaster management information system to be installed in office of PCC-NDPCSR in T.T. Hue Province and office of CSC-NDPC in Hanoi.

8-6. Necessary permissions for implementation of the Project

Both sides agreed to identify necessary permissions and its necessary period for implementation of the Project during the 1st Preparatory Survey Mission including allocation of frequency for radar and requested LiDAR survey. Both sides also confirmed that all permissions should be cleared before tender notice at latest and critical and important permissions should be cleared before the Draft Report Explanation Mission to be scheduled in early September 2016.

8-7. EIA procedure

The both sides confirmed that equipment to be procured in the Project will be installed in conformity to Law on Environment Protection.

8-8. Hydrological observation stations

The both sides confirmed that locations of Hydrological observation stations will be decided according to following criteria;

(1) access to electricity is secured
(2) there will be no problems for radio transmission
(3) availability of land can be confirmed by the end of August 2016
(4) other technical conditions

The Team will further survey and have discussions with the Vietnamese side. The both sides also confirmed that number of hydrological stations is subject to change according to technical necessity and will be discussed as well as candidate locations during the 1st Preparatory Survey Mission period.

8-9. Water related Disaster Management Information system

The both sides confirmed procurement of the Water Related Disaster Management Information System including "Multiple information display" in office ofPCC-NDPCSR in T.T. Hue Province and office of CSC-NDPC in Hanoi is requested by the Vietnamese side. The system shows the results of hydrological observation and flood forecast in Huong river basin. The Vietnamese side will secure the adequate space for installation of the system. Details of the system will be further studied and will be explained to the Vietnamese in early June 2016 during in the 2nd Preparatory Survey Mission period.

8-10. Monitoring during the implementation

Both side agreed to monitor the Project every three (3) months during the implementation by using the Project Monitoring Report form as attached in Annex 9.

8-11. Exemption of Taxes and Duties

Both sides confirmed that in accordance with Japanese Grant Aid scheme the Vietnamese side ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the

country of the Recipient with respect to the purchase of the Products and/or the Services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.

8-12. Undertakings of the Vietnamese side for the Survey

As a response to the request by the Team, the Vietnamese side agreed to arrange counterpart personal for the study and to provide promptly necessary data and information relevant to the Project for the smooth implementation of the study.

8-13. Confidentiality of the Project

The Team explained that preparatory survey report to be prepared at the end of the survey would be disclosed to the public in Japan. However, the Team also explained that a confidential part which might affect bidding process such as cost estimation should be kept undisclosed until the bidding has completed.

8-14. No objections or comments from related Ministries

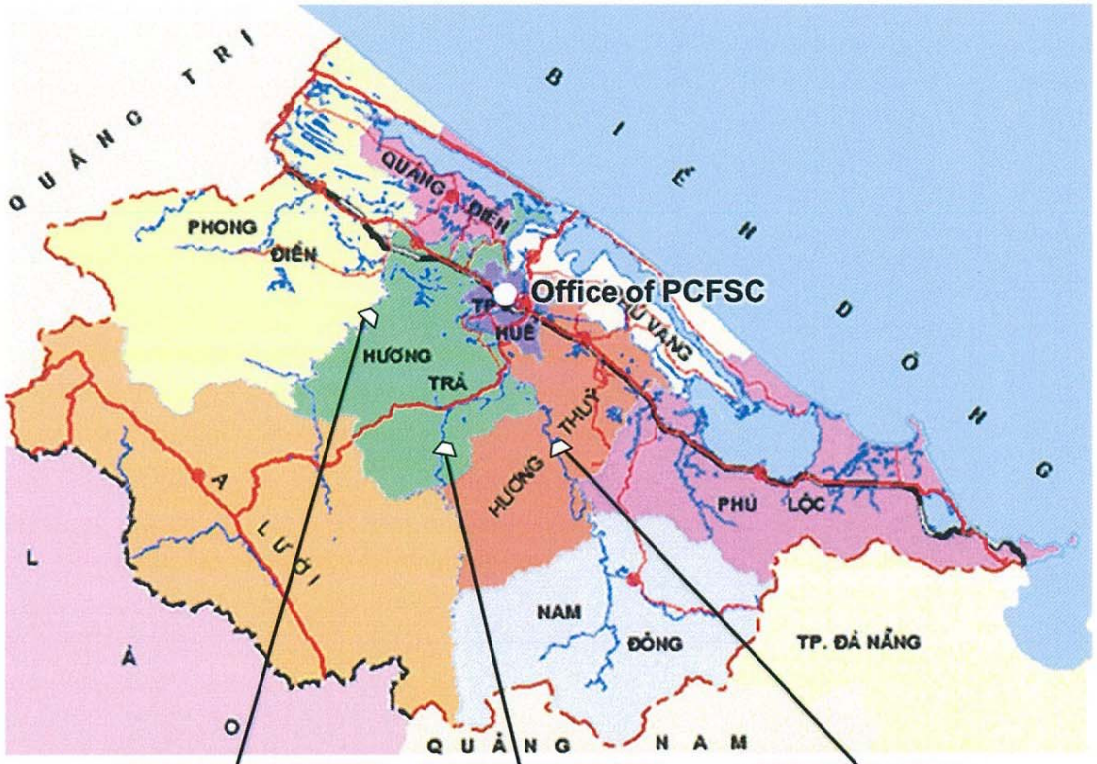
Both sides confirmed that MARD will circulate this Minutes of Discussions to Ministry of Planning and Investment(MPI), Ministry of Natural Resources and Environment(MONRE) and Ministry of Industry and Trade (MOIT) and collect No objections or comments by the end of March 2016. Both sides also confirmed that MARD will inform JICA Vietnam office of the result by a letter.

Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Items requested by the Government of Vietnam
Annex 4 Japanese Grant
Annex 5 Flow Chart of Japanese Grant Procedures
Annex 6 Financial Flow of Japanese Grant
Annex 7 Major Undertakings to be taken by Each Government
Annex 8 Provisional translation of the roles of each organization under PM – Decision 2482/QĐ-TTg dated 30/12/2015)
Annex 9 Project Monitoring Report (template)

Annex 1

Project Sites

Thua Tien Hue Province
Huong River Basin (Catchment Area: 2,800 km^2)

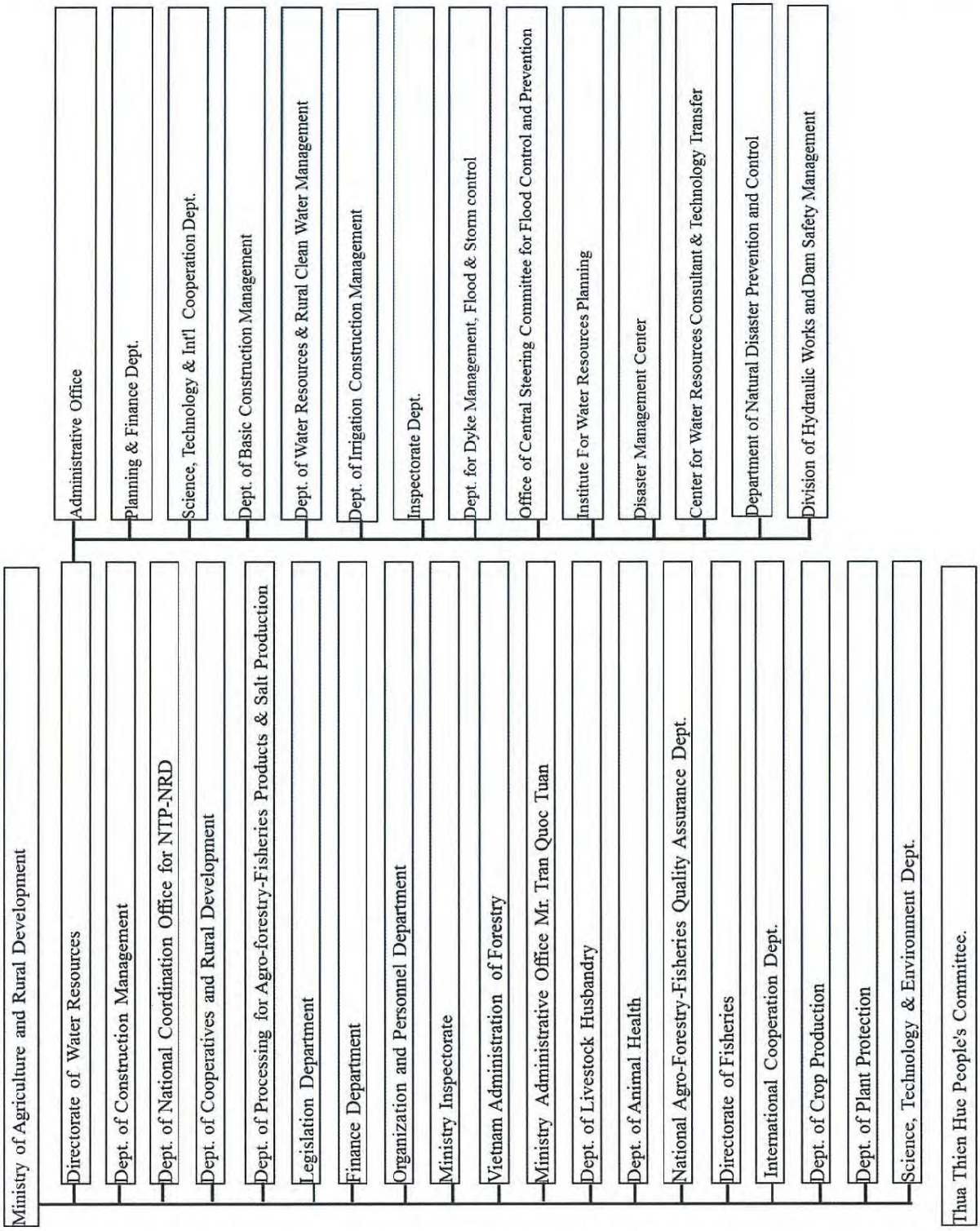


Huong Dien Dam **Binh Dien Dam** **Ta Trach Dam**

In addition office of CCFSC CSC-NDPC in Hanoi

Annex 2

Organization Chart of MARD, DWR and T.T. Hue PPC



Annex 3

Table: Items requested by the Government of Vietnam

	Component	Contents		Quantity	Organization with Ownership and Responsibility
1	Data collection in the river basin	(1)	X-band radar	1 set	T.T. Hue PCC-NDPCSR
		(2)	Hydrological observation station	22 sets	Upstream of Dams: the units managing and operating the reservoirs Downstream of Dams: T.T. Hue PCC-NDPCSR, T.T. Hue HMS
		(3)	CCTV in downstream	10 sets	T.T. Hue PCFSC
2	Reservoir operation facility at dam offices	(4)	Real-time operation system for dam	3 dams	the units managing and operating the reservoirs
		(5)	CCTV/alert facility on dam	3 dams	ditto
		(6)	Direct communication network	5 lines	ditto
		(7)	Back-up power generation 3 dams	3 dams	ditto
3	Water related Disaster Management Information System in Office of PCC-NDPCSR in T.T. Hue Province	(8)	Information management (input)	1 set	PPC T.T. Hue
		(9)	Information management (processing)	1 set	ditto
		(10)	Information management (output)	1 set	ditto
		(11)	Multiple information display	1 set	ditto
		(12)	Digital signage system for flood fighting	1 set	ditto
		(13)	Direct commanding unit	1 set	ditto
		(14)	Back-up power generation	1 set	ditto
4	Water related Disaster Management Information System in Office of CSC-NDPC in Hanoi	(15)	Multiple information display	1 set	MARD
		(16)	Direct commanding unit	1 set	ditto
5	Basic data collection (such as LiDAR data)	(17)	Topographical survey by LiDAR	1 set	-
		(18)	River channel cross-section survey	1 set	-
6	Operation manual for quality control	(19)	Manual and training	1 set	MARD

※Items will be further examined.
Component, contents and quantity are subject to change through the Survey.
Organizations with ownerships and responsibilities will be further examined by Vietnamese side by the end of March 2016.
Draft specifications for LiDAR survey and telecommunication will be provided by the Team to Vietnamese side by the end of March 2016.

JAPANESE GRANT

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1. Grant Procedures

The Grant is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.

- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen, in principle, to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010) .

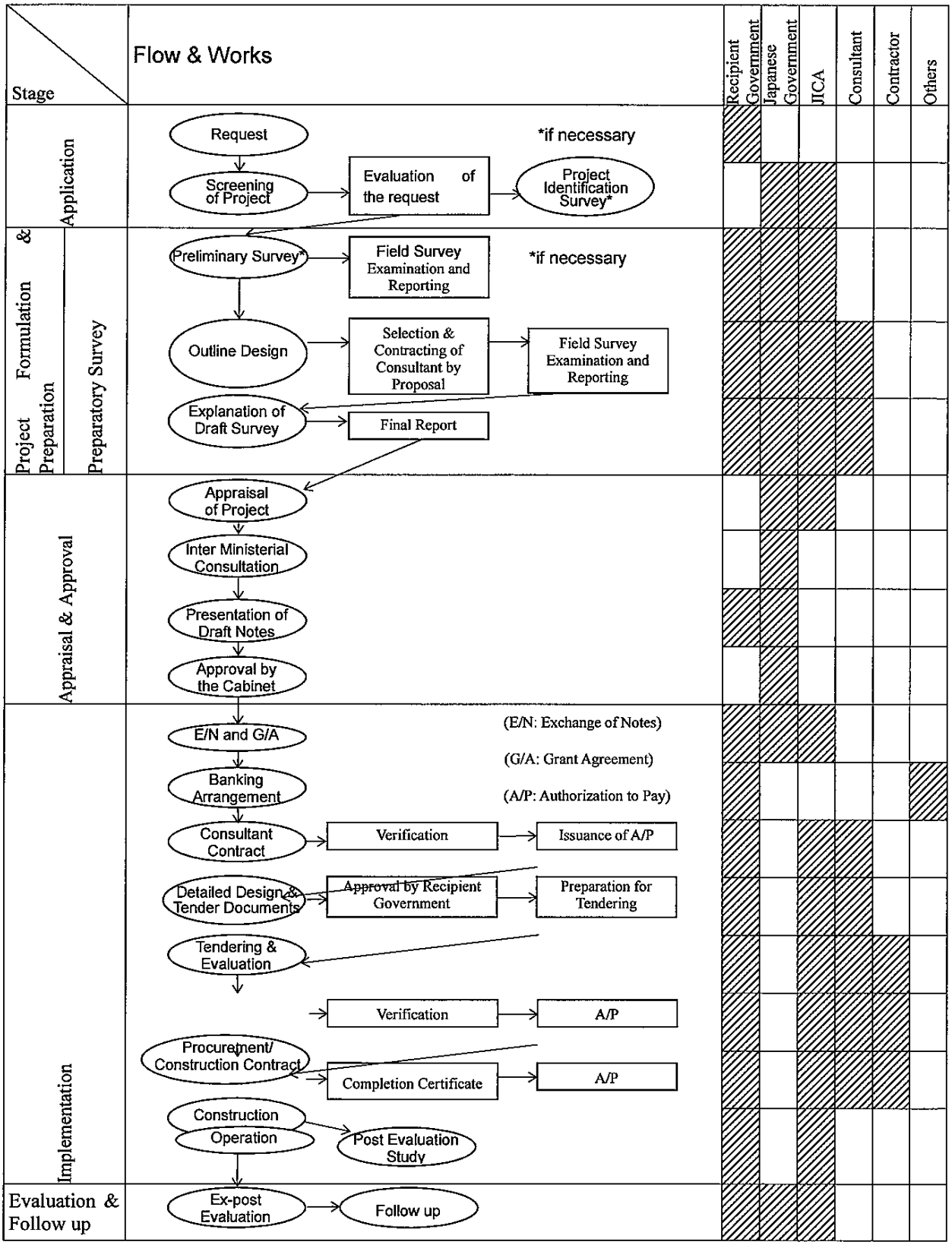
(11) Monitoring

The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

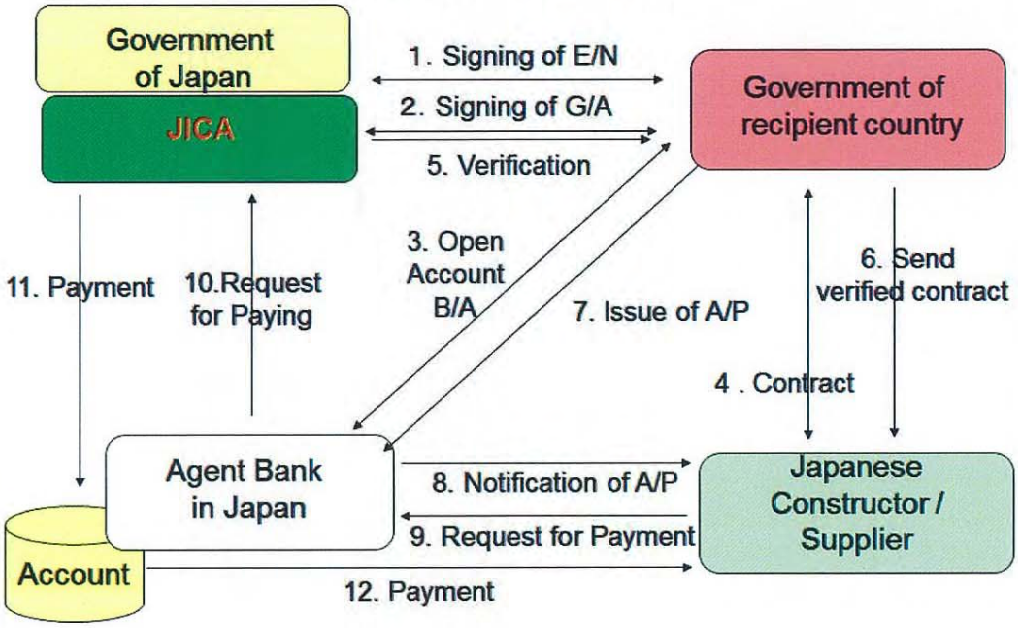
(12) Safety Measures

The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

FLOW CHART OF JAPANESE GRAND PROCEDURES



Financial Flow of Grant Aid



Annex 7

Major Undertakings to be taken by the Recipient Government

Specific obligations of the Recipient

The Recipient shall undertake the specific obligations for the Project as listed in the table below. JICA and the Recipient may agree from time to time separately in writing on the items, deadlines and other matters described in the tables below and the specific obligations of the Recipient.

Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A			
2	To secure the following lands 1) project sites for X band radar 2) project sites for Hydrological observation stations 3) Sufficient space for temporary facilities such as a constructor's office, workshop, building material storage, etc. needed for the work.	before notice of the tender document			
3	To obtain necessary permission for construction of the Radar Tower Building.	before notice of the tender document			
4	To obtain necessary permission for X band frequency	before notice of the tender document			
5	To obtain necessary permission for LiDAR survey	before notice of the tender document			

During the Project

NO	Items	Deadline	in Charge	Cost	Ref
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Requesting budget for the Project	At the initial occasion to request a budget for the Project			
	2) Advising commission of A/P	within 1 month after the singing of the contract			
	3) Payment commission for A/P	every payment			
	4) Payment commission for amendment of A/P	each payment			
2	To obtain the required frequencies for radar systems.	before notice of the tender document			
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Products and/or the Services be borne by its designated authority without using the Grant. Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.	during the Project			

4	To accord Japanese nationals and other foreign nationals including their dependent/s (if any), whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Vietnam and stay therein for the performance of their work	during the Project			
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted be borne by its designated authority without using the Grant; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project			
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment	during the Project			
7	To provide necessary working spaces with Internet Connection for the implementation of the Project.	during the Project			
8	To provide the commercial power supply along with electric poles/wires, etc. from the main supply line to the proposed site for Radar Tower Buildings.	during the Project			
9	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities.	during the Project			
10	To undertake incidental outdoor works such as a guard shed, gardening, fencing, gates, boundary walls and exterior lightings and to renovate the existing buildings and facilities in Observation Stations.	during the Project			
11	To provide reliable and high-speed Internet environment at the MARD Head Office and each prospective project site.	during the Project			
12	To ensure transport for the personnel and to shoulder the dispatching cost of the trainees to the training sites, such as daily allowance, accommodation, etc.	during the Project			

After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment.	After completion of the construction			
2	To assign the required staff for the smooth operation and maintenance of the Equipment.	After completion of the construction			
3	To provide adequate maintenance of the observation stations and the Radar Tower Buildings constructed under the Project so that they may function long lasting and effectively.	After completion of the construction			
4	To effectively utilize the facilities constructed and the Equipment procured/installed under the Project.	After completion of the construction			
5	To allocate the necessary budget for the smooth conduct of meteorological radar observation and forecasting works.	After completion of the construction			

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(Note) Progress of the specific obligations of the Recipient may be confirmed and updated from time to time with written agreement between JICA and the Recipient in the form other than the amendment of the G/A.

Annex-8

Provisional translation of the roles of each organization under PM - Decision 2482/QĐ-TTg dated 30/12/2015)

(Abbreviations)
Disaster Prevention and Control = DPC
People's Committee = PPC
Hydro-meteorological = HM

▪ The Head of Thua Thien Hue Commanding Committee for disaster prevention, control, search and rescue

- To determine the reservoir operation of 3 reservoirs in order to control flood for the lowland.
- To inform immediately to Heads of District Commanding Committees for disaster prevention, control, search and rescue, the HM Station for Middle-Central Region, the National Center for HM Forecasting and the Chairman of T.T. Hue PPC that will likely be affected by floods due to the reservoir operation.

▪ The Heads of District Commanding Committees for disaster prevention, control, search and rescue

- To inform Chairmen of Commune PPCs of the affected lowland areas.

▪ Chairmen of Commune People's Committees

- To inform peoples and implement responding measures.

▪ Thua Thien Hue People's Committee (T.T. Hue PPC)

- To direct the limited one membership state company T.T. Hue irrigation works exploitation and management (HUTHUNO) to assure safety of Ta Trach reservoir during flood seasons
- To decide the reservoir operation of 3 reservoirs in case of abnormal flood in the lowland, at the same time direct the implementation of safety measures for people.
- To report to the Prime Minister and the Head of the Central Steering Committee for disaster prevention and control to direct flood prevention for the lowland before the Ta Trach reservoir performs urgent flood discharge in order to assure safety for the main works.

▪ The Head of Central Steering Committee for disaster prevention and control

- To decide the warning and direct the implementation of measures against flood incidents.
- To report to the Prime Minister to have timely measures in case of urgent flood discharge.
- To decide the reservoir operation in special cases.

▪ The Minister of Industry and Trade

- To direct Vietnam Electricity Corporation, the National Power Conditioning Center, Binh Dien Joint Stock Company, HD Investment Joint Stock Company to assure

safety of Binh Dien and Huong Dien reservoirs during flood seasons.

- To direct the units in charge of managing and operating hydropower reservoirs to monitor, forecast and provide statistics, information for organizations and to operate the reservoirs.
- To direct Vietnam Electricity Corporation, the National Power Conditioning Center to mobilize power at full capacity from Binh Dien and Huong Dien hydropower companies when the reservoirs control flood for the lowland.
- To report to the Prime Minister and the Head of the Central Steering Committee for DPC to direct flood prevention for the lowland before Huong Dien and Binh Dien reservoirs perform urgent flood discharge.

▪ The Minister of Agriculture and Rural Development

- To direct safety assurance for related hydraulic works.
- To decide measures to handle urgent incidents at hydraulic systems in Huong river basin, to report to the Prime Minister and the Head of the Central Steering Committee for DPC.

▪ The Minister of Natural Resources and Environment

- To direct the Department of Water Resources Management and competent organizations to inspect, examine the implementation of the reservoir operation controlling flood for the lowland.
- To direct the National Center for HM Forecasting to monitor, provide warnings, forecast and to provide statistics, information for the organizations.
- To submit the revision of the operation rules of the reservoirs to the Prime Minister if necessary

▪ Directors of the units managing and operating the reservoirs

- To Implement operation orders by the Head of T.T. Hue Commanding Committee for disaster prevention, control, search and rescue
- To report immediately to the commanding person, in case of abnormal cases and it is impossible to follow the operation orders.
- To decide the reservoir operation following the regulations, and make proper measures in case of contact loss or not receiving any operation orders,
- To send notification to the organizations by fax or via computer networks or direct communication by phone, and then by official documents to them for monitor, compare and archive in management files.
- To monitor, provide warnings, forecast following the regime and to provide statistics, information for the organizations.
- To immediately report to the Central Steering Committee for DPC, Head of T.T. Hue Commanding Committee for disaster prevention, control, search and rescue.To operate and assure works safety in compliance when operating to assure works safety.

▪ The National Center for Hydro-Meteorological Forecasting

- To conduct forecasting, warning news.
- To gather monitoring statistics of rain, water level at HM stations of Huong river basin following regulations.
- To conduct warning news of flood, urgent flood at Kim Long and Phu Oc hydraulic stations.

▪ The Hydro-Meteorological Station in Middle-Central Region

- To conduct warning news of floods at Kim Long and Phu Oc hydraulic stations.
- To collect statistics of rain, water level at monitoring, HM stations lying within the scope, management responsibilities of Huong river basin.
- To conduct forecasting news of water level, flood, urgent flood at Kim Long and Phu Oc hydraulic stations.
- To follow, forecast, detect the time when the water level at Kim Long hydraulic station reaches 1.7m, warning level II; that at Phu Oc hydraulic station reaches 2.7, warning level II.

▪ Binh Dien hydropower joint stock company, HD investment joint stock company, HUTHUNO

- To conduct monitoring, calculating reservoir water level, coming water level to the reservoir, discharge volume through weirs and plants for at least every 15 minutes
- To make flood forecasting news of the reservoirs every 03 hour.

Project Monitoring Report
on

Project for Emergency Reservoir Operation and Effective Flood Management using Water Related Disaster Management Information System Grant Agreement No. XXXXXXX

20XX, Month

Organization Information

Authority (Signer of the G/A)	Person in Charge _____ Contacts Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	Person in Charge _____ Contacts Address: _____ Phone/FAX: _____ Email:
Line Agency	Person in Charge _____ Contacts Address: _____ Phone/FAX: _____ Email: _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY . Government of Vietnam:
Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:

1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr 2016)	Target (Yr 2021)
Qualitative Effect		

2: Project Implementation

2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	**Original:** *(M/D)* **Attachment(s):Map**	**Actual:** *(PMR)* **Attachment(s):Map**

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual

2-1-2 Reason(s) for the modification if there have been any.

2-2 Implementation Schedule

2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

Items	Original		Actual
	DOD	G/A	
Cabinet Approval		-	-
E/N			
G/A			
Approval of consultant contract			
Early Mobilization of consultant			
Detailed Design			
Budget Request for FY2016			
Tender Process of contractor and supplier			
Approval of contractor and supplier contract			
Budget Appropriation and Issuance of A/P			
Construction Period			
Shipment			
Custom Clearance			
Installation and acceptance Check			
Soft component			
Project Completion Date			
Defect Liability Period			

*Project Completion was defined as Completion of Soft component at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project.

2-3 Undertakings by each Government

2-3-1 Major Undertakings

See Attachment 2.

2-3-2 Activities

See Attachment 3.

2-3-3 Report on RD

See Attachment 4.

2-4 Project Cost

2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan
(Confidential until the Tender)

Items			Cost (Million Yen)	
	Original	Actual	Original	Actual
Construction of Facilities				
Equipment				
Soft Component				
Consulting Services				
Contingency				
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =**Yen

Table 2-4-1b Comparison of Original and Actual Cost by the Government of **

Items			Cost (Thousand MMK)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =(local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

Minutes of Discussions
on
the Preparatory Survey for the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System

In response to the request from the Government of the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam"), the Government of Japan decided to conduct a Preparatory Survey for the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System (Project title used by Vietnamese side : "Project for Emergency Reservoir Operation and Effective Flood Management using Integrated Disaster Management Information System" (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Second Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") to Vietnam, headed by Mr. Yoichi Inoue, Acting Director of Disaster Risk Reduction Team 1, Global Environment Department, and is scheduled to stay in the country from 3rd July to 5th August, 2016.

The Team held a series of discussions with the officials concerned of the Government of Vietnam. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

Hanoi, 12th July, 2016

Mr. Yoichi Inoue
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Tran Quang Hoai
Deputy Director General
Directorate of Water Resources
Ministry of Agriculture and Rural Development
The Socialist Republic of Vietnam

Mr. Le Thanh Hai
Deputy Director General
National Hydro-Meteorological Service
Ministry of Natural Resources and Environment
The Socialist Republic of Vietnam

Mr. Nguyen Van Phuong
Vice Chairman
Thua Thien Hue Provincial People's Committee
The Socialist Republic of Vietnam

Mr. Tran Dinh Hoa
Deputy Director
Vietnam Academy for Water Resources
Ministry of Agriculture and Rural Development
The Socialist Republic of Vietnam

ATTACHMENT

1. **Project Site**
Both sides confirmed that the sites of the Project are Hue and Hanoi. Concrete sites are three reservoir offices in Ta Trach reservoir, Binh Dien reservoir and Huong Dien reservoir, Hydrological observation stations in Huong river basin, office of Provincial Commanding Committee for Natural Disaster Prevention and Control, Search and Rescue (hereinafter referred to as "PCC-NDPCSR") in T.T. Hue Province and office of Central Steering Committee for disaster prevention and control (hereinafter referred to as "CSC-NDPC") in Hanoi which are shown in Annex 1.

2. **Items requested by the Government of Vietnam**
2-1. As a result of discussions, both sides noted that the items requested by the Government of Vietnam (dated on 10/8/2014) and its ownership and responsibility including budget allocation for operation and maintenance and actual Operation and Maintenance bodies, as shown in Annex 2.
2-2. JICA will assess the appropriateness of the above requested items through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.

3. **Japanese Grant Aid Scheme**
3-1. The Vietnamese side understands the Japanese Grant Scheme and its procedures as described in Annex 4, Annex 5 and Annex 6, and necessary measures to be taken by the Government of Vietnam.
3-2. The Vietnamese side understands to take the necessary measures, as described in Annex 6, for smooth implementation of the Project, as a condition for the Japanese Grant to be implemented. The detailed contents of the Annex 6 will be worked out during the survey and shall be agreed no later than by the Explanation of the Draft Preparatory Survey Report. The contents of Annex 7 will be used to determine the following:
(1) The scope of the Project.
(2) The timing of the Project implementation.
(3) Timing and possibility of budget allocation.
Contents of Annex 7 will be updated as the Preparatory Survey progresses, and will finally be the Attachment to the Grant Agreement.

4. **Schedule of the Survey**
4-1. The Team will further implement Land/geological surveys and radio-wave propagation test around by 5th August 2016.
4-2. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Vietnam in order to explain its contents in the middle of November 2016.
4-3. If the contents of the draft Preparatory Survey Report is accepted in principle and the Undertakings are fully agreed by the Vietnamese side, JICA will complete the final report in English and send it to the Government of Vietnam in January 2017.
4-4. The above schedule is tentative and subject to change.

5. **Contents of the Report**
After the explanation of the contents of the Report by the Team, the Vietnamese side agreed in principle to its contents.
National Hydro-Meteorological Service (hereinafter referred to as "NHMS") notes project proposal contents and will report to the Ministry of Natural Resources and Environment (hereinafter referred to as "MONRE"). Directorate of Water Resources (hereinafter referred

to as "DWR") is requested to report to Ministry of Agriculture and Rural Development (hereinafter referred to as "MARD") to send an official letter to MONRE.

6. Other Relevant Issues

6-1. Steering Committee for the Project

The Vietnamese side explained proposed constitution of Steering Committee as follows;

- Chairman: Vice Minister – Director General (DG) of DWR, Mr. Hoang Van Thang
- Vice Chairmen: (1) Deputy DG of MARD, ICD, Mr. Tran Kim Long,
  (2) Deputy DG of DWR, Mr. Tran Quang Hoai
- Members: department leaders of MONRE, MOIT, MOF, MPI, representative of Thua Thien Hue PPC and some related agencies under MARD

The Vietnamese side also explained that his proposed composition will be decided by the Decision from Minister of MARD when the Project starts.

6-2. Proposed roles of related organizations for the Project

The both sides recorded that proposed roles of related organizations for the Project are as follows;

1) Ministry of Agriculture and Rural Development (MARD)
   - Responsible Agency
   - Supervision of the Executing Agency (DWR)
2) Directorate of Water Resources (DWR), MARD
   - Project Owner and Executing Agency of the Project
   - Making necessary approval for the Project on behalf of the Government of Vietnam
   - Responsible for coordination of related organizations
   - Ownership and Responsibility for "Component 4: Water related Disaster Management Information System in Office of CSC-NDPC" (13) (14)
   - To bear cost for Operation and Maintenance of "Component 4: Water related Disaster Management Information System in Office of CSC-NDPC" (13) (14)
   - Actual Operation and Maintenance for "Component 4: Water related Disaster Management Information System in Office of CSC-NDPC" (13) (14)
   - Ownership and Responsibility for "Component 5: Basic data collection" (15) and "Component 6: Operation manual for quality control"(17)
   - Technical Support of the Project
3) T.T. Hue Provincial People's Committee,
   - Co-Executing Agency of the Project
   - Ownership and Responsibility for "Component 1: Data collection equipment in the river basin"(1) X-band radar, (2)Hydrological observation station, (3)CCTV, "Component 3: Water related Disaster Management Information System in Office of PCC-NDPCSR in T.T. Hue Province" and "Component 5: Basic data collection"(15) Topographical survey by LiDAR and (16) River channel cross-section survey
   - To bear cost for Operation and Maintenance for "Component 1: Data collection equipment in the river basin"(1) X-band radar, (2)Hydrological observation station, (3)CCTV, "Component 3: Water related Disaster Management Information System in Office of PCC-NDPCSR in T.T. Hue Province"(7)-(12)
   - Actual Operation and Maintenance for "Component 1: Data collection equipment in the river basin"(1) X-band radar, (2)Hydrological observation station, (3)CCTV, "Component 3: Water related Disaster Management Information System in Office of PCC-NDPCSR in T.T. Hue Province"
   - Ownership and Responsibility for "Component 2: Reservoir operation facility at dam

offices"(4)(5)(6) for Ta Trach Dam
- To bear cost for Operation and Maintenance for "Component 2: Reservoir operation facility at dam offices"(4)(5)(6) for Ta Trach Dam
- To request technical support on Operation and Maintenance of (1) X-band radar and (2)Hydrological observation stations to NHMS
- To share observation data and forecasting/natural disaster warning output data to NHMS
-
- Technical support of the Project, especially equipment to be utilized in T.T Hue Province
- Utilization of system and equipment
- To direct Binh Dien Hydropower Joint Stock Company and HD Investment Corporation regarding follows;
  1) Ownership and Responsibility for "Component 2: Reservoir operation facility at dam offices"(4)(5)(6)
  2) bear cost for Operation and Maintenance for "Component 2: Reservoir operation facility at dam offices"(4)(5)(6)
  3) Utilization of system and equipment under the regulations and supports from PPC-NDPCSR and Department of Tradc and Industry in T.T Hue Province
- To direct Operation Units of Binh Dien Hydropower Plant and Huong Dien Hydropower Plant regarding follows;
  1) Actual Operation and Maintenance for "Component 2: Reservoir operation facility at dam offices"(4)(5)(6)
  2) Utilization of the system and equipment

4) National Hydro-Meteorological Service (NHMS), Ministry of Natural Resources and Environment (MONRE)
   - To share hydro-meteorological observation data with related governmental agencies that are responsible for natural disaster prevention under regulations and laws.
   - To provide technical supports on Operation and Maintenance for "Component 1: Data collection equipment in the river basin" (1)X-band radar and (2)Hydrological observation station
5) Ministry of Industry and Trade (MOIT)
   - To direct and support Dam Operation Units of Binh Dien Dam and Huong Dien Dam with PPC-NDPCSR in accordance with the decision on Operation Rules in Huong River Basin (PM-Decision 2482/QD-TTg dated 30/12/2015)
6) Vietnam Academy for Water Resources
   - Technical support of the Project

Estimated necessary budget and number of personnel for Operation and Maintenance of the Project will be explained and agreed in the next mission scheduled in the middle of November 2016.

6-3. Proposed locations of Hydrological observation stations, X-band radar, Radio Base Stations and CCTVs

The both sides noted that the proposed locations of Hydrological observation stations, X-band radar, Radio Base Stations and CCTVs as described in Annex-3

6-4. Land/geological surveys and radio-wave propagation test for X band radar, Hydrological observation stations and Radio Base Stations

The Team will conduct the land/geological surveys and radio-wave propagation test for the

X-band radar, Hydrological observation stations and radio stations around July/August 2016. The Vietnamese side is going to provide the Team with necessary support for the surveys and test.

6-5. Necessary permissions for implementation of the Project

Both sides confirmed necessary permissions and its deadlines as attached in Annex-8 and follows;

1) Deadline: the end of September 2016
- Permission to use land (for X-band radar, hydrological observation stations, CCTVs, radio base stations)
- Permission to use radio frequency channels: 9 GHz for X-band radar observation, 70 MHz for telemetry, and 7.5 GHz for multiplex data transmission
- Permission for LiDAR aerial survey (Use of airplane, photographing, taking data out of the country)

2) Deadline: before tender notice
- Permission to construct buildings: X-band radar, hydrological observation stations and radio base stations
- Confirming the safety over buildings: X-band radar and radio base stations

The Vietnamese side is going to get approvals for 1) and will submit evidential documents or letters to JICA Vietnam Office by the end of September 2016.
Both sides confirmed that approvals and letters of evidential documents to JICA Vietnam is pre-conditions of dispatch of next mission and failure to this will lead to serious delay of the Project and the both sides also confirmed that the Project cannot be approved by the Government of Japan without necessary permissions for the Project by the Government of Vietnam.

6-6. Utilization of data of Water related Disaster management Information System in office of CSC-NDPC in Hanoi

The Vietnamese side explained that data of Water related Disaster management Information System is necessary for the office of CSC-NDPC in Hanoi to make technical advice as per PM Decision 2482 and is going to fully utilize the Water related Disaster Management Information System in Office of CSC-NDPC in Hanoi.

6-7. Preparation of Project documents by the Vietnamese side

The Vietnamese side is going to timely prepare Project document to get approval of the Project from the Government of Vietnam utilizing draft Preparatory Survey Report to be submitted by the Team around the middle of November 2016 as well as to obtain authorization to sign the E/N and G/A of the Project.
The Vietnamese side also explained that approval of the Government of Vietnam of the Project and above-mentioned authorization can be expected by March 2017.

6-8. Exemption of Taxes and Duties

Japanese side request that in accordance with Japanese Grant aid scheme the Vietnamese side ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above

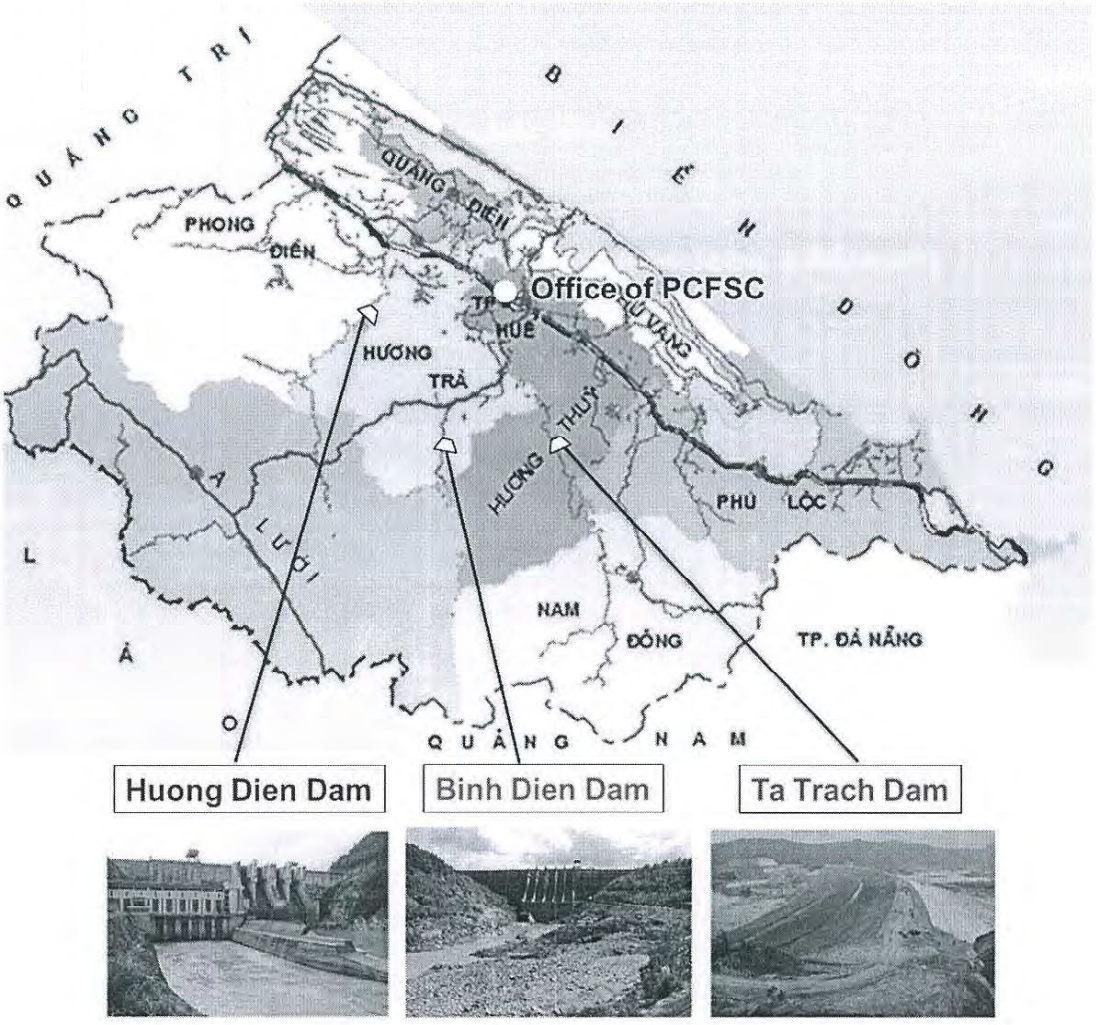
include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.
DWR, MARD will confirm the above with Ministry of Finance.

Annex 1 Project Site
Annex 2 Items requested by the Government of Vietnam
Annex 3 Planed Locations of Hydrological observation stations, X-band radar, Radio Base Stations and CCTV
Annex 4 Japanese Grant
Annex 5 Flow Chart of Japanese Grant Procedures
Annex 6 Financial Flow of Japanese Grant
Annex 7 Major Undertakings to be taken by the Recipient Government
Annex 8 List of Permissions for the Project

Annex 1

Project Sites

Thua Tien Hue Province
Huong River Basin (Catchment Area: 2,800 km²)



In addition office of CCFSC CSC-NDPC in Hanoi

Annex 2

Table: Items requested by the Government of Vietnam

	Component	Contents		Quantity	Organization with Ownership and Responsibility, budget allocation for Operation and Maintenance	Actual Operation and Maintenance
1	Data collection equipment in the river basin	(1)	X-band radar	1 set	T.T. Hue PPC	T.T. Hue PCC-NDPCSR Technical Supports by NHMS
		(2)	Hydrological observation station	11 sets	T.T. Hue PPC	T.T. Hue PCC-NDPCSR Technical Supports by NHMS
		(3)	CCTVs	14 sets	T.T. Hue PPC	T.T. Hue PCC-NDPCSR
2	Reservoir operation facility at dam offices	(4)	Real-time operation system for dam	3 dams	T.T.Hue PPC (for Ta Trach dam), Binh Dien Hydropower Joint Stock Company and HD Investment Corporation	The units managing and operating the reservoirs
		(5)	CCTV/alert facility on dam	3 dams	T.T.Hue PPC	T.T. Hue PCC-NDPCSR
		(6)	Direct communication network (Radio Base Stations)	7 lines	Ditto	Ditto
3	Water related Disaster Management Information System in Office of PCC-NDPCSR in T.T. Hue Province	(7)	Information management (input)	1 set	T.T. Hue PPC	T.T. Hue PCC-NDPCSR
		(8)	Information management (processing)	1 set	Ditto	Ditto
		(9)	Information management (output)	1 set	Ditto	Ditto
		(10)	Multiple information display	1 set	Ditto	Ditto
		(11)	Web site and alert messaging system	1 set	Ditto	Ditto
		(12)	Direct commanding unit	1 set	Ditto	Ditto
4	Water related Disaster Management Information System in Office of CSC-NDPC in Hanoi	(13)	Multiple information display	1 set	MARD	CSC-NDPC
		(14)	Direct commanding unit	1 set	Ditto	Ditto
5	Basic data collection (such as LiDAR data)	(15)	Topographical survey by LiDAR	1 set	MARD or T.T. Hue PPC	
		(16)	River channel cross-section survey	1 set	T.T. Hue PPC	
6	Operation manual for quality control	(17)	Manual and training	1 set	MARD	

※Items will be further examined.
Component, contents and quantity are subject to change through the Survey.

Annex 3 (1): Lists of hydrological stations, radar, radio stations, CCTVs and operation equipment.

Table 1: List of Hydrological observation station.

Category	No.	Site Name	Observation elements		Highs of Antenna Pole	Area needed for candidate station	Equipment	Lat	Long
			Type of water level sensor	Rainfall					
Hydrological observation station	P1	Thuong Lo	--	o	10m	5m x 7m	·Water level sensor ·Rainfall gauge ·DC Power supply (Solar panel) ·Telemetering equipments ·Station house ·Antenna	16°08'28.2"N	107°45'00.2"E
	P2	Khe Tre	Ultrasonic	o	10m	5m x 7m		16°10'01.0"N	107°43'07.8"E
	P3	Sao La	--	o	10m	5m x 7m		16°04'36.4"N	107°29'17.3"E
	P4	Thao Long	Ultrasonic	o	10m	5m x 7m		16°32'35.4"N	107°36'58.8"E
	P5	Thuan An	Pressure & Ultrasonic	o	10m	5m x 7m		16°33'58.1"N	107°38'05.4"E
	P6	Dai Giang Weir	Ultrasonic	o	10m	5m x 7m		16°21'34.4"N	107°46'31.2"E
	P7	A Roang	--	o	10m	5m x 7m		16°07'22.2"N	107°23'49.9"E
	P8	Ta Luong	Ultrasonic	o	10m	5m x 7m		16°17'21.4"N	107°21'39.8"E
	P9	Thanh Luong	Pressure	o	10m	5m x 7m		16°30'59.9"N	107°30'43.9"E
	P10	Niem Pho	Pressure	o	10m	5m x 7m		16°32'29.2"N	107°31'32.5"E
	P11	A Luoi Reservoir	Pressure	o	10m	5m x 7m		16°13'42.2"N	107°15'03.7"E

Table 2: List of Radar. *: The radar is located on the tower of T2 or T6

Category	No.	Location	Type of Radar	Highs of Radar	Area for Tower	Equipment	Lat	Long
Radar (T2 or T6)*	T2	Binh Dien Dam	X-Band Radar	34m	10m x 10m	·X-Band Radar ·Transmitter ·AC Power supply ·Antenna	16°18'58.9"N	107°30'05.3"E
	T6	Near Chùa Phật Đứng					16°23'27.8"N	107°35'12.3"E

Table 3: List of Radio Base Stations.

Category	No.	Location	Type of Antenna		Highs of Tower	Area for Tower	Equipment	Lat	Long
			Sleeve Antenna	Parabolic Antenna					
Radio Base Station	T1	Ta Trach Dam	1	1	32m	10m x 10m	·Multiplex transmisson ·Telemetering equipments ·DC Power supply ·Station house ·Antennas	16°19'15.0"N	107°38'17.6"E
Radio Base Station	T2	Binh Dien Dam	1	1	32m (36m)*	10m x 10m	·Multiplex transmisson ·Telemetering equipments ·DC Power supply ·Station house ·Antennas	16°18'58.9"N	107°30'05.3"E
Passive repeater	T3	Binh Dien Dam	--	2	6m	5m x 5m	·Antennas	16°19'40.0"N	107°30'40.9"E
Radio Base Station	T4	Huong Dien Dam	1	1	32m	10m x 10m	·Multiplex transmisson ·Telemetering equipments ·DC Power supply ·Station house ·Antennas	16°27'29.2"N	107°25'34.2"E
Passive repeater	T5	Huong Dien Dam	--	2	6m	5m x 5m	·Antennas	16°27'31.6"N	107°26'35.2"E
Repeater	T6	Near Chùa Phật Đứng	--	3	32m (36m)*	10m x 10m	·Multiplex transmisson ·DC Power supply ·Station house ·Antennas ·Generator	16°23'27.8"N	107°35'12.3"E
Radio Base Station	T7	PCC-NDPCSR	1	2	32m	Existing Area in PCC-NDPCSR	·Multiplex transmisson ·Telemetering equipments ·DC Power supply ·Antennas	16°27'47.8"N	107°35'21.3"E

*: The height when the radar is installed.

Table 4: List of CCTVs.

Category	No.	Location	Type of CCTV	Highs of Pole	Area for bottom of Tower	Equipment	Lat	Long
	C1	Đập Thảo Long Hương Phong		5m	1m x 1m		16°32'37.2"N	107°37'00.2"E
	C2	Nguyễn Đình Chiểu tp. Huế		5m	1m x 1m		16°28'01.9"N	107°35'21.4"E
	C3	212 Bùi Thị Xuân Phường Đúc		5m	1m x 1m		16°27'13.9"N	107°33'54.6"E
	C4	Cầu Niêm Phò A Cầu Nguyễn Chí Thanh		5m	1m x 1m		16°32'29.2"N	107°31'32.1"E
	C5	Lê Đức Thọ		5m	1m x 1m		16°31'01.2"N	107°30'45.3"E

CCTV	C6	Cầu Tứ Phú Quảng Phú	Situations: Day/Night Data transmission: 1 picture / 10 minutes	5m	1m x 1m	CCTV Camera DC Power supply (Solar panel) 3G Module & Antenna Control box	16°31'27.3"N	107°29'02.7"E
	C7	Phong Sơn		5m	1m x 1m		16°29'08.3"N	107°26'02.6"E
	C8	Lower of Huong Dien Dam		5m	1m x 1m		16°27'38.0"N	107°25'28.8"E
	C9	Upper of Huong Dien Dam		5m	1m x 1m		16°27'32.8"N	107°25'27.4"E
	C10	Lower of Binh Dien Dam		5m	1m x 1m		16°19'09.9"N	107°30'00.2"E
	C11	Upper of Binh Dien Dam		5m	1m x 1m		16°18'58.2"N	107°30'06.3"E
	C12	Lower of Ta Trach Dam		5m	1m x 1m		16°19'01.7"N	107°37'59.3"E
	C13	Upper of Ta Trach Dam		5m	1m x 1m		16°18'57.1"N	107°38'14.9"E
	C14	Dai Giang Weir		5m	1m x 1m		16°21'34.4"N	107°46'31.2"E

Table 5: List of Water related Disaster Management Information System and Reservoir Operation Facilities in Offices.

Category	No.	Location	Room	Total Area of bottom of Equipments	Equipments	Note
Water related Disaster Management Information System in Office of PCC-NDPCSR in T.T. Hue Province	1	PCC-NDPCSR	2nd Floor Operation Roo	16m^2	·Information equipments ·Multiple information display ·Control PC ·UPS	
Reservoir operation facility at dam offices (Real-time operation system for dam)	2	Huong Dien Dam	Operation Room	6m^2	·Information equipments ·Information display ·Control PC ·UPS	
	3	Binh Dien Dam	Operation Room	6m^2	·Information equipments ·Information display ·Control PC ·UPS	
	4	Ta Trach Dam	Operation Room	6m^2	·Information equipments ·Information display ·Control PC ·UPS	
Water related Disaster Management Information System in Office of CSC-NDPC in Hanoi	5	CCFSC	1st Floor Operation Roor	6m^2	·Multiple information display ·Control PC ·UPS	

Annex-4

JAPANESE GRANT

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.

Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1. Grant Procedures

The Grant is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.

- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services

necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen, in principle, to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for

Environmental and Social Consideration (April, 2010) .

(11) Monitoring

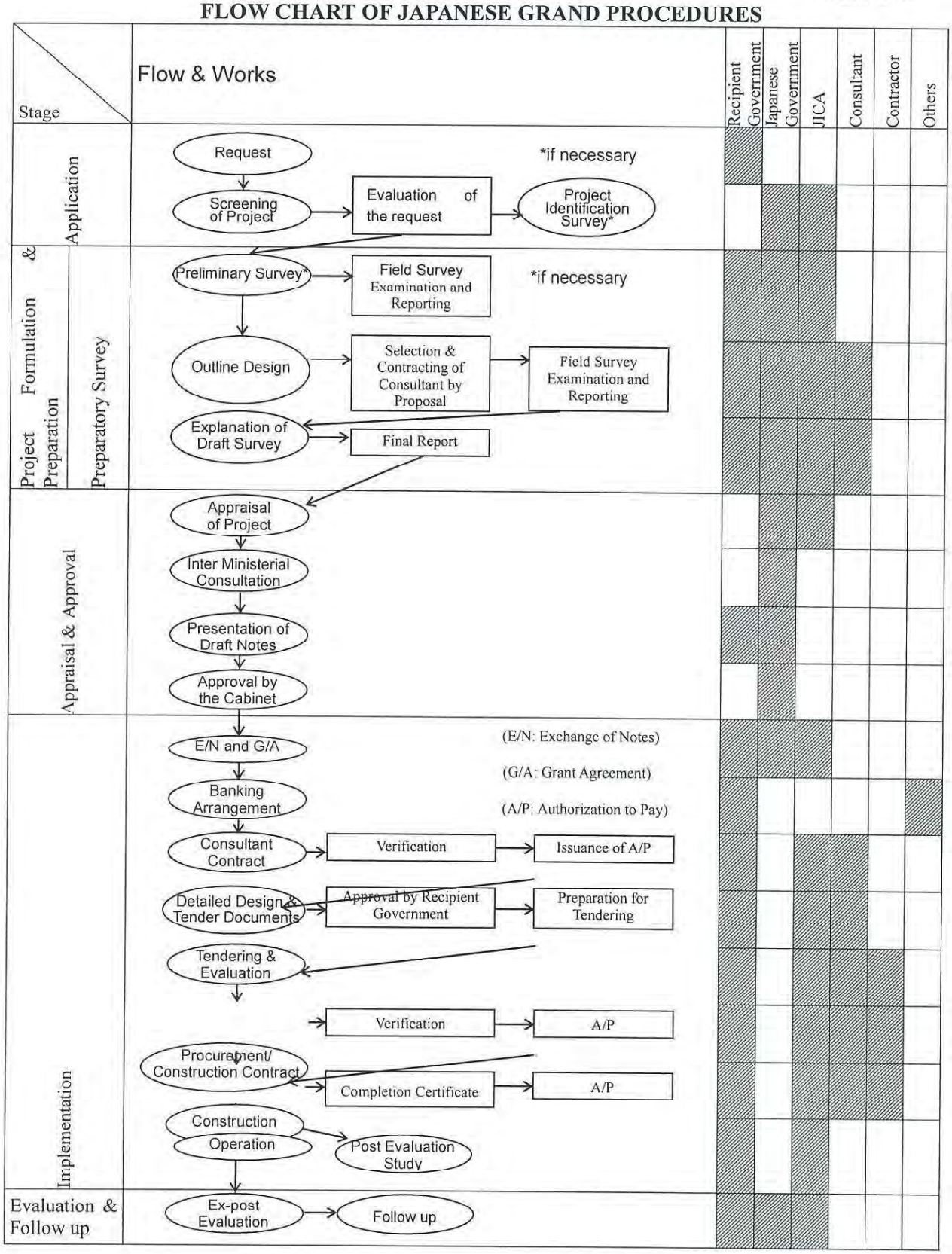
The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

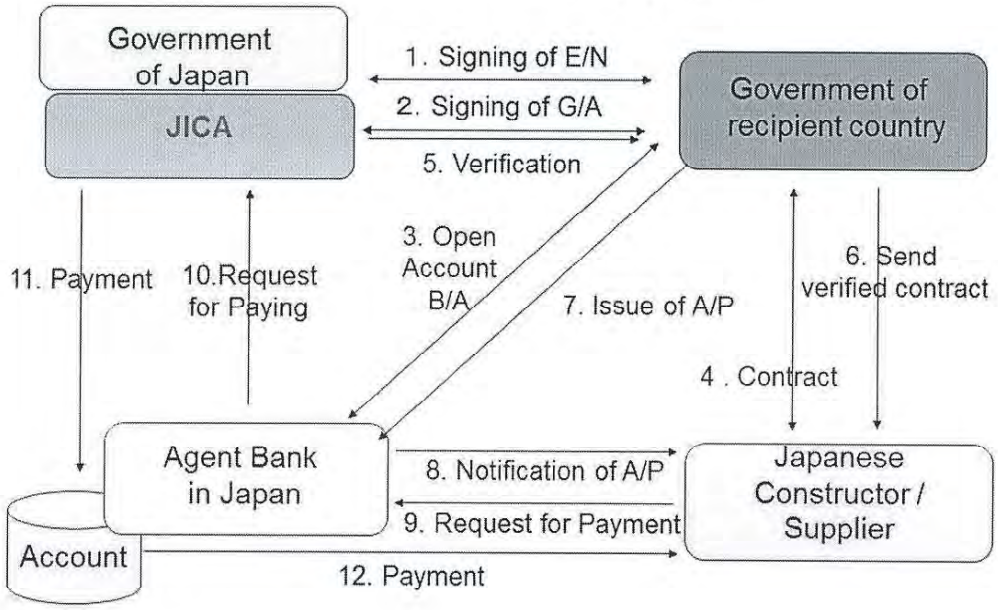
The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

Annex-5

FLOW CHART OF JAPANESE GRAND PROCEDURES



Financial Flow of Grant Aid



Annex 7

Major Undertakings to be taken by the Recipient Government

Specific obligations of the Recipient

The Recipient shall undertake the specific obligations for the Project as listed in the table below. JICA and the Recipient may agree from time to time separately in writing on the items, deadlines and other matters described in the tables below and the specific obligations of the Recipient.

Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A			
2	To secure the following lands 1) project sites for X band radar 2) project sites for Hydrological observation stations 3) project sites for radio transmission stations 4) Sufficient space in Hue PCC-NDPCSR, DNDPC of MARD, operation room in 3 dams for installation of equipment 5) Sufficient space for temporary facilities such as a constructor's office, workshop, building material storage, etc. needed for the work.	before notice of the tender document			
3	To obtain necessary permission for construction of the Radar Tower Building.	before notice of the tender document			
4	To obtain necessary permission for X band frequency	before notice of the tender document			
5	To obtain necessary permission for LiDAR survey (Use of airplane, photographing, taking data out of the country)	before notice of the tender document			

During the Project

NO	Items	Deadline	in Charge	Cost	Ref
1	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Requesting budget for the Project	At the initial occasion to request a budget for the Project			
	2) Advising commission of A/P	within 1 month after the singing of the contract			
	3) Payment commission for A/P	every payment			
	4) Payment commission for amendment of A/P	each payment			
2	To obtain the required frequencies for radar systems.	before notice of the tender document			
3	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Products and/or the Services be borne by its designated authority without using the Grant. Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract.	during the Project			

4	To accord Japanese nationals and other foreign nationals including their dependent/s (if any), whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Vietnam and stay therein for the performance of their work	during the Project			
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted be borne by its designated authority without using the Grant; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project			
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment	during the Project			
7	To provide necessary working spaces with Internet Connection for the implementation of the Project.	during the Project			
8	To provide the commercial power supply along with electric poles/wires, etc. from the main supply line to the proposed site for Radar Tower Buildings.	during the Project			
9	To provide the commercial power supply along with electric poles/wires, etc. from the main supply line to the proposed site for Hue PCC-NDPCSR, DNDPC in MARD and operation rooms in 3 dams	during the project			
10	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities.	during the Project			
11	To undertake incidental outdoor works such as a guard shed, gardening, fencing, gates, boundary walls and exterior lightings and to renovate the existing buildings and facilities in Observation Stations.	during the Project			
12	To provide reliable and high-speed Internet environment at the MARD Head Office and each prospective project site.	during the Project			
13	To ensure transport for the personnel and to shoulder the dispatching cost of the trainees to the training sites, such as daily allowance, accommodation, etc.	during the Project			

After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment.	After completion of the construction			
2	To assign the required staff for the smooth operation and maintenance of the Equipment.	After completion of the construction			
3	To provide adequate maintenance of the equipment procured under the Project so that they may function long lasting and effectively.	After completion of the construction			
4	To effectively utilize the facilities constructed and the Equipment procured/installed under the Project	After completion of the construction			
5	To allocate the necessary budget for the smooth conduct of operation and maintenance of the Project	After completion of the construction			

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(Note) Progress of the specific obligations of the Recipient may be confirmed and updated from time to time with written agreement between JICA and the Recipient in the form other than the amendment of the G/A.

Annex 8: List of permissions for the Project.

	Items	Permission/confirmation	Authority of permission	Applicant	Deadline
(1)	X-band Radar, hydrological observation stations and radio base stations	To use public land To expropriate private land if necessary	T.T. Hue Province DONRE	DARD	End of September 2016
(2)	X-band Radar observation, radio-wave data transfer (telemetry and multiplex transmission)	To use radio frequency channels	Authority of Radio Frequency Management, Ministry of Information and Communications	MARD	End of September 2016
(3)	X-band Radar, hydrological observation stations and radio base stations	To construct buildings	Dept. of Construction, T.T. Hue Province	DARD	before tender notice
(4)	X-band Radar, radio base stations	Confirming the safety over buildings	Dept. of Operation, Ministry of Defence	MARD/DARD	before tender notice
(5)	LiDAR aerial survey	To use airplane	Dept. of Aviation, Ministry of Defence	MARD	End of September 2016
		To measure topography by LiDAR	Ministry of Defence, Ministry of Public Security	MARD	End of September 2016
		To utilize/analyze LiDAR data overseas	Ministry of Public Security	MARD	End of September 2016

Minutes of Discussions
on
the Preparatory Survey for the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System

With reference to the minutes of discussions signed between Ministry of Agriculture and Rural Development and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 12th July 2016 and in response to the request from the Government of the Socialist Republic of Vietnam (hereinafter referred to as "Vietnam") dated 10th August 2014, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System (Project title used by Vietnamese side: "Project for Emergency Reservoir Operation and Effective Flood Management using Comprehensive Disaster Management Information System" (hereinafter referred to as "the Project"), headed by Mr.Yoichi Inoue, Acting Director of Disaster Risk Reduction Team 1, Global Environment Department from 16th November to 25th November 2016.

As a result of the discussions, both sides confirmed on the main items described in the attached sheets.

Hanoi, 25th November, 2016

Mr. Yoichi Inoue
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Tran Quang Hoai
Deputy Director General
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ATTACHMENT

1. **Title of the Preparatory Survey**
Although change of the title of the Survey was confirmed in the minutes of discussions signed on 18th March 2016 as "the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System", the Vietnamese side explained the title of "the Project for Emergency Reservoir Operation and Effective Flood Management using Comprehensive Disaster Management Information System" is preferable because this title is widely shared among related Vietnamese Ministries and organizations.

The Team explained that the title of the Project will be further considered in Japan and will be consulted with the Vietnamese side before signing of E/N and G/A if the Project is approved by the Government of Japan

2. **Contents of the Draft Report**
After the explanation of the contents of the Draft Report by the Team, both sides agreed to its contents in principle and also confirmed some changes in the draft report. JICA will send the updated draft Report to the Vietnamese side prior to December 20th, 2016. The Vietnamese side will confirm updated draft Report within five days after the date of receipt.

3. **Cost estimate**
Both sides confirmed that the cost estimate including the contingency described in Annex-1 is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

4. **Confidentiality of the cost estimate and technical specifications**
Both sides confirmed that the cost estimate in Annex-1 and technical specifications in the Draft Report should never be duplicated or disclosed to any third parties until all the contracts under the Project are concluded.

5. **Japanese Grant Aid Scheme**
The Vietnamese side understands the Japanese Grant Aid Scheme and its procedures as described in Annex 2, Annex 3 and Annex 4, and necessary measures to be taken by the Government of Vietnam.

6. **Timeline for the project implementation**
The Team explained to the Vietnamese side that the expected timeline for the project implementation is as attached in Annex 5.

7. **Expected outcomes and indicators**
Both sides confirmed that key indicators for expected outcomes are as follows. Both sides are expected to achieve agreed key indicators targeted in year 2022 and shall monitor the progress based on those indicators.

1) Quantitative indicators:

Indicator		Baseline (2016)	Target (2022)
Hydrological data density	Rainfall data applicable to the Project (grid points per km^2)	1/400	1/0.1
	River water level and discharge (points in the basin)	6	16

Flood discharge with the effect of dam operations (m^3/s)	−1,480 (25% reduction)*	−3,130 (55% reduction)*
Interval time of disseminating rainfall and water level information (interval time)	60 min	10 min

*Estimates at Kim Long in Hue City under the same condition with historical high flood in September 2009.

2) Qualitative indicators:
- Capacity improvement of appropriate operation and management of dams and reservoirs in the Huong River basin
- Prevention and mitigation of water-related natural disasters in the Huong River basin
- Provision of inundations area forecasting in the Huong River basin

8. Soft Component of the Project

Considering the sustainable operation and maintenance of the products and services granted through the Project, following soft component is planned under the Project. The Vietnamese side will deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the soft component as described in the Draft Report.
- Operation and maintenance of hydrological observation station e.g. countermeasures against troubles, routine check and maintenance of equipment
- Interpretation of hydrological observation data
- Calibration of the X-band radar and runoff/inundation model
- Development and utilization of rating curves of river channels (P2, P4, P6, P8, N7, N11)
- Operation of Integrated Disaster Management System

9. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 6. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in No.5 of "(2) During the Project Implementation" in Annex 6, both sides confirmed that such customs duties, internal taxes and other fiscal levies include VAT, commercial tax, income tax and corporate tax, which shall be clarified in the bid documents by Directorate of Water Resources, Ministry of Agriculture and Rural Development during the implementation stage of the Project.

The Team explained and requested as follows;
1) The consultant and contractors to be procured under the Project will not bear any custom duties, taxes and fiscal levies.
2) According to Japanese grant aid regulation, the grant amount shall not cover any taxes, duties or fiscal levies. All custom duties, taxes and fiscal levies should be exempted by the Vietnamese side or be borne by its designated authority in accordance with the Vietnamese current regulations and shall not be covered by the Grant.

The Vietnamese side assured to take the necessary measures and coordination including allocation of the necessary budget which is preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.
Both sides also confirmed that the Annex 6 will be used as an attachment of G/A.

10. Monitoring during the implementation

The Project will be monitored by the Vietnamese side and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 7. The timing of submission of the PMR is described in Annex 6.

11. Project completion

The project completes when all the facilities constructed and equipment procured by the grant are in operation in accordance with Japanese Grant Aid scheme. The completion of the project will be reported to JICA promptly, but in any event not later than six months after completion of the Project. Total project period will come to an end by completion of the soft component.

12. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, and Sustainability). The result of the evaluation will be publicized. The Vietnamese side is required to provide necessary support for the data collection.

13. Schedule of the Study

JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Vietnamese side around the middle of February 2017.

14. Environmental and Social Considerations

The Team explained that 'JICA Guidelines for Environmental and Social Considerations (April 2010)' (hereinafter referred to as "the Guidelines") is applicable for the Project. The Project is categorized as C because the Project is likely to have minimal adverse impact on the environment under the Guidelines. The project will be also implemented in accordance with the Environment Law of Vietnam.

15. Other Relevant Issues

15-1. Disclosure of information

Both sides confirmed that the Preparatory Survey Report which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

15-2. Necessary permissions for implementation of the Project

Both sides confirmed necessary permissions and its status as attached in Annex-8.

The Vietnamese side will collect the permissions to construct the buildings for X-band radar, hydrological observation stations and radio base stations, and permissions to confirm the safety over the tall buildings (towers for the X-band radar and multiplex radio communication) before the tender notice.

15-3. Data processing of LiDAR survey

The team explained that the data processing of LiDAR survey is planned to be done in Vietnam and it will be done in Japan if permitted by Ministry of Public Security after the tendering in order to improve the quality of topography data.

15-4. Operation and Maintenance plan of the Project

The Team explained Operation and Maintenance plan of the Project as described in the Draft Report. The both side confirmed that soft component will support capacity development of the Vietnamese side in terms of Operation and Maintenance of the Project. Details of the soft component are also described in the Draft Report.

15-5. Budget and staff allocation for the operation and maintenance of the Project

The Team explained the budget and staff necessary for the operation and maintenance of the Project as follows. The Vietnamese side will allocate the budget and staff necessary for the operation and maintenance.

Budget necessary for the operation and maintenance of the Project

(1) PCC-NDPCSR (Hue)

(a) Costs for equipment (VND)

No.	Items	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Hydrological stations	10	0	0	0	0	469,791,667	0	0	0	0	469,791,667	
2	CCTVs	14	0	0	0	0	1,447,916,667	0	0	0	0	1,447,916,667	
3	Radar	1	0	0	0	0	1,956,458,333	0	0	0	0	1,956,458,333	
4	Multiplex radio communication	1	0	0	0	0	844,270,833	0	0	0	0	844,270,833	
5	Telemetry	10	0	0	0	0	1,470,000,000	0	0	0	0	1,470,000,000	
6	Information processing and display	1	0	0	0	0	1,618,229,167	0	0	0	0	1,618,229,167	
7	Reservoir water level sensors	3	0	0	0	0	238,125,000	0	0	0	0	238,125,000	Ta Trach, Binh Dien, Huong Dien
8	Dam gate sensors	2	0	0	0	0	117,291,667	0	0	0	0	117,291,667	Binh Dien, Huong Dien
	Subtotal of (a) (VND)		0	0	0	0	8,162,083,333	0	0	0	0	8,162,083,333	

(b) Other necessary costs (VND)

No.	Items	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Land-use and facility fees	1											
2	Electricity fee	1	47,892	47,892	47,892	47,892	47,892	47,892	47,892	47,892	47,892	47,892	Electricity fee at Tô
3	VPN fee	3	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	158,400,000	VPN fees at Hue, Da Nang and Ha Noi
4	SIM card fee	2	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	1,800,000	Fees to use mobile phone lines at P7 and A Luoi Hydropower Plant
	Subtotal of (b) (VND)		160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	160,247,892	
	Total for (1) (VND)		160,247,892	160,247,892	160,247,892	160,247,892	8,322,331,225	160,247,892	160,247,892	160,247,892	160,247,892	8,322,331,225	17,926,645,587
	Total for (1) (JPY)		769,190	769,190	769,190	769,190	39,947,190	769,190	769,190	769,190	769,190	39,947,190	86,047,899

(2) CSC-NDPC (Ha Noi)

(a) Costs for equipment (VND)

No.	Items	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Information processing and display	1	0	0	0	0	62,500,000	0	0	0	0	62,500,000	
	Subtotal of (a) (VND)		0	0	0	0	62,500,000	0	0	0	0	62,500,000	

(b) Other necessary costs (VND)

No.	Items	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Electricity fee	1	0	0	0	0	0	0	0	0	0	0	Electricity will be obtained from DNDPC office.
2	VPN fee	1	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	VPN fee at Ha Noi
	Subtotal of (b) (VND)		52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	52,800,000	
	Total for (2) (VND)		52,800,000	52,800,000	52,800,000	52,800,000	115,300,000	52,800,000	52,800,000	52,800,000	52,800,000	115,300,000	653,000,000
	Total for (2) (JPY)		253,440	253,440	253,440	253,440	553,440	253,440	253,440	253,440	253,440	553,440	3,134,400

(3) Three dam offices (Ta Trach, Binh Dien, Huong Dien)

(a) Costs for equipment (VND)

No.	Items	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Information processing and display	1	0	0	0	0	348,229,167	0	0	0	0	348,229,167	
	Subtotal of (a) (VND)		0	0	0	0	348,229,167	0	0	0	0	348,229,167	

(b) Other necessary costs (VND)

No.	Items	Qty	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	Remarks
1	Electricity fee	1	0	0	0	0	0	0	0	0	0	0	Electricity will be obtained from dam offices.
	Subtotal of (b) (VND)		0	0	0	0	0	0	0	0	0	0	
	Total for (3) (VND)		0	0	0	0	348,229,167	0	0	0	0	348,229,167	696,458,333
	Total for (3) (JPY)		0	0	0	0	1,671,500	0	0	0	0	1,671,500	3,343,000

Grand total (VND)		20,669,020,587
Grand total (JPY)		99,211,299

*Costs are estimated based on the actual expenses in Japan

Abbreviations: PPC-NDPCSR: Provincial Commanding Committee for Natural Disaster Prevention and Control, Search and Rescue in T.T.Hue Province
(hereinafter referred to as "PPC-NDPCSR")

CSC-NDPC : Office of Central Steering Committee for Natural Disaster Prevention and Control in Hanoi
(hereinafter referred to as "CSC-NDPC")

Staff allocation necessary for the operation and maintenance of the Project

Positions		T.T. Hue PPC, PCC-NDPCSR	Dam offices	CSC-NDPC
Senior River Management Technical Officer (Representative of office)		1*	1*	1*
System operation and data monitoring	River Management Technical Officer	2	1*	1*
Data collection and utilization	River Management Technical Officer	2		1*
	River Management Technical Assistant	(10)**		
Routine inspection and maintenance of equipment	River Management Technical Officer	2	1*	1*
	Electronics Technical Officer	2	1*	1*
Total		8–9 (18–19)**	4*	5*

*If the works will be done by regular staff members only, specific staffs are not necessary.
**If the flood discharge observation works will be outsourced, specific staffs are not necessary.

Duties of the above positions are as follows;

- System operation and data monitoring:
  Monitoring of rainfall, rivers and dams, operation of display, communications with three dam offices, dissemination of inundation area forecasting and warning information, and detecting errors and investigating the causes
- Data collection and utilization:
  Observation of flood discharge, updating rating curves in river channels (P2, P4, P6, P8, N7, N11), updating the parameters of X-band radar and runoff/inundation model, and archiving and evaluation of observation data
- Routine inspection and maintenance of equipment
  Routine inspection and maintenance of equipment including trouble shooting and repair for data missing and failures in displaying information

15-6. Validation and calibration of the data collection equipment and Integrated Disaster Management Information System

Both sides confirmed undertakings of the validation and calibration of the data collection equipment (particularly the X-band radar) and Integrated Disaster Management Information System as described in Annex-9. Both sides will implement the validation and calibration when required. Both sides also confirmed that the undertakings above are indispensable to keep high accuracy of the data collection equipment and Water-related Disaster Management Information System.

15-7. Performance and handing over conditions of equipment and Integrated Disaster Management Information System

As described in 15-6, factory-verified rain gauges and water level sensors will be installed and their performance will be examined to meet requirements through on-site adjustment and test operation. The X-band radar, direct communication networks and Integrated Disaster Management Information System will be also examined to meet requirements (including display contents and operation procedures) in factory tests and on-site test operations.

Handing over condition of the equipment is to confirm its performance meets required

specifications in factory test and on-site test operation. The required performance and guarantee condition of equipment including the Integrated Disaster Management System will be described in the bidding document and specifications.

Performance of equipment will be guaranteed as per guarantee condition of each equipment, however, the total performance in combination of equipment cannot be guaranteed

In addition, accuracy of 1) observation data from data collection equipment and 2) information from Integrated Disaster Management Information System cannot be guaranteed due to following two reasons

1) Accuracy of observation data from data collection equipment

   Accuracy of the observation data depends on operation and maintenance of data collection equipment by users.

2) Accuracy of information from the Water-related Disaster Management Information System

   The GPV data, which have been produced and provided by Japan Meteorological Agency (JMA) using internationally shared observation data in the WMO framework and JMA Global Spectral Model, will be utilized as rainfall predictions in the Water-related Disaster Management Information System, until rainfall predictions by NHMS will be available in future. Any prediction contains uncertainties, thus the Project cannot guarantee the quality of the GPV data. The Water-related Disaster Management Information System will display estimated errors in river discharge and water level predictions to avoid misunderstandings by the system users and to secure proper operation.

   Accuracy of other information from the Integrated Disaster Management Information System (e.g. inundation predictions) depends on the accuracy of observation data from the data collection equipment.

The Team explained that the following maintenance works are indispensable to keep good accuracy and performance of data collection equipment and the Integrated Disaster Management Information System:

- Routine inspection and proper maintenance of the data collection equipment, direct communication network and Integrated Information Management System,
- Preservation of suitable environment (for example removing obstacles such as trees) around data collection equipment and direct communication network,
- Continuation of the flood discharge observation,
- Updating rating curves in river channels (P2, P4, P6, P8, N7, N11), and
- Updating parameters of X-band radar and runoff/inundation model.

The Vietnamese side will undertake the above-mentioned maintenance works after handing over of the Project.

15-8 Recommendations to better emergency operation of three reservoirs in the Huong River basin

The Team explained following recommendations to better emergency operation of three reservoirs in the Huong River basin.

- To improve protocol and methodology of warning and evacuation information dissemination to residents in T.T.Hue PPC utilizing Integrated Disaster Management Information System
- To secure redundancy of observation data transmission and archiving
- To update operation rules of 3 dams stipulated the Decision on Operation rules in Huong River Basin (PM-Decision 2482/QD-TTg dated 30/12/2015) as per actual observation data in order to make three dam operations more efficient.

15-9 Preparation of Project documents by the Vietnamese side

The Vietnamese side is going to timely prepare Project document to get approval of the Project from the Government of Vietnam utilizing draft Preparatory Survey Report submitted by the Team as well as to obtain authorization to sign the E/N and G/A of the Project.
The Vietnamese side also explained that approval of the Government of Vietnam of the Project and above-mentioned authorization can be expected by March 2017.

15-10 Adaptation to Climate Change

In Vietnam under changing climates, the occurrence of more frequent and higher rainfall has been projected. The Project is aiming to improve the capacities of emergency operation of three reservoirs in the Huong River basin in Thua Thien-Hue Province through establishing the Integrated Disaster Management Information System as well as real-time observation system of rainfall and water level in the basin, thereby contributing to mitigation of flood damage. Thus, the Project is expected to contribute to adaptation to climate change.

Annex 1 Project Cost Estimation
Annex 2 Japanese Grant
Annex 3 Flow Chart of Japanese Grant Procedures
Annex 4 Financial Flow of Japanese Grant
Annex 5 Implementation Schedule
Annex 6 Major Undertakings to be taken by the Recipient Government
Annex 7 Project Monitoring Report
Annex 8 List of Status of the permissions for the Project
Annex 9 Undertakings of validation and calibration of the data collection equipment and Water related Disaster Management Information System

Annex 1

Project Cost Estimation

1. Project Cost to be borne by Japan's Grant Aid

Total Project Cost: Approx. 1,919Million JP Yen

Table: Project Cost Estimates of the Japan's Grant Aid

Items		Estimate (JP Yen)
Equipment	• X band radar • Hydrological observation station • CCTV • Real-time operation system for dams • Direct communication networks • Information Management system (input, output, processing) • Multiple information display • Direct commanding unit • LiDAR Survey • River channel cross-section survey	JPY1,664 Million
Soft Component		JPY27 Million
Consulting Services (Detailed Design, Supervision)		JPY198 Million
Contingency		JPY30 Million
	Total	JPY1,919 Million

JAPANESE GRANT

*These explanations (Annex 2, Annex 3, Annex 4) are quoted from Procurement Guidelines for the Japanese Grant, format of E/N and G/A and cannot be modified.

The Japanese Grant (hereinafter referred to as the "Grant") is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant is not supplied through the donation of materials as such.
Based on a JICA law which was entered into effect on October 1, 2008 and the decision of the GOJ, JICA has become the executing agency of the Japanese Grant for Projects for construction of facilities, purchase of equipment, etc.

1. Grant Procedures

The Grant is supplied through following procedures :

- Preparatory Survey
  - The Survey conducted by JICA
- Appraisal &Approval
  - -Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
  - -The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
  - -Agreement concluded between JICA and a recipient country
- Implementation
  - -Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Scheme from a technical,

financial, social and economic point of view.

- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant project. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA employs (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japanese Grant Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes(hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles, in accordance with the E/N, to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions.

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. The Grant may be used for the purchase of the products or services of a third country, if necessary, taking into account the quality, competitiveness and economic rationality of products and services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals", in principle.

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals, in principle. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Project, the recipient country is required to undertake such necessary measures as Annex. The Japanese Government requests the Government of the recipient country to exempt all customs duties, internal taxes and other fiscal levies such as VAT, commercial tax, income tax, corporate tax, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract, since the Grant fund comes from the Japanese taxpayers.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant.

(7) "Export and Re-export"

The products purchased under the Grant should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"), in principle. JICA will execute the Grant by making payments in Japanese yen, in principle, to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Environmental and Social Considerations

The Government of the recipient country must carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the recipient country and JICA Guidelines for Environmental and Social Consideration (April, 2010) .

(11) Monitoring

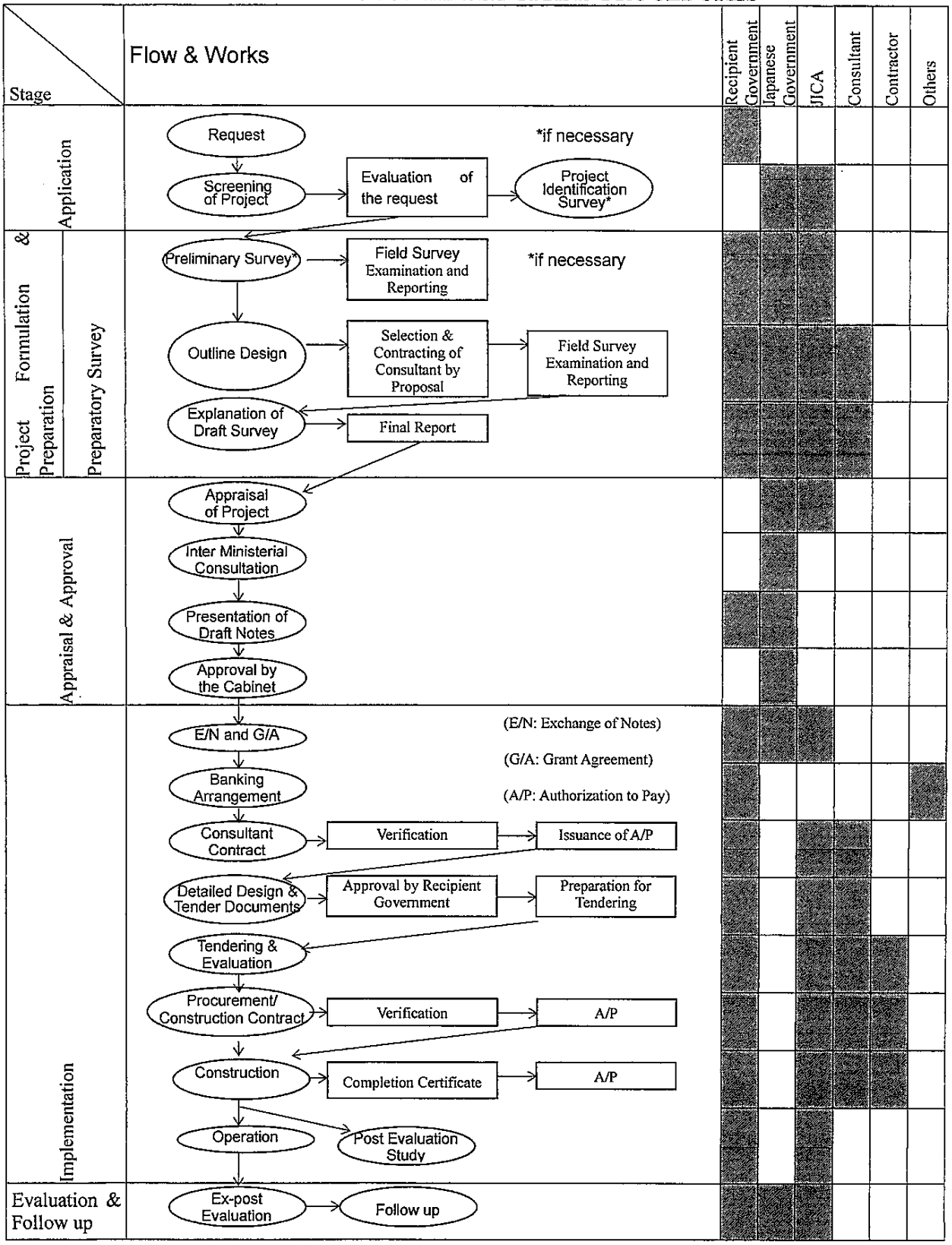
The Government of the recipient country must take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and must regularly report to JICA about its status by using the Project Monitoring Report (PMR).

(12) Safety Measures

The Government of the recipient country must ensure that the safety is highly observed during the implementation of the Project.

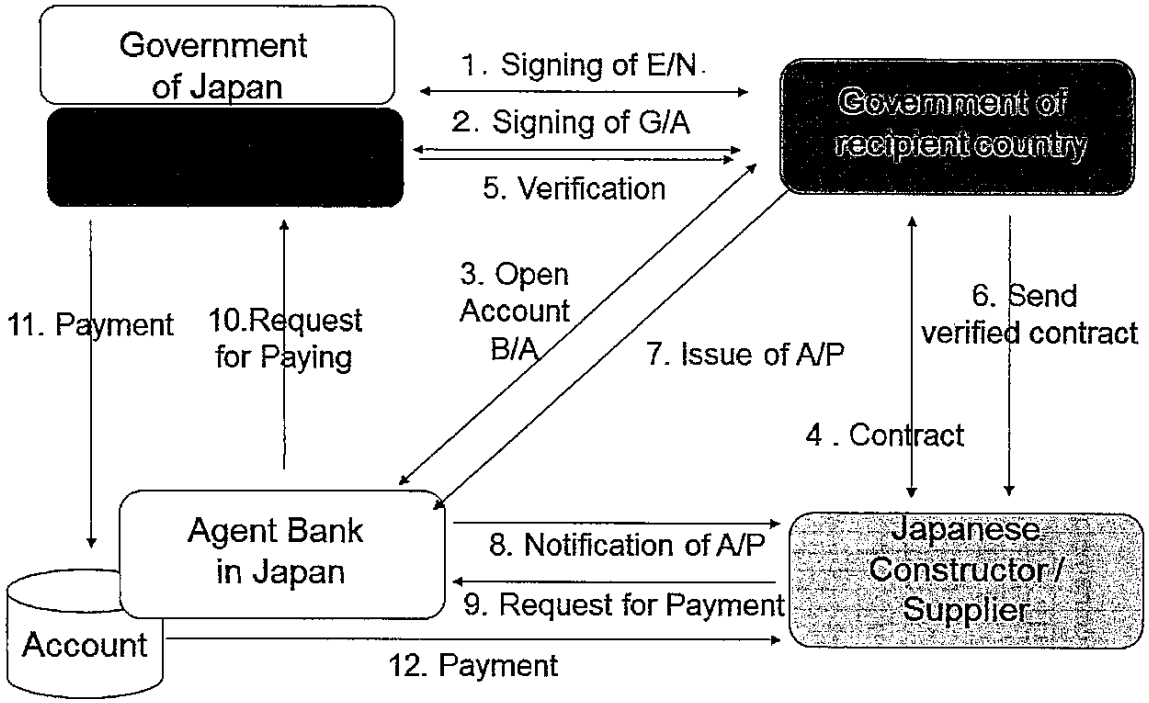
Annex 3

FLOW CHART OF JAPANESE GRAND PROCEDURES



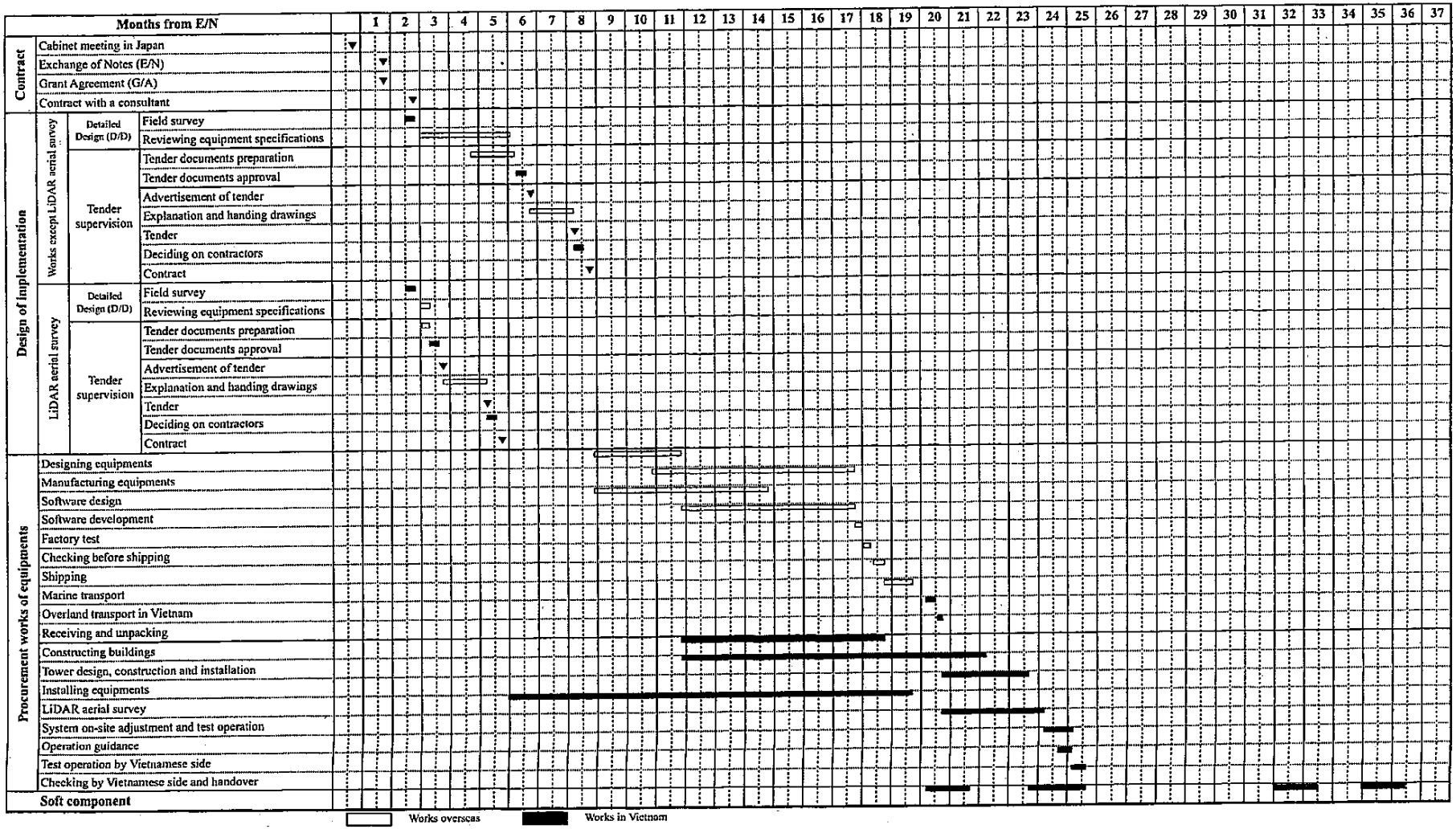
Annex 4

Financial Flow of Grant Aid



Annex 5

Implementation Schedule



Annex 6

Major undertakings to be undertaken by the Government of Vietnam

1. Specific obligations of the Government of Vietnam which will not be funded with the Grant

The Recipient shall undertake the specific obligations for the Project as listed in the table below. JICA and the Recipient may agree from time to time separately in writing on the items, deadlines and other matters described in the tables below and the specific obligations of the Recipient.

(1) Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 1 month after G/A	MARD and related organizations	--	
2	To issue A/P to a bank in Japan (the Agent Bank) for the Payment to the consultant	within 1 month after G/A	MARD and related organizations	1.919 million JPY in total with contractors	
3	To secure the following lands	before notice of the tender document			
	1) project sites for X band radar		T.T.Hue PPC	--	
	2) project sites for Hydrological observation and CCTV stations		Ditto	3,043,600 VND	
	3) project sites for radio transmission stations		Ditto	2,250,000 VND	
	4) Sufficient space in Hue PCC-NDPCSR for installation of equipment		Ditto	--	
	5) Sufficient space in DNDPC of MARD for installation of equipment		MARD	--	
	6) Sufficient space in operation room in 3dams for installation of equipment		T.T. Hue PPC, Binh Dien Hydropower Company and HD Investment Corporation	--	
	7) Sufficient space for temporary facilities such as a constructor's office, workshop, building material storage, etc. needed for the work.		T.T.Hue PPC MARD	--	
4	To obtain necessary permissions for construction of the buildings for X-band radar, hydrological observation stations and radio base stations	before notice of the tender document	T.T.Hue PPC	--	
5	To obtain necessary permissions for X band radar frequency and telemetry and multiplex transmission frequency	before notice of the tender document	MARD	--	
6	To obtain necessary permissions for the safety over the tall buildings for towers for the X-band radar and multiplex radio communication	before notice of the tender document	MARD	--	
7	To obtain necessary permissions for LiDAR survey (Use of airplane, photographing)	before notice of the tender document	MARD	--	
8	To secure necessary budget for Project Management activities at the central level		MARD	6 billion VND (*)	
9	To secure necessary budget for Project Management activities in T.T.Hue province		T.T.Hue PPC	6 billion VND(*)	

Notes: (*) This amount is proposal and calculation from the Vietnamese side

(2) During the Project Implementation

NO	Items	Deadline	in Charge	Cost	Ref
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the supplier(s)	Within 1 month after the signing of the contracts	MARD and related organizations	1.919 million JPY in total with consultant	
2	To bear the following commissions to a bank of Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the singing of the contracts	Ditto	5,000 JPY	
	2) Payment commission for A/P	every payment	Ditto	2.159 million JPY in total	
	3) Payment commission for amendmentof A/P	each payment	Ditto		
3	to ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MARD T.T.Hue PPC	--	
4	To accord Japanese nationals and other foreign nationals including their dependent/s (if any), whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Vietnam and stay therein for the performance of their work	during the Project	MARD	--	
5	According to Japanese grant aid regulation, the grant amount shall not cover any taxes, duties or fiscal levies. To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority and shall not be covered by the Grant; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project	MARD	--	
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for implementation of the Project	during the Project	MARD T.T.Hue PPC		
7	1) To submit Project Monitoring Report after each work under the contacts such as shipping, hand over, installation and operational training utilizing the draft by the consultant	Within one month after completion of each work	MARD DWR	--	
	2) To submit Project Monitoring Report (final) utilizing the draft by the consultant	Within one month after signing of Certificate of Completion for the works under the contracts	MARD DWR	--	
8	To submit a report concerning completion of the Project utilizing the draft by the consultant	Within six months after completion of the Project	MARD DWR	--	
9	To provide necessary working spaces with Internet Connection for the implementation of the Project.	during the Project	MARD T.T.Hue PPC	--	
10	To provide the commercial power supply along with electric poles/wires, etc. from the main supply line to the proposed site for Radar Tower Buildings.	during the Project	T.T.Hue PPC	--	
11	To provide the commercial power supply along with electric poles/wires, etc. from the main supply line to the proposed site for Hue PCC-NDPCSR, DNDPC in MARD and	during the project	T.T.Hue PPC MARD	--	

			Hydropower Company and HD Investment Corporarion		
12	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities.	during the Project	Ditto		
13	To provide the commercial power supply along with electric poles/wires, etc. from the main supply line to the proposed site for radio base stations	during the Project	T.T.Hue PPC	375 million VND	
14	To undertake incidental outdoor works such as a guard shed, gardening, fencing, gates, boundary walls and exterior lightings and to renovate the existing buildings and facilities in Observation Stations.	during the Project	T.T.Hue PPC	1,990 million VND	
15	To provide reliable and high-speed Internet environment at the MARD Head Office and each prospective project site.	during the Project	MARD	211.2 million VND	
16	To ensure transport for the personnel and to shoulder the dispatching cost of the trainees to the training sites, such as daily allowance, accommodation, etc.	during the Project	T.T.Hue PPC MARD	--	
17	To secure necessary budget for Project Management activities at central level	during the Project	MARD	19 billion VND(*)	
18	To secure necessary budget for Project Management activities in T.T.Hue province	during the Project	T.T.Hue PPC	10 billion VND(*)	

Notes: (*) This amount is proposal and calculation from the Vietnamese side

(3) After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment. (Note: Detailed breakdown of this cost is shown in the upper table of Subsection 15-4.)	After completion of the construction	T.T.Hue PPC MARD Binh Dien Hydropower Company and HD Investment Corporarion	About 20.7 billion VND	
2	To assign the required staff for the smooth operation and maintenance of the Equipment.	After completion of the construction	Ditto	--	
3	To provide adequate maintenance of the equipment procured under the Project so that they may function long lasting and effectively.	After completion of the construction	Ditto	--	
4	To effectively utilize the facilities constructed and the Equipment procured/installed under the Project.	After completion of the construction	Ditto	--	
5	To allocate the necessary budget for the smooth conduct of operation and maintenance of the Project	After completion of the construction	Ditto	--	

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(Note) Progress of the specific obligations of the Recipient may be confirmed and updated from time to time with written agreement between JICA and the Recipient in the form other than the amendment of the G/A.

2. Other obligations of the Government of Vietnam funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	1) To conduct the following transportation a) Marin (Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site	Project completion	
	2) To provide equipment with installation and commissioning		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		
	Total		1,919

*The Amount is provisional. This is subject to the approval of the Government of Japan.

Project Monitoring Report
on
The Project for Emergency Reservoir Operation and Effective Flood Management Using Integrated Disaster Management Information System
Grant Agreement No. XXXXXXX
20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:
Executing Agency	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:
Line Ministry	Person in Charge	(Designation)
	Contacts	Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual

	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*

Actual *(PMR)*

3-2 **Budgetary Arrangement**
- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*
Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low

	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6 of Annex 7

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C－D	Price (Increased) F=C＋D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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Attachment 7 of Annex 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Annex 8

List of Status of the permissions for the Project

	Items	Permission/confirmation	Authority of permission	Applicant	Deadline	Current status/remarks
(1)	X-band radar, hydrological observation stations and radio base stations	To use public land To expropriate private land if necessary	T.T. Hue Province DONRE	DARD	Done	T.T. Hue PPC sent JICA Vietnam Office the official letter (No. 6303/UBND-DN, dated on October 14th, 2016), mentioning that the PPC pledges to arrange available lands to install all the project equipment.
(2)	X-band radar observation, radio-wave data transfer (telemetry and multiplex transmission)	To use radio frequency channels	Authority of Radio Frequency Management, Ministry of Information and Communications	MARD	Done	MARD received the official confirmation letter from ARFM dated on 23rd November 2016 and forwarded it to JICA
(3)	X-band radar, hydrological observation stations and radio base stations	To construct buildings	Dept. of Construction, T.T. Hue Province	DARD	Before tender notice	
(4)	X-band radar, radio base stations	Confirming the safety over buildings	Dept. of Operation, Ministry of Defense	MARD/T.T.Hue PPC	Before tender notice	
(5)	LiDAR aerial survey	To use airplane	Ministry of Defense	MARD	Done	MARD received the official letter from MOD (No. 8172/BQP-TM, dated on August 24th, 2016), mentioning that MOD agreed in principal to the LiDAR survey implementation in the project. It is necessary to make additional procedures for obtaining the permission in the project.
		To measure topography by LiDAR	Ministry of Defense	MARD	Done	
		To utilize/analyze LiDAR data overseas	Ministry of Public Security	MARD	Done	MARD received the official letter from MPS (No. 2233/BCA-TCAN, dated on September 16th, 2016), mentioning that MARD must submit detailed information to MPS for obtaining the permission after the entrusted organization for LiDAR data analysis will decided in the project.

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Annex 9

Undertakings of validation and calibration of the data collection equipment and Water related Disaster Management Information System

No.	Items		Undertakings of the Japanese side during the Project with participation from the Vietnamese side			Undertakings by the Vietnamese side after handing over		
			a) Validation	b) Calibration	c) Detect Survey (After completion)	d) Periodic inspection *	e) Specific inspection after floods	f) Calibration
			(Period) Before handover	(Period) Before handover and one year after handover (soft component)		(Period) After handover	(Period) After handover	(Period) From the second year after handover
1	Rain gauges		Factory verification, adjustment and test operation	---	One year after handing over	Once per year	---	---
2	Water level sensors		Factory verification, adjustment and test operation	---	One year after handing over	Once per year	Any time after floods	---
3	Flood discharge observation and updating rating curves in river channels		Flood discharge obs.: during flooding in the first year Updating rating curves in river channels: before the system completion		One year after handing over	Flood discharge obs.: every time after floods Updating rating curves in river channels: once per year		
4	Rainfall radar (X-band radar)		Factory verification, adjustment and test operation	Initial setting: calibration using past data After handover: calibration using rain gauge and satellite data (during soft component activities)	One year after handing over	Once per year	---	Once per year, calibration using rain gauge and satellite data
5	Data transmission equipment		Factory verification, adjustment and test operation	---	One year after handing over	Once per year	---	---
6	Water-related Disaster Management Information System	Setting rating curves in river channels(P2, P4, P6, P8, N7, N11)	Factory verification, adjustment and test operation	Calibration using past data and rating curves (mentioned in Item 3)	One year after handing over	Once per year	---	Once per year, calibration using rating curves (mentioned in Item 3)
		Setting model parameters		Initial setting: calibration using past data After handover: calibration through runoff analyses	One year after handing over		---	Once per year, calibration through runoff analyses

*Any time in case of equipment failures

Technical Notes

The First Field Survey
of
the Preparatory Survey
for
the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System"
in
Socialist Republic of Vietnam

The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of the Department of Agriculture and Rural Development, Thua Thien Hue Provincial People's Committee which is the responsible and implementing organization for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project) have agreed upon the items described in the attached Technical Notes. Based on the Technical Notes, the Survey Team analyze and discuss with authorities in Japan to justify the Project and determine its scope.

25 March 2016 in Hue

Hideyuki Kamimera

for Mr. Akihiko Nunomura
Chief Consultant
JICA Survey Team

Mr. Phan Thanh Hung
Director
Bureau of Irrigation,
Thua Thien Hue Province,
Socialist Republic of Vietnam
Vice Head
T.T. Hue Provincial Project Management Unit for Building Disaster Resilient Societies in Vietnam (Phase II)

Technical Notes

Technical meetings were held on 24 and 25 March 2016 at PCFSC, DARD of Hue PPC (hereafter Hue PCFSC). In the meetings, the Survey Team and Hue PCFSC discussed basic conditions in design of this preparatory survey, and then confirmed the followings.

1. Hydrological stations deployment

Following the first field survey conducted by the Survey Team, existing and candidate stations of rainfall and river water level observations are listed in Table 1 and shown in Figure 1. Suitability of the candidate stations will be investigated before the second field survey, considering array balance, topographic condition, accessibility, site management condition, etc.

During the second field survey, the result of the investigation will be explained to Hue PCFSC, and also radio wave transmission test will be conducted at the candidate stations.

Table 1: List of hydrological stations.

Station no.	Station no. in the Inception Report	Station name	Existing or candidate	Observation elements		Area needed for candidate station
				Rainfall	Water level	
1	1	Thuong Lo	Candidate	O	None	5 m x 5 m
2	2	Nam Dong	Existing	O (IT)	None	
3	Not listed	Khe Tre	Candidate	O	O	5 m x 5 m
4	3	Thuong Nhat	Existing	O (IT)	O (IT)	
5	4	TTU	Candidate	O	O	5 m x 5 m
6	6	Duong Hoa	Existing	O (KR)	O (KR)	
7	7	Kim Long	Existing	O (IT)	O (IT)	
8	8	Thanh Luong	Candidate	O	O	5 m x 5 m
9	Not listed	Niem Pho	Candidate	O	O	5 m x 5 m
10	9	Dai Giang	Candidate	O	O	5 m x 5 m
11	10	Thao Long	Candidate	O	O	5 m x 5 m
12	Not listed	HRM	Candidate	O	O	5 m x 5 m
13	11	Sao La	Candidate	O	None	5 m x 5 m
14	12	BDU	Candidate	O	O	5 m x 5 m
15	14	Binh Dien (Binh Thanh)	Existing	O (IT)	O (IT)	
16	15	A Roang	Candidate	O	None	5 m x 5 m
17	16	Ta Luong	Existing	O (IT)	None	
18	17	HDU	Candidate	O	O	5 m x 5 m
19	19	Co Bi	Existing	O (IT)	O (IT)	
20	20	Phu Oc	Existing	O (IT)	O (IT)	
21	Not listed	Hue	Existing	O (IT)	None	
22	Not listed	A Luoi	Existing	O (IT)	None	
23	Not listed	Bach Ma	Existing	O (IT)	None	
24	Not listed	Cau Truoi	Existing	O (IT)	O (IT)	
25	Not listed	Phong Dien	Existing	O (IT)	O (IT)	
26	Not listed	A Luoi Reservoir	Candidate	O	O	5 m x 5 m
27	Not listed	Hong Van	Existing	O		

Note: The name of candidate stations is tentative. One station of No. 3 and No. 5 will be selected. IT: equipment by Italian ODA, KR: equipment by Korean ODA.

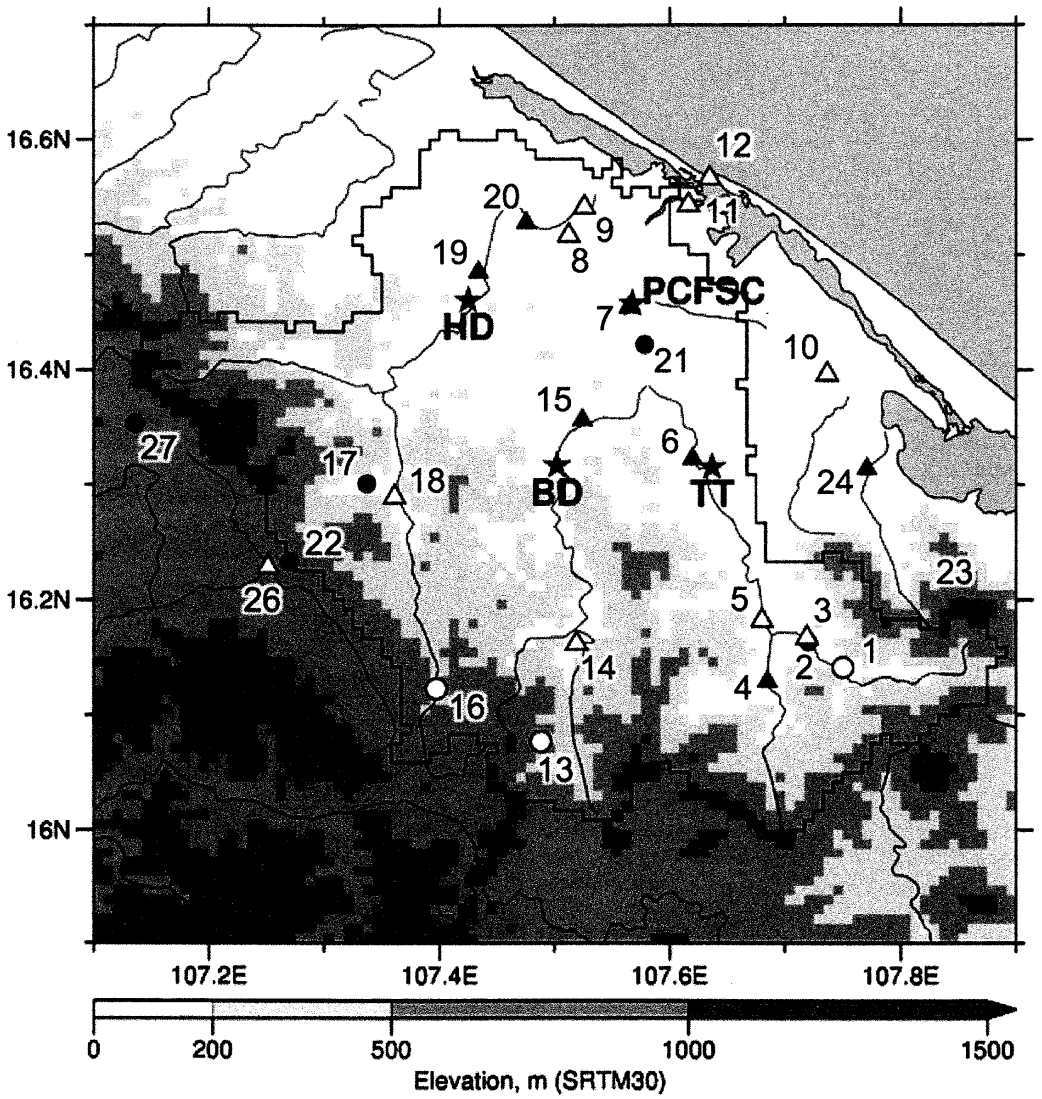

Figure 1: Distribution of hydrological stations in/around the Huong Basin. Station number corresponds to the number in Table 1. Black color means exist station, and white candidate (new) station. Circle indicates rainfall station, and triangle rainfall/water level station. Black stars are three reservoirs (HD: Huong Dien, BD: Binh Dien, TT: Ta Trach) and Hue PCFSC. Station No. 25 (Phong Dien) listed in Table 1 is not shown in this figure, because its location is unknown.

Policy on candidate stations:

1) Water level sensors

Real-time data from existing seven stations at Thuong Nhat, Kim Long, Binh Dien, Co Bi, Phu Oc, Cau Truoi and Phong Dien are utilized in the project. And also at the following seven stations in six regions, water level sensors will be installed and the data from the new sensors will be transferred to three reservoirs and Hue PCFSC.

(1) Upper Reach of Ta Track Reservoir, Ta Track River

The Survey Team surveyed around a new hydro-met observation station site just lower reach of the confluence two rivers, Ta Track River and Thuong Lo (tributary from right hand side). This site is good because of the point just after the confluence of the two rivers. However, it is concerned that the water level around this point might receive the influence of the water level of the Ta Track reservoir during high water level of the reservoir. The Survey Team will examine the detail of the elevation, etc. and will evaluate the validity of the installation of new water-level observation station. It is noted that the land around the candidate station is private-owned according to the interview with local inhabitants.

If it is difficult to install the station around this point, the Survey Team will examine the possibility of installation of a new station at the Khe Tre Bridge, crossing the Thuong Lo River. At this point, water level has been observed by viewing with the water-level gauge under the bridge. Land owner is needed to be identified.

(2) Upper Reach of Binh Dien Reservoir, Huu Track River

The crossing point of the route 74 and the Huu Track River, which is located at around 20 km south from the Binh Dien Reservoir is a candidate site for a new water-level observation station.

However, the route 74 is under construction and the Survey Team could not reach the site due to no accessibility by car. It is necessary to use motor bikes to get there. It is necessary to submit the application to access to this area to the police.

(3) Upper Reach of Huong Dien Reservoir, Bo River

The Ta Luong Bridge, crossing point of the route QL49 and the Bo River, which is located at around 20 km south-south-west from the Binh Dien Reservoir is a candidate

site for a new water-level observation station.

(4) Lower Area of Bo River

The lower reach of the Bo River (Sja River?) diverges near Pho Nam Village into the two rivers. The right branch flows meanderingly eastward into the Huong River. The left branch flows northward into the Pha Tam Giang (lake) at Quang Hoa.

This area is at high risk of inundation and it is important to observe water-level in rivers for evaluating the inundation risk. It is also important to know the flowing situation in the two diverged rivers. The Survey Team proposes to install water-level observation stations along the two branches.

Thanh Luong Bridge (Route TL8) is a candidate site for a new water-level observation station along the right branch. If there is another appropriate site like public facilities (public owned land) along the branch, it is possible to install the station there.

Niem Pho Bridge (Route TL8) is a candidate site for a new water-level observation station along the left branch (Sja River). If there is another appropriate site like public facilities (public owned land) along the branch, it is possible to install the station there.

(5) Dai Giang River, Lower area of east side

From the center of Hue City, several rivers like the An Cuu River and the Nhu Y River diverges to the east lowland area and then flow into the Dai Giang River. The area along the Dai Giang River is also at high risk of inundation.

It is important to observe water-level in this river for evaluating the inundation risk in surrounding area. It is also important to know the flowing situation in this river. The Survey Team proposes to install water-level observation stations along the Dai Giang River.

In order to grasp the flowing situation of the Dai Giang River during flood, it is desirable to install a new water-level observation station away from the Huong River in which water-level is already observed. The Survey Team proposes to install a water-level observation station at the east end of the Dai Giang, where the gate operation facility for irrigation is located. It is noted that there is no accessibility by car to this facility and the Survey Team could not survey this site during the first field survey.

If it is difficult to install an observation station there, the bridge of route 18 is another candidate for installation. If there is another appropriate site like public facilities (public owned land) along the river, it is possible to install the station there.

(6) Near the river mouth, inner area

Water level of the rivers flowing in low land area is heavily affected the tide level. The Survey Team proposes to install a water-level observation station near the river mouth of the Huong River, in order to evaluate the inundation risk in the low land area.

The seashore side near the river mouth has strong influence of waves and winds so that it is hard to observe water-level precisely. It is better to observe water-level at the inner area. The Survey Team proposes to install an observation station at a small jetty of the boat repair place. It is needed to confirm the possibility from the owner to use this jetty to install an observation station.

If it is difficult to install an observation station there, or if there is an appropriate site like public facilities (public owned land) near the jetty, it is possible to install the station there.

2) Rain gauges

(1) Both rain gauge and water level sensor will be installed at all candidate stations.
(2) Existing stations where rainfall data can be obtained and transferred in real time will be utilized in the project.
(3) Existing stations where rainfall data cannot be transferred in real time will be utilized in the project. For this purpose, specific method to transfer the data will be examined.

[Items to be discussed continuously]
The Survey Team will send a list of the water-level and rainfall observation stations with coordinate information based on the Vietnam coordinate system to Mr. Minh, PCFSC, Hue as soon as possible. PCFSC will check the detail including topography information and respond about the possibility of the site use to the Survey Team by 15 April 2016. Hue PCFSC will support the Survey Team in the necessary processes.

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2. Radar installation

Binh Dien reservoir site and repeater site for multiplex radio-wave transmission are selected as candidate location of radar installation.

[Items to be discussed continuously]
To clarify the process of obtaining the permission of X-band radar observation (radio wave transmission at a frequency of 9 GHz), the Survey Team will study the purpose of using radar and the condition in use such as antenna location and directivity (type of antenna). Then the Survey Team with WRD in MARD will consult the Authority of Radio Frequency Management (ARFM) in the Ministry of Information and Communications (MIC).

To clarify the availability of the land for radar installation, the Survey Team will inform candidate radar location to Hue PCFSC, and then Hue PCFSC will investigate and inform the Survey Team the availability of the land by 15 April 2016.

Hue PCFSC will support the Survey Team in the necessary processes.

3. Equipments for warning and CCTVs for dam-gate operation

The Survey Team will examine the necessity and appropriate array of the equipments for warning and CCTVs for dam-gate operation at the Huong Dien and Binh Dien reservoirs, considering the safety of residents in the downstream areas.

4. Flood forecasting and warning dissemination

For flood forecasting and warning dissemination, PCFSC requests other ways such as alert mailing through mobile phones, in addition to digital signage required in the request. The Survey Team will examine the necessity, effectiveness and costs of the additional ways and discuss with JICA.

5. Disaster information processing and display equipments at Hue PCFSC

To install the equipments (listed in Table 2) at Hue PCFSC, the Survey Team and Hue PCFSC will do the necessary processes. The equipments will be installed at the second floor of the new building of PCFSC. For this installation, enlargement of the building will not be necessary. To receive the data from reservoirs and radar, an antenna will be constructed in the site of PSFSC if necessary.

Table 2: List of equipments, which will be installed at Hue PCFSC.

No.	Name of equipments	Number of equipment	Supplementary explanation
1	Telemetry monitoring system	1	For receiving the data from hydrological stations
2	CCTV control system	1	For receiving the data from CCTVs
3	Alert system for reservoir release	1	For I/O processing of reservoir release alert data
4	Information management system	1	Data storage
5	Data processing server	1	For processing the data from hydrological stations
6	Data visualizing server	1	For control of multi-display system
7	Multi-display system	1	100-inch display
8	Display system	1	Display
9	VOIP converter	1	Voice On Internet Protocol converter
10	Router	1	Network communication equipment
11	Hub	1	Network communication equipment
12	Printer	1	
13	Power supply	1	Including UPS

Note: CCTV: Closed Circuit Television, VOIP: Voice On Internet Protocol.

[Items to be discussed continuously]

For the equipments suggested by the Survey Team in the first field survey, Hue PCFSC and MARD will send comments to the Survey Team by the end of March 2016. The Survey Team will respond to the comments in the second field survey.

6. Data transfer network

Data transfer network between hydrological stations, radar station, reservoir offices and Hue PCFSC is constructed as shown in Tables 3, 4 and Figure 2.

Table 3: List of data transmission stations.

No.	Station name	Communication	Repeater(s)	Type/band of radio wave	Radio wave frequency	Area needed
1	Ta Trach reservoir	Hue PCFSC	Main repeater	Multiplex, microwave	7.5 GHz	10 m x 10 m (outside), 4 m x 2 m (inside)
1-1	Thuong Lo	Ta Trach reservoir	None	VHF	70 MHz	
1-2	TTU or Khe Tre	Ta Trach reservoir	None	VHF	70 MHz	
2	Binh Dien reservoir	Hue PCFSC	Passive repeater near Binh Dien reservoir and main repeater	Multiplex, microwave	7.5 GHz	10 m x 10 m (outside), 4 m x 2 m (inside)
2-1	Sao La	Binh Dien reservoir	None	VHF	70 MHz	
2-2	BDU	Binh Dien reservoir	None	VHF	70 MHz	
3	Huong Dien reservoir	Hue PCFSC	Passive repeater near Huong Dien reservoir	Multiplex, microwave	7.5 GHz	10 m x 10 m (outside), 4 m x 2 m (inside)
3-1	A Roang	Huong Dien reservoir	None	VHF	70 MHz	
3-2	HDU	Huong Dien reservoir	None	VHF	70 MHz	
3-3	A Luoi Reservoir	Huong Dien reservoir	Will be investigated	Will be investigated	Will be investigated	
4-1	Thanh Luong	Hue PCFSC	None	VHF	70 MHz	
4-2	Niem Pho	Hue PCFSC	None	VHF	70 MHz	
4-3	Dai Giang	Hue PCFSC	None	VHF	70 MHz	
4-4	Thao Long	Hue PCFSC	None	VHF	70 MHz	
4-5	HRM	Hue PCFSC	None	VHF	70 MHz	

Table 4: List of data transmission repeaters.

No.	Repeater name	Area needed
1	Main repeater	10 m x 10 m
2	Passive repeater near Binh Dien reservoir	5 m x 5 m
3	Passive repeater near Huong Dien reservoir	5 m x 5 m

Figure 2: Data transfer network.

In the second field survey, radio wave transmission test will be done for VHF and microwave bands. In this test, physical parameters such as received signal strength indication (RSSI) and signal-to-noise ratio (SNR) will be measured.

For on-line data transfer, radio wave lines at VHF band will be employed from view-point of stability in emergency. If it is difficult to be employed at a line, mobile phone lines will be examined for SMS data transmission.

[Items to be discussed continuously]
To clarify the process of obtaining the permission of multiplex radio-wave transmission at a frequency of 7.5 GHz and telemetry at a frequency of 70 MHz, the Survey Team with WRD in MARD will consult the Authority of Radio Frequency Management

(ARFM) in the Ministry of Information and Communications (MIC) with information of the purpose and the condition in use such as antenna location and directivity (type of antenna).

To clarify the availability of the land for repeaters in the data transfer network, the Survey Team will inform candidate location of the repeaters to Hue PCFSC, and then Hue PCFSC will investigate and inform the Survey Team the availability of the land by 15 April 2016.

Hue PCFSC will support the Survey Team in the necessary processes.

7. Reservoir site survey

The Survey Team confirmed soundness of reservoir body at Huong Dien, Binh Dien and Ta Trach reservoirs through visual inspections. The Survey Team learned about reservoir operation at Huong Dien and Binh Dien reservoirs, but could not learn at the Ta Trach reservoir in the first field survey. The Survey Team hopes to investigate the Ta Trach reservoir. Hue PCFSC will support the Survey Team in the necessary processes.

After necessary information/data about the reservoirs will be provided by Hue PCFSC and MARD, the Survey Team will make suggestions based on long-term experiences in reservoir management in Japan.

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Technical Notes

The First Field Survey
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The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of Thua Thien Hue Provincial Hydro-Meteorological Center have agreed upon the items described in the attached Technical Notes for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project). Based on the Technical Notes, the Survey Team analyze and discuss with authorities in Japan to justify the Project and determine its scope.

26 March 2016 in Hue

Hideyuki Kamimera	
for Mr. Akihiko Nunomura	Mr. Nguyen Van Hung
Chief Consultant	Director
JICA Survey Team	T. T. Hue Provincial Hydro-Meteorological Center

Technical Notes

1. The Survey Team and T. T. Hue Provincial Hydro-Meteorological Center (HMC) confirmed that the rainfall and river water level data from the existing HMC stations will be utilized in the Project. It helps build a dense network of hydrological stations in/around the Huong basin. After building the network, all the data/information from the network will be shared with HMC.

2. The Survey Team conducted the first field survey and then summarized a list of existing and candidate hydrological stations shown in Table 1 and Figure 1. A network of the stations listed in Table 1 is necessary for appropriate management of rivers and reservoirs in the Huong basin. The Survey Team will consult with DARD, HMC and related organizations on management of the network in the Project.

3. The Survey Team and HMC continue the collaboration to reach the goal of the Project.

4. HMC will take the actions above after receiving official indication letters from NHMS head office and Mid-Central Regional Hydro-Meteorological Center.

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Table 1: List of hydrological stations.

Station no.	Station no. in the Inception Report	Station name	Existing or candidate	Observation elements		Area needed for candidate station
				Rainfall	Water level	
1	1	Thuong Lo	Candidate	O	None	5 m x 5 m
2	2	Nam Dong	Existing	O (IT)	None	
3	Not listed	Khe Tre	Candidate	O	O	5 m x 5 m
4	3	Thuong Nhat	Existing	O (IT)	O (IT)	
5	4	TTU	Candidate	O	O	5 m x 5 m
6	6	Duong Hoa	Existing	O (KR)	O (KR)	
7	7	Kim Long	Existing	O (IT)	O (IT)	
8	8	Thanh Luong	Candidate	O	O	5 m x 5 m
9	Not listed	Niem Pho	Candidate	O	O	5 m x 5 m
10	9	Dai Giang	Candidate	O	O	5 m x 5 m
11	10	Thao Long	Candidate	O	O	5 m x 5 m
12	Not listed	HRM	Candidate	O	O	5 m x 5 m
13	11	Sao La	Candidate	O	None	5 m x 5 m
14	12	BDU	Candidate	O	O	5 m x 5 m
15	14	Binh Dien (Binh Thanh)	Existing	O (IT)	O (IT)	
16	15	A Roang	Candidate	O	None	5 m x 5 m
17	16	Ta Luong	Existing	O (IT)	None	
18	17	HDU	Candidate	O	O	5 m x 5 m
19	19	Co Bi	Existing	O (IT)	O (IT)	
20	20	Phu Oc	Existing	O (IT)	O (IT)	
21	Not listed	Hue	Existing	O (IT)	None	
22	Not listed	A Luoi	Existing	O (IT)	None	
23	Not listed	Bach Ma	Existing	O (IT)	None	
24	Not listed	Cau Truoi	Existing	O (IT)	O (IT)	
25	Not listed	Phong Dien	Existing	O (IT)	O (IT)	
26	Not listed	A Luoi Reservoir	Candidate	O	O	5 m x 5 m
27	Not listed	Hong Van	Existing	O		

Note: The name of candidate stations is tentative. One station of No. 3 and No. 5 will be selected. IT: equipment by Italian ODA, KR: equipment by Korean ODA.

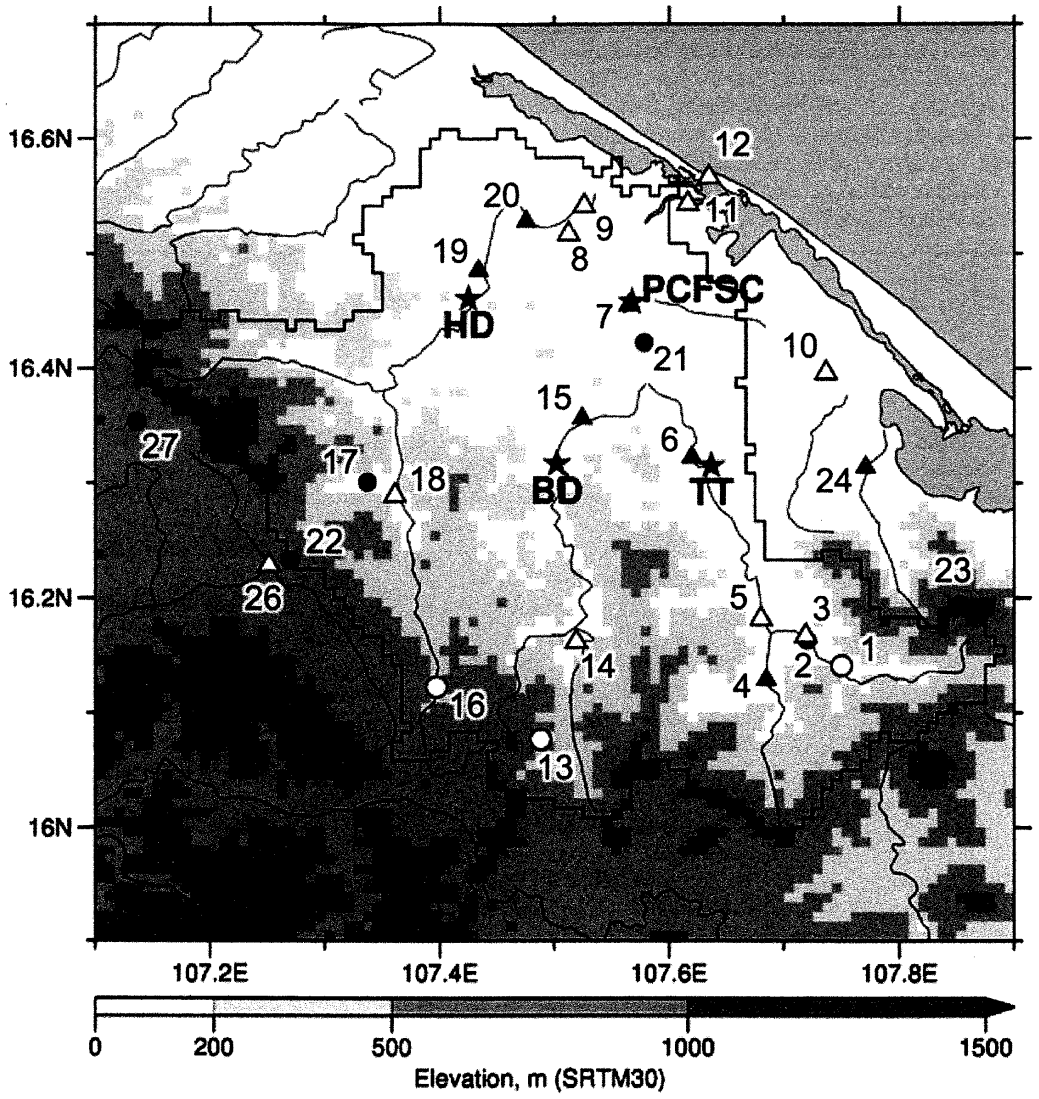

Figure 1: Distribution of hydrological stations in/around the Huong Basin. Station number corresponds to the number in Table 1. Black color means exist station, and white candidate (new) station. Circle indicates rainfall station, and triangle rainfall/water level station. Black stars are three reservoirs (HD: Huong Dien, BD: Binh Dien, TT: Ta Trach) and Hue PCFSC. Station No. 25 (Phong Dien) listed in Table 1 is not shown in this figure, because its location is unknown.

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The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of Mid-Central Regional Hydro-Meteorological Center have agreed upon the items described in the attached Technical Notes for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project). Based on the Technical Notes, the Survey Team analyze and discuss with authorities in Japan to justify the Project and determine its scope.

28 March 2016 in Da Nang

Hideyuki Kamimera

for Mr. Akihiko Nunomura
Chief Consultant
JICA Survey Team

Mr. Dinh Phung Bao
Director
Mid-Central Regional Hydro-Meteorological Center,
National Hydro-Meteorological Service
Socialist Republic of Vietnam

Technical Notes

1. The Survey Team and Mid-Central Regional Hydro-Meteorological Center (MCRHMC) confirmed that the rainfall and river water level data from the existing HMC stations will be utilized in the Project. It helps build a dense network of hydrological stations in/around the Huong basin. After building the network, all the data/information from the network will be shared with MCRHMC, through the internet or alternative ways immediately.

2. The Survey Team conducted the first field survey and then summarized a list of existing and candidate hydrological stations shown in Table 1 and Figure 1. A network of the stations listed in Table 1 is necessary for appropriate management of rivers and reservoirs in the Huong basin. The Survey Team will consult with Hue DARD, Hue HMC under the indication of MCRHMC and related organizations on management of the network in the Project.

3. The Survey Team and MCRHMC continue the collaboration to reach the goal of the Project.

4. MCRHMC will take the actions above after receiving official indication letters from NHMS head office.

Table 1: List of hydrological stations.

Station no.	Station no. in the Inception Report	Station name	Existing or candidate	Observation elements		Area needed for candidate station
				Rainfall	Water level	
1	1	Thuong Lo	Candidate	O	None	5 m x 5 m
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5	4	TTU	Candidate	O	O	5 m x 5 m
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7	7	Kim Long	Existing	O (IT)	O (IT)	
8	8	Thanh Luong	Candidate	O	O	5 m x 5 m
9	Not listed	Niem Pho	Candidate	O	O	5 m x 5 m
10	9	Dai Giang	Candidate	O	O	5 m x 5 m
11	10	Thao Long	Candidate	O	O	5 m x 5 m
12	Not listed	HRM	Candidate	O	O	5 m x 5 m
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14	12	BDU	Candidate	O	O	5 m x 5 m
15	14	Binh Dien (Binh Thanh)	Existing	O (IT)	O (IT)	
16	15	A Roang	Candidate	O	None	5 m x 5 m
17	16	Ta Luong	Existing	O (IT)	None	
18	17	HDU	Candidate	O	O	5 m x 5 m
19	19	Co Bi	Existing	O (IT)	O (IT)	
20	20	Phu Oc	Existing	O (IT)	O (IT)	
21	Not listed	Hue	Existing	O (IT)	None	
22	Not listed	A Luoi	Existing	O (IT)	None	
23	Not listed	Bach Ma	Existing	O (IT)	None	
24	Not listed	Cau Truoi	Existing	O (IT)	O (IT)	
25	Not listed	Phong Dien	Existing	O (IT)	O (IT)	
26	Not listed	A Luoi Reservoir	Candidate	O	O	5 m x 5 m
27	Not listed	Hong Van	Existing	O		

Note: The name of candidate stations is tentative. One station of No. 3 and No. 5 will be selected. IT: equipment by Italian ODA, KR: equipment by Korean ODA.

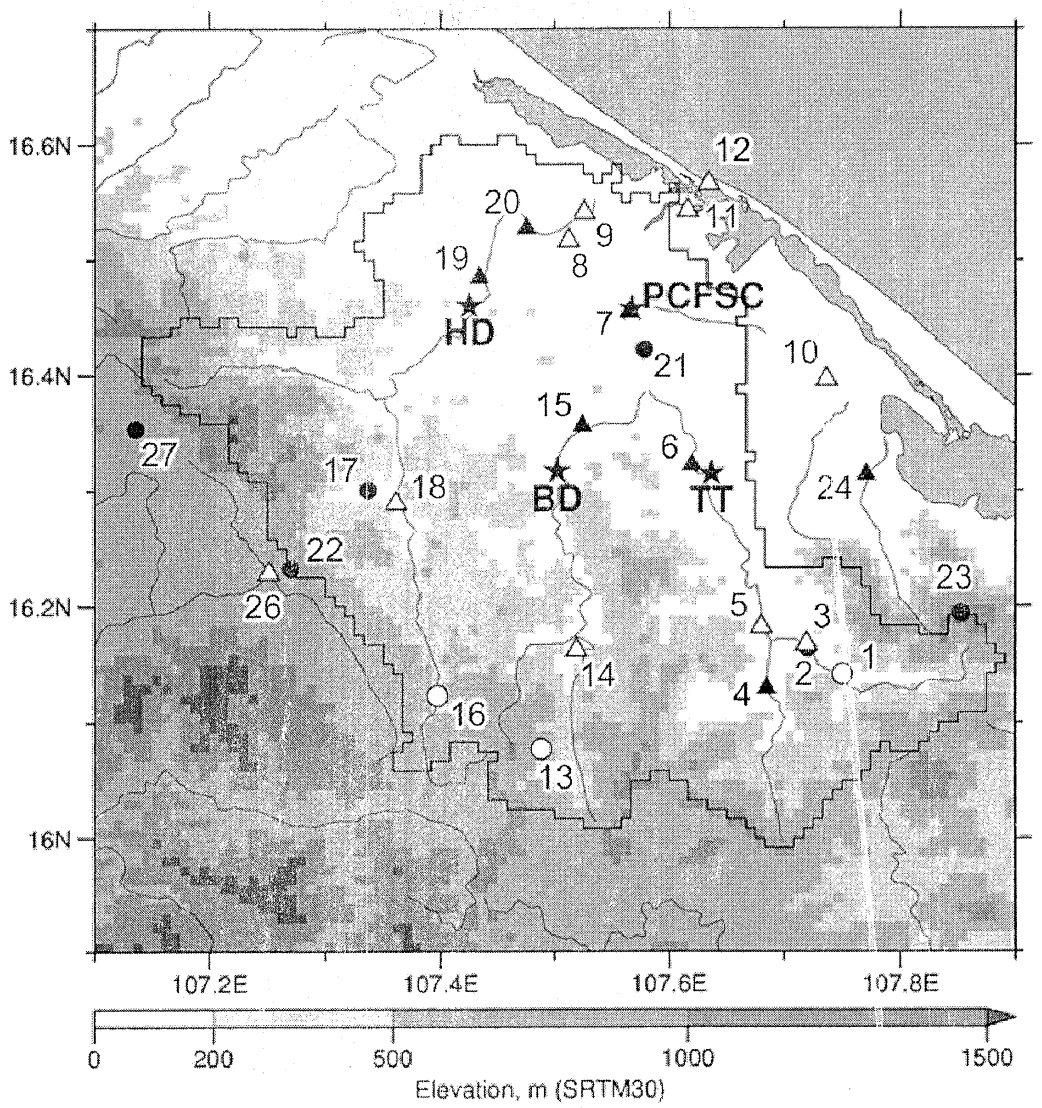

Figure 1: Distribution of hydrological stations in/around the Huong Basin. Station number corresponds to the number in Table 1. Black color means existing station, and white candidate (new) station. Circle indicates rainfall station, and triangle rainfall/water level station. Black stars are three reservoirs (HD: Huong Dien, BD: Binh Dien, TT: Ta Trach) and Hue PCFSC. Station No. 25 (Phong Dien) listed in Table 1 is not shown in this figure, because its location is unknown.

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The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of Department of Natural Disaster Prevention and Control (DNDPC), DWR, MARD have agreed upon the items described in the attached Technical Notes for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project). Based on the Technical Notes, the Survey Team analyze and discuss with authorities in Japan to justify the Project and determine its scope.

29 March 2016 in Ha Noi

Hideyuki Kamimera

for Mr. Akihiko Nunomura
Chief Consultant
JICA Survey Team

Mr. Van Phu Chinh
Director
Department of Natural Disaster Prevention and Control,
Directorate of Water Resources,
Ministry of Agriculture and Rural Development
Socialist Republic of Vietnam

Technical Notes

1. The Survey Team explained to the Department of Natural Disaster Prevention and Control (DNDPC), DWR, MARD the result of the first field survey, and DNDPC confirmed the result. Based on the field survey result, the Survey Team will examine a concrete structure of the Water-related Disaster Management Information System and explain to DNDPC the structure in the second field survey.

2. The Survey Team and the DNDPC confirmed that the place in the new building of DNDPC for installing the equipments (shown in Table 1) to receive, manage and display the data/information of the Water-related Disaster Management Information System. The Survey Team will examine specific equipments for the installation place and explain to DNDPC the specific equipments in the second field survey.

Table 1: List of equipments, which will be installed at DWR.

No.	Name of equipments	Number of equipment	Supplementary explanation
1	Data management server	1	For store/management of received data
2	Data visualizing server	1	For control of multi-display system
3	Multi-display system	1	100-inch display
4	Router	1	Network communication equipment
5	Power supply	1	Including UPS

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The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of Aero-Meteorological Observatory (AMO), NHMS have agreed upon the items described in the attached Technical Notes for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project). Based on the Technical Notes, the Survey Team analyze and discuss with authorities in Japan to justify the Project and determine its scope.

30 March 2016 in Ha Noi

Hideyuki Kamimera	
for Mr. Akihiko Nunomura	Mr. Hoang Gia Hiep
Chief Consultant	Director
JICA Survey Team	Aero-Meteorological Observatory,
	National Hydro-Meteorological Service
	Socialist Republic of Vietnam

Technical Notes

1. Based on the field survey result, the Survey Team and Aero-Meteorological Observatory (AMO) confirmed that a new meteorological radar is necessary for the Huong basin and its surrounding in the Project. It is quite helpful especially in rainfall observation over mountainous areas, combined use of the new radar and existing Dong Ha and Tam Ky radars, and short-range rainfall forecast in the basin and its surrounding.

2. AMO has long-term experience and knowledge in the radar operation and maintenance in Vietnam. Therefore, AMO will technically support Hue PCFSC and Hue Provincial HMC in the operation, maintenance and data-utilization of the new radar, as requested by Hue PCFSC and Hue Provincial HMC.

3. AMO will take the actions above after receiving official indication letters from NHMS head office.

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The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of the Department of Agriculture and Rural Development, Thua Thien Hue Provincial People's Committee which is the responsible and implementing organization for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project) have agreed upon the items described in the attached Technical Notes. Based on the Technical Notes, the Survey Team analyze and discuss with authorities in Japan to justify the Project and determine its scope.

27 May 2016 in Hue

Hideyuki Kamimera

for Mr. Akihiko Nunomura
Chief Consultant
JICA Survey Team

Mr. Phan Thanh Hung
Director
Bureau of Irrigation,
Thua Thien Hue Province,
Socialist Republic of Vietnam
Vice Head
T.T. Hue Provincial Project Management Unit
for Building Disaster Resilient Societies in
Vietnam (Phase II)

Technical Notes

Technical meeting was held on 26 May 2016 at PCFSC office, DARD, Hue (hereafter Hue PCFSC). In the meetings, the survey team and Hue PCFSC confirmed the following things in the discussion.

- Availability of the lands for hydrological stations
  - Both province and private lands can be probably obtained without difficulty.
  - The lands can be obtained preferentially in ODA projects. PM permission is necessary to use forestlands, but not for ODA projects.
  - Site P4 (BDU) construction and its maintenance may be with difficulty due to poor accessibility.
  - Hue PCFSC will confirm the situation and land availability at the P7b (Dai Giang Weir) and P12 (A Luoi Reservoir) sites.

- Availability of the lands for towers for radio-wave data transfer linkage
  - Binh Dien Dam will cooperate with the project to provide their land for tower construction.
  - Hue PCFSC will confirm the availability of the lands of Ta Trach and Huong Dien Dams.
  - The lands can be probably obtained, but tower construction and its maintenance may be with difficulty due to poor accessibility.
  - Because of this, Hue PCFSC suggested to build towers next to/near the existing towers for mobile-phone radio-wave networks as an alternative plan.
  - The survey team will examine the alternative plan and inform Hue PCFSC the result of the examination.

- Necessary procedures to have licenses to use lands and to construct buildings
  - The survey team and Hue PCFSC discussed necessary procedures to have licenses to use lands and to construct buildings (hydrological stations and towers).
  - In the main project, Hue PCFSC will do the necessary things to use lands and to construct buildings.

- Things to be done in this preparation survey
  - The survey team will do the radio-wave propagation test, land measuring and geological survey in around July 2016.
  - Hue PCFSC will support the survey team.

Technical Notes

The Second Field Survey
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the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System"
in
Socialist Republic of Vietnam

The JICA Survey Team for the Preparatory Survey (the Survey Team) and the representative of the Department of Agriculture and Rural Development, Thua Thien Hue Provincial People's Committee which is the co-executing agency for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project) have agreed upon the items described in the attached Technical Notes. Based on the Technical Notes, the Survey Team analyzes and discusses with authorities in Japan to justify the Project and determine its scope.

27 July 2016 in Hue

BAN QUẢN LÝ DỰ ÁN XÂY DỰNG XÃ HỘI THÍCH ỨNG VỚI THIÊN TAI TẠI VIỆT NAM (GIAI ĐOẠN 2)

Hideyuki Kamimera

for Mr. Akihiko Nunomura
Chief Consultant
JICA Survey Team

Mr. Phan Thanh Hung
Director
Bureau of Irrigation,
Thua Thien Hue Province,
Socialist Republic of Vietnam
Vice Head
T.T. Hue Provincial Project Management Unit for Building Disaster Resilient Societies in Vietnam (Phase II)

Technical Notes

Following the Minutes of Discussions, a technical meeting was held on July 26 and 27, 2016 at PCC-NDPCSR office, DARD, Hue. Following the MARD decision no. 2911/QD-BNN-HTQT, a representative of the project owner DWR joined the meeting on July 26. In the meeting, the JICA survey team and T.T. Hue Provincial Project Management Unit (PMU) for Building Disaster Resilient Societies in Vietnam (Phase II) confirmed the following items.

Note that PMU is under DARD, T.T. Hue Provincial People's Committee (Hue PPC), and is the Hue PPC-appointed unit for the project (Hue PPC document no. 3838/UBND-DN). PMU will report the technical notes to Hue PPC and the project owner DWR.

Through this field survey, the survey team and PMU reconfirmed that the Water-related Disaster Management Information System will be quite useful for (1) appropriate dam/reservoir management and operation, and (2) flood/drought forecasting/warning.

1. Final adjustments at radar/hydrological stations, radio-wave towers and CCTV sites

The survey team and PMU staff visited the sites of the radar, hydrological sensors, radio-wave towers and CCTVs, partly for the preliminary survey of the radio-wave propagation test and land/geological surveys. At the sites, the survey team and PMU staff finalized technical matters such as the way to install sensors as follows.

1.1 Radar

At Binh Dien hydropower plant (T2 site), the survey team and PMU staff confirmed the land for radar installation. Binh Dien Hydropower Joint Stock Company (BDHJSC) verbally agreed to install radar at T2 site. In addition, Hue PPC/PMU will obtain a paper-based agreement on the radar installation from BDHJSC.

T2 or T6 will be finalized as radar site, considering radar visibility (which will be clear after the analysis of beam blockage by surrounding obstacles, such as topography and buildings, in the radio-wave propagation test).

1.2 Hydrological stations

The survey team and PMU staff visited the sites of hydrological sensors and made

necessary final adjustments. Details of the adjustments are summarized in Table 1.

1.3 Radio-wave towers

The survey team and PMU staff visited the sites of radio-wave towers and made necessary final adjustments. Details of the adjustments are summarized in Table 2.

1.4. CCTVs

The survey team and PMU staff visited the sites of CCTVs and made necessary final adjustments. Details of the adjustments are summarized in Table 3.

2. Finalizing the places of information system equipments

At PCC-NDPCSR office, the survey team and PMU staff finalized the place of information system equipments, which is the room at third floor of PCC-NDPCSR building. The equipments will be installed in the room using Japanese non-reimbursable fund to Vietnam. Partition and two air conditioners will be prepared in the room by Hue PPC.

At the three dam offices, the survey team, PMU staff and representative of each dam office finalized the place of information system equipments. Ta Trach Project Management Committee (TTPMC), BDHJSC and Huong Dien Hydropower Plant (HDHP) verbally agreed to install information system equipments at their offices. In addition, Hue PPC/PMU will obtain paper-based agreements on the equipments installation from TTPMC, BDHJSC and HDHP.

Details are shown in Table 4.

3. Progress of radio-wave propagation test and land/geological surveys

The survey team entrusted the support of the radio-wave propagation test to HUTIC and the land/geological surveys to TICCO on July 6, 2016. Also the survey team employed a coordinator between the team, PMU and HUTIC/TICCO. The survey team is conducting the test and surveys with PMU, HUTIC, TICCO and the coordinator. The outcomes of the test and surveys will be shared with PMU.

3.1 Radio-wave propagation test

In the radio-wave propagation test, the transmission and reception tests of radio waves

at 72.1 MHz for telemetry and the sunlight test using mirrors for multiplex transmission will be done.

The equipments necessary for the radio-wave propagation test have not yet been imported from Japan. DWR is now working for temporary import of the equipments.

The survey team is conducting the sunlight test, because the test can be done without the equipments which will be imported.

3.2 Land/geological surveys

From July 19 to 22, the survey team, PMU staff and TICCO visited the sites of land/geological surveys, and then the survey team explained details of the sites to TICCO. The land survey is scheduled to be completed on August 17, 2016, and the geological survey on August 11, 2016.

4. Obtaining data from three dam offices and A Luoi Hydropower Plant

The survey team investigated the way to obtain the data from three dam offices, such as rainfall, storage water level, inflow to/outflow from reservoirs. The results of the investigation are shown in Table 5. It is not difficult to obtain the data of existing rain gauges and water level sensors from Huong Dien Hydropower Plant, but technically not easy to obtain the remaining data of Huong Dien and the other two dam offices.

The survey team visited A Luoi Hydropower Plant (ALHP) located in the catchment of Huong Dien reservoir, and confirmed that the data of discharge from the plant are available as shown in Table 5. The discharge from the plant is important to grasp inflow from the neighboring Sekong basin to the Huong basin. The upper limit of the discharge from the plant is 42.7 m^3/s. Considering the PM decision no. 2482/QD-TTg, a server will be installed to obtain the discharge data in real time in the project. Hue PPC will be the owner of the server, and PMU will manage the server.

TTPMC, BDHJSC, HDHP and ALHP verbally agreed to share their data with the project. In addition, Hue PPC/PMU will obtain paper-based agreements on the data sharing from TTPMC, BDHJSC, HDHP and ALHP.

5. Sharing the data with NHMS

Following the Minutes of Discussions, the survey team visited T.T. Hue Provincial Hydro-Meteorological Center (Hue PHMC) with PMU staff and Mid-Central Regional

Hydro-Meteorological Center (MCRHMC) in Da Nang and then discussed/investigated the way to share data.

The survey team and PMU staff confirmed that the data of the Water-related Disaster Management Information System will be shared with Hue PHMC on the Web (with the function of downloading data files).

The survey team confirmed that the data from existing hydrological stations in Italy ODA system are archived on a server at MCRHMC, and thus the data can be obtained from the server with the indication from NHMS head office in Ha Noi to MCRHMC.

6. Possibility of installing water level and dam gate sensors at three dams

As mentioned in Section 4, it is not difficult to obtain the data of existing rain gauges and water level sensors from Huong Dien Hydropower Plant, but technically not easy to obtain the remaining data of Huong Dien and the other two dam offices.

Besides, according to dam managers at Huong Dien and Binh Dien, the accuracy of storage water level observations at the two dams is not high. And also at the two dams, the degree of opening dam gates and discharge from reservoirs are manually observed and calculated respectively. Details of data availability are summarized in Table 5.

Considering local needs, the status mentioned above and also the requests from DARD and Hue PHMC, water level and dam gate sensors must be installed to certainly obtain accurate data in real time. The sensors are necessary for appropriate dam gates operation and flood/drought forecasting/warning.

To solve the problems above, which were revealed after signing on the Minutes of Discussions, the survey team investigated possibility of installing water level and dam gate sensors, and collected necessary materials at three dams. And also the survey team and PMU confirmed agreements from three dam offices to install the sensors. In addition, Hue PPC/PMU will obtain paper-based agreements on the sensor installation from TTPMC, BDHJSC and HDHP.

PMU will report to DWR within one week, and then PMU will collaborate with DWR (as the project owner) in further arrangements on the sensor installation at three dams. Hue PPC will be the owner of the sensors, and will be responsible for budget allocation and management.

List of tables

Table 1. List of hydrological stations.

ID	Station name (location)	Sensors (R: rainfall, H: water level)	Revised contents	Reason for revision
P1	Thuong Lo (upper Ta Track)	R	Location of rain gauge is changed to 150-m downstream point from the dam, right bank of the river.	To install a sensor a certain distance away from the dam. Confirmed point is open to air and appropriate for rainfall observation.
P2	Khe Tre (bridge, upper Ta Track)	R, H	Location of station house is changed to upstream land, left bank of the river.	Difficult to install at the proposed point because it is a hotel and restaurant area.
P3	Sao La (upper Binh Dien)	R	Location of station house is changed to the land behind the office building.	Following the guidance by DARD, due to land use condition.
P4	Thao Long (weir)	R, H	Location of station house is changed to the north side of the operation office building.	Following the guidance by DARD, due to land use condition.
P5	Thuan An (river mouth)	R, H	Water level sensor is installed in the sea 30 m away from the jetty. Structure is necessary for installation.	Not possible to install a sensor at a jetty due to berthing of many boats.
P6	Dai Giang (gates)	R, H	Location of station house is changed to the south side of the operation office building.	It was not clear the point to be installed because JICA team could not approach to the site.
P7	A Roang (upper Huong Dien)	R	Location of station house is changed to the south side of the office building.	Following the guidance by DARD, due to land use condition.
P8	Ta Luong (bridge, upper Huong Dien)	R, H	Location of station house is changed to upstream land, right bank of the river (on the old road).	Difficult to negotiate with land owner to install a station house.
P9	Thanh Luong (bridge, right branch of Bo River)	R, H	(No change)	---
P10	Niem Pho (bridge, left branch of Bo	R, H	Location of station house including sensors is changed to the south side of school, lower right	Niem Pho Bridge is planned to be reconstructed in the near future and the proposed point is exactly

	river)		bank.	on the new route.
P11	A Luoi Reservoir (water channel to hydropower plant)	R, H	Location of station house including sensors is changed to lower right bank of the channel.	Proposed point is located along the public area (like a park, many people can enjoy walking, etc.) and is considered to be avoided.

Table 2. List of radio-wave towers.

ID	Location	Revised contents	Reason for revision
T1	Ta Trach Dam	(No change)	---
T2	Binh Dien Dam	(No change)	---
T3	Binh Dien Dam (passive repeater)	(No change)	---
T4	Huong Dien Dam	(No change)	---
T5	Huong Dien Dam (passive repeater)	(No change)	---
T6	Near Chùa Phật Đứng (repeater)	Location is changed to the west side near the top of a hill.	To build a new tower a certain distance away from existing tower following a low
T7	PCC-NDPCSR	Location is changed to the northeast side of the main building.	To fit the plan of land use

Table 3. List of CCTVs.

ID	Location	Revised contents	Reason for revision
C1	Thao Long weir	(No change)	---
C2	Huong River (right), city center	(No change)	---
C3	Huong River (left), existing water level st.	Location is changed to the northwest end of the office area.	Considered CCTV pole to be installed not at the middle area.
C4	Niem Pho bridge (left branch of Bo River)	Location of station house including sensors is changed to the south side of school, lower right bank.	Niem Pho Bridge is planned to be reconstructed in the near future and the proposed point is exactly on the new route.
C5	Thanh Luong bridge (right branch of Bo River)	(No change)	---
C6	Bo River (right), management office	(No change)	---
C7	Bo River (left), existing water level st.	Changed to midpoint between existing water level sensor and pumping station	Pumping station is planned to be reconstructed.
C8	Huong Dien Dam (lower)	Changed to east side, beside the road to the dam	To not be affacted by dam discharge from reservoir
C9	Huong Dien Dam (upper)	(No change)	---
C10	Bin Dien Dam (lower)	(No change)	---
C11	Bin Dien Dam (upper)	(No change)	---
C12	Ta Track Dam (lower)	(No change)	---
C13	Ta Track Dam (upper)	Changed to south side, near the stairs to reservoir	To follow the guidance by dam manager
C14	Dai Giang gates	Location of station house is changed to the south side of the operation office building.	It was not clear the point to be installed because JICA team could not approach to the site.

Table 4. List of the places of information system equipments.

No.	Office name	Place	Revised contents	Reason for revision
1	PCC-NDPCSR	3rd floor, new building	Equipments location was changed from 2nd to 3rd floor. Equipments array was finalized on floor plan, newly provided.	To fit the plan of building use
2	Huong Dien dam	2nd floor, hydropower plant operation office building	Equipments location was changed from 1st to 2nd floor. Equipments array was finalized on floor plan, newly provided.	To follow the guidance by dam manager
3	Binh Dien dam	1st floor, hydropower plant operation office building	Equipments array was finalized on floor plan, newly provided.	To follow the guidance by dam manager
4	Ta Trach dam	1st floor, reservoir office building	Equipments array was finalized on floor plan, newly provided.	To follow the guidance by dam manager

Table 5. Data availability at three dam offices and A Luoi Hydropower Plant.

	Ta Trach	Binh Dien	Huong Dien	A Loui
Rainfall	Online (1 pt)	Online (2 pt, 10 min)	Online (4 pt, 30 min)	---
Storage water level (SWL)	Online	Online	Online	Offline
Downstream river water level	Online	NA	Online	NA
Degree of opening gates (DOG)	Online	Offline	Offline	---
Inflow to reservoir	Calc by Hue PHMC	Manual calc from SWL	Manual calc from SWL	---
Outflow from reservoir	Automatic calc from SWL and DOG	Manual calc from SWL and DOG	Manual calc from SWL and DOG	---
Outflow from plant	---	---	---	Online (2 turbines, 1 sec)
CCTV	4 pt	8 pt	2 pt	---

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The JICA Survey Team for the Preparatory Survey (the Survey Team), the Directorate of Water Resources (DWR) and the Vietnam Academy for Water Resources (VAWR) under Ministry of Agriculture and Rural Development (MARD), and the National Hydro-Meteorological Service (NHMS) under Ministry of Natural Resources and Environment (MONRE) have agreed upon the items described in the attached Technical Notes for the Project "Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System" (the Project). Based on the Technical Notes, the Survey Team analyzes and discusses with authorities in Japan to justify the Project and determine its scope.

September 9th, 2016 in Ha Noi

Hideyuki Kamimera

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Technical Notes

A technical meeting was hold at DNDPC, DWR, MARD on September 6th, 2016. Twenty-two participants from JICA survey team, JICA Vietnam Office, DWR and VAWR in MARD, and NHMS in MONRE attended the meeting.

In the meeting, JICA survey team and Vietnamese side discussed and/or finalized the remaining issues, which should be completed in this preparation phase of the project.

1. The schedule until February 2017

The JICA survey team and Vietnamese side confirmed the following schedule until February 2017 as follows.

- By the end of September 2016: DWR will submit the evidential documents or letters on the permission necessary for the project implementation, following the Minutes of Discussions signed on July 12th, 2016.
- November 2016: The JICA team and Vietnamese side will confirm the finalized project design and cost estimation. After that the project will be reported to the Government of Japan.
- February 2017: The project will be reported in the Cabinet meeting for approval (if all goes well).

2. Current status of the permission issue

DWR reported the current status of the permission issue, as of September 6th, 2016.

Completed:

- MIC and MOIT provided the support necessary for the temporary import/export of the equipments of radio-wave propagation test.
- Ministry of Finance provided the opinions on the exemption of tax and other expenses according to the official letter No. 12188/BTC-QLN, dated 1 September 2016.
- Permission for LiDAR aerial survey:
  - Ministry of Defense agreed to make flights for topographic measurements using LiDAR with the conditions mentioned in the official letter No. 8172/BQP-TM, dated 24 August 2016.
  - T.T. Hue PPC issued the official letter No. 4779/UBND-NN, dated 12 August 2016, confirming the state secret level of the LiDAR data.
- MONRE provided their opinions through the official letter No. 3365/BTNMT-KH, dated 12 August 2016, which include some content as follows:
  - A plan of special-purpose observation network should be made and applied

for the project, following the law on hydrometeorology.

- Observation network building, the forecast and warning, and observation equipments selection should be done following related laws in Vietnam.
- As for the topography data, the applicability of existing data should be examined, and also the necessity of the LiDAR aerial survey should be clear.
- NHMS cannot have responsibility for the maintenance and operation of the observation network, but can make technical support.

On-going:

- Permission to utilize and analyze the LiDAR data oversea
  - MARD sent the official letter to Ministry of Public Security mentioning the LiDAR data exportation oversea for analyzing, after the receipt of the official letter confirming the state secret level of the data from T.T. Hue PPC and the official letter from Ministry of Defense.

DWR sent all the official letters above to JICA Vietnam Office as soon as possible after the receipt of those documents.

As for the radio-wave frequencies use, ARFM requests reporting the results of radio-wave propagation test.

By the end of September, PMU will submit the evidential documents or letters on the permission, following the Minutes of Discussions signed on July 12, 2016.

3. Sharing the results of the land/geological surveys and radio-wave propagation test

JICA survey team shared the results of the land/geological surveys and radio-wave propagation test with Vietnamese side as follows.

- There is no problem for the equipments installation in the results of land/geological surveys.
- Following the results of radio-wave propagation test, data transmission (or obtaining) methods are revised at A Roang hydrological station (P7) and A Luoi hydrological station (P11).
  - At P7 and P11 the data transmission (or obtaining) methods are revised, because radio waves cannot reach the receiving points over two passes between P7 and Huong Dien dam tower (T4), and between P11 and T4.
  - P7: The data transmission through a mobile phone line is applied.
  - P11: Rain gauge data from existing NHMS A Luoi meteorological station and discharge data from A Luoi Hydropower Plant are utilized.
- As for the radar beam blockage at Binh Dien dam site (T2), the transit measurements obtained in the radio-wave test and the simulation with topography data are almost same. Considering this result and other local situations, weather radar will be installed at T2.

- Storage water level sensors requested from T.T. Hue Province will be installed at the three dam sites.

Following the results above, the survey team will make and submit promptly the cost estimation for the project implementation.

4. Technical issues discussed

4.1 Radar

The both sides agreed to install a radar at Binh Dien dam site (T2), although the small part of the radar coverage is affected by beam blockage. To effectively operate the Binh Dien radar over the coverage, satellite-based radar data will be used for validation of the Binh Dien radar observations. And also the data from the Binh Dien radar will be considered to be composited with the data from existing NHMS Dong Ha and Tam Ky radars. The survey team will explain a solution in the next JICA team's field survey scheduled in November 2016.

4.2 Water level sensor

The both sides agreed the locations of water level sensors.

Considering local situation at each station, appropriate sensor type, such as pressure and ultrasonic types, will be selected.

Vietnamese side suggested that the equipments manufactured in Vietnam should be utilized to create favorable conditions in future sensors maintenance.

4.3 Data transmission

Vietnamese side suggested that the data transmission from P7 through a mobile phone line should be reconsidered to ensure the stability and consistency of the system.

4.4 Model selection

Vietnamese side suggested that a commonly-used model in Vietnam should be utilized for the system, and RRI model should be used in combination with the model if necessary.

4.5 System validation and calibration

Vietnamese side suggested that the system validation and calibration should be done in the project before handover. The validation and calibration strategies will be explained

in the next JICA team's field survey scheduled in November 2016.

5. Data sharing with NHMS

- The data of the system were planned to be shared at the web site with limited users including NHMS before the meeting. In the meeting, NHMS requested the data should be shared automatically with them.
- The data from existing NHMS stations in T.T. Hue Province, belonging to the Italian ODA system, are shared to the project.
- For the composite with Binh Dien radar, the data from NHMS Dong Ha and Tam Ky radars are also necessary.
- JICA survey team will inform the list of necessary NHMS data to PMU.
- PMU will ask NHMS for the cooperation in data sharing. After that NHMS head office will make indication letters to Mid-Central Regional Hydro-Meteorological Center (MCRHMC) in Da Nang and T.T. Hue Provincial Hydro-Meteorological Center (Hue PHMC) for sharing the data in the project.

6. Items should be prioritized in the project

6.1 System maintenance/operation

As for the system maintenance/operation, the maintenance/operation structure considering local needs and situation in T.T. Hue Province is necessary.

The designs for the system maintenance/operation such as structure, contents and necessary costs will be shown in the next field survey scheduled in November 2016.

6.2 System maintenance/operation training

The education and training for the system maintenance/operation are necessary, as also requested by T.T. Hue PPC. Furthermore, Vietnamese side requested the education and training should be made during and after the project.

The designs of the education and training, such as contents and necessary costs, will be shown in the next field survey scheduled in November 2016.

6.3 Dissemination of forecast and warning information

The project should establish warning systems for the safety of the lowland area of dam downstream in T.T. Hue Province.

(12) Technical Notes, Ha Noi, 28th October, 2016

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October 28th, 2016 in Ha Noi

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Technical Notes

A technical meeting was held at DNDPC, DWR, MARD on October 26th, 2016. JICA survey team, JICA Vietnam Office, DWR and VAWR in MARD, and NHMS in MONRE attended the meeting.

In the meeting, JICA survey team and Vietnamese side discussed and/or finalized the remaining issues, which should be completed in this preparation phase of the project.

1. Remaining issues on the permission

As for the permission, JICA Vietnam Office will send a letter to ask MARD about the confirmation letter from ARFM. MARD will submit to JICA the confirmation letter from ARFM within 15 days after receiving of the JICA letter.
Following ARFM's suggestion, MARD will proceed to obtain the permission from them before the project starts.

LiDAR data processing to make a DEM will be planned to be done in Vietnam, after a company for the data processing will be selected, MARD will make necessary arrangements to export the LiDAR data and the project implementation will be revised in that case.

2. Solution of radar beam blockage problem and utilizing existing radars

Both sides agree to apply interpolation methods as a short-term solution for beam blocked area in the project, and as a long-term solution it can be combined with the Dong Ha radar data through sharing data format.

3. Type of hydrological sensors (considering the use of sensors produced in Vietnam)

Considering local situation at each station, the survey team appropriately selected the type of water level sensor, such as pressure and ultrasonic types, as shown in the meeting material. Specification of pressure type sensor for the project will be equivalent to the pressure type sensors produced in Vietnam, which have enough accuracy.

4. Way to obtain the data from P7 and P11

Radio waves cannot reach the receiving points over the pass between P7 and Huong Dien dam, the data transmission through a mobile phone line is applied. If the mobile line is not available, rainfall at P7 is complemented by radar observations. The survey team will examine to use not only the mobile line but a satellite-based line for ensuring redundancy.

As for the P11, discharge data can be obtained from A Luoi Hydropower Plant and will be transmitted through a mobile phone line, as shown in the meeting material.

5. Reason to use RRI model (including the comparison with other models), and collaboration between new system and existing system

RRI model is suitable for flood prediction, and its source code is open to the public. MIKE model is not open and cannot be coupled to the system. Thus, New RRI model will be applied in the project.

The source codes of the entire system including RRI model will be provided to Vietnamese side. As for the human resources development on RRI model, FRICS, ICHARM and JICA will find suitable ways including existing JICA training system. FRICS continues to make collaboration with existing systems in Vietnam.

As for the contents of information on the system in the project, the information on the VAWR web site for water disaster prevention will be utilized.

The things above, explained in the meeting material, will be applied in the project.

6. System validation and calibration plan and handover

Basically, both sides agreed on the methods and contents of the system validation, calibration and trial operation. Besides, there are some following points raised in the meeting:

- About radar and monitoring equipment: The JICA survey team explained that validation and calibration works will be carried out immediately after installation of equipment
- About model calibration: The calibration time will be the 1.5 month during the whole rainy season (from September until December).

The Vietnamese side proposed that the project should extend the support time for operation and maintenance to ensure stability of the system.

7. Way to share data in real time with NHMS

Considering the web security on both the NHMS and ~~the~~ project systems, necessary equipments will be installed and the raw data will be shared through VPN (virtual private network), as explained in the meeting material. The raw data will be shared with NHMS head office in Ha Noi and MCRHMC in Da Nang. Installation place and equipments will be fixed in discussion with related departments in NHMS.
Hue's side requested to share real-time processed data and the JICA survey team will clarify this matter later with Hue's side.

8. System operation and maintenance plan after the project

Planned contents and structure of the system operation and maintenance are shown in the meeting material. Considering this plan, Vietnamese side will build the structure.

The survey team will prepare more detailed cost estimation of the system operation and maintenance after the project, considering experiences in Japan.

Detailed procedures of the system operation will be described in maker's documents during equipment installation in the project.

9. Training and capacity development in/after the project

Both sides agreed on the training and capacity development as the JICA survey team's proposal. In the future, the survey team need to put in detail training plan, content and approach in/after the project.
Since this system is implemented in Vietnam for the first time, for effective training, handover and operation, the Vietnamese side suggested that the project should arrange a study tour to similar systems in Japan or other countries in the region.
PMU made comments on needs for system applications, such as in river and dam/reservoir management, and disseminating disaster prevention information and forecasting/warning to residents. And to meet the needs, PMU requested collaboration with Japanese side in and after the project for human resources development in related organizations in Vietnam.

10. Disseminating disaster prevention information to residents

To effectively disseminate disaster prevention information to residents, a web site will be constructed.

To deliver the information to residents, an alert system will be constructed.

PMU agreed the things above, explained in the meeting material. And also PMU made

PMU agreed the things above, explained in the meeting material. And also PMU made requests for example for alarm system at places at flood inundation risk, in addition to the things above.

The survey team explained, as an answer to the requests, that the project aiming at information system installation for dam/reservoir management is based on the request from the Vietnamese Government, and that the things can be done in the project are limited.

11. Other issues, should be done in the project

Following Article 12 in the Law on Hydrometeorology, DWR, NHMS and Hue PPC will make a plan to observe rainfall and water level in the rivers and reservoirs in the project and will submit the plan to MONRE before the project starts. The survey team will collaborate with Vietnamese side for this issue.

Hue PPC will make paper-based official agreements with the three dam managers to install equipments and to obtain their data in the project. And also Hue PPC and the three dam managers will make official agreement for the management and maintenance of the system before the project starts.

5.5 ソフトコンポーネント計画書

(1) ソフトコンポーネントの背景

ベトナムの中部沿岸部は台風の常襲地帯であることから毎年のように風水害、土砂災害に見舞われており、人命及び社会経済資本の損失防止の観点からも、災害予防・応急対策が喫緊の課題となっている。主要河川流域に設置された利水ダム（ほとんどがアースダム）では、豪雨発生時にダムの決壊による下流地域の洪水被害が多発している。洪水被害の原因としては、ダムの施設上の問題（設計・施工）のほか、降雨量、河川水位・流量、ダム水位等の情報収集、洪水被害の予測、洪水予警報の発信体制が未整備であることや適切なタイミングと水量でダムの貯留・放流が行われていないことがある。

ベトナム国政府は、災害予防に重点を置いた 2013 年策定の「災害予防・軽減法」においてダムの適切な管理と運用を重要課題として挙げるとともに、近年の下流地域の洪水被害の多発を受けて、2013 年に首相が農業・農村開発省に対しフォン川のダムの適切な管理と安全対策強化を指示している。また、2014 年にはフォン川流域の主要 3 ダム（ビンディエンダム、ホンディエンダム及びターチャックダム）を対象とした洪水時統合管理ルールが首相決定で定められ、2015 年には干ばつ対策も追加されたが、これらの実現に必要な情報システムは未整備である。

以上のようなことから、ダムの貯留・放流のタイミングや放流量を適切に判断・制御し、また下流地域の洪水災害リスク情報を的確に把握・伝達することによってダムと流域の安全性を向上させるためには、リアルタイムでの精度の高い水文情報の観測・共有と洪水予測が不可欠であり、それを行う防災情報システムの整備が急務となっている。

こうした背景のもと、「ベトナム国 総合防災情報システムを用いた緊急時における効果的ダム運用及び洪水管理計画」は、フエ省フォン川流域において、降雨量、河川水位・流量、ダム水位等の観測機材の設置とそれらによる観測データを活用した総合的な防災情報システムの構築を行うことにより、ダムの適切な管理と運用、適時・的確な防災情報の発信・伝達を行い、流域全体の水関連災害防止・軽減に寄与することを目的としている。

ベトナムの河川流域では、これまで十分な水文観測体制が整っておらず、リアルタイムの観測情報等に基づくダム操作や河川管理の経験に乏しい。したがって、本プロジェクトで整備する機器やシステムを適切に運用、利活用して、プロジェクトの目的を十分に達成するためには、ソフトコンポーネントの実施を通じて、ベトナム側担当組織職員の能力向上を図ることが必要である。

(2) ソフトコンポーネントの目標

ソフトコンポーネントの目標は、ベトナム国の人材によって、下記の目的が長期にわたって持続的に達成されるよう、必要な技術知識基盤を構築するための技術移転を行うことにある。

①新設・既設の水文観測施設の観測データが適切に観測・伝送され、水防災情報シ

ステムの表示画面にリアルタイムで表示されるようトラブル発生時の対応や点検保守を行う

②現地関係機関が、水防災情報システムを的確に運用・活用し、ダムの適切な操作によりフォン川流域の洪水災害軽減及び適切な水利用に役立てる

(3) ソフトコンポーネントの成果

ソフトコンポーネントの実施により期待される成果を表１に示す。

表 5-1　ソフトコンポーネントにより期待される成果

成果項目	内容	達成度の確認方法
成果1 機器・システムのトラブル発生時の対処	レーダを含む観測機器、CCTV、通信機器、情報処理・表示機器、データ蓄積機器およびそれらのシステムのトラブル発生時の対処方法習得	実務利用時のトラブル対応を通じた習熟度確認
成果2 機器・システムの点検・保守	各機器・システムの点検・保守及び不具合個所の特定、原因究明、対処方法の習得	マニュアルに沿った点検・保守実務を通じた習熟度確認
成果3 表示データの監視方法の習得	表示データの異常検出及び原因究明・対処方法の習得	実務利用時の表示データの異常検出・対処を通じた習熟度確認
成果4 水防災情報システムの運用	水防災情報システムを活用した(首相指示に沿った)洪水被害の軽減と旱魃対策のためのダム操作方法の習得	マニュアルに沿ったダム操作訓練による習熟度確認
成果5 水害リスク情報の伝達	水害リスク情報(流域諸情報・洪水予警報)の住民等への的確な伝達方法の習得	マニュアルに沿った情報伝達訓練による習熟度確認
成果6 レーダ雨量計の定数同定手法の習得	雨期の観測データによるレーダ雨量計の品質算定・調整及び地上雨量観測値を用いた精度評価・定数同定手法の習得	実務作業のプロセス及び結果の確認
成果7 流出解析モデルの定数同定手法の習得	雨量観測値(地上、レーダ)、水位・流量観測値、氾濫・浸水状況調査等に基づく、流出解析モデルの定数同定手法の習得	実務作業のプロセス及び結果の確認
成果8 HQ曲線の作成・活用手法の習得	河川の水位観測値を流量に変換するための、流量観測及びHQ曲線作成手法の習得	実務作業のプロセス及び結果の確認

(4) 成果達成度の確認方法

ソフトコンポーネントの各成果目標に対し、ベトナムの担当職員が自ら実施できるかどうかをテストすることによって、その達成度を評価する。

ソフトコンポーネントの各成果目標に対し、ベトナムの担当職員が自ら実施できるかどうかをテストすることによって、その達成度を評価する。

1) 機器・システムのトラブル発生時の対処

実務利用時に、機器・システムのトラブル発生時に円滑に対処できることを確認する。

2) 機器・システムの点検・保守

「維持管理マニュアル」に沿って、機器・システムの定期的な点検・保守実務を円滑に実施できることを確認する。

3) 示データの監視方法の習得

実務利用時に、表示画面を監視し、異常を検出した場合に不具合箇所の特定や適切な対処ができることを確認する。

4) 水防災情報システムの運用

「水防災情報システムを活用したダム操作マニュアル」に沿って、水防災情報システムを実際のダム操作実務に活用できることを確認する。

5) 水害リスク情報の伝達

情報伝達訓練等を通じて、水害リスク情報を住民等に的確に伝達する手順を理解し、実行できることを確認する。

6) レーダ雨量計の定数同定手法の習得

地上雨量観測データによるレーダ雨量計の精度検証及び定数同定手順を理解し、実施するとともに、それを実際にシステム上で設定できることを確認する。

7) 流出解析モデルの定数同定手法の習得

流域の水文観測データに基づいて降雨流出解析を行い、流出解析モデルの定数同定を実施するとともに、それを実際にシステム上に設定できることを確認する。

8) HQ 曲線の作成・活用手法の習得

水位観測地点における出水期の(浮子測法や電波流速計等による)流量観測及びそれに基づいて HQ 曲線を作成し、システム上に設定できることを確認する。

(5) ソフトコンポーネントの活動（投入計画）

ソフトコンポーネントは、機器操作・管理担当、水防災情報システム担当及びレーダ雨量計担当による直接支援型とし、計 17 月で実施することを基本に、より効果的な実施時期に行うように工夫する。機器操作・管理担当は「成果 1 機器・システムのトラブル発生時の対処方法」と「成果 2 機器・システムの点検・保守」を、水防災情報システム担当は「成果 3 表示データの監視方法の習得」、「成果 4 水防災情報システムの運用」、「成果 5 水害リスク情報の伝達」、「成果 7 流出解析モデルの定数同定手法の習得」、「成果 8 HQ 曲線の作成・活用手法の習得」を、レーダ雨量計担当は「成果 6　レーダ雨量計の定数同定手法の習得」をそれぞれ担当する。

ソフトコンポーネントの活動計画を、成果品及び実施リソースの調達方法と合わせて次表に示す。なお、トラブル発生時の対処や表示データ異常の監視にかかる実務指導に関しては、実際に発生するトラブル対処等とあわせて、停電によるシステムダウンや一部観測データの異常や欠測などを擬似的に発生させて、原因究明や対処方法を指導する。

表 5-2　ソフトコンポーネントの活動計画

成果項目	対象	実施方法	成果品	リソース
成果1 機器・システムのトラブル発生時の対処方法	MARD、DARD及び3ダム管理所等の機器操作担当職員（20名程度）	・実務を通じたOJTを指導 ・擬似的なトラブル発生への対処方法指導	研修資料 実務指導結果のまとめ	機器操作・管理担当コンサルタント 5日（直接支援型）
成果2 機器・システムの点検・保守	MARD、DARDおよびダム管理所等の機器維持管理担当職員（20名程度）	・各機器設置サイトにおいて機器の動作確認・保守の実務研修を実施 ・維持管理マニュアルの作成 ・外部保守業者の作業管理のOJT（TORの作成）を指導	点検・保守マニュアル 保守契約TOR 実務指導結果のまとめ	機器操作・管理担当コンサルタント 5日（直接支援型）
成果3 表示データ監視方法の習得	MARD、DARD及び3ダム管理事務所等の表示データ監視担当職員（10名程度）	・表示データ異常の検出・原因究明・対処方法の研修実施及びOJTを指導（観測施設の故障、データ入力のミス、情報伝達・処理機器のトラブル、プログラムのバグ、電源異常など） ・擬似的な異常表示への対処方法指導	研修資料 実務指導結果のまとめ	水防災情報システム担当コンサルタント 5日（直接支援型）
成果4 水防災情報システム運用	MARD、DARD及び3ダム管理所の水防災システム運用担当職員（20名程度）	・水防災情報システムを活用したダム操作についての研修実施 ・システム運用の実務指導	水防災情報システムを活用したダム操作マニュアル 実務指導結果のまとめ	水防災情報システム担当コンサルタント 10日（直接支援型）
成果5 水害リスク情報伝達	MARD、DARDおよび3ダム管理所の防災担当職員（20名程度）	・水害リスク情報（流域諸情報や洪水予警報）の住民等への効果的な伝達に関する研修の実施 ・水害リスク情報伝達訓練の実施 ・水害リスク情報伝達にかかる実務指導	情報伝達訓練の指導結果まとめ	水防災情報システム担当コンサルタント 5日（直接支援型）
成果6 レーダ雨量計定数同定手法の習得	MARD、DARD及びNHMSのレーダ雨量計運用管理担当職員（10名程度）	・レーダ雨量計観測に関する研修の実施（定数同定や精度評価手法を含む） ・レーダ運用開始初期の品質算定手法の実務指導 ・出水期（9月～12月）の観測データによる観測精度検証、定数同定及びシステム上の設定についての実務指導	研修資料 実務指導結果のまとめ	レーダ雨量計担当コンサルタント 70日（直接支援型）
成果7 流出解析モデルの定数同定手法の習得	MARD、DARD等の水防災システム運用担当職員（10名程度）	・（水防災情報システムに組み込まれた）流出解析モデルの概要及び定数同定手法に関する研修の実施 ・出水期（9月～12月）の水文観測データによる流出解析モデルの定数同定・検証及びシステム上の設定についての実務指導	研修資料 実務指導結果のまとめ	水防災システム担当コンサルタント 40日（直接支援型）
成果8 HQ曲線の作成・活用手法の習得	DARD等の水文観測担当職員（10名程度）	・出水期（9月～12月）に、フン川本・視線の水位観測地点における流量観測に基づくHQ曲線を作成するための一連の作業及びシステム上の設定についての実務指導	研修資料 実務指導結果のまとめ	水災害情報システム担当コンサルタント 20日（直接支援型）

現時点で想定しているプロジェクトの工程では、機材調達の検収・引渡しまでの間に、機器の操作・維持管理や水防災情報システムの運用等にかかる OJT を含む研修とあわせて、その時点で得られているデータを用いてレーダ雨量計定数や流出解析モデルの定数の初期値同定のための技術指導を行う。

また、機器引き渡し以降、プロジェクトで構築した水文観測ネットワークによる雨期（9 月～12 月）のデータの分析結果を各種定数設定に反映させるために、レーダ定数同定、流出解析モデルの定数同定及び HQ 曲線の作成・活用について OJT 型の技

術指導を行うこととあわせて、実際の出水をふまえたシステム運用等の習熟を図ることとする。

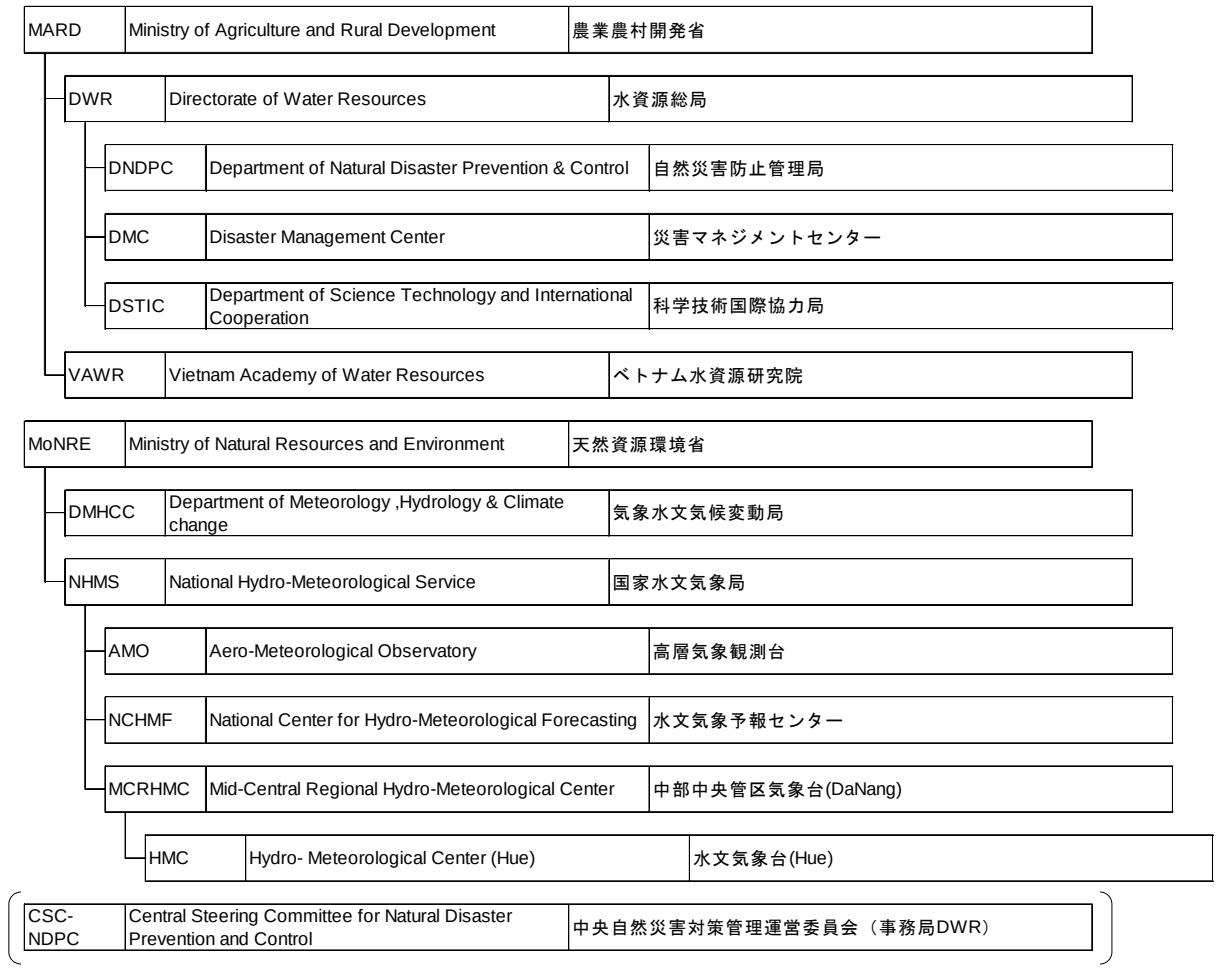
機材の設置が完了し試験運用を開始した時点で、MARD、DARD、NHMS 及び 3 ダム管理所の職員等を対象として実施する予定の研修内容は以下のとおりである。

○ MARD 及び DARD の職員等対象（ハノイ 3 日間及びフエ 7 日間）
- ・水防災情報システムの内容
- ・機器やシステムのトラブル発生時の対処方法
- ・機器の点検・保守方法
- ・表示データ異常時の原因究明と対処方法
- ・水防災情報システムを活用した（首相決定に即した）ダム操作
- ・ダム管理所との連携・情報共有
- ・水害リスク情報の効果的な住民への伝達方法
- ・レーダ雨量計観測の内容
- ・レーダ雨量計定数同定と精度管理手法
- ・流出解析モデルの内容
- ・流出解析モデルの定数同定手法　　等

○ 3 ダム管理所の職員対象（各ダム管理所において各 1 日間）
- ・水防災情報システムの内容
- ・機器やシステムのトラブル発生時の対処方法
- ・水防災情報システムを活用したダム操作
- ・水害リスク情報の効果的な伝達方法　　等

○ NHMS の職員等対象　（1 日間）
- ・水防災情報システムの概要
- ・水文観測機器の点検・保守及びトラブル発生時の対処方法
- ・レーダ雨量計観測の内容
- ・レーダ雨量計定数同定と精度管理手法　　等

ベトナムの河川流域においては、これまでリアルタイムの観測情報等に基づく水管理情報システムを用いたダム操作や河川管理の経験が乏しく、関連技術水準が低い状況にある。本ソフトコンポーネントの実施により、機器・システムを円滑に運用し、それらを実際のダム操作やリスク情報伝達に効果的に活用するとともに、（必要に応じて）観測定数やモデル定数等を更新してシステム上で設定できる技術水準まで引き上げることを目標とする。本プロジェクトのベトナム側関係機関の体制図の中で、以下の部署の関連する職員をソフトコンポーネントの対象として想定している。



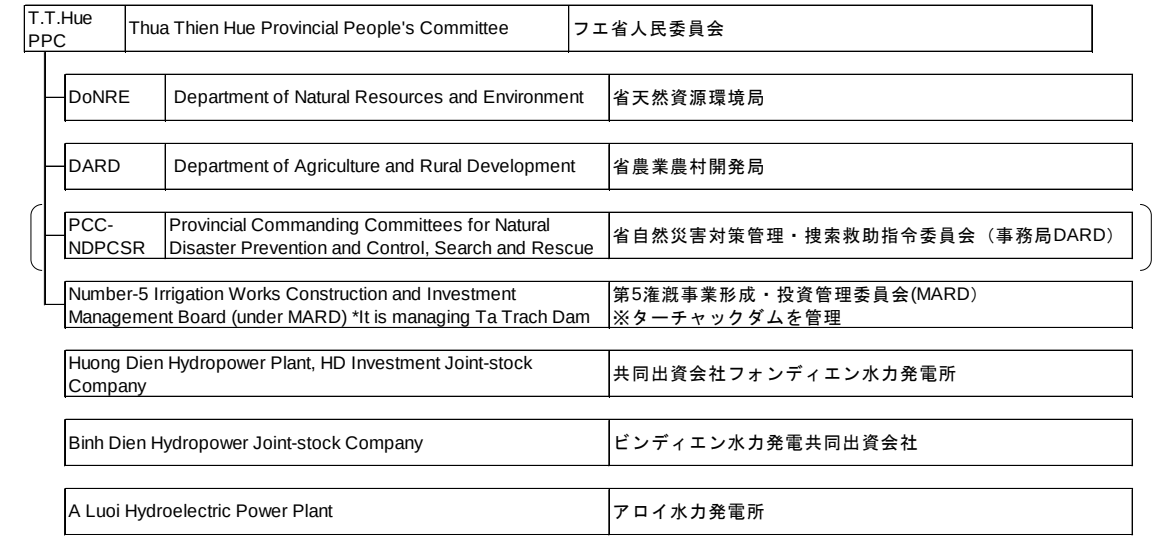


図 5-1　　ベトナム側関連組織体制図

なお、機器・システムの操作及び維持管理に関して機器メーカによる初期操作指導とソフトコンポーネントで実施する内容を対比して整理したものを下表に示す。

表 5-3　メーカによる初期操作指導とソフトコンポーネント実施内容の整理

機器メーカによる初期操作指導	ソフトコンポーネントで実施する内容
○各機器・システムについて、電源のオン・オフを含む主要な機能ボタンの操作方法 ○停電等に起因するシステムダウン時の再起動方法 ○各種定数のシステム上での設定（更新）方法 ○消耗品等の交換方法	○機器・システムのトラブル発生時の対処方法の実務指導 ○マニュアルに基づく定期的な点検・保守の実務指導 ○表示画面の監視による異常検出及び原因究明、対処方法の実務指導 ○各種定数更新手順の実務指導

(6) ソフトコンポーネントの実施リソースの調達方法

ソフトコンポーネントで実施する内容には、同様のシステムの運用管理、レーダ雨量計精度評価・定数同定及び流出解析モデルの定数同定等についての専門的な技術ノウハウが必要であるため、現地のローカルリソースに適切な人材を求めることは困難である。したがって、当該事項について経験と実績を有する受注コンサルタントが直接実施することが適切である。なお、実施にあたってはベトナム国内の観測や解析の現状などについて、ベトナム国内の関係機関の協力を得る。

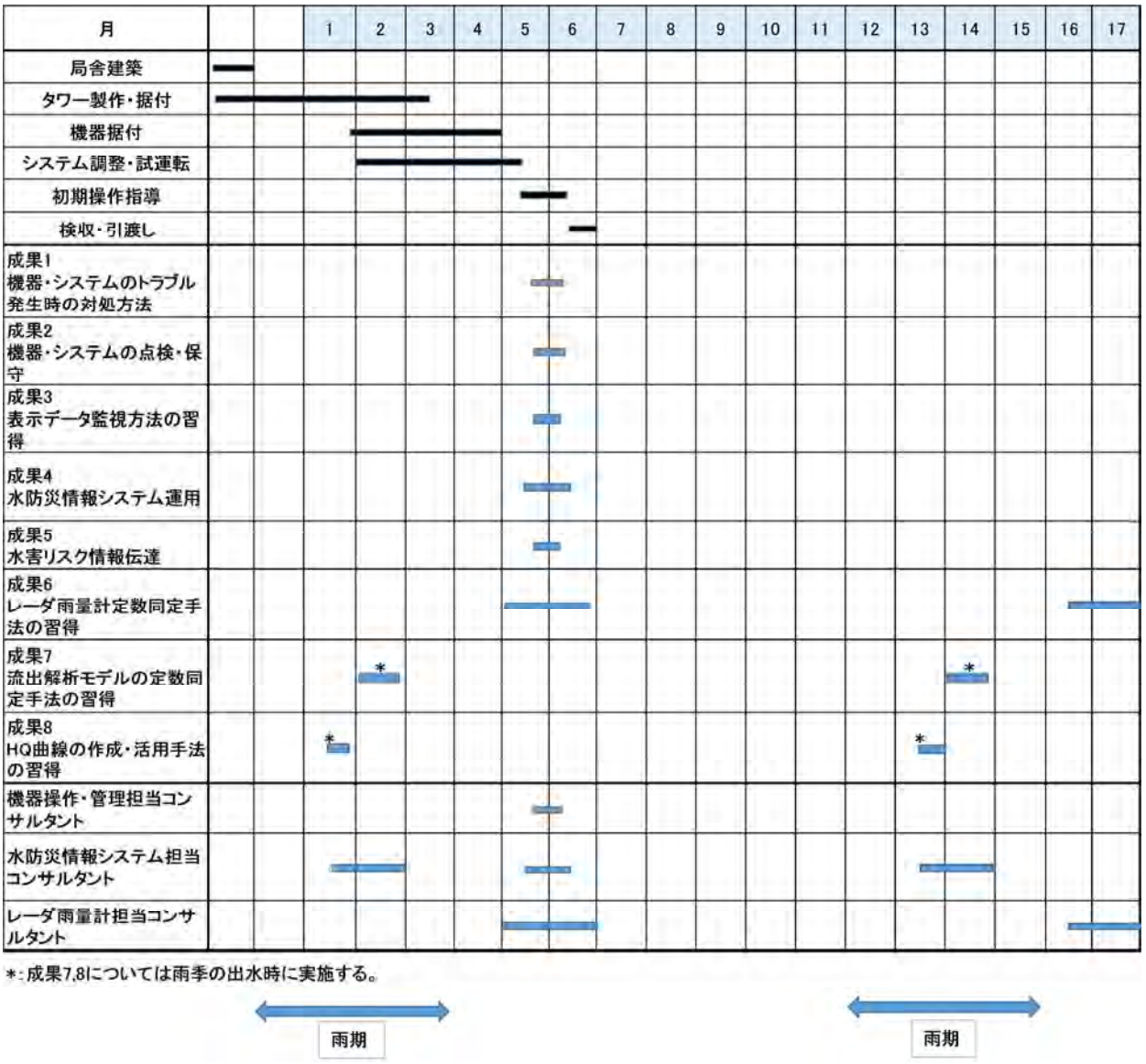
また、ソフトコンポーネント担当コンサルタントの現地での活動期間中、資料収集・整理・とりまとめ、関係機関との連絡調整及び研修の準備等を支援するため、現地傭人として経験 10 年程度以上の技術者を一人雇用する。現地技術者は相当量の支援業務を一人で担当し、時間のほとんどすべてをそれらにあてることになるため、コンサルタントが現地機関の関係者等と日常のコミュニケーションを含む意思疎通を円滑に行えるよう、通訳を一人雇用する。

(7) ソフトコンポーネントの実施工程

機器引渡し前に実施するソフトコンポーネントは、HQ 曲線作成とそれをふまえた流出解析モデルの定数初期値設定について雨期の出水期に、それ以外の項目（観測施設の設置及びシステム構築の概成を待って行う項目）については機器の設置が完了し試験運用を開始した時点で実施する。また、機材引渡し後の雨期（9 月～12 月）におけるプロジェクトで構築した観測ネットワークによる観測データに基づいて、流出解析モデルの定数同定やレーダ雨量計定数同定にかかる OJT 型技術指導を実施する。なお、この実施工程は基本的な予定であり、より効果的な時期に行うように工夫する。

ソフトコンポーネントの全体実施工程を下表に示す。

表 5-4　ソフトコンポーネント全体工程表（機材引渡し前後の 17 月間）



(8) ソフトコンポーネントの成果品

ソフトコンポーネントの成果として、技術移転完了時に、下記の資料等を作成・提出する。

1) 機器・システムのトラブル発生時の対処

機器・システムのトラブル発生時の対処についての研修資料及び実務指導結果のまとめ

2) 機器・システムの点検・保守

機器・システムの点検・保守マニュアル、保守契約 TOR 及び実務指導結果のまとめ

3) 表示データの監視方法の習得

表示異常の検出及び対処方法についての研修資料及び実務指導結果のまとめ

4) 水防災情報システムの運用

「水防災情報システムを活用したダム操作マニュアル」及び実務指導結果のまとめ

5) リスク情報の伝達

情報伝達訓練の指導結果まとめ

6) レーダ雨量計の定数同定手法の習得

レーダ雨量計精度評価・定数同定手順にかかる研修資料及び実務指導結果のまとめ

7) 流出解析モデルの定数同定手法の習得

流出解析モデルの定数同定にかかる研修資料及び実務指導結果のまとめ

8) HQ 曲線の作成・活用手法の習得

HQ 曲線作成手順にかかる研修資料及び実務指導結果のまとめ

(9) ソフトコンポーネントの概略事業費

ソフトコンポーネントの実施に要する概略事業費（税抜き）は、下記の通りである。

直接経費	11,135 千円
直接人件費	6,960 千円
間接経費	8,908 千円
諸経費	6,264 千円
技術経費	2,644 千円
合計	27,003 千円

(10)ベトナム側の責務

本プロジェクトの完了後、ベトナム側が機器やシステムの長期的な有効活用を図っていくために、下記の事項を継続的に実施すべきである。

1) 機器・システムの定期的な点検・保守

2) 水位観測サイトにおける出水期の流量観測に基づく HQ 式の更新とシステムへの反映

3) 出水期の水文観測データによる流出解析モデルの検証と（必要に応じて）モデルパラメータの更新

4) 地上観測雨量によるレーダ雨量計観測精度の検証と（必要に応じて）観測パラメータの更新

これらについては、ソフトコンポーネントで実施する実務指導を通じて技術移転が図られる。ベトナム側は、その間に必要な組織体制の構築と人材の確保を行い、実務における活用を通じて担当者の継続的な能力向上を図る必要がある。

5.6 参考資料

政府首相 ----------	ベトナム社会主義共和国 独立 – 自由 – 幸福 ----------
決定番号: 2482/QĐ-TTg	ハノイ市、2015 年 12 月 30 日

決定

フォン川流域調整池群の操作規程の公布について

政府首相

2001 年 12 月 25 日発行の政府組織法に基づき、

2012 年 6 月 21 日発行の水資源法に基づき、

2013 年 6 月 19 日発行の自然災害防止法に基づき、

天然資源環境大臣の提言書に基づき、以下の決定を下す。

決定

第 1 条　本決定に付随してフォン川流域の調整池群：Ta Trach, Huong Dien, Binh Dien、 A Luoi 並びに Thao Long ダムの操作規程を公布する。

第 2 条　実施要項

1. 本決定は、公布日以降有効とする。
2. 政府首相により 2014 年 8 月 25 日に発行された洪水期のフォン川流域調整池群の操作規程公布に関する決定 1497/QĐ-TTg を廃止する。
3. Ta Trach において管轄機関の許可により常時満水位まで貯水された場合は、本規程の各規定に従って操作を行う。
4. 第 1 条にて規定された各池及びダムに関する操作規程の内、本決定より以前に公布されたものについては、本決定に適合するよう修正および補足されるものとする。

第 3 条　次の省庁の各大臣：天然資源環境省、農業農村開発省、商工省、建設省、及び自然災害防止中央指導委員会委員長、人民委員会委員長、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長、国家水文気象センター総取締役、各調整池管理運営団体代表者並びに本決定の実施に際して責任を負う各関係機関。

首相
代　副首相

Hoang Trung Hai

宛先:
- 第三条の通り;
- 政府首相並びに副首相
- 救命捜索国家委員会
- 水資源管理局
- 水文気象予報中央センター
- 中中部地区水文気象台
- ベトナム電力グループ
- Ta Trach 運営管理団体
- HD 投資株式会社
- Binh Dien 水力発電株式会社
- 中部水力発電株式会社
- トゥア・ティエン・フエ省灌漑工事開発
一人有限会社
- Ta Trach Bitexco 水力発電株式会社
- 第五灌漑設備投資建設管理員会
- 政府事務局: 大臣・事務局長, Nguyen Cao Luc
事務局次長, 首相秘書、ガバメントポータル　総取締役, 総務部,公報;
- 保管先:文書管理部, Department for Sectorial Economy (3 部)

規程
フォン川流域調整池群の操作について

(2015 年 12 月 30 日発行の政府首相による決定書 2482/QĐ-TTg 内の規程に付随して公布)

第 1 章
一般規定

第 1 条　毎年フォン川流域の Ta Trach, Huong Dien, Binh Dien 並びに A Luoi は、以下の優先順序原則に従い運営されるものとする。

1.洪水期

a) 調整池の各施設における絶対的安全を確保すること。Ta Trach, Huong Dien, Binh Dien 並びに A Luoi の水位はこの 1000 年間で小規模もしくは同程度の反復周期性を有する洪水において観測された洪水時最高水位を超えてはならない。

b) 下流地域への洪水軽減への寄与。

c) 河川の最低限の水量及び下流地域の最低限の水需要の保障。

d) 発電効果の保障。

2.渇水期

a) 周辺施設設備の安全確保。

b) 河川の最低限の水量及び下流地域の最低限の水需要の保障。

c) 発電効果の保障。

第 2 条　本規程における洪水期及び渇水期の定義

1. 洪水期は 9 月 1 日から 12 月 15 日まで。

2. 渇水期は、12 月 16 日から翌年 8 月 31 日まで。

第 3 条　各調整池の放流設備の操作

調整池の放流設備の操作では頭首工設備の安定を確保するため、公布済みの操作規程を遵守しこれを実施しなければならない。

第 4 条　各調整池の基本仕様

1. Ta Trach

- 洪水時最高水位：	53.07 m;
- 設計洪水位：	50.00 m;
- 常時満水位：	45.00 m;
- 最低水位：	23.00 m;
- 総貯水量：	646.00 百万 m^3;
- 有効貯水量：	346.62 百万 m^3;
- 洪水調節容量：	556.25 百万 m^3;

2. Huong Dien

- 洪水時最高水位：	59.93 m;
- 設計洪水位：	58.17 m;
- 常時満水位：	58.00 m;

- 最低水位：	46.00 m;
- 総貯水量：	820.66 百万 m^3;
- 有効貯水量：	350.80 百万 m^3;

3. Binh Dien

- 洪水時最高水位：	85.96 m;
- 設計洪水位：	85.16 m;
- 常時満水位：	85.00 m;
- 最低水位：	53.00 m;
- 総貯水量：	423.68 百万 m^3;
- 有効貯水量：	344.39 百万 m^3;

4. A Luoi

- 洪水時最高水位：	555.1 m;
- 常時満水位：	553.0 m;
- 最低水位：	549.0 m;
- 総貯水量：	60.20 百万 m^3;
- 有効貯水量：	24.40 百万 m^3;

第 2 章
洪水期の調整池操作

第 5 条　下流低地域の洪水軽減措置における調整池操作原則

1. 政府首相や自然災害防止中央指導委員会委員長の決定等の特別な場合を除き、Huong Dien 並びに Binh Dien の放流設備の各バルブが、完全に開栓していない場合、常時満水位以上洪水時最高水位までの貯水容量を使用することはできない。
2. 下流地域のために洪水軽減措置をとる場合は、管轄機関より発行された放流設備の開閉栓手順や方式に関する規則を遵守し、下流地域の人々の生命及び財産を脅かすような異常かつ突発的な洪水を人為的に引き起こしてはならない。
3. 本規程の第 2 条第 1 項で規定される洪水期において、下流地域のための洪水軽減措置をとっていない場合、本規程の第 12 条に規定される場合を除き、各調整池の水位は表 2 で定められた洪水前の最高水位を上回ってはならない。
4. 作業中は常に降雨・洪水などの気象情報や、各水文観測所の水位、調整池の水位及び流量や今後の気象予報等を追跡・更新し、実際の状況に対して適切に作業、調整すること。
5. 下流地域に対する洪水軽減措置の終了時には、本規程第 12 条にて規定される場合を除いて、調整池の水位が表 2 で規定される洪水前の水位に戻さねばならない。

第 6 条　洪水期の調整池水位操作規定

1. 各水文観測所の警報レベルと対応する水位は表 1 に規定されている通りである。

表 1.　洪水警報レベル対応水位表

河川名称	水文観測所	警報レベル 1 (m)	警報レベル 2 (m)	警報レベル 3 (m)
フォン川	Kim Long	1.0	2.0	3.5
ボー川	Phu Oc	1.5	3.0	4.5

2. 洪水期の各調整池の洪水前最高水位は表 2 で規定される通りである。

表 2.　洪水期の各調整池の洪水前最高水位

調整池名称	Ta Trach		Huong Dien	Binh Dien
	9 月 1 日から 10 月 31 日まで	11 月 1 日から 12 月 15 日まで		
水位(m)	25.0	35.0	56.0	80.6

3. 下流地域への洪水軽減措置実施時における各調整池の洪水防止最低水位は、表 3 にて規定される通りである。

表 3.　各調整池の洪水を引き起こす最低水位

調整池名称	Ta Trach		Huong Dien	Binh Dien
	9 月 1 日から 10 月 31 日まで	11 月 1 日から 12 月 15 日まで		
水位(m)	23.0	28.5	53.5	74.5

第 7 条　Ta Trach 並びに Binh Dien の下流地域への洪水軽減措

1. 洪水期における調整池操作命令の発令決定権

a) 通常の天候の場合、第 12 条で規定される場合を除き、調整池管理運営団体の代表者は、自発的に操作調整し、表 2 で定めた値を超過しない水位を確保すること。

b) 第 2 項で規定される各種の気象現象もしくは第 3, 4, 5 項で規定されるような降雨及び洪水が確認された場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は各調整池の操作を取り決めること。

2. 洪水に備えた水位低下操作

国家水文気象センターより、緊急の台風、沿海熱帯低気圧もしくは各種大雨洪水をもたらす気象現象の予報が出され、且つ 24 時間から最長 48 時間の間で、フォン川流域の各地域に直接的な影響が懸念される場合、各調整池に対し以下の操作を行う。

a) 表 3 で規定する値より水位が高い場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は各調整池に対し、以下の操作を決定する。

- Kim Long 水文観測所において 1.7m 以上且つ警報レベル 2 の水位未満の水位が観測された場合、調整池の放流量が流入量と同量になるよう調整操作を行い、現状水位を維持すること。
- Kim Long 水文観測所の観測水位が 1.7m 以下であった場合、調整池の放流量が流入量を上回るよう調整操作を行い、水位を低下させるが、表 3 で規定された値を下回らないこと。

作業過程で、同水文観測所において、1.7m 以上且つ警報レベル 2 の水位未満の水位が観測された場合、調整池の放流量と流入量が同量になるよう調節操作を行い、現状水位を維持すること。

b) 表 3 の規定値に対して水位が低い場合、調整池管理者は流量調節操作を行うこと

が認められるが、表 3 に規定された水位値を上回ってはいけない。

c) 本項 a)並びに b)の規定従い作業する過程で、国家水文気象センターの気象予報情報に基づき、降雨及び洪水を引き起こすような気象兆候が確認され、且つフォン川流域の各地域に直接的な影響を及ぼすおそれがない場合、調整池管理者は表 2 で規定される値となるよう徐々に水位調整を行うことが認められる。

3. 洪水に備えるため、第 2 項の a), b) の規定に従って調整池の水位調節操作を終了したものの、第 4 項で規定される洪水軽減措置を行うための条件が整っていない場合、調整池の流入量と放流量が同量になるように調節操作を行い、現状水位を維持するとともに、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長の指令があった場合は下流地域への洪水軽減措置体制への移行準備をすること。

4. 下流地域への洪水軽減措置

a) Kim Long 水文観測所での観測水位が警報レベル 2 を上回る場合、下流地域への洪水軽減を目的としてトゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長により放流量を流入量より減らす調整措置が決定されるが、Binh Dien については常時満水位を、Ta Trach については設計洪水位を超えてはならない。

b) Binh Dien の水位が常時満水位に、Ta Trach の水位が設計洪水位にそれぞれ達した場合、調整池の流入量と放流量が同量になるよう調整操作を行う。

5. 洪水前最高水位へ戻す貯水位調整操作

a) Kim Long 水文観測所での観測水位が警報レベル 1 を下回った場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は、表 2 に規定される水位に戻すため 24 時間以上 72 時間を上限として、調整池の放流量が流入量を上回るよう調整操作を行う。

b) 作業過程で、Kim Long 水文観測所での観測水位が 1.7m に達した場合、調整操作を行い、現状水位を維持すること。

6. 非常事態における Ta Trach 及び Binh Dien の操作については、トゥア・ティエン・フエ省人民委員会委員長がこれを決定する。

第 8 条　Huong Dien の下流地域への洪水軽減措置

1. 洪水期の調整池操作措置命令の発令決定権

a) 通常の天候の場合、第 12 条で規定される場合を除き、調整池管理運営団体の代表者は、自発的に操作調整し、表 2 で定めた値を超過しない水位を確保すること

b) 第 2 項で規定される各種の気象現象もしくは第 3, 4, 5 項で規定されるような降雨及び洪水が確認された場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は各調整池の操作を決定すること。

2. 洪水に備えた水位低下操作

国家水文気象センターより、緊急の台風、沿海熱帯低気圧もしくは各種大雨洪水をもたらす気象現象の予報が出され、且つ 24 時間から最長 48 時間の間で、フォン川流域の各地域に直接的な影響が懸念される場合、各調整池に対し以下の操作を行う。

a) 表 3 で規定する値より水位が高い場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は各調整池に対し、以下の操作を決定する。

- Phu Oc 水文観測所の観測水位が 2.7m 以上で警報レベル 2 以下である場合、またはKim Long 水文観測所の観測水位が 1.7m 以上で警報レベル 2 以下である場合は、調整池の流入量と放流量が同量になるよう調整操作を行い、現状水位を維持すること。
- Phu Oc 水文観測所の観測水位が 2.7m 以下であり、Kim Long 水文観測所の観測水位が 1.7m 以下である場合は、水位低下を目的として調整池の放流量が流入量を上回るよう調整操作を行うが、表 3 で規定する値を下回らないこと。作業過程で、Phu Oc 水文観測所の観測水位が 2.7m を超過し、警報レベル 2 以下である場合、またはKim Long 水文観測所の観測水位が 1.7m を超過し、警報レベル 2 以下である場合は、調整池の流入量と放流量が同量になるよう調整操作を行い、現状水位を維持すること。

b) 表 3 で規定される値を貯水位が下回る場合、各調整池管理者は流量調節操作を行うことが認められるが、表 3 に規定される値を上回ってはいけない。

c) 本項 a)及び b)の規定に従い作業を行う過程で、国家水文気象センターの気象予報情報に基づき、降雨及び洪水を引き起こすような気象兆候が確認され、且つフォン川流域の各地域に直接的な影響を及ぼすおそれがない場合、調整池管理者は表 2 で規定される値となるよう徐々に水位調整を行うことが認められる。

3. 洪水に備えるため、第 2 項の a), b) の規定に従って調整池の水位調節操作を終了したものの、第 4 項で規定される洪水軽減措置を行うための条件が整っていない場合、調整池の流入量と放流量が同量になるように調節操作を行い、現状水位を維持するとともに、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長の指令があった場合は下流地域への洪水軽減措置体制への移行準備をすること。

4. 下流地域への洪水軽減措置

a) Kim Long 水文観測所もしくは Kim Long 水文観測所における観測水位が警報レベル 2 を上回る場合、下流地域への洪水軽減を目的としてトゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長により放流量を流入量より減らす調整措置が決定されるが、常時満水位を超過してはならない。

b)調整池水位が常時満水位に到達した場合は、流入量と放流量を同量にする調整操作を行うこと。

5.洪水前最高水位へ戻す貯水位調整操作

a) Phu Oc 水文観測所並びに Kim Long 水文観測所での観測水位が警報レベル 1 を下回った場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は、表 2 に規定される水位に戻すため 24 時間以上 72 時間を上限として、調整池の放流量が流入量を上回るよう調整操作を行う。

b) 作業過程のおいて Phu Oc 水文観測所の観測水位が 2.7m に到達、もしくは Kim Long 水文観測所の観測水位が 1.7m に到達した場合は、調整池の現状水位を維持するよう調整措置をとること。

6. 非常事態における Huong Dien の操作については、トゥア・ティエン・フエ省人民委員会委員長がこれを決定する。

第 9 条　最低流量の維持と Thao Long ダムの操作

1. 本規程の第 7 条並びに第 8 条で規定される下流地域への洪水軽減を目的とした調整池操作の作業中は、Thao Long ダムの全ての水門を完全開放しなければならない。

2. 下流地域への洪水軽減操作を実施しない場合、Ta Trach ではフォン川下流域に向かって連続的に放水操作を行うが、その際の放流量は 4.6 m^3/s を下回らないこと。トゥア・ティエン・フエ省人民委員会委員長の指示があった場合、各調整池は指示内容に従い下流域への放水操作を行うこと。

第 10 条　施設設備の安全を確保する調整池操作

Huong Dien 並びに Binh Dien において貯水位が常時満水位に達した場合、又、Ta Trach において貯水位が設計洪水位に達した場合で、さらに引き続き洪水起こり水位が上昇し施設設備の安全に影響が及ぶ場合、管轄機関が公布する操作規程に従い、施設設備の安全保護措置を実施すること。

第 11 条　本規程の第 2 条第 1 項で規定される洪水期以外で、国家水文気象センターもしくは各直属組織により大規模な洪水警報が出された場合、もしくは事前の予報なく調整池に大規模な流入が確認された場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は本規程に従い、Ta Trach、Huong Dien 並びに Binh Dien の調整池操作を決定すること。

第 12 条　洪水期末の貯水

1. 水文及び気象状況の変化の傾向に基づき、毎年 11 月 15 日から 12 月 15 日まで、国家水文気象センターは、該当流域に大雨をもたらす気象兆候が観測されない場合、Huong Dien 及び Binh Dien 管理者に対して、自主的に水位を常時満水位まで上昇させるよう、優先的に貯水許可を出す。

Ta Trach については、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長がこれを判断し、水位を常時満水位まで上昇させるよう貯水決定を下すこと。

2. 第 1 項の規定に従い貯水している期間において、国家水文気象センターより、緊急の台風、沿海熱帯低気圧もしくは各種大雨洪水をもたらす気象現象の予報が出され、且つ 24 時間から最長 48 時間の間で、フォン川流域の各地域に直接的な影響が懸念される場合、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長は各調整池に対し、以下に記す調整池操作を決定する。

a) 本規程第 7 条、第 2 項において規定される Ta Trach 並びに Binh Dien の洪水に備えた水位低下措置の決定。その場合は表 2 で規定された水位を下回らないこと。また、本規程第 7 条の第 3 項及び第 4 項において規定される下流地域に対する洪水軽減措置の決定。

b) 本規程第 8 条、第 2 項において規定される Huong Dien の洪水に備えた水位低下措置の決定。その場合は表 2 で規定された水位を下回らないこと。また、本規程第 8 条の第 3 項及び第 4 項において規定される下流地域に対する洪水軽減措置の決定。

c) 本項 a)及び b)の規定に従い作業を行う過程で、国家水文気象センターの気象予報に基づき、降雨及び洪水を引き起こすような気象兆候が確認され、且つフォン川流域の各地域に直接的な影響を及ぼすおそれがない場合、第 1 項の規定に従い、各調整池において貯水操作が認められる。

3. 下流地域に対する洪水軽減措置が終了し、第 2 項同様、引き続き国家水文気象セン

ターによる気象警報が確認されない場合、第 1 項の規定に従い、各調整池において貯水操作が認められる。

第 3 章
渇水期の調整池操作

第 13 条　渇水期の調整池操作原則

1. Ta Trach、Huong Dien、Binh Dien、A Luoi 並びに Thao Long ダムでは、水資源の利用、排水、洪水防止などの需要を満たすべく Thao Long ダム上流域の水位を維持しながら作業する必要がある。
2. 調整池作業は渇水期中の取水利用の時期に従い、10 日間行われるものとする。
3. 各調整池の操作中は、操作時点の貯水位と続く 10 日間における平均流入量予測に基づき、調整池水位が本規程付録 3 で規定される各時点での貯水位を下回らないよう操作調節を行うこと。

第 14 条　渇水期の調整池操作時期

1. 使用水量増加時期：2 月 15 日から 3 月 31 日まで、5 月 15 日から 7 月 31 日まで
2. 使用水量通常時：上記時期を除いた残りの期間

第 15 条　使用水量増加時期の Ta Trach、Huong Dien 並びに Binh Dien の操作

各調整池の毎日の操作は以下の通り：

1. Ta Trach ではフォン川下流域に向かって連続的に放水操作を行い、放流量は 4,6 m^3/s 以上、1 日平均 20 m^3/s 以上の総放流量を確保すること。
2. Huong Dien の下流域への放水操作では 1 日平均 20 m^3/s 以上の総放流量を確保すること。
3. Binh Dien の下流域への放水操作では 1 日平均 15 m^3/s 以上の総放流量を確保すること。

第 16 条　使用水量通常時期の Ta Trach、Huong Dien 並びに Binh Dien の操作

各調整池の毎日の操作は以下の通り：

1. Ta Trach ではフォン川下流域に向かって連続的に放水操作を行い、放流量は 4,6 m^3/s 以上、1 日平均 15 m^3/s 以上の総放流量を確保すること。
2. Huong Dien の下流域への放水操作では 1 日平均 15 m^3/s 以上の総放流量を確保すること。
3. Binh Dien の下流域への放水操作では 1 日平均 12 m^3/s 以上の総放流量を確保すること。

第 17 条　渇水期における A Luoi の調整池操作

A Luoi ではダムを通過して A Sap 川下流域に向けて連続的に放流操作を行うが、その際の放流量は 1,42 m^3/s を下回ってはいけない。又 Huong Dien の貯水量を補完するために Bo 川下流域にも放流を行う。

第 18 条　渇水期の Thao Long ダムの操作

Thao Long ダムでは毎日の調節操作により以下の水位を維持・確保すること。

1. 12 月 16 日より翌年 1 月 10 日までは 0.1m から 0.25m
2. 次の期間中は 0.2m から 0.4m：1 月 11 日以降 2 月 14 日まで、4 月 1 日以降 5 月 14

日まで、8 月 1 日以降 8 月 31 日まで

3. 2 月 15 日以降 3 月 31 日までは 0.3m から 0.4m

4. 5 月 15 日以降 7 月 31 日までは 0.3m から 0.5m

第 19 条　本規程の第 15 条、第 16 条並びに第 18 条の規程に従い作業を行う過程で、Thao Long ダム下流域の水産資源の育成のため一定の塩分濃度を確保する必要がある場合、フォン川下流域に冠水のおそれが無いように堤防の安全を確保する必要がある場合、もしくは大潮時において Thao Long ダムの貯水位を維持する必要がある場合は、各調整池・ダムの流量及び操作時間の調整について、トゥア・ティエン・フエ省人民委員会委員長がこれを決定する。

第 20 条　渇水期の調整池貯水位の確保

1. 本規程の第 15 条並びに第 16 条の規程に従い作業を行う際、本規程の付録 3 で規定される期間において規定値を下回らないよう貯水量を確保しなければならない。

2. 付録 3 の規定に相当する期間において規定の貯水量が確保できない場合、続く 10 日間の流量予測に基づき、天然資源環境大臣の指揮の下、トゥア・ティエン・フエ省人民委員会及び各関連組織・機関との連携により調整池の流量及び操作時間を調整し、続く期間において貯水量が規定値を下回ることのないよう努めること。

3. 渇水期初頭において各調整池の貯水位が付録 3 の規定値に達しない場合、天然資源環境大臣の指揮の下、トゥア・ティエン・フエ省人民委員会及び各関連組織・機関との連携により、遅くとも 2 月 1 日までに貯水量が付録 3 の規定値に到達するように調整池操作を決定すること。

第 4 章
調整池操作の実施及び情報提供と報告に関する義務

第 21 条　トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長の義務

1. 洪水期について

a. 常任組織を構成して 降雨及び洪水状況の変化を注視し、本規程の第 7 条、第 8 条、第 9 条、第 11 条及び第 12 条の規定に従って調整池の調整案を決議し、操作命令を出さなければならない。　本規程の第 7 条、第 8 条、第 9 条、第 11 条及び第 12 条に規定される操作命令に関して、緊急及び非常事態を除き、少なくとも最初の放流の 4 時間前にこれを発令しなければならない。

b. 調整池操作命令の発令や洪水対策の実行指揮、並びに放流作業時の下流域住民の安全に関する各状況の処置に対して、これを検査・監督すること。

c. 調整池操作命令の発令時は、調整池操作により洪水及び冠水の影響を受ける可能性がある各該当地域の県(huyện)相当の自然災害防止及び救命捜索委員会委員長に対して、速やかにこれを通報すること。同時に、中中部地区水文気象台並びに中央水文気象予報センターに通報を行うほか、トゥア・ティエン・フエ省人民委員会委員長に対しこれを報告せねばならない。

d. 非常事態発生時には、自然災害防止中央指導委員会委員長並びにトゥア・ティエン・フエ省人民委員会委員長に報告し、時間内に間に合うよう対策を講じなければならない。

e. トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会より調整池操作要請の通報を受けた場合、各県の自然災害防止及び救命捜索委員会委員長は、影響を受ける可能性がある各該当地域の村(xã)相当の人民委員会委員長に対し速やかにこれを通報し、同時に状況に応じた洪水・冠水被害防止対策の実行を指揮しなければならない。各村(xã)の人民委員会委員長は、住民に知らせるべく通報体制を整えるとともに、対応策を実行する義務を負う。

f. Ta Trach、Huong Dien 並びに Binh Dien の調整池操作命令の発令および調整に関する各種命令、通報、指揮、提言及び情報交換の際は、本項の a), b), c), d) 及び đ)において規定される各関連機関において書面化し、Fax もしくはコンピューターネットワークを用いて送信するか、電話等により直接読み上げること。報告後は経過の追跡・対照・保管のため、上記の関連機関に対し書面原本を送付しなければならない。

2. 渇水期について

本規程で規定される洪水期以外で Ta Trach、Huong Dien 並びに Binh Dien で大規模な降雨・洪水が確認された場合の調整池操作について、以下の通り決定する。

第 22 条　トゥア・ティエン・フエ省人民委員会委員長の義務

1. 各地方の各種マスメディアや放送システムを通じて、本規程の情報の整理、広報、公開説明を行い、該当地域の各機関ならびに住民の理解を促し、洪水・冠水に対して自発的な予防、処置、被害拡大防止を促すとともに、水資源の効果的な活用を目的として、各調整池の運用体制に適合した生産計画や灌漑利用計画を立てさせること。
2. 各調整池運営管理団体が本規程を実行するにあたり、検査及び監査指導に努めること。
3. 洪水・冠水の予防策の自発的立案並びに、洪水・冠水の各種状況における対応策の実行・実施について指揮すること。本規程第 7 条第 6 項並びに第 8 条第 6 項で規定される非常事態において、Ta Trach、Huong Dien 及び Binh Dien における作業を取り決めること。同時に、地域住民の安全確保並びに被害拡大防止対策の実行を指導すること。
4. Ta Trach の管理運営団体を指導し、次の安全確保対策の実行に努めること。本規程第 31 条、32 条及び 33 条の規定に従い観測・予報体制を実現し、各関連機関、組織に対し各種データ・情報を提供するよう指導すること。本規程に則った正しい調整池操作を実施できるよう、これを指導すること。
5. Ta Trach の頭首工設備の安全確保を目的とした緊急放流実施の際は、事前に政府首相及び自然災害防止中央指導委員会委員長に報告を行い、下流域の冠水対策について指導を仰ぐこと。
6. トゥア・ティエン・フエ灌漑設備開発管理 1 人有限責任会社(これ以降、トゥア・ティエン・フエ省灌漑工事開発一人有限会社と呼ぶ。)並びに地域の利水開発施設の管理運営団体を指導し、本規程で規定される調整池及びダムの運転スケジュールや時間に適した取水を実施すること。
7. 各地方自治体に対して、本規程内容に適した灌漑計画の立案を指導すること。
8. 旱魃ならびに深刻な水不足または異例の水需要が発生した場合、必要に応じて各調

整池の死水容量分の水利用も含めた計画および方策を立案して天然資源環境大臣に送達し、下流地域への調整池放流量の調節指導について見解を統一させること。

9. Ta Trach、Huong Dien、Binh Dien 並びに Thao Long ダムの管理運営団体に対し、本規程第 19 条の規定に従い流量や操作時間の調節について指導を行うこと。

10. Ta Trach 管理者に対し、放流操作時の監視カメラ設置及び自然災害防止中央指導委員会、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、天然資源環境省、商工省、ベトナム電力グループ、水資源管理局、電力調整局に対する画像情報の伝達について指導すること。また、規定の調整池放流操作のオンライン自動監視システムの設置及び建設計画について、これを指導すること。

第 23 条　洪水期における自然災害防止中央指導委員会委員長の義務

1. 洪水・冠水の発生において地方自治体では対処しきれない場合、警報発令の決定及び下流域への対応措置の実施にあたり、これを指導すること。

2. 非常事態の発生もしくは、頭首工設備の安全確保を目的とした緊急放流の場合、対処方法を提案及び政府首相への報告をおこなうこと。

3. 本規程第 5 条第 1 項で規定される特殊な状況における調整池操作について、これを決定すること。

第 24 条　商工大臣の義務

1. HD 投資株式会社、Binh Dien 水力発電株式会社並びに中部水力発電株式会社を指導し、Huong Dien、Binh Dien、A Luoi の安全確保に努めること。

2. HD 投資株式会社、Binh Dien 水力発電株式会社並びに中部水力発電株式会社に対して、本規程に従い、下流域に対する洪水軽減措置並びに水量調節操作を行うよう、指導・催促すること。本規程第 31 条、32 条及び 33 条の規定に従い観測・予報体制を実現し、各関連機関、組織に対し各種データ・情報を提供するよう指導・催促すること。調整池の水力発電の放流操作を実施する際、下流域の地域住民世帯が各種合図を確認できるような警報システム及び情報システムの設置について、これを指導・催促すること。

3. ベトナム電力グループ並びに国家給電指令センターに対して、本規程に則った下流地域への洪水軽減措置の実施期間中において、Huong Dien 並びに Binh Dien 水力発電所から最大量の電力を調達するよう、これを指導すること。各水力発電所の電力を調達する上で、本規程に則った渇水期間における各調整池の運転時期や時間に適した調達計画を立案し、調整できるように指導すること。

4. Huong Dien 並びに Binh Dien の頭首工設備の安全確保を目的とした緊急放流の実施の際には、事前に政府首相及び自然災害防止中央指導委員会委員長に報告を行い、下流域の冠水対策について指導を仰ぐこと。

5. Huong Dien、Binh Dien 並びに A Luoi の各管理者に対し、放流操作時の監視カメラ設置及び自然災害防止中央指導委員会、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、天然資源環境省、商工省、ベトナム電力グループ、水資源管理局、電力調整局に対する画像情報の伝達について指導すること。また、規定の調整池放流操作のオンライン自動監視システムの設置及び建設計画について、これを指導すること。

第 25 条　農業農村開発大臣の業務

1. 洪水期について

a) 関連する灌漑施設の安全確保の指導義務。

b) フォン川流域の灌漑施設における非常事態発生時の対処法の決定、並びに政府首相及び自然災害防止中央指導委員会委員長への報告義務。

2. 渇水期について

a) トゥア・ティエン・フエ省における灌漑設備の管理運営団体に対して、調整池放流時に水利用が可能な状態を整えるため、又水資源の浪費を防ぐために各灌漑用設備の点検・検査を行うよう、指導すること。

b) 必要時は、水源の供給能力に応じて各自治体並びに関連組織が自発的に農業用利水計画を調整できるよう指導すること。

第 26 条　天然資源環境大臣の義務

1. 本規程を公表するとともに、実行手順を案内すること。水資源管理局を始め、本規程に従い調整池操作の監査・検査を実施する各機関を指導すること。

2. 本規程第 31 条、32 条及び 33 条の規定に従い制度に準じた観測・予報・警報業務を実行し、各種データ・情報を提供できるよう国家水文気象センターを指導すること。

3. 渇水時に、各調整池において本規程に準じた操作が行えない場合、下流域への水量調節や対処法について、トゥア・ティエン・フエ省人民委員会及び関連機関を指揮し、協力してこれを統一させること。死水容量の取水業務についても、必要が生じた場合はこれを含む。

4. 本規程第 20 条第 2 項及び第 3 項の規則に従い各関連機関や組織を指揮し、協力しながら、流量や操作時間の調節について取り決めること。

5. 必要に応じて、マルチリザーバーの作業手順の改訂を PM に提出すること。

第 27 条　各関連省庁大臣の義務

任務、権限の範囲において以下の責務を負う。

1. 管轄下の各利水用施設の安全並びに、水資源利用や開発時における各作業の安全を確保できるよう、これを指導すること。

2. 洪水被害に対する対処法の構築及び本規程内容に則した水利用計画の立案にあたり、直属の各組織並びに関連機関を指導すること。

第 28 条　Ta Trach、Huong Dien、Binh Dien 及び A Luoi 池の管理運営団体の義務

1. 本規程規則に従い調整池操作を実行すること。

2. 本規程第 31 条、32 条及び 33 条の規定に従い観測・予報方式を実現し、各関連機関、組織に対し各種データ・情報を提供できるよう、気象状況並びに水文状況を追跡すること。

3. 放流操作時の監視カメラ設置及び自然災害防止中央指導委員会、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、天然資源環境省、商工省、ベトナム電力グループ、水資源管理局、電力調整局に対する画像情報の伝達について指導すること。また、規定の調整池放流操作の監視について、オンライン自動監視システムの設置及び建設計画の立案について、これを指導すること。

4. 洪水期について

a) 操作命令の実行に関する義務は以下の通り規定される：

- Ta Trach、Huong Dien 並びに Binh Dien の各管理運営団体代表者は、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長の調整池操作命令を実行する義務を負う。
- 非常事態の発生時や操作命令通りに実行できなかった場合、調整池管理運営団体代表者は操作命令の発令者に対して速やかに報告せねばならない。
- 連絡手段が絶たれた場合、または管轄機関の操作命令を受信できない場合やその他非常事態が発生した場合、調整池管理運営団体代表者は本規程に従い操作命令を取り決めるとともに、自発的に速やかに各種対応策を実行すること。

b) 放流口の操作実施にあたり、各調整池の管理運営団体代表者はトゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長、中央水文気象予報センター、中中部地区水文気象台に対して、速やかにこれを通知せねばならない。

c) 本規程第 10 条に従い、調整池操作実施時の各施設の安全確保に努めること。調整池操作時は各施設の安全を確保するため、自然災害防止中央指導委員会並びにトゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長に対し、速やかにこれを報告せねばならない。

d) 本項の b)、c)で規定する各機関に対して報告をおこなう際は、Fax による送信もしくはコンピューターネットワーク利用による転送、または電話や無線通信(ICOM)を用いて直接読み上げること。報告後は経過の追跡・対照・保管のため、上記の関連機関に対し書面原本を送付しなければならない。

5. 洪水期について

a) 事故発生時もしくは旱魃や渇水の発生時において本規程に則った調整池操作の実施が保証できない場合、各調整池の管理運営団体代表者は対処法を提案し、下流地域に対する水量調節案を統一するべく、これを天然資源環境省並びにトゥア・ティエン・フエ省人民委員会に報告せねばならない。

b) 本規程第 31 条に則した観測、予報方式を実現し、各種データ・情報を提供すること。

第 29 条　Thao Long ダム管理運営団体代表者の義務

1. 本規程に則り Thao Long ダムの操作を行うこと。
2. 本規程第 33 条に則した観測、予報方式を実現し、各種データ・情報を提供すること。
3. 事故発生時もしくは旱魃や渇水の発生時において本規程に則った操作を保証できない場合、管理運営団体代表者は対処法を提案し、各調整池に対して実施する下流地域への放流量調節指導において指導内容を統一するため、これを天然資源環境省並びにトゥア・ティエン・フエ省人民委員会に報告せねばならない。

第 30 条　各施設の安全に対する義務

1. Ta Trach、Huong Dien 及び Binh Dien に対する洪水調整操作命令の発令おいて、本規程規則への違反によって、頭首工設備・各灌漑設備システム・下流域の交通網や市民生活の安全が脅かされた場合、操作命令発令者はこの法的責任を取らなければならない。

2. 操作命令の実行ミスにより、頭首工設備・各灌漑設備システム・下流域の交通網や市民生活の安全が脅かされた場合、調整池管理運営団体の代表者はこの法的責任を取らなければならない。

3. 施設設備の作業工程中に頭首工設備にて事故発生の危険性が確認され、即座に調整が要請される場合、関係する各調整池の管理運営団体代表者は、Ta Trach の場合はトゥア・ティエン・フエ省人民委員会委員長に対して、Huong Dien 並びに Binh Dien の場合は商工省、ベトナム電力グループ、国家給電指令センターに対して、これに対処するため、事故の報告及び対応策を提案する義務を負う。同時に、下流域の洪水防止業務を指導できるよう、自然災害防止中央指導委員会並びにトゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長に対してもこれを報告すること。

4. 下流地域の灌漑設備において事故発生が確認された場合、トゥア・ティエン・フエ省人民委員会はこれに対処するため、農業農村開発省に事故の報告および対応策を提案する義務を負う。同時に自然災害防止中央指導委員会にも報告すること。

5. 規定に従い、毎年洪水期前に総合点検を実施すること。各調整池の管理運営団体代表者は各付属設備や施設項目の検査を実施するとともに、規定の業務体制に従い操作を行えるよう修理する義務を負う。また自然災害防止中央指導委員会、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会委員長並びに下記の機関に対してこれを報告し、監督、指導を仰ぐこと。

   a) Huong Dien 並びに Binh Dien は、商工省及びベトナム電力グループにこれを報告すること。

   b) Ta Trach はトゥア・ティエン・フエ省人民委員会にこれを報告すること。

6. 施設設備で事故が発生した場合、もしくは 8 月 31 日時点までに各付属設備の修理が完了しない場合、調整池管理運営団体代表者は第 5 項で規定された各関連機関に対し、対処に関して指導を仰ぐべくこれを報告せねばならない。

第 31 条　洪水期の観測体制及び予報方式

1. 通常の天候状況において第 2 項で規定される降雨や洪水をもたらす気象現象が未だ確認されない場合、各機関、団体は以下の通り観測・予報方式を実現すること。

   a) 中央水文気象予報センターは毎日 11 時に 1 回、Kim Long、Phu Oc 各観測所にて気象予報を行うこと。

   b) 中中部地区水文気象台は毎日 11 時に 1 回、Kim Long、Phu Oc 各観測所にて気象予報を行うこと。

   c) Ta Trach 管理運営団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社は毎日、以下の観測予報業務を実施すること。

      - 少なくとも 1 日 4 回、1 時、7 時、13 時、19 時の各時点において、調整池の貯水位と流入量、ダム放流口と発電所の通過流量について、これを観測、計測すること。

      - 10 時前 1 回、予報通知を行うこと。通知内容は次の内容を含まなければならない。作成時点ならびに 6 時、12 時、18 時及び深夜 24 時の各時点における調整池の流入量と貯水位、6 時、12 時、18 時及び深夜 24 時の各時点における放流量の予測総量。

2. 緊急の台風や沿海熱帯低気圧もしくは各種大雨洪水をもたらす気象現象の予報が出され、フォン川流域の各地域に直接的な影響が懸念される場合、各機関、組織は以下に記す観測・予報方式をとり、洪水収拾時までこれを維持すること。

a) 中央水文気象予報センター

- 各種気象予報及び気象警報を通知すること。予報及び警報の実施頻度については、2014 年 8 月 15 日発行の政府首相による自然災害時の予報警報に関する決定 46/2014/QĐ-TTg（以降、46 決定と呼ぶ。）に従うこと。
- 規定に従い、フォン川水系に属する各水文気象観測所における降雨や水位の観測データの収集を行うこと。
- Kim Long、Phu Oc の各観測所において、緊急の洪水や冠水予報を行うこと。予報実施頻度は、46 決定の規定内容に従うこと。

b) 中中部地区水文気象台

- Kim Long、Phu Oc の各観測所において洪水警報を発令すること。予報実施頻度は、46 決定の規定内容に従うこと。
- フォン川水系に属し管理責任を有する各水文気象観測所における降雨や水位の観測データの収集を行い、電報業務についてこれを決めること。
- Kim Long、Phu Oc の各観測所における水位や洪水情報、緊急洪水情報の予報を実施すること。予報実施頻度は、46 決定の規定内容に従うこと。
- Kim Long 水文観測所の観測水位が 1.7m、 Phu Oc 水文観測所の観測水位が 2.7m に到達し共に警報レベル 2 に達する時刻を確認、予報し、その経過を観察すること。

c) Ta Trach 管理団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社は以下に記す観測、予報業務を実施すること。

- 少なくとも 15 分毎に 1 回、調整池の貯水位と流入量、ダム放流口と発電所の通過流量を観測、計測すること。
- 定期的に 3 時間に一度、調整池の洪水予報を通知すること。予報内容は以下の情報を含むこと。予報時点及び 6 時、12 時、18 時、深夜 24 時の各時点における調整池の貯水量と流量。6 時、12 時、18 時、深夜 24 時の各時点における放流量の予測総量。また、調整池の洪水時における最大流入量出現時刻の予報情報を必ず含むこと。

3. 中央水文気象予報センターは毎年 11 月 15 日より以前に、水文及び気象状況の変化傾向を判断し、情報を提供するほか、本規程の第 12 条に従った各調整池の操作業務の調整に役立つように、およそ 11 月 15 日から 12 月 15 日までの洪水の可能性についても情報提供を行うこと。

第 32 条　洪水期の情報提供並びに報告義務

1. 通常の天候状況において、降雨や洪水をもたらす気象現象が未だ確認されない場合、各機関、団体は以下の通り観測・予報業務を行うこと。

a) 中央水文気象予報センターは、本規程第 31 条、第 1 項 a)の規定に則り毎日 12 時より以前に自然災害防止中央指導委員会に対し、情報提供を行うこと。

b) 中中部地区水文気象台は毎日 12 時より以前に、トゥア・ティエン・フエ省自

然災害防止及び救命捜索委員会、Ta Trach 管理運営団体、HD 投資株式会社、Binh Dien 水力発電株式会社並びに中部水力発電株式会社に対して、本規程第 31 条、第 1 項 b)に規定される気象予報の提供を行うこと。

c) Ta Trach 管理団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社は、気象予報情報及び本規程第 31 条、第 1 項 c)で規定される各種観測・計測データについて、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、国家給電指令センター、中央水文気象予報センター並びに中中部地区水文気象台に対して、毎日 10 時より以前にこれらの情報を提供せねばならない。

2. 緊急の台風や沿海熱帯低気圧もしくは各種大雨洪水をもたらす気象現象の予報が出され、フォン川流域の各地域に直接的な影響が懸念される場合、各機関、組織は以下に記すデータ及び情報を提供せねばならない。

a) 中央水文気象予報センターは、本規程第 31 条、第 2 項 a)で規定される各種データ、気象予報、気象警報情報について、自然災害防止中央指導委員会、農業農村開発省、商工省、ベトナム電力グループに対し、速やかに、また連続してこれを提供せねばならない。

b) 中中部地区水文気象台は、本規程第 31 条、第 2 項 b)で規定される各種データ、気象予報、気象警報情報について、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、Ta Trach 管理運営団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社に対し、速やかに、また連続してこれを提供せねばならない。

Kim Long 水文観測所の観測水位が 1.7m に到達し警報レベル 2 である場合、又 Phu Oc 水文観測所の観測水位が 2.7m に到達し警報レベル 2 である場合は、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、Ta Trach 管理運営団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社に対し、速やかにこれを報告せねばならない。

c) Ta Trach 管理団体、HD 投資株式会社、Binh Dien 水力発電株式会社はトゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、国家給電指令センター、中央水文気象予報センター並びに中中部地区水文気象台に対して予報情報を速やかに提供しなければならない。その際は本規程第 31 条第 2 項 c)で規定される観測・計測データを添えること。

3. 報告義務

Ta Trach 管理団体、HD 投資株式会社、Binh Dien 水力発電株式会社は洪水軽減措置の結果報告並びに施設稼働状態の報告義務を持つ。報告業務は以下の通り。

a) 調整池の管理運営各団体は洪水軽減措置の実施結果、洪水後の調整池稼働状況及びその他の関連情報について、自然災害防止中央指導委員会、トゥア・ティエン・フエ省自然災害防止及び救命捜索委員会、商工省、ベトナム電力グループ、国家給電指令センター並びに水資源管理局がこれを監督、指導できるように、洪水後遅くとも 2 日以内に報告せねばならない。

b) 調整池の各管理運営団体は毎年 12 月 31 日までに、洪水期の調整池の稼働結果や稼働状況について報告するとともに、各種提案や提言並びにその他の関連情報について、自然災害防止中央指導委員会、トゥア・ティエン・フエ省自然災害防止及び

救命捜索委員会、商工省、農業農村開発省、ベトナム電力グループ、国家給電指令センター並びに水資源管理局に対しこれを報告する義務を負う。

4. 各種情報・データの提供方法

第 1 項及び第 2 項にて規定されている各関連機関及び部局に情報・データを提供する際、以下の方法を用いるものとする。

a) Fax 使用

b) 郵便による文書の送付

c) コンピューターネットワーク使用による通知転送

d) 電話での直接連絡

第 33 条　渇水期における観測、予報方式並びに情報提供と報告義務

1. 観測および予報実施の義務

a) 国家水文気象センター並びに天然資源環境省は各直属組織に対して、これを指導し、業務配分を行う義務がある。

- 水文気象に関する各指数の測量及び観測を実施すること。フォン川水系に属する観測網全体の水量及び降雨データを対象とする。
- 毎月 1 日より翌月まで、フォン川流域の水文及び気象状況における変化傾向を確認すること。

b) Ta Trach の管理組織、HD 投資株式会社、Binh Dien 水力発電株式会社並びに中部水力発電株式会社について、

- 調整池への流入量、ダム放流口通過流量、発電所通過流量、上流域水位、下流域水位の測量・観測について、少なくとも 1 日 2 回、7 時から 19 時までの間にこれを実施すること。
- 毎月 1 日、11 日、21 日において、向こう 10 日間の調整池流入量及び貯水位を予測し、報知すること。

c) トゥア・ティエン・フエ省灌漑工事開発一人有限会社は、Thao Long ダムを通過してフォン川下流域方面へ向かう流量及び水位の測量・観測を実施すること。頻度は少なくとも 1 日 2 回、7 時から 19 時までとする。

2. 各種情報・データの提供義務

a) 国家水文気象センターは直属機関に対し、第 1 項の a)に規定される各種データについて、トゥア・ティエン・フエ省人民委員会、国家給電指令センター、Ta Trach 管理運営団体、HD 投資株式会社、Binh Dien 水力発電株式会社並びに中部水力発電株式会社に対してこれを提供するよう業務を配分し、指導を行うこと。

b) Ta Trach 管理団体、HD 投資株式会社、Binh Dien 水力発電株式会社並びに中部水力発電株式会社は、トゥア・ティエン・フエ省人民委員会、水資源管理局、中央水文気象予報センター、中中部地区水文気象台、国家給電指令センターに対して、以下に規定する各種データを提供すること。

- 各調整池の上流域及び下流域の水位、過去 10 日間で実測された調整池への流入量及び下流域への放流水量の総量に関するデータ提供。毎月 1 日、11 日、21 日の 11 時以前に提供すること。
- 以後 10 日間で予想される調整池への流入量及び下流域への放流水量の総量に関

するデータ提供。毎月 1 日、11 日、21 日の 11 時以前に提供すること。

c) Ta Trach 管理団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社はトゥア・ティエン・フエ省灌漑工事開発一人有限会社に対し、向こう 10 日間の放流計画について報告せねばならない。

d) Ta Trach 管理団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社は水資源管理局及びトゥア・ティエン・フエ省人民委員会に対して、渇水期初頭、並びに付録 3 に規定される貯水位が確保できない場合の水位情報について、直ちにこれを報告せねばならない。

e) トゥア・ティエン・フエ省灌漑工事開発一人有限会社は Thao Long ダムの貯水位について、本規程第 18 条の規定内容を担保できない場合、トゥア・ティエン・フエ省人民委員会委員長、Ta Trach 管理運営団体、HD 投資株式会社並びに Binh Dien 水力発電株式会社に対して直ちにこれを報告せねばならない。

3. 各種情報・データの提供方法

第 1 項及び第 2 項にて規定されている各関連機関及び部局に情報・データを提供する際、以下の方法を用いるものとする。

a) Fax 使用

b) 郵便による文書の送付

c) コンピューターネットワーク使用による通知転送

d) 電話での直接連絡

第 34 条　フォン川流域の調整池群における操作規程の実現段階において、修正及び補足が必要な個所が見受けられた場合、トゥア・ティエン・フエ省人民委員会委員長並びに各関連機関・組織の代表者によって文書をもって建議され、天然資源環境大臣がこれを審議し、政府首相に提出後、政府首相により審査、決定されるものとする。

付録 1

各調整池の基本仕様一覧表

(2015 年 12 月 30 日発行の政府首相による決定書 2482/QĐ-TTg 内の規程に付随して公布された。)

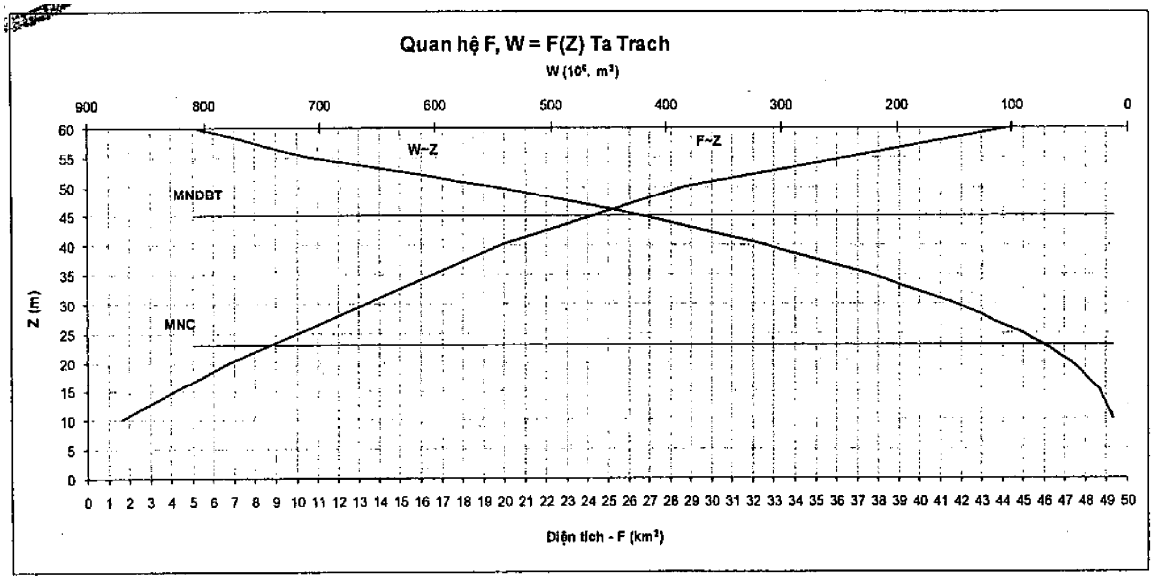
項目番号	仕様	単位	調整池名称			
			Binh Dien	Ta Trach	Huong Dien	A Luoi
I	流域特性					
1	流域面積	km^2	515.0	717	707	331
2	年間平均流量	m^3/s	41.70		82.6	27.06
3	(P)頻度に対応した最大流量					
-	P = 0.1%	m^3/s	6, 989.0	14, 200	9, 430	5, 756
-	P = 0.5%	m^3/s	5, 187.0	11, 200	6, 920	
-	P = 1%	m^3/s			5, 890	4, 276
-	P = 5%	m^3/s			3, 950	
-	P = 10%	m^3/s			3, 170	
II	調整池					
1	常時満水位	m	85.0	45	58	553
2	最低水位	m	53.0	23	46	549
3	P=0.5%に対応した最高貯水位	m	85.16	50	58.17	
4	P=0.1%に対応した最高貯水位	m	85.96	53.07	59.93	
5	総貯水量	10^6m^3	423.68	420.5	820.66	60.2
6	有効貯水量	10^6m^3	344.39	347.9	350.80	24.4
7	死水容量	10^6m^3	79.29	72.6	469.86	35.8
8	常時満水位の湛水面積	km^2	17.08		33.87	8.2
9	最高水位時の洪水調節容量 (P=0.1%)	10^6m^3		556.20		
10	最高水位時の洪水調節容量 (P=0.5%)	10^6m^3		435.93		
III	発電所通過時の流量					
1	正常流量　(90%)	m^3/s	21.99		43.96	
2	最大流量	m^3/s	72.00	80.32	196.10	43.3
3	最低流量	m^3/s		29.93	30	
IV	出力					
1	設備容量	MW	2x22	21	3x27	2x85
2	保証出力	MW			18.6	

付録 2

各調整池の水位、面積、容積の相関図

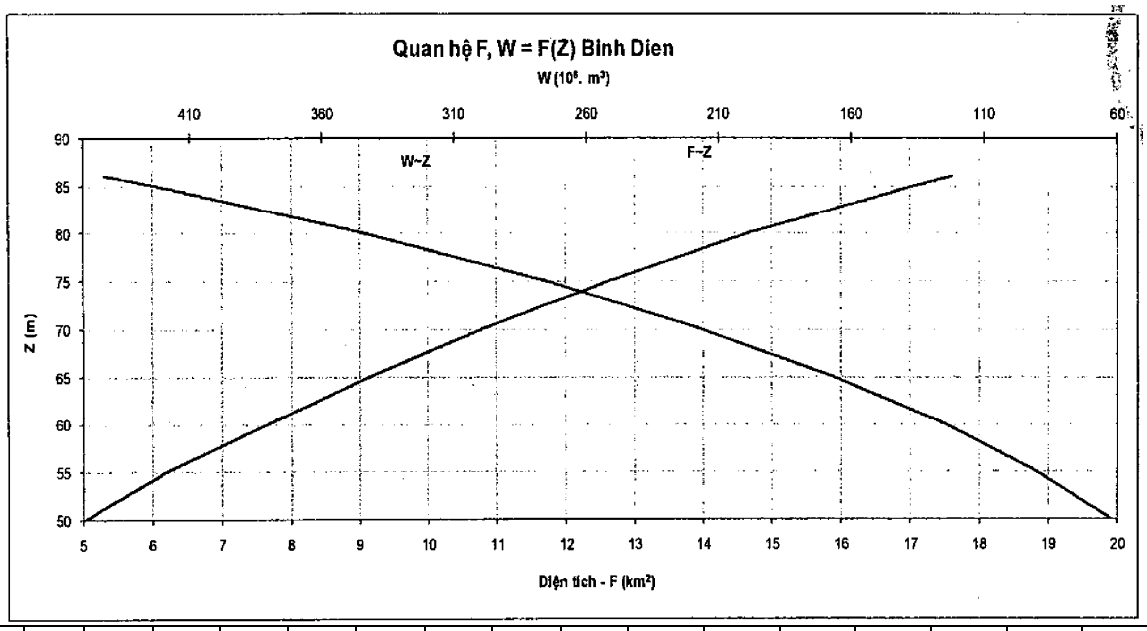
(2015 年 12 月 30 日発行の政府首相による決定書 2482/QĐ-TTg 内の規程に付随して公布された。)

TA TRACH



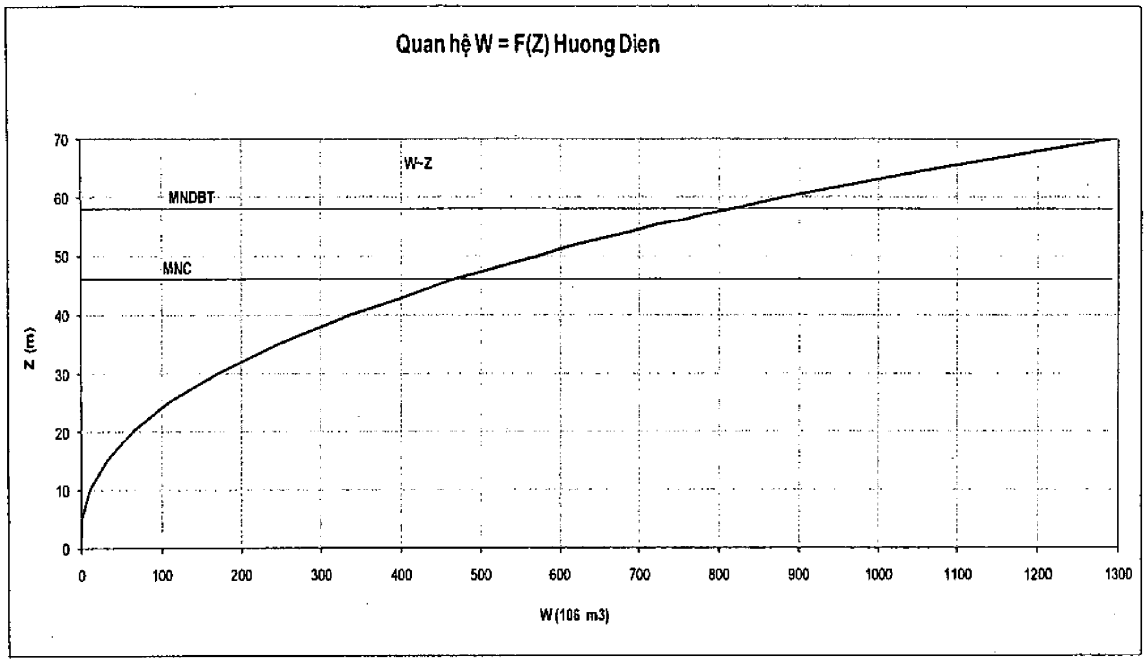
Z(m)	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
F(km^2)	1.69										6.78						
W(10^6m^3)	12	14.3	16.7	19	21.4	23.7	28.5	33.3	38.2	43	47.8	56.3	64.9	73.4	82	90.5	102
Z(m)	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
F(km^2)				13.4										19.9			
W(10^6m^3)	114	126	138	149	164	179	194	209	224	242	260	278	296	314	335	356	378
Z(m)	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
F(km^2)							28.7										44.4
W(10^6m^3)	399	420	446	471	497	522	548	580	612	645	677	709	729	749	769	789	809

BINH DIEN



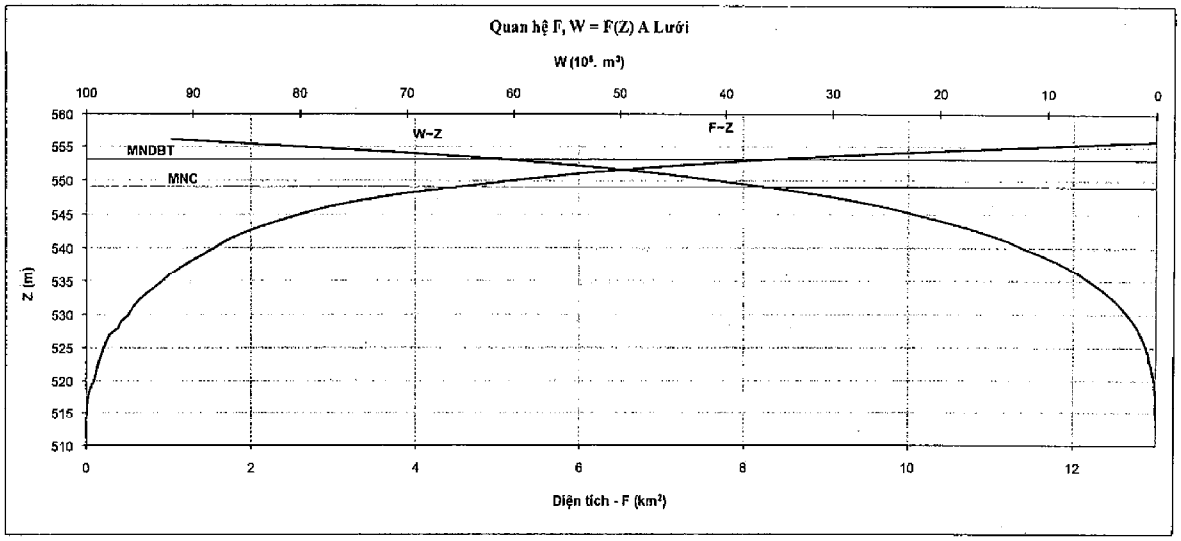
Z (m)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
F(km^2)	0	0.094	0.356	0.993	1.791	2.883	3.848	5.037	6.207	7.678	9.167	10.805	12.651	14.683	17.083	19.739	22.426
W (10^6m^3)	0	0.24	1.36	4.73	11.7	23.38	40.21	62.42	90.53	125.25	167.36	217.29	275.93	344.27	423.68	515.74	612.15

HUONG DIEN



Z(m)	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
W(10^6m^3)	0	1.3	10.25	31.96	64.68	110.3	172.1	247.6	337.7	444.3	572.2	720.5	887.5	1081	1239

A LUOI



Z(m)	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526
F(km^2)	0	0.002	0.004	0.008	0.015	0.023	0.04	0.06	0.1	0.12	0.14	0.16	0.19	0.21	0.25
W(10^6m^3)	0	0.001	0.004	0.01	0.022	0.041	0.07	0.12	0.2	0.31	0.44	0.6	0.77	0.97	1.2
Z(m)	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541
F(km^2)	0.29	0.39	0.43	0.51	0.56	0.63	0.71	0.82	0.92	1.02	1.14	1.27	1.4	1.54	1.7
W(10^6m^3)	1.47	1.81	2.22	2.69	3.22	3.82	4.49	5.25	6.12	7.09	8.17	9.38	10.71	12.19	13.81
Z(m)	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556
F(km^2)	1.87	2.08	2.32	2.59	2.93	3.32	3.8	4.47	5.16	5.98	6.99	8.2	9.68	11.36	13.326
W(10^6m^3)	15.6	17.57	19.77	22.23	24.99	28.11	31.67	35.8	40.61	46.17	52.65	60.23	69.16	79.67	92.00

付録 3

各観測時点における調整池の最低水位

(2015 年 12 月 30 日発行の政府首相による決定書 2482/QĐ-TTg 内の規程に付随して公布された。)

観測日時	調整池名称		
	Ta Trach	Binh Dien	Huong Dien
16/12	38.1	79.0	53.1
21/12	38.1	79.0	53.1
01/01	38.1	78.7	53.1
11/01	38.1	78.4	53.1
21/01	38.1	78.4	53.1
01/02	38.1	78.4	53.1
11/02	37.8	77.5	52.7
21/02	37.4	76.6	52.4
01/3	37.0	75.8	52.0
11/3	36.6	74.9	51.6
21/3	36.0	73.7	51.2
01/4	35.3	72.4	50.7
11/4	34.8	71.5	50.3
21/4	34.1	70.5	50.0
01/5	33.5	69.4	49.7
11/5	32.9	68.2	49.6
21/5	32.5	67.2	49.5
01/6	31.7	66.8	49.1
11/6	30.7	65.8	49.1
21/6	30.4	65.2	48.9
01/7	29.4	63.7	48.6
11/7	28.1	62.1	48.2
21/7	27.4	60.8	47.8
01/8	26.1	58.7	47.3
11/8	25.3	56.9	46.9
21/8	24.3	55.2	46.4
31/8	23.0	53.0	46.0