# 第5章　環境配慮と地下水モデル解析

## 5-1　環境配慮と事前スコーピング

### 5-1-1　環境社会配慮に係る法体制

- 「フィ」国では以下の環境法により環境配慮手続きが体系化されている。
- 大統領令第984号（1976年制定）: Pollution Control Law最初に制定された汚染規正法として、廃棄物・下水／排水処理等の定義から罰則等にも言及している。
- 大統領令 1151 号「フィ」環境政策（Presidential Decree: PD No.1151: Philippines Environmental Policy）1977 年制定人間と自然の調査・共存、「フィ」国民のよりよき将来と生活を維持するための環境保全を謳う、基本政策大統領令 1152 号「フィ」環境基準（PD No.1152 Philippine Environmental Code）1977 年制定。
- 大統領令 1586 号 EIS（PD No.1586 Environmental Impact Statement System）1978 年制定。
- 上記 1152、1586 号により「フィ」国における環境基準および環境影響評価手続き（EIS）が確立された。
- 布告第2146号（1981年制定）: 環境的に保護すべき区域及び環境への影響が考慮されるべきプロジェクトの配慮への布告。
- 環境・天然資源省令 No.34（1990 年制定）: 水質基準等を含む環境汚染防止法として、飲料水及び排水（家庭、工場を含む）の水質基準を規定したものであり、上・下水とも基準は溶存酸素、pH、BOD、有機物質と貴金属等かなり詳細な規定がなされている。
- 環境・天然資源省令 No.35（1990 年制定）: 大統領令 984 号を受け継いで環境。
- 天然資源省は排出基準の改定を行った。これは「排出基準改定 1990 年版」と呼ばれ、基準ないし規則は工業ないし市町村の家庭排水に適用される。また、ここでは、用語の定義をさらに、技術的に行っており、同 34 号で使用用途に応じて分類された河川（Class AA～Class B）での BOD、DO、COD、重金属の規定値等を定め、産業排水・家庭排水を規制し、河川水の保護を目的としている。

- 環境・天然資源省令 No.42（2002 年制定）: 大統領令 1586、1978 年制定の基準等他の目的も含む環境影響評価制度の実行をはかるため、環境・天然資源省（DENR）の担当局長及び地方局長に対し、環境審査免除証明や環境応諾証明書を発行する権限を与えている。

### 5-1-2 環境規則に係る所轄官庁

環境・天然資源局（DENR: Department of Environment and National Resources）、及び DENR 下の環境管理局（EMB: Environment Management Bureau）、保護区・野生生物事業部(EMPAS: Environment Management and Protected Areas Services) が管轄する。

### 5-1-3 環境影響に関連した本調査地域の開発計画

セブ都市圏の 4 都市 4 町の内、コンポステラ町を除く、4 市 3 町では各々の総合開発・土地利用計画が以下のように作成されている。これらは環境改善、環境負荷を軽減するためのプロジェクトである。

- セブ市: 下水処理将来計画（1995）および雨水排水総合計画(2003)。
- ラプラプ市: 総合開発計画 及び都市開発戦略計画（1999～2020）。
- マンダウエ市: マンダウエ市開発戦略計画（2002～2005）によれば総合雨水排水システム計画は最優先計画とされており、雨水排水路計画整備が約 70%程度の進捗を示している。
- タリサイ市: 2010 年を目標とした Talisay City Comprehensive Land Use Plan (2001～2010)において中央集中型雨水排水路を整備する方針である。
- コンソラシオン町: 総合土地利用計画（2001～2010）。
- リロアン町: 総合開発計画(2000～2020)。
- コルドバ町: 総合土地利用計画及び区画法（2004～2014）。
- コンポステラ町では明確な開発計画は確認されなかった。

### 5-1-4 環境社会配慮（環境影響評価）の手続き概要

1978 年に改定発布された大統領令第 1586 号（環境影響評価システム及び環境管理基準等に関する政令）に基づき、計画される全てのプロジェクトは以下に述べる環境審査の手続きを踏まなければならない。「フィ」国の環境審査では、申請するプロジェクトが、

(1) ECAs (Environmentally Critical Areas 環境的に配慮を必要とする地域)であるか、

(2) ECPs (Environmentally Critical Projects 環境に重大な影響を及ぼすとみなされるプロジェクト)

に該当するかの判断が最初に行われる。どちらにも該当しない場合は、環境審査免除証明（Certificate of Non Coverage）が発行される。

### 5-1-5 本調査の環境影響の検討

本調査は持続的な地下水利用と地下水汚染防止のための地下水モデル解析、および下水道事業化支援調査であるため、対象地域の環境の改善に大きく寄与するものであり、表 5-1 に示すとおり、本プロジェクトは ECAs や ECPs に該当するものではない。したがい、ECAs や ECPs の詳細な審査手続きの記述は無用と考えるので割愛する。

なお、本調査では地下水調査を目的とするボーリング(調査孔)を計画するので、事前スコーピング（負のインパクト及びその緩和措置）を評定した結果を表 5-1 に示す。

**表 5-1　スコーピングチェックリスト(本格調査におけるボーリング調査)**

| 環境項目 | | | 評定 | 根 拠 |
|---|---|---|---|---|
| | 1 | 住民移転 | D | 上下水道施設建設を想定しておらず、また、本格調査で掘削予定の調査孔の規模は小さく、用地取得による住民移転が起こる可能性はない。 |
| | 2 | 経済活動 | D | 経済活動への影響はない。 |
| | 3 | 交通・生活施設 | D | 交通・生活施設への影響は特にない。 |
| | 4 | 地域分断 | D | 同上の理由により、地域分断の可能性はない。 |
| | 5 | 遺跡・文化財 | D | 調査孔掘削は遺跡・文化財に影響しない。 |
| | 6 | 水利権・入会権 | D | 本格調査の調査孔は生産井戸に転換されることはない。水利権・入会権への影響は特にない。 |
| | 7 | 保健衛生 | D | 上下水道施設建設を想定していない。調査孔が生産井戸に転換されることはないので保健衛生に影響しない。 |
| | 8 | 廃棄物 | D | 本格調査の調査孔の規模は小さく、施工時掘削残土、廃材の発生はきわめて限定的である。 |
| | 9 | 災害（リスク） | D | 調査孔掘削による災害の可能性はない。 |
| | 10 | 地形・地質 | D | ハイダム建設時可能性なし。 |
| | 11 | 土壌浸食 | D | 特になし。 |
| | 12 | 地下水 | D | 地表の汚水が地下水浸透、地下水の水源を汚染する可能性を調査し対策立案する本調査目的の趣旨から、負影響はありえない。 |
| | 13 | 湖沼・河川流況 | D | 特になし。 |
| | 14 | 海岸・海域 | D | 主として内陸でのボーリング工事のため影響ない。 |
| | 15 | 動植物 | D | ダム建設の場合のような影響はない。 |
| | 16 | 気象 | D | 特になし。 |
| | 17 | 景観 | D | 特になし。 |
| | 18 | 大気汚染 | D | 特になし。 |
| | 19 | 水質汚濁 | D | 本格調査の提言により水質改善が期待される。 |
| | 20 | 土壌汚染 | D | 特になし。 |
| | 21 | 騒音・振動 | D | 井戸掘削による騒音・振動は短期間で軽微である。 |
| | 22 | 地盤沈下 | D | 調査ボーリングからは地盤沈下の可能性がない。 |
| | 23 | 悪臭 | D | 特になし。 |

（注1）評定の区分
A：重大なインパクトが見込まれる
B：多少のインパクトが見込まれる
C：不明（検討をする必要はあり、調査が進むにつれて明らかになる場合に考慮にいれるものとする）
D：ほとんどインパクトは考えられないためIEE あるいはEIA の対象としない
（注2）評定に当たっては、該当する項目別解説書を参照し、判断の参考とすること

本格調査においては上下水道施設の建設を想定しておらず、「社会環境」への影響はないが土地取得に関する制度として、下記の「フィ」国の法律がある。

“2000 年: Republic Act No. 8974, An Act to Facilitate the Acquisition of Right-Of-Way, Site or Location for National Government Infrastructure Projects and For Other Purposes”

同法は、用地価格の査定方法等に加え用地買収にともない発生しうる環境社会インパクトへの配慮について規定している。およそ 10 本の調査孔の地点選定は MCWD 用地や LGUs の公共用地を優先的に選ぶ予定と聞いている。私有地の場合、MCWD は調査期間内の借地として、限定することも考慮するという。

## 5-2　地下水モデル解析

### 5-2-1　これまでに実施された地下水モデル解析

セブ都市圏の地下水ポテンシャル評価と地下水保全、特に亜硝酸イオン（$NO_3$）による地下水汚染の原因究明は、本格調査の重要なテーマである。地下水モデル解析を有効に、また過去の事例からの教訓を最大限に反映して、本格調査では実のある地下水モデル解析結果を出す必要がある。

これまで 3 回の地下水解析が当地域で実施されている。それらの経緯、調査内容、成果と成果に対する評価などを以下の表 5-2 に示す。1983 年、LWUA はセブ都市圏で独の Lahmeyer 社などの JV に委託し、地下水モデル解析（2 次元）を行った。2004 年に MCWD はオランダ政府の支援とサン・カルロス大学 WRC との共同で HYMOS と RIBASIM のソフトを用いたタンクモデルで解析した（WRP レポート）。この結果、セブ都市圏では北部（Costela 一帯）と南部（Talisay 一帯）にポテンシャルが残されており、未利用のまま海に流れている地下水を有効利用できるとした。このデータベースは MCWD に移管されている。

一方、NWRB は同時期（2004 年 10 月）にフィリピン大学と CEST Inc 社に委託し、セブ都市圏の地下水シミュレーション（USGS の MODFLOW ソフトを利用）を実施した。その成果から、セブ都市圏の井戸の利用を規制する地域を特定し、NWRB は 2007 年 5 月に当地域の地下水利用のガイドラインを発効している。

**表 5-2　3 回の地下水モデル解析の内容**

| | 1 回目 | 2 回目 | 3 回目 |
|---|---|---|---|
| 報告書 | 1983 年 10 月、86 年 10 月 | 2006 年 3 月 | 2004 年 10 月 |
| 調査目的 | 急激な乱開発による地下水障害が発生しないかを予測 | 地下水の開発ポテンシャル評価 | 顕在化した地下水障害を防止するための開発規制ガイドラインの策定 |
| 発注機関 | LWUA | MCWD | NWRB |
| 実施機関 | CEBU コンサル<br>Lahmeyer Int と KKLI | サン・カルロス大学<br>オランダ政府 WRP | フィリピン大学<br>CEST コンサル |
| 使用ソフト | 差分法 | タンクモデル | Modflow |
| モデル諸元 | 0.5km～2km サイズ、海から山側に約 10km、約 10 層に区分 | 海から山側に約 10km で流域毎分割 | 0.5km サイズ、海から山側に約 10km、約 10 層に区分 |
| 解析範囲 | Compostela から Talisay に至る海岸沿いの平地とマクタン島 | | |
| 解析に用いたデータ | 47 揚水試験データ<br>47 井戸柱状図と地質情報 | 水理地質情報使わず | 揚水試験データのみ<br>47 井戸データを用いたかどうか不詳 |
| **検証方法** | **1979 年の地下水位コンタ** | **なし** | **1979 年と 2004 年の地下水位コンタ** |
| 成果と提言 | 開発者側に有利な結果になっている | | 開発者側に辛辣な結果になっている |
| 評価と問題点 | Modflow の原点である差分法を用い当地で初めて各種水理地質情報を整理した大作。当時は画期的な成果であるが、データの量と質は疑問ある。浸透量の推定方法が不明。 | 水理地質情報を使っていない。雨-河川流量から水収支をしている。当地の水理地質状況を反映してない。 | Modflow の密度流解析（Seawater Intrusion）を利用し海水進入を使い検証していない。透水係数が極端に小さいためか、G/W/L の Cone が現実と合わない、とするコメントが WRC と MCWD から出ている。 |
| 教訓と本格調査への提案 | 地下水汲み上げ量を時系列的に用いるべき。LGWA が開発した井戸と民間大口地下水利用データを入れるべき。調査ボーリングによって連続する垂直方向の透水係数情報を明らかにすべき。多点（メッシュ毎）の雨水浸透能を確認すべき。108 本生産井戸の再揚水試験結果のうち回復試験による透水係数を用いるべき。シンクホールから流れているであろう地下河川の流路方向とその透水係数を知るため、潮汐到達時間差を測って地下河川と透水性を明らかにすべき。1979 年と 2004 年の地下水位コンタはそれらの井戸のレベル測量をして精度を上げるべき。2 つの過去の地下水位コンタに加え、2006 年と 07 年の詳細コンタ(各月)を得て活用すべき、及び過去 3 回の塩分濃度コンタ図を用いモデルを検証すべき。 | | |

上記、3 回の地下水モデル解析は其々、地下水開発を規制する側と開発当事者側に分かれ実施されて利害が対立するため、相互に有益な情報交換をしつつ実施されているとは言い難い。本格調査ではMCWD をカウンターパートとするが、上記 3 回目の地下水モデル解析を指導したフィリピン大学の Dr. Leonardo Liongson, Director, UP-NHRC らとよく意見交換をおこない、中立の立場から精度がよい結果を出すよう留意するべきである。

### 5-2-2 地下水モデル解析を実施すべき範囲とデータの質と量

MCWD が計画する新規井戸地点は北へ Carmen、南へ Talisay 市におよぶ全長約 50km におよんでいる(表 5-3 参照)。本格調査で行うべき地下水解析のモデル設定範囲は、上記 3 回の解析範囲とほぼ一致する。ただし、山側の境界設定位置は Cebu 市、Mandaue 市、Talisay 市にある各河川の最上流域までをカバーする必要がある。

**表 5-3 MCWD の地下水開発予定**

| 開発予定年度 | 地点名と井戸数 | 予想ポテンシャル | 調査・検討方針、記事 |
|---|---|---|---|
| 2007 | Jaclupan、4 井戸 | 大 | Mananga 川中流部であり、有望 |
| 2008 | Lagtang、2 井戸 | 大 | Mananga 川の河床近くに位置する。掘削工事中。現地で確認したところ、深度 73m。80m まで掘削する予定 |
| 2008 | Tisa、 1 井戸 | 小さい | 地下水位低下と塩水化を慎重に予測する |
| 2008 | Prado、2 井戸 | | |
| 2008 | Lahug、4 井戸 | 小さい | |
| 2009 | Cabangkalan、1 井戸 | 大 | Butuanon 川からの涵養が大きい |
| 2008 | Kamputhaw、1 井戸 | | |
| 2009 | Casili、4 井戸 | 中 | Consolacion 付近はかっては有名な湧水地点 |
| 2009 | Mactan Fresh、15 井戸 | 絶望的 | 年間の雨水からの涵養量とその回収率の技術限界から計画の 1/10 くらいが妥当 |
| 2010 | 1 期試掘井戸、Bulacao | | |
| 2010 | 1 期試掘井戸、Lawa-an | 中～大 | ポテンシャルが大となる条件は既存井戸が少ない事 |
| 2010 | 1 期試掘井戸、Bonbon | | |
| 2011 | 1 期試掘井戸、Kotkot | 大 | Kotokot 川近傍であれば有望 |
| 2015 | 2 期試掘井戸、Compostella | 中～大 | 井戸と Kotkot 川までの距離次第 |
| 2011 | 2 期試掘井戸、Danao | 大 | Tangon 川近傍であれば有望 |
| 2011 | 2 期試掘井戸、Carmen | 大 | Carmen (Luyang)川近傍であれば有望 |

本格調査で留意すべき重要な点は、用いる水理地質データの質と量である。デジタル化された地質図、地形図、土地利用図、土壌分布図は解析対象地域をカバーしている。2004 年の CEST と NWRB などによる地下水シミュレーションは約 40 程度の揚水試験データのみを使って計算している(モデルの検証は 1979 年と 2004 年の地下水位コンタ図による)。水理地質にかかる既存データ(井戸の柱状図、揚水試験など)は、データの分布密度及び質ともにばらつきが大きい。これまで存在しているデータだけを使うだけであれば、過去 3 回の地下水モデル解析を上回る精度を期待する事はできない。

MCWD の Knowledge Center もデータの質と量について深い造詣があり、今年から 108 本の生産井戸について再揚水試験を開始している(巻頭写真 P-13 参照)。本格調査団が入る時までに再揚水試験を先方

が終了するよう依頼した。セブ市内にある約 40 井戸は水中ポンプから、貯水タンクなしにパイプシステムに直圧送されていて揚水量が変動する。受益者に前もって断水する旨を新聞公告する必要があるほか、各井戸の複雑なバルブ操作はMCWD職員外では難しいなど、多くの制約がある。井戸の揚水管は継ぎ手フランジ構造を持たない Well Master というオーストラリア製の揚水管へと全体のおよそ半分について順次、入れ替えている。再揚水試験の実施に支障が少ない（下表 5-4 参照）。

**表 5-4　108 生産井戸のうち、Well Master の揚水管を使っている井戸一覧(07 年 8 月で 34 井戸)**

| 井戸地区 | 井戸番号(注: MCWD の井戸番号のうち、MC を W とする場合がある) |
|---|---|
| Compostella | W3.2, W3.3, Mac5, SV10 |
| Canduman | 1 井戸(番号不詳) |
| Casili | 5.1, 5.3 |
| Talamban | 4.2, 4.10 |
| Banlad | 32, 31, 30 |
| Lahug | L7 |
| Central | 15 |
| Guadalupe | 11, 13, G1, G7, G9 |
| Banawa | G4, G5B |
| Tisa | MC5.6, K3.7 |
| Pardo | P4 |
| Mananga-I | 1.1, 1.2, 1.3 |
| Jaclupan | MG1, MG2, MG5, MG6, MG16, MG19, MG20 |

本章後記の図 5-1 は地下水開発のヒストリーと人口、社会変化、及び水文気象データの一覧である。同図における個々のデータの質については本格調査で精査することになるが、雨量、主要河川の流出量、MCWD が各地域毎に井戸開発した年、その後の汲み上げ量、人口分布など基本的なデータは信頼できるものと判断される。

MCWD が所有する、河川の流量観測データのリストを表 5-5 に示す。本格調査団は調査開始後、観測所の位置とデータや気象データを入手できる。

**表 5-5　表流水の流量データ**

| 河川名と観測所名 | 記録期間 | 記録方法 (Owner) |
|---|---|---|
| Mananga R. Camp4 | 79-8-11 to present | Water Level by Staff |
| Mananga R. Camp4 | 04-02-19 to present | Water Level by Piezo |
| Kotkot R. Paril | 04-07-16 to present | Water Level by Staff |
| Kotkot R. Paril | 04-07-16 to present | Water Level by Piezo |
| Lusaran R. | 79-06-17 to 04-01-11 | Water Level by Staff |
| Lusaran R. Bridge | 04-07-17 to present | Water Level by Staff |
| Lusaran R. Bridge | 04-07-17 to present | Water Level by Piezo |
| Luyang R, Lower Natimao-an | 02-01-24 to present | Water Level Staff (AYALA/WRC) |
| Luyang R, Lower Natimao-an | 04-04-22 to present | Water Level by Piezo (AYALA/WRC) |
| Danao R. Guinacot | 04-08-24 to present | Water Level by Staff |
| Danao R. Guinacot | 04-08-24 to present | Water Level by Piezo |

注：Piezoは投げ込み水圧感知式水位計、上記各河川とも1980年1月1日から気象データからの換算データをMCWDのKnowledge Centerは用意している。位置図を巻頭に示す。

追加すべき時系列的なデータとして、地下水モデル地域内で BWSA が開発してきた井戸位置、その開発年及び受益者数の経年推移を得て地下水モデル解析の精度向上を図る必要がある。MCWD の

Knowledge Center は、JICA の本格調査実施時期が確定した時点で、直ちに、モデル範囲内にある各バランガイに質問票を出し（第 6 章の本格調査の提言に質問票を示している）、井戸の実態調査を無償で開始する用意があるとしている。また、調査ボーリングの用地について、MCWD 用地、公共土地、民間土地の順に土地確保や調査の承諾を取り付けるとしている。

地下水の解析対象地域には無数のハンドポンプ井戸や掘り抜き井戸が存在する。83 年の CEBU コンサルレポートで、その数は推定で 7000 くらいあるであろうという。この浅井戸群は人力による地下水汲み上げであるため揚水量は微量あるから、過去の人口数及び人口密度、1 日・1 人当りの水必要量を適切に勘案することによって、ほぼ妥当な汲み上げ量が推定できるであろう。従い、浅井戸群の実態調査は必要ないし物理的に不可能である。注意すべきは、動力式または水中モータポンプによる多量の地下水汲み上げが、過去及び現在、どこにどれだけ存在するか、していたかである。本格調査の水理地質及び社会調査担当者は、図 5-1 に示す地下水開発のヒストリーを出来るかぎり実態に即すように現地聞き取り調査をしていく必要がある。すなわち、やや大口の民間井戸利用業者（San Miguel 社など）は、過去の汲み上げ量を現場施設から類推せざるを得ない。また、市内には港の船に給水する業者が 5 社あり、そのうちの 1 つは 4 本の井戸、7 台のタンクローリ($14m^3$)で、最大毎日、3 回くらいの汲み上げを行っていると洞察した。今回は市内状況を見る機会は限られたが、海産物食品加工会社、韓国系の繊維会社など大口汲み上げ会社が明らかにできると考える。これら業者が正確な汲み上げ量を告げるはずはないとして、商品生産量や施設規模、操業体制などから的確に汲み上げ量を推定する洞察力が求められる。

1983 年の CEBU コンサルによる 1 回目の地下水モデル解析時では、MCWD だけでも日量約 $100,000m^3$ の地下水汲み上げをしていて、地下水障害が危惧されてきた。2004 年の CEST コンサルによる 3 回目の地下水モデル解析時には、MCWD だけでも日量約 $150,000m^3$ の汲み上げに増えてきたため、地下水障害が深刻になると言われていた。

しかし、これらの地下水モデル解析による地下水の塩水障害や地下水位の低下予想に反し、現在、それほど深刻な事態に立ち至っていないため、MCWD など関係者に危機感が薄い可能性がある。フィリピン大学の Dr. Leonardo Liongson, Director, UP-NHRC らと地下水解析による予測と実際との乖離に関して意見交換を行った。

原因は色々と考えられる。1 つは透水係数が実際にはもっと大きい値であるかもしれない(回復試験による透水係数値が揚水時の値より大きく、回復試験値のほうが妥当と考える)、1 つは石灰岩の大空洞に見るように地下水の貯留量が大きいと推定される、1 つは 2000 年以前の MCWD の配水網からの漏水量が 40％以上であったためセブ市内は地下への涵養にかなり寄与してきた、などである。出来る限り、真の水理地質情報に基づいた解析を行うこと、過去の地下水くみ上げ量を適切に把握して入力する、などが肝要である。

# 第6章　本格調査への提言

本章では、セブ都市圏の上下水道事業が抱える課題を解決するために必要と考える調査期間、調査手法等などを示す。

## 6-1　調査の目的

(1)　持続可能は地下水利用を含む上下水道改善計画案を策定する。

地下水保全計画: 地下水モデル解析を実施し、今後、開発可能な地下水ポテンシャルのある地区と量を把握するとともに、海水進入と $NO_3$ などの地下水汚染の実態を把握する。地下水解析結果に基づいて MCWD の地下水開発計画をレビューし、地下水汚染対策の提言、海水進入影響地域の予測にもとづく保全策を提案する。

上下水道改善計画: 上水道事業の改善案ならびに淡水化プラントを含む水需要抑制計画案を策定し、現実的な下水道整備手法と上下水道事業における貧困層への配慮を提言する。

(2)　本格調査を通じ、「フィ」国カウンターパートに技術移転を行う。

## 6-2　調査対象地域

本件の調査対象地域は、以下の通り。

(1)　地下水モデル解析の範囲は北のコンポステラ町から南のタリサイ市までとする。

(2)　上水道施設、衛生施設改善に関しては、セブ都市圏の MCWD サービス地域とする。

## 6-3　「フィ」国側の調査実施体制

本件の「フィ」側実施機関はセブ都市圏水道公社（Metropolitan Cebu Water District: MCWD）である。MCWD はセブ都市圏における上水道及び衛生施設の管轄機関と位置付けられている。本格調査は、MCWD とともに LGUs の協力を得て、ステークホルダーとの連携に留意しつつ実施する。

また、地下水の保全に関しては、管轄機関である NWRB の助言を得ながら、MCWD と共に LGU 等の関係機関との連携を行う必要がある。

上記の調整を行うために MCWD を議長とする委員会等を設立する必要があり、MCWD もその旨了解している。

## 6-4 調査項目及び内容

### 6-4-1 調査の概要

本件開発調査は、セブ都市圏を対象に、目標年次を 2015 年に想定した地下水管理も含む上水道施設整備と衛生改善計画を策定するものである。

基礎情報として、自然条件、社会経済状況、既存施設(取水施設、浄水場、送配水施設等)の現況の情報収集、また、社会調査による給水事業に対する住民意識や水利用の実態等の把握、MCWD の組織・人員体制や財務状況の調査を行い、現在の水道事業の問題点を分析する。

その後、MCWD の実施体制の整備計画、水道施設整備計画、家庭排水やし尿処理への対応策等を取りまとめ、事業関係者が短期的中期的に取り組むべき課題と方策を整理し行動計画を策定する。

### 6-4-2 調査項目

【フェーズ 1】(既存上下水道及び地下水の現状分析)

(1) 現状把握と問題分析

下記情報収集を通じて、対象地域の上下水道に関わる課題分析を行う。

ア. 上下水道、地下水保全に関連する法制度、規制の把握。

イ. 地域開発計画、都市計画、MCWD 事業計画等の上下水道に関連する各種計画の分析。

ウ. 既存の水需要予測と水資源開発計画のレビュー。

エ. 既存上下水道施設の現況。

オ. MCWD の人的資源、経営状況の評価。

カ. 社会経済調査(家計調査、貧困分析、給水・衛生サービスの内容と満足度、衛生状況、水利用実態等)。

(2)　地下水モデル解析

対象地域における地下水賦存量を評価し、開発及び保全の基本方針を検討する。

ア. 既存地下水資料のレビュー。

イ. 地下水の簡易水質調査。

ウ. ボーリング調査、揚水試験。

エ. 水文データの分析（降雨流出量、地下水浸透量）。

オ. 地下水ポテンシャルの解析。

【フェーズ 2】(上水道、衛生改善及び地下水保全に関わる計画の策定)

以下の課題を中心に 2015 年を目標年次とした上水道整備、衛生改善のための基本方針とその行動計画を取りまとめる。また、地下水保全のために新規開発に対する技術的審査の指針とその運用方法を提案する。

ア. 将来需要レビューと水需要の管理

イ. 未給水地域への対応(貧困層への対策も含む)

ウ. 水需要に応じた水源開発

エ. 水道事業の運営体制

オ. 水道公社の経営財務

カ. 水道施設整備と維持管理(特に送配水管網、無収水削減等)

キ. 家庭排水、し尿処理

ク. 地下水保全(揚水規制と汚染対策も含む)

ケ. 事業費積算及び財務分析

## 6-5　要員計画(案)

(1)　総括/水道計画

(2)　水理地質

(3)　水道施設計画

(4)　社会経済/貧困分析

(5)　企業経営/財務分析

(6)　漏水対策

(7)　都市衛生(生活排水/し尿処理)

(8)　施工計画/事業費積算

(9)　社会環境配慮

## 6-6　本格調査実施上の留意点

### 6-6-1　水理地質調査及び地下水モデル解析

(1)　バランガイ給水事業の実態調査

5章の5-2“地下水モデル解析”で説明している通り、信頼できる地下水モデルを構築するためバランガイ給水事業の井戸群が、いつ、どこに建設されてその給水人口はどのように推移してきたのか、質問表による実態調査を MCWD に依頼し得られた情報をモデルの検証に反映し信頼できる地下水モデルを構築する。

MCWD は、モデル対象地域内のバランガイに対し、質問表を配布、調査開始時までに回収する用意があるという。質問表フォーム案を以下に示す。

(2)　調査ボーリング、各種水理地質調査

セブ都市圏の市街地内は空き地が少ない。地下水汚染の実態究明のための調査ボーリングの用地確保に手間取ることがないよう、MCWD の土地や公共用地などから、候補土地を選定する用意があるという。

(3) 地下水解析

MCWD の Knowledge Center は Modflow の Sea Water Intrusion ソフト(密度流解析)を用いた地下水モデル解析の技術移転に JICA に大きな期待を寄せている。基本的なデジタルデータは整っている。MCWD による揚水試験の再試験の結果も調査開始時に入手できる。水質分析は MCWD の試験室で実施可能である。モデルの構築作業は MCWD 技術者と共同してデータ入力を行い技術移転する。フィリピン大学やサン・カルロス大学の地下水研究者と技術交流と意見交換をしてかつ中立を保持しつつ解析するよう心がける必要がある。

## 6-6-2 上水道計画

(1) 水需要抑制計画の策定ならびに MCWD の役割と民間とのデマケの提言

MCWD はセブ都市圏におけるサービス区域の拡大と水需要の増大に応えるとともに、企業体として財務的に持続可能な経営を行わなければならない立場にある。従って多額の投資を要する表流水の開発に先立ち、地域内の水需要に対し、節水対策や政策的水需要抑制策、淡水化プラント等の代替水源の開発や特定地域の下水の再利用等を併せた水需要抑制計画を策定するとともに、MCWD が財務的に独立企業体として出来る範囲と民間セクターがやるべき役割分担を明確にし、MCWD が公共サービス機関として提供すべき、適正な価格での公平な水配分のあり方について提言する。

(2) 配水管網水理解析モデル作成支援ならびに配水システム改善案の提言

MCWD は現在、無料ソフトの EPANET を使用して送配水管網の設計に必要な管網の水理計算や小規模なクラスター内の配水管網計算を行っているが、大規模なネットワークの水理計算の経験がない。MCWD はマクタン島での水資源の開発と配水管網の拡張を来年予定しているため、今年末までにマクタン島内の送配水管網の水理計算モデルを作成し送配水管網の設計を行う予定である。その後、セブ本島の既存送配水管網の水理計算に適応させ将来の水源からの水供給の影響を検討する意向はあるが、大規模な送配水管網の水理計算の経験がない。JICA 調査団の技術的支援を要望している。新規水源に対する適切な配水システムの改善がなされない限り、地域的な水供給不足が改善できないので、セブ本島の配水管網モデルの作成支援をし、水理解析結果に基づき、既存上水道改善計画を精査し、適切な配水管網の更新、配水タンクの増設等、適切な配水システム改善計画案を提言する。

(3) 送配水管網の効率的な運転管理に係る技術支援

MCWD は 2005 年に送配水幹線に 50 箇所の配水区メーター（District Meter）ならびに制水弁を設置し全区域を 52 の配水ブロックに区分して水圧、漏水の状況をブロック毎に把握する作業を行っている。

今後、送配水管網上に圧力計を常時設置し送配水管網の破損・漏水等による圧力低下の情報をテレメーターシステム等により司令室で感知し、即座に井戸ポンプの停止と修繕チームの派遣を可能にする効率的な遠隔監視システム導入を検討中で、JICA の技術的支援を要望している。

同システムは、水資源の有効利用ならびに効率的な送配水管網の運転管理には必要不可欠な技術で MCWD が今後、迅速かつ効率的な流量・水圧の管理、ならびに漏水の探知が行えるよう、遠隔監視システム導入等運転管理の近代化のために必要な技術支援を行うこととする。

(4) 無収水削減対策に係る技術支援

MCWD は 2003 年から「Massive Rehabilitation Project」を立ち上げ、無収水削減対策に取り組んでいる。配水本管から各家庭への分岐部分が漏水の最大の原因であるから配水本管から直接、個別に分岐することをやめ、1 箇所の分岐にまとめ給水管と給水メーターを設置する方式（Stub-Out 方式）へと切り替える工事を進めている。年間 9,000 栓のペースで切り替え工事を行っている。当初、7 年計画であったが接続栓数が増加したため計画を 2 年間延長して 2012 年までの計画である。

日本製の相関式漏水探知機器を購入し無収水削減に真剣に取り組んでいるが、まだ経験が浅く、既存の無収水削減対策でこれからも無収水削減計画の目標を達成することができるか不安であり、既存対策の評価並びに無収水削減計画対する技術支援を要望している。上記の状況を勘案し、既存の無収水削減計画ならびに漏水調査方法を精査し、MCWD に対し改善の提言を行うとともに、中・長期的な無収水削減計画に立脚した 2015 年までのアクションプランを立案する。

### 6-6-3 貧困者対策及び下水道事業化支援

(1) 都市貧困層への水供給

MCWD は市街地内の貧困地域を対象に共同水栓方式による給水サービスを行っている。貧困世帯 30 世帯以上が管理組合を組織し、運営・維持管理をしていくことを前提に提供されるサービスであるが、管理組合数（共同水栓数に同じ）は、2004 年末時点の 258 から一貫して緩やかな減少傾向にあり、2007 年 7 月現在、221 となっている。減少の理由としては、各戸給水への選好に加え、管理組合の運営の煩雑さなどがあげられており、実際に、現在までに約 80 程度の組合が、規約違反や料金の滞納などにより、登録を抹消され、共同水栓の利用を止められている。各戸給水への選好があるとはいえ、都市部の貧困問題が劇的に改善されたとは言いがたい現状では、引き続き、共同水栓事業の果たす役割は大きく。また、現在 MCWD が行っている画一的な共同水栓方式の改善の余地も大きいといえる。本格調査においては、MCWD 共同水栓事業のレビュー、バランガイや協同組合の行う共同水栓事業との比較を行い、よりよい共同水栓事業の提案を行うとともに、世帯調査においては、家計状況、給水

サービス内容と満足度（Willingness to Pay を含む）、衛生状況などを調査する。既存の世帯調査としては、第 4 章表 4-4 の通り 3 種の調査があるものの、調査 1、調査 2 は MCWD の給水サービスを受けていない山間部が対象であり、調査 3 は MCWD サービス利用者も対象としているものの、水利用の実態調査や Willingness to Pay 調査は行われておらず、本格調査においては、より包括的な世帯調査が必要と思われる。貧困層への給水サービスは、LGUs や協同組合、NGO なども行っており、これらの組織との連携・情報共有にも十分留意する必要がある。

(2) 水衛生環境の改善に関わる提言

下水道の現状は、セブ市、マンダウエ市、ラプラプ市は其々、独自計画を持っているがその実施が伴っていない。また、MCWD も下水道整備に関わる事業責任を負っており、LGUs と MCWD との責任範囲が不明確になっている。

一般家庭ではセプティックタンクが広く普及しているが、地下水汚染の源と見られており、し尿処理、家庭排水の方向性、LGUs、MCWD の役割分担の検討も含めて、指針が必要となっている。マニラでは、し尿の回収や浄化槽整備も行われており、MCWD では、従来型の下水道システムだけでない財務的、技術的に当国で対応可能な選択肢を示すことを期待している。

また、MCWD では対応しきれない資金調達や制度上の課題についても、中央政府、LGU 等の関係機関にとっての懸案事項として整理し、提言に取りまとめることが期待されている。

# 要　請　書

REPUBLIC OF THE PHILIPPINES
Metropolitan Cebu Water District

# APPLICATION for the GOVERNMENT OF JAPAN

# The Study on Metro Cebu Sewerage System Development

*September 2002*

4/4

# I. PROJECT DIGEST

## (1) PROJECT TITLE

THE STUDY ON METRO CEBU SEWERAGE SYSTEM DEVELOPMENT

## (2) LOCATION

Metro Cebu, Region VII (See Annex A)

## (3) EXECUTING AGENCY

*Name of Agency*

Metropolitan Cebu Water District (MCWD)

*Number of Staff of the Agency*

| | *Regular Employees* | *Casual Employees* | *Total* |
|---|---|---|---|
| Operation & Maint Group | 161 | 100 | 261 |
| Pipelines Maint Group | 104 | 99 | 203 |
| Technical Services Group | 47 | 41 | 88 |
| Adminstrative Group | 84 | 18 | 102 |
| Finance Group | 90 | 10 | 100 |
| General Manager's Office | 52 | 11 | 63 |
| TOTAL ..... | | | 817 |

*Financial Data*

| | *Amount (₱ Million)* Year 2000 |
|---|---|
| Annual Gross Revenue | 715 |
| Annual Net Revenue | 692 |
| Annual Collection | 708 |
| Annual O&M Expenses | 355 |

*Organizational Chart*

Refer to Annex B.

## (4) JUSTIFICATION OF THE PROJECT

*Present Condition of the Sector*

The Metropolitan Cebu Water District (MCWD) is a government owned and controlled corporation set up in 1974, although the original waterworks system started operation in 1911. It is responsible for water supply within Cebu City and seven other surrounding towns and cities with a total population of 1,445,527

people. It envisions itself to be a progressive and economically viable utility that will provide adequate, safe, potable and affordable water and an effective sewerage system for Metro Cebu.

Metro Cebu has a humid tropical climate with an annual mean temperature of 27.4 °C and average relative humidity of 78%. The average annual rainfall is 1,637 mm, and July receives the highest rainfall while March the lowest. The rainy season extends from June to December.

There is no comprehensive sewerage system in Metro Cebu. In some areas, septic tanks are used while various kinds of pit latrine are used in other areas. In most cases, overflows from soakaways and leaching pits go to ditches and natural water bodies. It is reported that in Cebu City, 39% of the population use water sealed cistern flush (to septic tanks) toilet, 10% use water sealed pour-flush, 11% use pit latrines, while the rest use other types of toilet facilities. Commercial establishment and high-income residential areas use water carried system with septic tanks. Most of the medium and low-income people use pit or other types of latrines. Hence, the present sewerage disposal practices are threat to the environment and public health.

A number of studies found direct relation between the poor sanitation condition prevailing in Metro Cebu area and the degraded public health condition. It is reported that water born diseases are among the top five causes of infant mortality in Metro Cebu. Another study showed that there exists a strong correlation among health, hygiene, literacy and income in the Metro Cebu area.

*Sectoral Development Policy of the National/Local Government*

There have been no comprehensive sewerage systems in Metro Cebu. The growing population of Metro-Cebu is presently experiencing degraded public health conditions, increasing number of epidemic brought about by water-borne diseases, increasing infant mortality, and other related social problems. This problem has not been addressed directly by the neither national nor the local government, except for some development studies that is yet to be implemented and functional.

*Problems to be Solved in the Sector*

Overall sanitation condition in the Metro Cebu area is an urgent concern. Improvement of the existing system is a must such that adequate excreta disposal facilities should be provided. The growing population of the metropolis will further aggravate and deteriorate the living conditions of the residents. Likewise, a new water supply scheme with the construction of a new dam is being planned and will be implemented in the near future. Increased amount of water supply will consequently result in increased amount of wastewater to be generated, which will

be discharged into the coastal area. If not properly treated, this will be a threat to natural environment and the government's thrust on environmental conservation. Therefore, a comprehensive study consisting of a Master Plan and Feasibility Study for the future wastewater disposal system has become necessary.

*Outline of the Study*

The study will consist of the following:

A. Master Plan Study:
- Data gathering
- Field reconnaissance survey
- Socio-economic analysis
- Master Plan formulation
- Information Education and Communication Program for Sewerage and Sanitation Sector

B. Feasibility Study
- Topographic Survey of proposed site
- Cost estimation and project evaluation
- Evaluation of financial requirment
- Formulation of implementation plans
- Preparation of EIA
- Preparation of detailed study
- Preparation of financing strategy/approach for sewerage sector

*Objective of the Study*

The objective of the study is to focus on the improvement of sanitation in the Metro-Cebu area . The area has no comprehensive sewerage system. The present sewerage disposal practices are generally poor and threatening to public health and hygiene. In line with the implementation of a large scale water supply program, a large amount of wastewater is expected to overflow. This will create a severe environmental deterioration if proper collection and treatment system will not be in place.

*Prospective Beneficiaries*

The prospective beneficiaries of the study will be the residents of Metro-Cebu, i.e., the four cities of Cebu, Mandaue, Lapulapu and Talisay; and the four municipalities of Compostela, Liloan, Consolacion, and Cordova.

*The Project's Priority in the National Development Plan/Public Investment*

The project is one of the projects under the Cebu Integrated Area Development Master Plan of the Government and is included in the Medium Term Program.

(5) DESIRABLE TIME OF COMMENCEMENT OF THE PROJECT

- Expected date of start - June 2002
- Expected date of completion - October 2003

Refer to the Study Schedule below.

(6) PROSPECTIVE FUNDING SOURCE AND/OR ASSISTANCE

The Government of Japan through the Development Study Program of the Japan International Cooperation Agency (JICA-DSP).

II. TERMS OF REFERENCE OF THE PROPOSED STUDY

(1) NECESSITY OF THE STUDY

The need for a comprehensive Master Plan and Feasibility Study for the Metro-Cebu Sewerage System has been necessitated due to the following facts:

a) The general level of sanitation in the Metro Cebu area is not satisfactory. Only few areas are served with proper facilities for excreta disposal. Sewerage and excreta are disposed directly in the environment. Inadequate capacity of existing system causes overflowing . A consequence of these is the increasing incidents of water borne diseases.

b) In near future, implementation of large scale water supply programs is planned to secure current potable water deficit in the Metro Cebu area. This will increase a large amount of wastewater. Without proper collection and treatment system, the wastewater will create a severe environmental deterioration.

c) Cebu is famous for its scenic beauty in the Philippines which calls many tourists through the year. Direct discharge of wastewater to the coastal area brings about serious pollution to the coastal area and further the sea itself, however, none of the practical study has been made since long time before.

(2) NECESSITY OF THE JAPANESE TECHNICAL COOPERATION

The Cebu Integrated Area Development, which was already done by the JICA team in 1994 has included the Metro Cebu Sewerage System Development Project. The initial studies thereto will be vital in correlating all the necessary tasks and plans for the success of this program. Integration of all the plans is necessary to facilitate all concerns towards the vision of making Metro-Cebu a progressive urban metropolis in Southern Philippines.

## (3) OBJECTIVES OF THE STUDY

a) General Objective

To raise the living standard of residents of Metro Cebu by providing a healthy, hygienic, and clean environment through an effective sewerage system.

b) Specific Objective

The specific objectives of the Study are:

- To establish a Sewerage System Master Plan up to the target year of 2020 for Metro Cebu,
- To implement a Feasibility Study of the most prioritized project, and
- To transfer technical knowledge to counterpart personnel.

## (4) STUDY AREA

Metro Cebu lies at the center of the island province of Cebu, which comprises of four cities (namely; Cebu, Mandaue, Lapulapu and Talisay) and four municipalities (namely; Compostela, Liloan, Consolacion, and Cordova). The combined land area of Metro Cebu together with Mactan Island is about 677 $km^2$.

## (5) SCOPE OF THE STUDY

The study will be composed of :

*Master Plan Study*

- Collect and review all the available relevant data and information on natural and socio-economic aspects
- Conduct field reconnaissance for wastewater disposal facilities and sanitation practices.
- Conduct socio-economic analysis of Metro Cebu to determine population growth, urban expansion, and industrial development
- Make overall wastewater generation projection for 2010 and 2020 for Metro Cebu
- Analyze and compare all possible collection and disposal option. Pilot area should be identified for the implementation phase, with scenario of expanding the system to adjacent areas and possibly to the entire Metro Cebu in the future.
- Formulate a Master Plan for sewerage system for Metro Cebu
- Conduct Information Education and Communication Program for Sewerage and Sanitation Sector
- Select the most prioritized alternative to be implemented urgently as a

Feasibility Study

*Feasibility Study*

- Conduct topographic survey for proposed major facilities as needed
- Prepare basic design of facilities, cost estimation and project evaluation
- Evaluate financial and economic feasibility, including willingness to pay survey.
- Prepare implementation program for the project
- Conduct Environmental Impact Assessment (EIA) of the project
- Propose improvement of institutional capacity in order to ensure sustainability of the proposed sewerage system
- Prepare financing strategy/approach for sewerage sector

(6) STUDY SCHEDULE

The study shall be carried out for 16 months.

The tentative work schedule is as shown below.

| Work Phase | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Preparatory Work in Japan | | | | | | | | | | | | | | | | |
| First Field Work in Philippines | | | | | | | | | | | | | | | | |
| First Home Work in Japan | | | | | | | | | | | | | | | | |
| Second Field Work in Philippines | | | | | | | | | | | | | | | | |
| Second Home Work in Japan | | | | | | | | | | | | | | | | |
| Third Field Work in Philippines | | | | | | | | | | | | | | | | |
| Third Home Work in Japan | | | | | | | | | | | | | | | | |

(7) EXPECTED MAJOR OUTPUT OF THE STUDY

A Master Plan report that would contain the following (at the end of the month 10 from the commencement of the project):

- Frame work plan for sewerage system development in Metropolitan Cebu up to the year 2020
- Basic design of sewerage systems-related structures
- Implementation schedule
- Operation and Management Plan of MCWD for sewerage system.

A Feasibility Study report that would contain the following (at the end of the month 16 from the commencement of the project):

- Feasibility Study on the prioritized projects
- Organization
- Monitoring system
- Cost to be allocated to each sector
- Operation and Maintenance Method

(8) REQUEST FOR THE STUDY TO OTHER DONOR COUNTRIES, IF ANY

None

(9) OTHER RELEVANT INFORMATION, IF ANY

None

III. FACILITIES AND INFORMATION FOR THE STUDY TEAM

(1) ASSIGNMENT BY THE IMPLEMENTING AGENCY OF COUNTERPART

*Local Counterpart Staff*

1. Team Leader
2. Hydrologist
3. Sewerage Engineer
4. Sewerage Process Engineer
5. Facilities Planner
6. Organizational & Institutional Expert
7. Environmental & Social Expert
8. Cost Estimator/Implementation Planner
9. Financial & Economic Expert

(2) AVAILABLE DATA, INFORMATION, DOCUMENTS, MAPS ETC., RELATED TO THE STUDY

| | | |
|---|---|---|
| • Socio-economic data | - | NEDA |
| • Hydrologic Data | - | NWRB, DPWH, PAGASA, Univ. of San Carlos - WRC |
| • Health Standards | - | DOH |
| • Water Resources Dev't Plans | - | MCWD, LWUA, NWRB |
| • Environmental Data | - | DENR, Cebu Provincial Gov't. |
| • Land Use | - | DILG, Cebu Provincial Gov't. |
| • Maps | - | NAMRIA |

(3) OFFICE ACCOMODATION

An office space sufficient to accommodate study team member with sufficient desks and chairs, a telephone set and air conditioner.

IV. GLOBAL ISSUE

(1) ENVIRONMENTAL COMPONENTS

An environmental study will be conducted for the project to determine its possible impact to the environment. This will include identification of environmentally critical areas, the presence of endangered species and investigation of the present

land use, water management, waste disposal management, and projected overall development in the study area.

(2) ANTICIPATED ENVIRONMENT IMPACTS

Construction and operation of the proposed sewerage system may cause negative effects and these shall be given utmost consideration in the study.

(3) WOMEN AS MAIN BENEFICIARIES OR NOT

Implementation of the project will benefit both sexes of the population because the project is not gender-oriented.

(4) PROJECT COMPONENTS WHICH REQUIRES SPECIAL CONSIDERATION FOR WOMEN

None.

(5) ANTICIPATED NEGATIVE IMPACTS ON WOMEN

None.

(6) POVERTY REDUCTION

The realization of this study and eventual implementation of the projects will improve access to one of the most basic human needs, sanitation. This will result in upliftment of the health and living standard of the people and improvement of the economy of Metro Cebu and consequently, of the country as a whole.

(7) ANY CONSTRAINTS AGAINST THE LOW INCOME PEOPLE CAUSED BY THE PROJECT

None. The project will instead benefit the low income people who could not afford to be sick and spend for hospitalization. The project will benefit their livelihood as it will provide a safe and healthy place for them to live in.

V. UNDERTAKING OF THE GOVERNMENT OF THE REPUBLIC OF THE PHILIPPINES

In order to facilitate a smooth and efficient conduct of the Study, the Government of the Republic of the Philippines shall take necessary measures:

(1) to secure the safety of the Study Team.

(2) to permit the members of the Study Team to enter, leave and sojourn in the Republic of the Philippines in connection with their assignment therein, and exempt them from alien registration requirement and consular fees.

(3) to exempt the Study Team from taxes, duties and any other charges on equipment, machinery and other materials brought into and out of the Republic of the Philippines for the conduct of the Study.

(4) to exempt the Study Team from income taxes and other similar levies in connection with any emoluments or allowances paid to members of the Study team for their services in connection with the implementation of the Study.

(5) to provide necessary facilities to the Study Team for remittances as well as utilization of the funds in the Republic of the Philippines from Japan in connection with the implementation of the Study.

(6) if necessary, to secure permission for entry into private properties or restricted areas for the conduct of the Study.

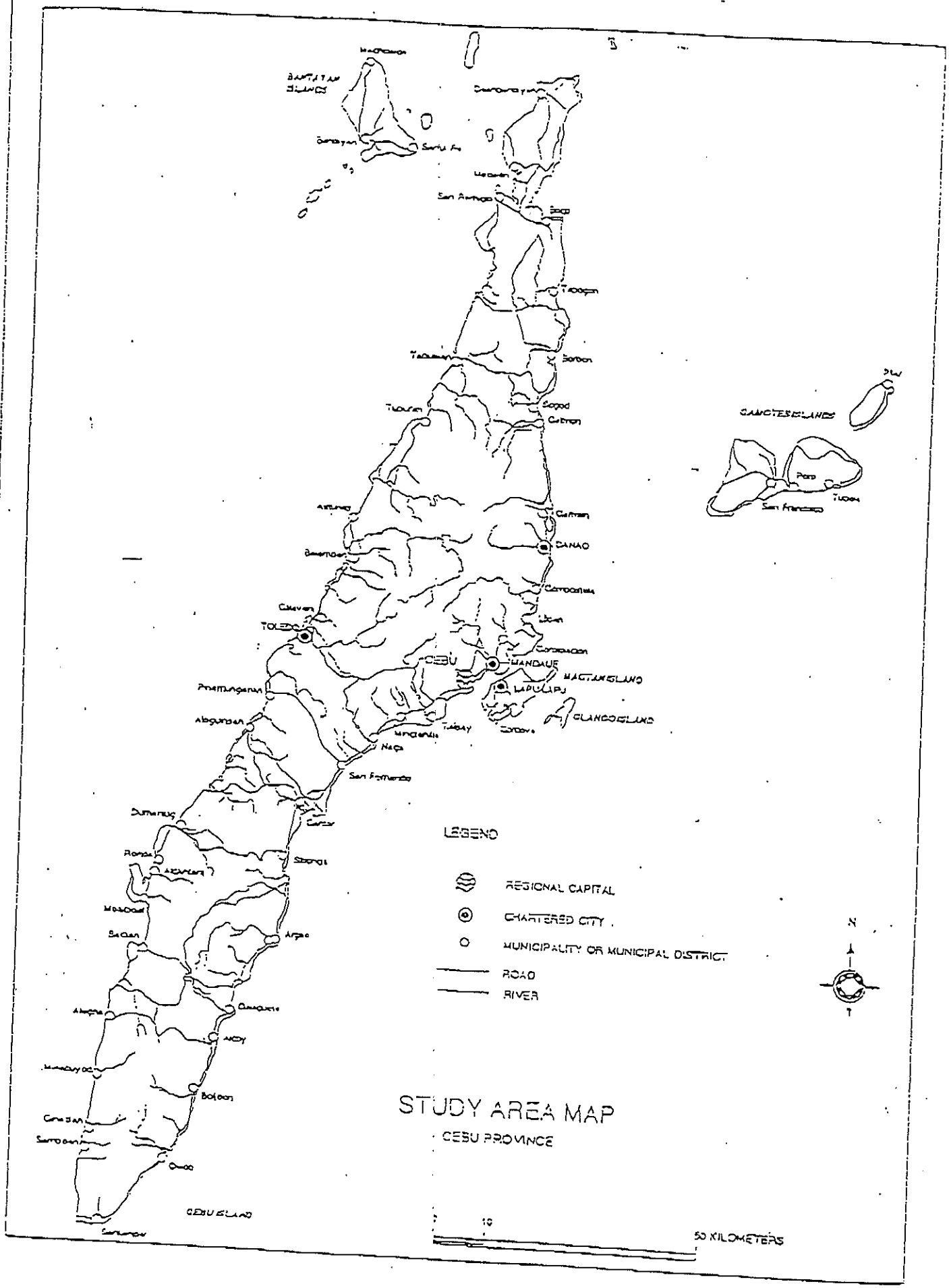
(7) if and when necessary, to secure permission for the Study Team to take all necessary data, documents and materials related to the Study out of the Republic of the Philippines to Japan in accordance with Philippine regulations

(8) to provide medical services as needed, however, expenses will be chargeable to members of the Study team.

(9) The Government of the Republic of the Philippines shall bear claims, if any arises against member(s) of the Japanese Study Team resulting from, occuring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claim arise from gross negligence or willful misconduct on the part of member of the Study Team.

(10) The Metropolitan Cebu Water District shall act as counterpart agency to the Japanese Study Team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

(11) The Government of the Republic of the Philippines assures that the undertakings by the Philippine Government referred to in this form will be ensured for smooth conduct of the Development Study by the Japanese Study Team.




STUDY AREA MAP

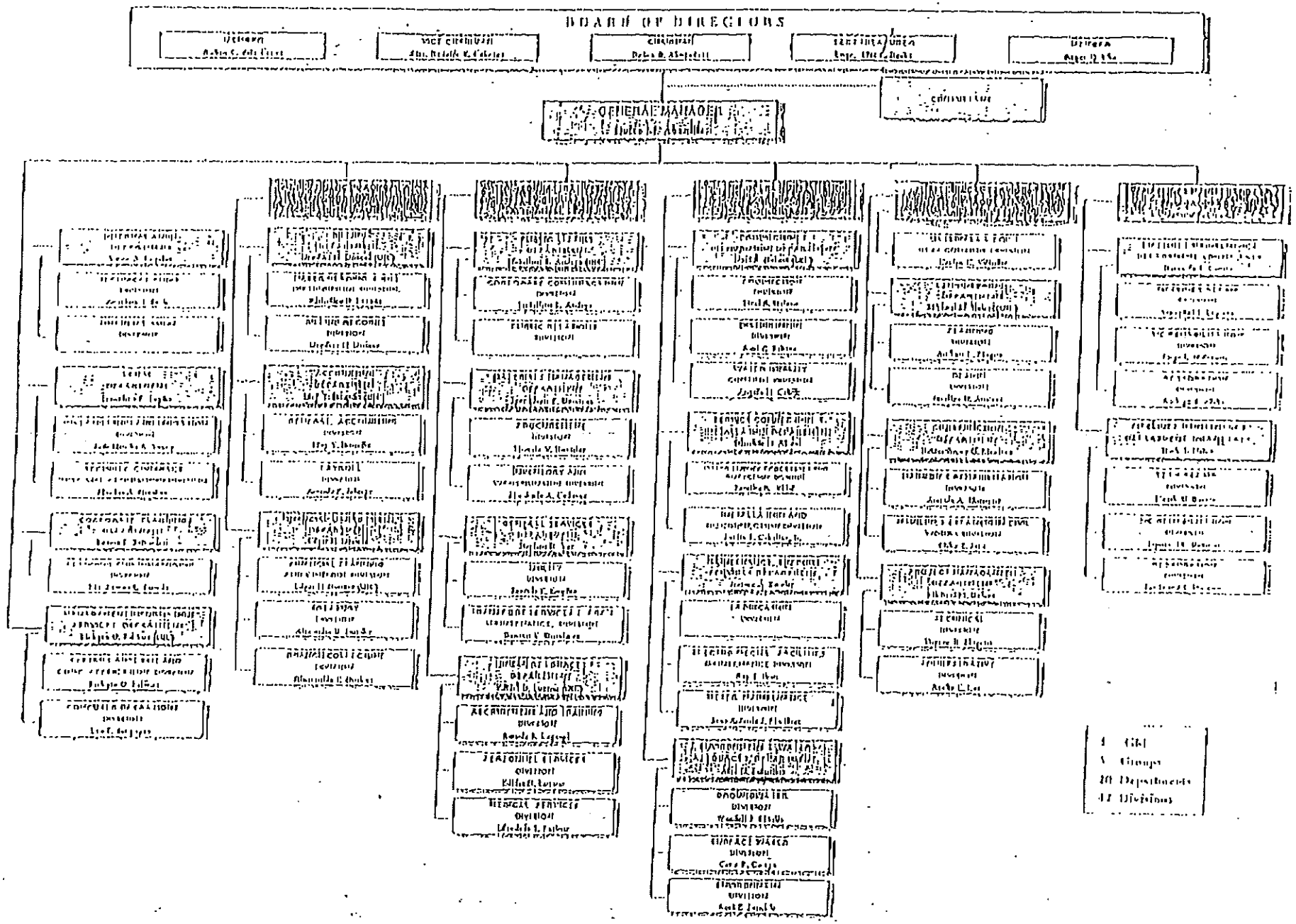
CEBU PROVINCE

# Metropolitan Cebu Water Di

## Table of Organization

December 2009

Annex D



Rev. 06

REPUBLIC OF THE PHILIPPINES
Metropolitan Cebu Water District

APPLICATION for the
GOVERNMENT OF JAPAN

# Master Plan and Feasibility Study on Water Resources Development for Metro Cebu

*September 2002*

# I. PROJECT DIGEST

## (1) PROJECT TITLE

The Study on Water Resources Development for Metro Cebu

## (2) LOCATION

Cebu Island (See Annex A)

## (3) EXECUTING AGENCY

Name of Agency

Metropolitan Cebu Water District (MCWD)

Number of Staff of the Agency

| | *Regular Employees* | *Casual Employees* | *Total* |
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| Operation & Maint Group | 161 | 100 | 261 |
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*Financial Data*

| | *Amount (₱ Million)* Year 2000 |
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| Annual Gross Revenue | 715 |
| Annual Net Revenue | 692 |
| Annual Collection | 708 |
| Annual O&M Expenses | 355 |

Organizational Chart

Refer to Annex B.

## (4) JUSTIFICATION OF THE PROJECT

Present Condition of the Sector

The Philippines, being in the typhoon belt, is blessed with abundant rainfall. In recent years, however, the country has been experiencing water and food shortages due to severe dry spell and to the increasing demand for water. The rapid growth of the economy, the improving standard of living and the increasing population invariably gave rise to increased water demand.

The Government has been trying to minimize the negative effects of the dry spells

by instituting palliative measures but the incidence of water shortage is getting frequent in some areas of the country. For example, from 1997 until this year, severe dry spell due to the El Nino phenomenon affected the watershed area of Metro Cebu, the country's city with economic development potential based on tourism industry. However, during the peak demand of water in the month of May, water shortage has been extremely severe, which results in discouragement of tourist bound for Metro Cebu. Some area within island province of Cebu, the basic human needs, i.e. potable water, cannot be reached, resulting in difficulty to alleviate the poverty existing in the area. Water-borne disease, such as ameba dysentery, is present in the area, since residents rely on their domestic water from water springs available. Domestic water supply in island province of Cebu is one of the most urgent obstacles to be tackled immediately. Therefore, identification and formulation of development plans for water resources for Metro Cebu are required urgently.

## Sectoral Development Policy of the National/Local Government

As early as the 1990's, the Philippine Government already anticipated an impending water crisis and started to identify possible solutions. This lead to the conceptualization of the Water Summit in 1994. Then, in 1995, Congress enacted Republic Act. No. 8041 known as the National Water Crisis Act of 1995 which embodies the government's thrust to provide sufficient supply of water in all areas in the country.

In line with this thrust, the Master Plan Study on National Water Resources Management in the Republic of the Philippines was carried out in 1997 under a technical cooperation extended by JICA. The Study confirmed the possibility of a severe water shortage in Cebu in the coming years. According to the Study, the annual water demand of Metro Cebu in 1995 was **59 million tons** and during this year, the water supply capacity was hardly sufficient to provide the demand. The projected water demand in the year 2025 is 342 million tons, i.e. **5.8 times that of 1995.** Water resources development in the area is considered a must in order for the area to be developed.

Various agencies and authorities have studied alternative schemes to develop water sources for Cebu. JICA's Nationwide Master Plan Study proposes a few development scenarios as possible water resources development sources. The outcome of the Study has been accepted by its Steering Committee, which decided to promote the development scheme. The Committee strongly recommended to conduct the master plan and feasibility study on the proposed development schemes as the first step in the promotion.

Metro Cebu Water District is the government's agency mandated for water supply and sewerage within Metropolitan Cebu. It was created to be responsible for achieving a scientific and orderly development of all water supply and sewerage systems for Cebu consistent with the principles of optimum utilization, conservation and protection to meet present and future needs.

## Description of the Study Area

Metro Cebu has a humid tropical climate with an annual mean temperature of 27.4 °C and average relative humidity of 78%. The average annual rainfall is

1,637 mm, and July receives the highest rainfall while March the lowest. The rainy season extends from June to December.

Established in 1974, the Metropolitan Cebu Water District (MCWD) is responsible to supply drinking water for the Metro Cebu area. The service area of MCWD covers four cities (Cebu, Talisay, Mandaue, Lapulapu) and four municipalities (Liloan, Consolacion, Compostela, Cordova). As of December 2000, the total population within the MCWD service area is approximately 1.5 million people. Out of the total service area of 677km$^2$, MCWD presently supplies water to 260 km$^2$. Breakdown of population and status of water supply within MCWD service area as of December 2000 are as follows:

| | Population | connections | supply(m3/day) | % supplied |
|---|---|---|---|---|
| Cebu City | 718,821 | 54,982 | 63,250 | 42% |
| Mandaue City | 259,728 | 11,575 | 13,350 | 25% |
| Lapu-lapu City | 217,019 | 4,380 | 5,050 | 10% |
| Talisay City | 148,110 | 3,747 | 4,300 | 15% |
| Consolacion | 62,298 | 1,923 | 2,200 | 16% |
| Cordova | 34,032 | 459 | 550 | 7% |
| Liloan | 64,970 | 1,887 | 2,200 | 34% |
| Compostela | 31,446 | 731 | 850 | 43% |
| Total | 1,536,424 | 79,684 | 91,750 | 29% |

Source : MCWD 2001 (estimated at 225 LPCD : 5.1capita/connection)

As noted above, MCWD supplies average of 29% of the total population in the area. While 42% is served within Cebu City, only 7% is served in Municipality of Cordova.

Although the water supply needs of this area have been partially met for many decades by abstraction of groundwater by both MCWD and private well owners from the coastal limestone aquifer, the ground source is now no longer adequate and is threatened with over-exploitation and eventual salinization. Study conducted by Water Resources Center at University of San Carlos concluded that in 1975, seepage of saline water was near the shoreline and in the south, intruded areas did not reach Barangay Pardo. However, due to the over-exploitation of groundwater in the area, the saline water edge has presently moved beyond the Pardo church to the foothills and has passed Fuente Osmena, on the Provincial Capital to the hills behind the Palace of Justice, about 4 km inland.

Individual surface water source for Metro Cebu has been seriously studied. For example in 2001, MCWD studied BOT scheme Mananga II, which concluded that the present Mananga II scheme is infeasible under BOT scheme. However, future plan for water resources development for Metro Cebu is largely dependent on private sector participation. Piece-meal approach of implementing "water supply bids" from independent water producers (IWPs) to provide water to MCWD has been made in the year 2001. However, a comprehensive Master Plan based on updated Feasibility Study for water resources development for Metro Cebu is not available. Considering the increasing demand forecasted by the JICA Study mentioned above, it is pertinent to prepare the overall master plan for the water resources development for the Metro Cebu, with the national government's attention and assistance.

## Problems to be Solved in the Sector

The alarming rate of increase in the demand for water in Metropolitan Cebu coupled with decreasing supply warrants urgent response from the Government. The most realistic solution would be the implementation of the water development scheme proposed in the Master Plan Study on National Water Resources Management. However, it is expected that the full realization of the scheme proposed would take more than 10 years from the commencement of the Study. Therefore, there is an urgency to commence the study immediately considering the worsening water shortage in Metropolitan Cebu.

## Outline of the Study

The **master plan** would cover the following:

(1) Review of existing water resources development plans within Metro Cebu: dam, weir and ponds projects within Metro Cebu, alternative scheme for Mananga II Dam, Lusaran Dam, desalination using waste heat, Kot Kot River development, etc.
(2) Review of ground water exploitation within Metro Cebu.
(3) Discharge measurement of the selected river along the cross section adjacent to the established hydrologic station.
(4) Hydrologic data collection, study and analysis
(5) Study on the water demand by sectors (municipal, irrigation, industry, etc) in Metropolitan Cebu.
(6) Water Balance Study
(7) Geologic data collection, study and soil mechanical analysis
(8) Geological surveys at the proposed dam site and quarry site including core drillings
(9) Land use surveys and social and environmental impact assessment
(10) Study on the watershed management
(11) Study on overall operation and management for MCWD.
(12) Study on improvement of unaccounted water for MCWD.

The **Feasibility Study** would cover the following:

(1) Feasibility Study on the prioritized scheme for water resources development based on the Master Plan;
(2) Preliminary design of water supply facilities
(3) Basic design of structures for water supply
(4) Estimations of cost and benefit
(5) Study on implementation schedule
(6) Preliminary study on implementing organization
(7) Study on cost allocation
(8) Study on the methods for operation and maintenance
(9) Economic and financial assessment
(10) Social Development Study
(11) Environmental Impact Assessment

## Objective of the Study

(a) General Objective

To further promote the economic activities of Metropolitan Cebu area and its surroundings by providing sufficient supply of water through water resources development. This will further enhance the economic development of the entire province of Cebu.

(b) Specific Objective

To determine the technical, social, economic and environmental feasibility of the alternative schemes to come up with final recommendations on the most appropriate water resources development Master Plan up to the year 2020. To strengthen the operation and management of MCWD, including improvement in status of unaccounted water.

Prospective Beneficiaries

Residents of Metropolitan Cebu and its vicinity area.

The Project's Priority in the National Development Plan/Public Investment

The project is one of the priority projects of the Government and is included in the Medium Term Investment Program. The current Administration encourages and puts high priority on water resources development for the overall economic development within Metropolitan Cebu.

## (5) DESIRABLE TIME OF COMMENCEMENT OF THE PROJECT

- Expected date of start - June 2002
- Expected date of completion - May 2004

Refer to Annex C for the Study schedule.

## (6) PROSPECTIVE FUNDING SOURCE AND/OR ASSISTANCE

The Government of Japan through the Development Study Program of the Japan International Cooperation Agency (JICA-DSP).

# II. TERMS OF REFERENCE OF THE PROPOSED STUDY

## (1) NECESSITY OF THE STUDY

The Philippines, being in the typhoon belt, is blessed with abundant rainfall. In recent years however, the country has been experiencing water and food shortages attributable to the uneven distribution of rainfall, severe dry spell due to the El Nino phenomenon and to the increasing demand for water. The rapid growth of the economy, the improving standard of living and the increasing population invariably gave rise to the increased water demand.

Metropolitan Cebu is among the areas severely affected. Severe dry spell in 1997 and 1998 affected the watershed within the area. This event affected not only the residents of Metropolitan Cebu area but also the farmers cultivating paddies in the irrigation areas in its vicinities, who is tapping water from the area

for irrigation purposes. During the visit of President Macapagal-Arroyo to Cebu in December 2001, the president confirmed that the development of water source for the Metropolitan Cebu is vital for the further economic development in the area.

In 1997, the Master Plan Study on National Water Resources Management was carried out under the technical cooperation of JICA. The Study proposes comprehensive water resources development master plan of Metropolitan Cebu and vicinity area. The study proposal include appraisal of ground water developmental potentials as well as appraisal on the development scenarios, including Mananga II Dam, Lusaran Dam, Kot Kot River development, small dams, and desalination. The MCWD is thus seeking technical assistance from JICA in the conduct of a feasibility study on water resources development to look into the potentials of these rivers as possible sources.

## (2) NECESSITY OF THE JAPANESE TECHNICAL COOPERATION

Successful transfer of technology provided by JICA's Master Plan Study on National Water Resources Management as well as Metro Manila Water Resources Development projects are expected to apply to this project as well.

## (3) OBJECTIVES OF THE STUDY

### a) General Objective

To further promote the economic activities of Metropolitan Cebu area and its surroundings by providing sufficient supply of water through water resources development. This will further enhance the economic development of the entire province.

### b) Specific Objective

To determine the technical, social, economic and environmental feasibility of the alternative schemes to come up with final recommendations on the most appropriate water resources development Master Plan up to the year 2020; to strengthen the operation and maintenance of MCWD, including improvement in status of unaccounted water.

## 4) STUDY AREA

Metropolitan Cebu. (See Annex A)

## 5) SCOPE OF THE STUDY

The study team shall undertake the following;

**Master Plan Stage:**

(1) Review of existing water resources development plans within Metro Cebu: dam, weir and ponds projects within Metro Cebu; alternative scheme for Mananga II Dam, Lusaran Dam, Kot Kot River development, desalination, etc.
(2) Review of ground water exploitation within Metro Cebu.

(3) Discharge measurement of the selected river along the cross section adjacent to the established hydrologic station.
(4) Hydrologic data collection, study and analysis
(5) Study on the water demand by sectors
(6) Water Balance Study
(7) Geologic data collection, study and soil mechanical analysis
(8) Geological surveys at the proposed dam site and quarry site including core drillings
(9) Land use surveys and social and environmental impact assessment
(10) Study on the watershed management
(11) Study on overall operation and management for MCWD.
(12) Study on improvement of unaccounted water for MCWD.

**Feasibility Study Stage:**

(1) Feasibility Study on the prioritized scheme for water resources development based on the Master Plan;
(2) Preliminary design of water supply facilities
(3) Basic design of structures for water supply
(4) Estimations of cost and benefit
(5) Study on implementation schedule
(6) Preliminary study on implementing organization
(7) Study on cost allocation
(8) Study on the methods for operation and maintenance
(9) Economic and financial assessment
(10) Social Development Study
(11) Environmental Impact Assessment

## (6) STUDY SCHEDULE

The study shall be carried out for 24 months.

## (7) EXPECTED MAJOR OUTPUT OF THE STUDY

A Master Plan report that would contain the following (at the end of the month 12 from the commencement of the project):

- Frame work plan for water resources development in Metropolitan Cebu and its vicinity up to the year 2020
- Basic design of dam and/or other water resources development-related structures
- Implementation schedule
- Operation and Management Plan of MCWD, including recommended methodology for Non-Revenue Water reduction.

A Feasibility Study report that would contain the following (at the end of the month 24 from the commencement of the project):

- Feasibility Study on the prioritized projects
- Organization
- Monitoring system
- Cost to be allocated to each sector
- Operation and Maintenance Method

(8) REQUEST FOR THE STUDY TO OTHER DONOR COUNTRIES, IF ANY

USTDA (USA) is presently conducting pre-feasibility study on the Mananga II water resources development scenario.

(9) OTHER RELEVANT INFORMATION, IF ANY

None

## III. FACILITIES AND INFORMATION FOR THE STUDY TEAM

(1) ASSIGNMENT BY THE IMPLEMENTING AGENCY OF COUNTERPART

Local Counterpart Staff
Team Leader
Assistant Team Leader/Dam Engineer
Hydrologist
Geologist
River Engineer/Hydraulic Engineer
Structural Engineer
Soil Mechanical Engineer
Environment Specialist
Economist/Financial Expert
Cost Estimator
Institutional (Cooperate Operation and Maintenance) Expert
Specialist in Non-Revenue Water Problem
Administration staff
Social Development Coordinator

(2) AVAILABLE DATA, INFORMATION, DOCUMENTS, MAPS ETC. RELATED TO THE STUDY

| Type of Data | Source |
|---|---|
| Socio –economic data | NEDA |
| Hydrologic Data | MCWD,DPWH,PAGASA, Univ. of San Carlos – WRC. |
| Geologic Data | BSR |
| Water Resources Dev't plans in the study area | MCWD, LWUA, NWRB |
| Irrigation plan | Cebu Province, NIA |
| Hydropower generation plan | NPC |
| Environmental data | Cebu Province, DENR |
| Land Use | Cebu Province, DILG |
| Water Right | NWRB |
| Maps | NAMRIA |

(3) OFFICE ACCOMODATION

An office space sufficient to accommodate study team member with sufficient desks and chairs, a telephone set and air conditioner.

## IV. GLOBAL ISSUE

### (1) ENVIRONMENTAL COMPONENTS

An environmental study will be conducted for the project to determine its possible impact to the environment. This will include identification of environmentally critical areas, the presence of endangered species and investigation of the present land use, water management and projected overall development in the study area.

### (2) ANTICIPATED ENVIRONMENT IMPACTS

Construction of the proposed dam may cause negative effects on the watershed and such effects will be given utmost consideration in the study.

### (3) WOMEN AS MAIN BENEFICIARIES OR NOT

Implementation of the project will benefit both sexes of the population because the project is not gender-oriented.

### (4) PROJECT COMPONENTS WHICH REQUIRES SPECIAL CONSIDERATION FOR WOMEN

None.

### (5) ANTICIPATED NEGATIVE IMPACTS ON WOMEN

None.

### (6) POVERTY REDUCTION

The realization of this study and eventual implementation of the projects will improve access to one of the most basic human needs, potable water. This will result in upliftment of the health and living standard of the people and improvement of the economy of the entire province, of the entire Visayas and thus country as a whole.

### (7) ANY CONSTRAINTS AGAINST THE LOW INCOME PEOPLE CAUSED BY THE PROJECT

None.

## V. UNDERTAKING OF THE GOVERNMENT OF THE REPUBLIC OF THE PHILIPPINES

In order to facilitate a smooth and efficient conduct of the Study, the Government of the Republic of the Philippines shall take necessary measures:

(1) to secure the safety of the Study Team.

(2) to permit the members of the Study team to enter, leave and sojourn in the Republic of the Philippines in connection with their assignment therein, and exempt them from alien registration requirement and consular fees.

(3) to exempt the Study team from taxes, duties and any other charges on equipment,

machinery and other materials brought into and out of the Republic of the Philippines for the conduct of the Study.

(4) to exempt the Study team from income taxes and other similar levies in connection with any emoluments or allowances paid to members of the Study team for their services in connection with the implementation of the Study.

(5) to provide necessary facilities to the Study team for remittances as well as utilization of the funds in the Republic of the Philippines from Japan in connection with the implementation of the Study.

(6) if necessary, to secure permission for entry into private properties or restricted areas for the conduct of the Study

(7) if and when necessary, to secure permission for the Study team to take all necessary data, documents and materials related to the Study out of the Republic of the Philippines to Japan in accordance with Philippine regulations

(8) to provide medical services as needed, however, expenses will be chargeable to members of the Study team.

(9) The Government of the Republic of the Philippines shall bear claims, if any arises against member(s) of the Japanese Study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claim arise from gross negligence or willful misconduct on the part of member of the Study team.

(10) Metro Cebu Water District shall act as counterpart agency to the Japanese Study team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

(11) The Government of the Republic of the Philippines assures that the undertakings by the Philippine Government referred to in this form will be ensured for smooth conduct of the Development Study by the Japanese Study team.

# I / A & M / M

# IMPLEMENTATION ARRANGEMENT

# FOR

# THE STUDY
# FOR IMPROVEMENT OF WATER SUPPLY AND SANITATION IN METRO CEBU

# IN

# THE REPUBLIC OF THE PHILIPPINES

# AGREED UPON BETWEEN

# METRO CEBU WATER DISTRICT
# AND
# JAPAN INTERNATIONAL COOPERATION AGENCY

**July 24th 2007, at Cebu**

**Mr. Armando H. Paredes**
**General Manager**
**Metro Cebu Water District**

**Mr. Shiono Hiroshi**
**Leader**
**Preparatory Study Team**
**Japan International Cooperation Agency**

## I. INTRODUCTION

In response to the request of the Government of Republic of the Philippines, the Government of Japan decided to conduct "the Master Plan and Feasibility Study on Water Resources Development for Metro Cebu" and "the Study on Metro Cebu Sewerage System Development" in 2004.

From October 24th to November 23rd in 2004, the Japan International Cooperation Agency (JICA) dispatched the preparatory evaluation study team and signed on the minutes of meeting on the above-mentioned studies between Metro Cebu Water District (MCWD) and the JICA preparatory evaluation study team on November 3rd 2004.

The JICA preparatory evaluation study team, however, found that there was some duplication with Water REMIND Project, in which MCWD participated, under implementation. JICA, therefore, has been suspending the preparation of the said studies.

From July 17th to August 15th in 2007, JICA dispatched the preparatory study team in reply to the request from MCWD of resuming the consideration to implement the studies. The team agreed to proceed to implement "the Study for Improvement of Water Supply and Sanitation in Metro Cebu" (hereinafter referred to as "the Study") named after integrating the two studies requested by MCWD.

Accordingly, JICA, the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Philippines side.

The present document sets forth the Implementation Arrangement with regard to the Study and will be valid after the notification of approval by JICA headquarters through JICA Philippines Office to the Philippines' side.

## II. Objectives of the Study

The Study has the following objectives:

(1) To formulate a plan for improvement of water supply and sanitation, including sustainable groundwater use;
(2) To carry out the technical transfer to the Philippine counterparts in the courses of the Study.

## III. Study Area

The Study will cover MCWD's service area and its surroundings as attached Annex I.

(1) Water resources development: MCWD's service area and its surroundings
(2) Water supply and sanitation: MCWD's service area

## IV. Target Year

The Target year of the plan shall be 2015.

## V. Scope of the Study

The Study will be carried out with the following two phases:

(1) Phase I: Analysis on the present water supply and sanitation conditions, including a groundwater simulation

(2) Phase II: Planning for water supply and sanitation

The each phase shall contain the following study items:

### Phase I: Analysis on the present water supply and sanitation conditions

#### Phase I-1: Basic Study

Institutional Framework on Water Supply and Sanitation

(1) Collection and analysis of laws and regulations, the existing data and information related to water supply and sanitation

(2) Confirmation of the regional development plan, other on-going plans and projects related to water supply and sanitation

Groundwater Modeling (Hydrogeological Study)

(1) Collection and analysis of the existing data and information as well as the on-going plans and projects regarding groundwater utilization

(2) Survey of the hydrogeological conditions in the Study area by the confirmation of main existing wells, springs, streams, soil types, change of land use, agricultural and irrigation conditions

(3) Data acquisition of hydrogeological parameters by core drilling, soil infiltration capacity test, pumping test, etc.

Water Supply and Sanitation

(1) Collection and analysis of the existing data and information as well as the on-going plans and projects regarding water supply and sanitation

(2) Review of the existing study on water demand forecast

(3) Field reconnaissance on the existing water supply facilities and current conditions of NRW (Non Revenue Water)

(4) Social survey on present water supply and sanitation conditions including

willingness to pay for water supply and sanitation services.

**Phase I-2: Groundwater Modeling and Simulation**

(1) Establishment of a groundwater model and calibration
(2) Simulation analysis based on the future groundwater abstraction plan, etc
(3) Optimization on well sites and each abstraction volume

**Phase II: Planning for water supply and sanitation**

Water supply

Study

(1) Hydraulic calculation of water distribution mains
(2) Study on proper measures for water demand management, financially viable new water sources and expansion of service areas with special consideration on equitable distribution of water up to 2015
(3) Study on the optimum water distribution network including allocation of necessary pump stations and reservoirs taking the planned new water sources into consideration
(4) Study on a telemeter remote control system for effective water distribution

Plan

(5) Formulation of a plan for rehabilitation, renewal and extension of water distribution network
(6) Formulation of an action plan for NRW reduction
(7) Cost estimate and financial analysis of the above plans
(8) Water demand management plan
(9) Recommendation for the institutional arrangement for the improvement of water supply

Sanitation

Study

(1) Identification of nitrate contaminated aquifer location (places and depths) and its extent by water quality data and surface drainage condition
(2) Analysis of groundwater contamination caused by waste water
(3) Interpretation of sanitation and sewage improvement method

Plan

(1) Formulation of a conceptual plan and recommendable approaches on sanitation

improvement

Groundwater conservation

(1) Formulation of an action plan for groundwater conservation

## VI. SCHEDULE OF THE STUDY

The Study will be carried out in accordance with the tentative schedule as attached Annex 2.

## VII. REPORTS

JICA shall prepare and submit the following reports in English to the Government of the Philippines.

1. Inception Report:
   Thirty (30) copies at the commencement of the work in the Philippines. (This report will contain the schedule and methodology of the Study.)

2. Progress Report:
   Thirty (30) copies in the forth month of the work in the Philippines.

3. Interim Report:
   Thirty (30) copies at the commencement of the second phase of the work in the Philippines. (This report will contain the results of the phase I.)

4. Draft Final Report
   Thirty (30) copies about two months before completing the Final Report.
   The Government of the Philippines shall submit its comments within one (1) month after receipt of the Draft Final Report.

5. Final Report:
   Thirty (30) copies with digital archive after JICA's receipt of the comments on the Draft Final Report.

## VIII. UNDERTAKINGS OF THE GOVERNMENT OF THE PHILIPPINES

1. The Government of the Philippines shall take necessary measures to facilitate the smooth conduct of the Study;

(1) To permit the members of the Japanese Study Team (hereinafter referred to as "the Team") to enter, leave and sojourn in the Philippines for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees;
(2) To exempt the members of the Team from taxes, duties and any other charges on equipment, machinery and other material brought into the Philippines for the implementation of the Study;
(3) To exempt the members of the Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study;
(4) To provide necessary facilities to the Team for the remittance as well as utilization of the funds introduced into the Philippines from Japan in connection with the implementation of the study;

2. The Government of the Philippines shall be responsible for dealing with claims which may be brought by third parties against the members of the Team and shall hold them harmless in receipt of claims and liabilities arising in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims or liabilities arise from gross negligence or willful misconduct of the above mentioned members.

3. MCWD shall, at its own expense, provide the Team with the following, in cooperation with other organizations concerned :

(1) Security-related information on as well as measures to ensure the safety of the Team;
(2) Information on as well as support in obtaining medical service;
(3) Available data (including maps and photographs) and information related to the Study;
(4) Counterpart personnel;
(5) Suitable office space with necessary equipment; and

(6) Credentials or identification cards.

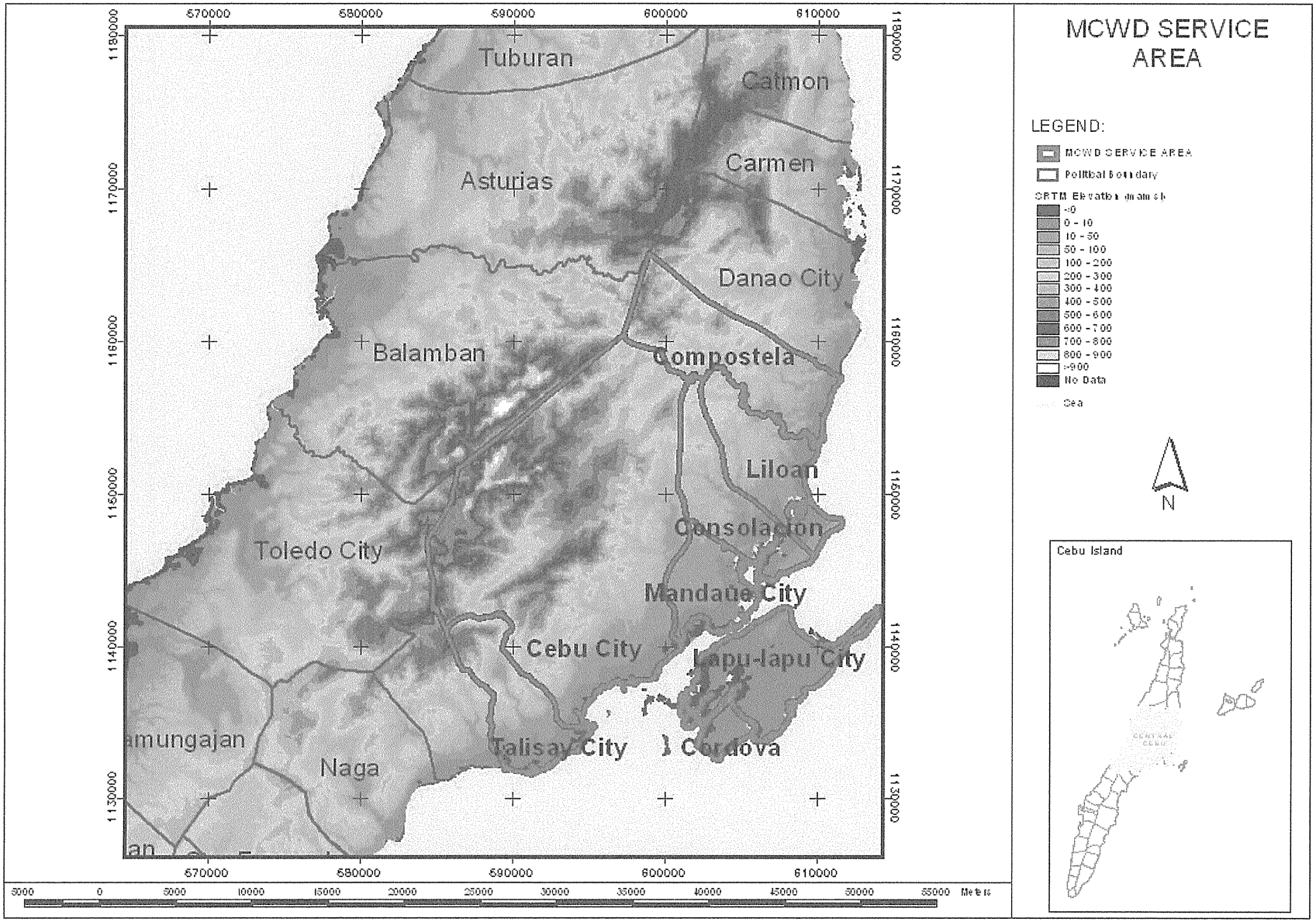
## IX. UNDERTAKINGS OF JICA

For the implementation of the Study, JICA shall take the following measures:
1. to dispatch, at its own expense, the Team to the Philippines
2. to perform technology transfer to the Philippines counterpart personnel in course of the Study

## X. OTHERS

JICA and MCWD will consult with each other in respect of any matter that may arise from or in connection with the Study.

Annex 1


MCWD SERVICE AREA
LEGEND:
MCWD SERVICE AREA
Political Boundary
SRTM Elevation in m.s.l.
<0
0 - 10
10 - 50
50 - 100
100 - 200
200 - 300
300 - 400
400 - 500
500 - 600
600 - 700
700 - 800
800 - 900
>900
No Data
Sea
N
Cebu Island
Tuburan
Catmon
Carmen
Asturias
Danao City
Balamban
Compostela
Liloan
Consolacion
Toledo City
Mandaue City
Cebu City
Lapu-lapu City
Talisay City
Cordova
Naga
670000
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690000
700000
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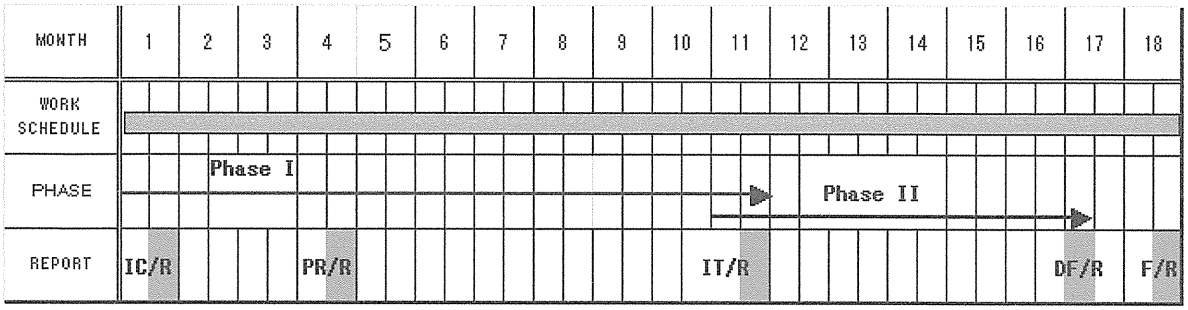
## Work Schedule




Note: IC/R: Inception Report
PR/R: Progress Report
IT/R: Interim Report
DF/R: Draft Final Report
F/R: Final Report

# MINUTES OF MEETINGS

# ON

# THE STUDY

# FOR IMPROVEMENT OF WATER SUPPLY AND SANITATION IN METRO CEBU

# IN

# THE REPUBLIC OF THE PHILIPPINES

## AGREED UPON BETWEEN

## METRO CEBU WATER DISTRICT

## AND

## JAPAN INTERNATIONAL COOPERATION AGENCY

July 24th, 2007 at Cebu

**Mr. Armando H. Paredes**
**General Manager**
**Metro Cebu Water District**

**Mr. Shiono Hiroshi**
**Leader**
**Preparatory Study Team**
**Japan International Cooperation Agency**

In response to the official request for development study of the Government of Philippines, the Japan International Cooperation Agency (JICA) dispatched the preparatory study team, headed by Mr. Shiono Hiroshi (hereinafter referred to as "the Study Team"), to Philippines from July 17 to August 15 in 2007 to discuss the Implementation Arrangement (hereinafter referred to as "I/A") for the Study for Improvement of Water Supply and Sanitation in Metro Cebu (hereinafter referred to as "the Study").

During its stay in Philippines, the Study Team carried out field surveys and held a series of discussions with the National Economic and Development Authority (NEDA), National Water Resources Board (NWRD) and Metro Cebu Water District (MCWD) and other authorities concerned. The list of those with whom the Study Team held meetings is shown in Appendix 1.

The minutes of meeting have been prepared for the better understanding of I/A agreed upon between the Philippines side and the Study Team.

The main items that were discussed and agreed by both sides are summarized as follows.

## 1 The name of the Study

The name of the Study has changed as following because of the amendment of the terms of references.

Renewed: the Study for Improvement of Water Supply and Sanitation in Metro Cebu
Original: the Master Plan and Feasibility Study for Improvement of Water Supply and Sanitation in Metro Cebu

## 2. Coordination with other relevant organizations

1) Water Supply and Sanitation

The Study Team mentioned that a water and sanitation plan in the MCWD's service area, as the result of the Study, should be formulated, taking the regional development plan and urban development plans of the related Local Government Units (hereinafter referred as "LGUs") into considerations. The Study Team, therefore, suggested that a committee for the Study chaired by MCWD, consisting of the representatives of Cebu city, Talisay City, Mandaue City, Lapu-Lapu City, Cordova Municipality, Consolacion Municipality, Liloan Municipality and Comostela Municipality, should be set up for the coordination.

MCWD agreed to invite the LGUs to be members of the stakeholders' committee.

The Study Team requested MCWD for the preparation to set up the committee after the official notification of the commencement of the Study from the JICA Philippines office.

2) Groundwater Conservation

Because NWRB deputizes MCWD to evaluate applications for the permission of groundwater abstraction in the MCWD service area, it would be preferable to consult with NWRB during the preparation of a groundwater conservation plan.

MCWD will arrange the meetings inviting NWRB for the consultation in course of the Study.

## 3. Undertaking of the Government of Philippines

JICA will send a study team (hereinafter referred as "the JICA study team") to implement the Study. Both sides confirmed the following matters.

1) As to VIII. 3 (3) of I/A, the Study Team requested MCWD to take necessary procedures to permit the JICA study team to take available aero photographs, satellite images and maps out of Philippines. MCWD notified that they would provide convenience to the JICA study team

as far as possible according to the laws and regulations of the Government of Philippines.

2) As to VIII. 3 (4) of I/A, the Study Team requested MCWD that counterpart personnel of the Study should be identified at the commencement of the Study for ensuring better cooperation, to which MCWD agreed. For this purpose, JICA shall notify number and their expertises of the JICA study team members before the commencement of the Study. The Study Team also requested the Philippines side to assign counterpart personnel with English ability for better and smooth technology transfer.
3) As to VIII. 3 (5) of I/A, MCWD agreed that the office space would be provided in its headquarters office for the use of the JICA study team.

# 主要面談者リスト

付属資料－３．主要面談者リスト

**JICA Pilippines Office**

| | |
|---|---|
| Mr. Shozo Matsuura | Resident Representative |
| Mr. Makoto Iwase | Assistant Representative |
| Ms. Minnie M. Dacanay | Planning & Coordination Section |

**Embassy of Japan**

| | |
|---|---|
| Mr. Koichi Sakai | Second Secretary, Economic Affairs |

**JBIC Representative Office in Manila**

| | |
|---|---|
| Mr. Jin Wakabayashi | Senior Representative |

**NEDA HQ**

| | |
|---|---|
| Ms. Coy Roncesvalles | Water Resource Development |
| Mr. Robert L. Domingo | Economic Development Section |
| Mr. Joseph Coplsttans | Economic Development Section |

**NWRB**

| | |
|---|---|
| Mr. Ramon B. Alikpala | Executive Director |

**Phillipine University**

| | |
|---|---|
| Dr. Leonardo Liongson | Director, UP-NHRC |
| Dr. Guillermo Q. Tabios III, Ph.D | NHRC |

**Metro Cebu Water District (MCWD)**

| | |
|---|---|
| Mr. Armando H. Paredes | General Manager |
| Mr. Ernie T. Delco | Asst. General Manager for Operations |
| Mr. Michael M. Balazo | Asst. General Manager for Technical Services |
| Mr. Lasaro P. Salvacion | Manager, Knowledge Center |
| Atty. Clairon Pañares | Manager, Legal Department |
| Ms. Rowan E. Teñedo | Manager, Corporate Planning Department |
| Mr. Raul E. Tabasa | Manager, Engineering Department |
| Mr. Angelo Cabije | Manager, Production and Distribution Department |
| Mr. Edgar Ortega | OIC, Production and Distribution Department |
| Ms. Rebecca Husayan | OIC, Talanban Laboratory |
| Mr. Ronnel Magalso | Supervisor, Knowledge Center |
| Mr. Geoffer Gonzaga | Knowledge Center GIS Specialist |
| Mr. Veronico Castro | Talanban Satellite Office |

| | |
|---|---|
| Ms. Tertuliana Andaya | Manager, Public Affairs Department |
| Mr. Noel R. Dalena | Manager, Pipeline Maintenance Department |
| Mr. Benjie Gabriel | Knowledge Center Specialist |
| Ms. Yvonne Quilaton | Knowledge Center Department Secretary |
| Ms. Gennifer Delco | Asst. Manager, Financial Department |
| Mr. Israel Gcasan Ortiz | OIC, Service and Installation Department |

**Cebu City**

| | |
|---|---|
| Mr. Paul Villarete | Head, City Planning & Development Division |
| Mr. Dinigio S. Guallza | OIC, Department of Public Services |
| Ms. Rufina A. Adlawan | Engineer, Department of Public Services |
| Mr. Arnold Fabillar | Project Management Office, South Reclamation Project |

**Mandaue City**

| | |
|---|---|
| Ms. Delia B. Rodrigo | Head, City Planning & Development Division |
| Mr. Dexter P. Fortuna OIC | OIC, City Planning Division |
| Mr. Eduardo Carba | OIC, City Planning Division |
| Mr. Emil Rosal | City Councilor |
| Mr. Danny Tariman | Barangay Captain |

**Lapu-lapu City**

| | |
|---|---|
| Ms. Perla T. Amar | Head, City Planning & Development Division |
| Mr. Marshall Ycong | City Councilor |
| Mrs. Erlinda Beduya | Head, Urban Poor Affairs Office |

**Talisay City**

| | |
|---|---|
| Mrs. Christine Homez | Head, City Planning & Development Division |
| Mr. Albert L. Obandu | OIC, City Planning & Development Division |
| Ms. Lagrimas Abargua | Head, Urban Poor Affairs Office |

**Consolacion Municipality**

| | |
|---|---|
| Ms. Salome Palang | OIC, Planning |

**Compostela Municipality**

| | |
|---|---|
| Mr. Carmelo Tejero | Head, Municipal Planning & Development Division |
| Mr. Gilbert Wagas | Advisor to the Mayor |

**Liloan Municipality**

| | |
|---|---|
| Mr. Epifanio Jordan | Head, Municipal Planning & Development Division |

**Cordoba Municipality**

| | |
|---|---|
| Ms. Leonides Ator | Head, Municipal Planning & Development Division |

**NEDA Region VII**

| | |
|---|---|
| Ms. Marlene Catalina P. Rodriguez | Regional Director |
| Ms. Aina Hubahib | Officer in Charge |

**National Irrigation Authority (NIA) in Region VII**

| | |
|---|---|
| Mr. Tabato | Director |

**Mines and Geoscience Bureu VII**

| | |
|---|---|
| Mr. Abraham R. Lucero, JR. | MSc Geologist |

**University of San Carlos**

| | |
|---|---|
| Fr. Herman van Engelen | Director, Water Resources Center |
| Ms. Fe B. Walag | OIC for Water REMIND, Water Resources Center |

**CUSW (Cebu Uniting for Sustainable Water Foundation, Inc.)**

| | |
|---|---|
| Fr. Marqarito Alingasa | President |
| Ms. Soccrro B. Atega | Program Officer |
| Mr. Casiano Q. Catapang | Program Officer |

**PAGASA Cebu office**

| | |
|---|---|
| Mr. Diosdado | Representative |

**Foremost (Private Water Supplier)**

| | |
|---|---|
| Mr.Casar J. Rebosura | Operations Manager |

**Mactan Rock Industries, Inc.**

| | |
|---|---|
| Mr. Antoio Camelo P. Tompar | President / CEO |

**San Miguel Beer Company, Cebu Factory**

| | |
|---|---|
| Mr. Gin Antencio | Department of Engineering |
| Mr. Pancho | Dept of Engineering |

# Q/N 及び回答

# QUESTIONNAIRE

The JICA Preparatory Study Team would like to submit the Questionnaire formed of the following general and particular questions in relation with the proposed study in order to clarify the contents of the study and to appraise the scope of the cooperation.

Please answer in detail as much as possible in writing to the following questions (Items A), and please kindly provide us with data and information requested herein (Items B) for the purpose of smooth implementation of the preparatory study:

Notes;

1. Distribution of Questionnaire to Authorities concerned

   It is supposed that all the questions will be answered by Metro Cebu Water District (MCWD). However if needed it is sincerely requested that relevant Authorities shall be in charge of answering the questionnaire.

2. Source of Data and Information

   Names and Dates of Data and Information Sources shall definitely be written at the end of data and information.

3. Statistical Book to be prepared in advance

   No answer shall be needed for the general matters if they are described in the publicized Statistical Book.

The Scope of Work shall be discussed on the basis of this questionnaire. Therefore the smoothness of JICA preparatory study will entail your cooperation in answering the questionnaire.

## A. QUESTIONS

### 1. Questions on water resources

#### 1-1 Hydrology and Hydro-geological Information

- Well Data

Local Water Utilities Administration (LWUA), Manila has a database regarding wells in Cebu area. They are lack of information for water quality, groundwater level, well elevation, permeability coefficient, geological log, depth and location of aquifer, and discharge records, etc. Is it available from LWUA or MCWD, or other offices such as San Carlos University? Please provide the detail for existing well location, elevation, well depth, diameter, SWL and PWL, discharge, past operation records

回答:

The LWUA office in Manila has copies of all water resources reports being the financing and supervising agency of MCWD water supply development projects before. The last major project with LWUA was in 1997 during the implementation of the Mananga Phase I project. They have copies of well information from drilling reports for completed wells including interim water resources updates, studies and investigations until 1997. The PGDB (Phil. Groundwater Data Bank) project handled by LWUA in 1991 started to consolidate operational MCWD data (i.e. swl, pwl, Cl and Q ). The updating was not sustained especially when MCWD ceased its financial dependability to LWUA.

The USC-WRC maintains a good collection of information on private wells drilled and supervised by them. However, access and use of this information are restricted by most of their clients.

MCWD collects operational, hydrologic, hydro-geologic information on a monthly basis since 1989. It also maintains a large database of water resource information as groundwater elevation and operational water level, salinity and nitrate and extraction volumes of the 108 wells in its service area. Aside from these operational data individual well or aquifer information like location, geologic setting, ground elevation, size and depth of drilling, resistivity logs, conductivity logs (lately) and pumping tests results are available either as paper and digital archives (see attachment).

- Other Water Supply System in the Groundwater Balance Study Area

If there is other organized water supply system such as local water supply district (WD) in the study area, please specify the name of WD and person in charge to be contacted to get necessary hydro-geological information of WD

回答:

Many private wells exist in the study area. Some are registered with NWRB but many are not. Some entities operate more than one well making a small system for their immediate water needs or for

small public water systems (i.e. Adala, Mactan Rock, TARUWAS, Casuntingan, SMC). Other significant private well operators are commercial establishments and subdivisions which operates their own single wells or more than one well in some cases. They operate their wells without taking operational hydrologic or aquifer data into consideration and without proper engineering consideration into sustainability and protection. Only San Miguel Corporation Brewery (SMC) in Mandaue City maintains a systematic record of their well operation.

- Hydro-meteorological Data

Past meteorological data of rainfall, evaporation, temperature (mean, max and minimum), humidity, sunshine

回答:

Hydrologic data as monthly rainfall and river flows and evaporation are collected for the major basins in the service area since 1977 maintained by USC-WRC and MCWD. Over the years many stations were added in some areas by WRC. With the Water REMIND Project all hydrologic data were consolidated, validated and integrated into one reliable database system including the long years of time series well data. It was turned over to MCWD and now is operated and maintained by the Knowledge Center.

- Hydrological Data

Past reliable flow records and water quality for Mananga, Cambado-Lusaran, Danao, Kotkot and the Luyang River

- The coded 10 types of soil classification Map in the study area (refer to “Water Resources Assessment” conducted by NRWB)

- Land use condition at present and future plan in the study area

Aerial map, topographic map and satellite images

回答:

-Soil maps

Soil classification information in digital maps were part of the huge information from the project handed to MCWD. The existing and future land-use conditions for the different municipalities in the Central Cebu area are also part of the GIS information database.

-Aerial and Satellite photos

Aerial photo maps at MCWD are actually old grayscale maps contracted by CERTEZA dating to 1988 and covering the three main watersheds in the MCWD area. The resolution is quite high provide very good impression on land features and existing development. A low resolution color photo map was

taken somewhere in the early 1990's (LANDSAT) but only covers a portion of Cebu and Mandaue City.

Another LANDSAT satellite image from USGS was purchased during WRP at 30 m resolution covering the REMIND project area. Topographic maps are also available in different scales but were pantographed renditions from old 1954 BCGS maps prepared during the American occupation. It was digitize by WRC and is part of the information maintained at KC.

**1-2 Groundwater Modeling and Simulation**

Please specify the area to be studied with newly planned well location with design criteria

Is there any obstacle or opposition for smooth execution of the study?

Is there any problem to enter the area and execution of field survey work?

回答:

Groundwater modeling was only made in 1986 covering 180 $km^2$ of the coastal aquifer bounded by the Mananga River in the west, the Kotkot River in the east, the volcanic formation and the sea for the west and east respectively. Though it was a mainframe model it was the first comprehensive digital flow and solute transport model made for MCWD. It was calibrated to 1956, 1978, 1988 water level data was made to forecast water resource scenarios under different development and water resources utilization schemes. Except for the model itself all data are in MCWD/KC ranging from distributed population and its growth, aquifer parameters and well development schemes. A digital model of the same type was also made for the Mananga Phase I in the same period.

In 1997, in the implementation of the Mananga Phase I, a digital model was also made for the final evaluation of the withdrawal in the particular area. For milestone annual population figures the NSO provided during the WRP project data on the population growth in the different barangays of the Central Cebu area.

**1-3 Relevant Data Information for Groundwater Balance Simulation**

Chronological Data for calibration of groundwater modeling (1970's, 1980's, 1990's and 2007) such as,

- Population with distribution map
- Land use condition by aerial map, any kinds of land use change records
- Surface water use condition
- Past rainfall data by monthly base

**1-4 For groundwater simulation**

- Future water demand forecast

- Future other water resources development schedule with supply volume

**1-5 Introduction of topographic survey, well drilling and construction companies for water supply project**

For supplemental data and information collection for water balance study, and price quotation for field investigation, please provide the reliable companies list

回答:

Survey, Drilling and construction companies for water supply Locally, only WRC maintains a comprehensive water resources database is capable of performing related investigation and studies. Many similar outfits are based in Manila but may not have locally integrated information.

Two local drilling companies in Cebu cater to MCWD projects. The Woolbright and Abesamis Drilling Corp. has necessary equipments to carry out large diameter (up to 20 in.) percussion type drilling activities.

Several competent surveying companies with adequate and state of the art instruments are available locally (i.e. Genson, Tuastumban, Jabil, etc.)

**2. Questions on water supply**

**2-1 Water demand**

(1) Was your "Market Study on the Existing and Potential Real Water Demand of Metro Cebu Water District" completed?

If completed, please describe your estimated future water demand projection based on the above study.

回答:

The Market Study has been partially completed however the results are currently being reviewed by the Corporate Planning Department as the latter has reservations as to the quality and reliability of the output.

*Reference: Corporate Planning Department, MCWD*

(2) How do you evaluate the proposal on reduction of water demand and water demand management recommended in the water REMIND project?

回答:

a. Except for leakage reduction of MCWD distribution system, and differentiated water pricing, the rest of the water demand reduction measures selected for the water remind action plan such as rainfall harvesting, reduction of losses in the MCWD distribution system, adequate and

differentiated pricing, and promoting water saving equipment and measures in industry, and general and dedicated awareness campaigns, would only be effective if plans and regulations are stringently enforced in coordination with concerned government agencies (i.e. LGU's, NWRB). The water demand management measures will be for naught if these government agencies fall short in backing up the water district's implementation of these measures. Thus, we should first strengthen our water governance at least starting from the creation of an improved institutional setting for Central Cebu.

b. As regards the *reduction losses in the MCWD distribution system*, the leakage reduction measure is a must for MCWD because its benefits would double once the supply oriented measures (e.g. additional water sourcing scheme) are in place. This means that, additional supply together with the reduced losses in the distribution system will deliver a significant reduced demand over the years with practically no added cost. In effect, the investment on water sources will yield a higher rate of return than the normal rate of return in the absence of loss reduction measures.

The proposals in the Water Remind Project provide for effective measures to manage water already being used rather than keep on adding new sources of water (*e.g. reduction of non-revenue water instead of building a damn).*

*Reference: Knowledge Center, MCWD*

(3) Please describe your on-going program for water demand management, such as water saving measures, reduction of unaccounted for water, and general awareness campaign to reduce water use.

回答:

The following programs are being undertaken by the water district to manage water demand:

a. Massive Rehabilitation Project

The Massive Rehabilitation Project is a 7-year program proposed in 1998 with the objective of rehabilitating service connection to reduce unaccounted water through the reduction of pipeline leaks. For 2007, the Pipelines Monitoring Group (PMG), the group tasked to carry out this project, focuses its efforts on the critical areas in the South.

Due to the growing number of service connections that needed rehabilitation, the implementation period of the project will have to be extended to 9 years or until 2012.

b. Rehabilitation of Transmission and Distribution Lines

The rehabilitation of transmission and distribution lines is undertaken by the MCWD Construction Department to reduce leaks of the water system's main lines.

Rehab projects are currently done in the areas of Kamagong Street, Archbishopp Reyes Avenue, Echavez Street, Mactan, Cordova, and Bulacao.

c. Supply Distribution Improvement Program (SDIP)

The SDIP aims to improve the water district's distribution efficiency and maximize available

water by bringing the water to areas where it is needed the most. SDIP activities include the putting up of reservoirs, upgrading or installing booster stations, linking major transmission mains, isolating smaller elevated areas and initiating exploratory works on the pipe network.

Once all these programs are zealously pursued and in place, MCWD will be in the position to distribute water supply equitably throughout Metro Cebu regardless of source. Further, problems such as suspension of water application in many elevated areas shall be gradually eliminated.

SDIP is a 4-year program, expected to be completed by 2009.

d. Meters Maintenance

Maintenance of the meters are in charge of the MCWD Maintenance and Support Services Department (MSSD) to maximize meter efficiency through preventive and corrective meter repairs. The process involves the pulling out of meters for testing, repair and calibration. Since most of these meters are still useful, these meters will be installed again in the field but will be pulled out only after 5 years for preventive maintenance.

For 2007, the total corrective and preventive meter replacements are expected to be 10,680 and 8,817 meters respectively.

e. Conservation Tips

The Public Affairs Department (PAD) is giving out Water Conservation Tips to the consuming public for the latter's general awareness of the importance of water saving measures. The tips are embodied in pamphlets given out to the concessionaires.

*Reference: Corporate Planning Department, MCWD*

*Public Affairs Department, MCWD*

(4) Do you think what kind of technical assistance of JICA Study is useful for you in water demand management?

回答:

Technical assistance on the following will be very useful in MCWD's water demand management:

a. Methodology in determining demand or MCWD water

b. Study on Sanitation and Sewerage System

c. Other innovations on non-revenue water reduction

**2-2 MCWD Strategic Sourcing Plan (2007-2030)**

(1) How much is the present water production capacity of wells?

回答:See accompanying MS Excel file production plan2007.xls

(2) At the time of the last preparatory study (October 2004), 10 wells among 103 were not operated and waiting proper rehabilitation. Was rehabilitation completed? Please provide the latest list of wells with present available capacity.

回答:

We could not determine the 10 wells reported in the preparatory study in 2004. However we have the list of new wells commissioned or completed after 2004. These are:

| | |
|---|---|
| G4 | commissioned in February 2005 |
| CAD1 | commissioned in September 2006 |
| MC27 | commissioned in October 2006 |
| CAN6 | commissioned in December 2006 |
| CAD7 | commissioned in 2006 |
| L6 | commissioned in June 2007 |

(3) Groundwater development of 56,000$m^3$/day in short term (2007-2010) and 28,000$m^3$/day in medium term (2011-2015) is planned in MCWD Strategic Sourcing Plan (2007-2030).

- There are three kind of wording in implementation plan regarding groundwater development; well commissioning, drilling of new wells and exploratory drilling. Please describe definition and discrepancy between three wordings.
- Please describe the area and population that will be covered by the planned wells
- Please provide the list of water supply pipelines and reservoirs, which are needed for construction and rehabilitation in distribution of water from the above planned wells.

回答:

The exploratory wells always come first in any of our water supply project related to groundwater extraction. It is primarily a drilling operation to validate and confirm hydro-geological data inferred from reports and studies made for the particular project. Normally, it is made to gather actual water quantity and quality of groundwater in the project area.

Upon verification, after interpretation of data from completed exploratory wells, the actual well drilling project commences with due consideration and modification based on the new information gathered. The right of way acquisition for the wells and pipes also goes full blast with this activity.

The commissioning refers to the activities related to the final usage of the new facilities after the completed well drilling. It may include pump house and electrical controls construction and also the laying of transmission and distribution pipes to target areas or to existing MCWD lines (see attached SSP and relevant pipe laying projects).

(4) Please describe present monitoring system of observation well and coastal monitoring well for

groundwater level and chloride ion concentration, and the latest monitoring records of the database.

回答:

All wells are monitored monthly for portability, salinity, nitrate, SWL, PWL and discharge volume (see also answers to 1-1 queries)

(5) As surface water source some dam constructions are planned in medium and long term. What do you think of procurement of fund for such dam construction? Please describe your basic policy on financial management in dam construction.

回答:

MCWD do not have the capability to finance large water supply projects like dams. (Answers may be referred to Corporation plan).

(6) Priority of Water Resources Development and its Environmental Issue

Please specify the prioritized project name for groundwater and surface water resources with explanation for environmental issue

How is the present situation to clear environmental issue for prioritized projects?

回答:

In terms of water resources development, you can find this in our strategic sourcing plan.

**2-3 Water supply development project and basic policy on unsolicited BOT scheme**

(1) South bulk water supply project

- Was commissioning completed? If not, when it is completed?

回答:No.

- Present water supply quantity

回答:100,000 cubic meters per day will be supplied to MCWD

- Present water buying rate by MCWD

回答:Not determined

(2) Luyan weir (Carmen bulk water supply)

- Present progress and current situation of the project

回答:

MCWD and Ayala-led consortium are trying to resolve the issue on development cost for the proposed multi-billion Carmen Bulk Water Project. MCWD and Ayala have verbally agreed to take

out the development cost issue and leave it to the transfer of water rights for the NWRB to resolve. MCWD and Ayala would submit their respective proposals to the NWRB for this matter.

MCWD is still waiting for the resolution of the MCWD board, which is scheduled to meet on July 30 for its board meeting.

The issue on the water permit valuation for transfer of the water permit is now with NWRB for decision. In case NWRB suggests an amount that is not acceptable to both parties, MCWD may declare failure of negotiations and terminate the proposed projects.

- It is said that MCWD workers employees union is against the project because they dislike privatization scheme. What is the situation now?

回答:

No new issues have been raised by the union, thus, it is assumed that the union has not controverted its certain stand on the project.

- What does the employer side think of the project?

回答:

Notwithstanding all opinions presented, the project has already been accepted by MCWD, thus, laws and legal procedures now bind the all the parts involved in the project. MCWD will no longer be in a position to withdraw from the project without being sanctioned by governing laws, rules and regulations.

(3) Saltwater reverse osmosis (JBIC-S)

- What kind of business scheme it will be?

回答:

The options pertaining to the kind of business scheme are yet to be examined and the best option shall be proposed taking into consideration the ongoing BOO projects in the Philippines such as the Carmen Water Diversion Project proposed for Metro Cebu.

- How MCWD will involve in the project?

回答:

MCWD shall provide the Study Team with the following:

a. Security-related information as well as ensuring the safety of the team;

b. Available data, including maps and photographs, and information related to the study;

c. Counterpart personnel;

d. Suitable office space; and

e. Credentials for identification cards

- Please describe the outline of the project.

- Is a part of water used for domestic? If yes, how much is water buying rate by MCWD?

回答：Not determined.

- Present progress and current situation of the project

回答：The project has been set aside due to high project cost.

(4) Desalination plant in Mactan by Mactan Rock Industries Inc.

- Present water supply quantity

回答：A guaranteed minimum volume of 150,000 $m^3$. per month

- Present water buying rate by MCWD

回答：MCWD shall be billed monthly at PhP 17.00 per $m^3$. in the year 1999 subject to price escalation based on the following parametric formula:

a. Power Rate Adjustment

$$\frac{\text{(Current Power Rate – Base Power Rate)}}{\text{Base Power Rate}} \times 30\% \text{ of base selling price}$$

b. Consumer Price Index (CPI) Adjustment

$$\frac{\text{(Consumer Price Index – Base CPI)}}{\text{Base CPI}} \times 40\% \text{ of base selling price}$$

For 2007, MCWD is paying PhP 22.44 per $m^3$. (Inclusive of price escalation cost) plus cost of soda ash of PhP 2.45 per $m^3$.

- What do you think of extension of this project after expiring the 10-year BOO scheme contract since 1998?

回答：The extension of this project is not possible because of the restrictions provided for under RA 9184 of the General Procurement Reform Act (GPRA).

(5) If you have the other on going or planned BOO or BOT scheme projects, Please describe the outline of the projects.

回答：Non

(6) Basic policy on unsolicited BOT scheme

The final report of water REMIND project said the unsolicited BOT proposal for development of water

supply projects (Bohol, southern wells, Luyan, Malubog and the like) was as follows:

Unsolicited BOT proposals are typically more costly and less transparent. The public sector must be more vigilant in ensuring competition and invest more resources for water supply project planning, feasibility studies and monitoring of the implementation. If the public does not become pro-active and instead only respond to unsolicited proposals, they will end up in situations that completely go beyond their control.

What do you think of the above opinion? Please describe your basic policy on unsolicited BOT scheme

回答:

Considering the high risk that is apparent in non-solicited BOT projects, it is imperative that the water district must be well equipped with the technical know-how and must always be ready with contingency plans to prepare for any significant changes in the projects. Further, since the parties shall agree upon the terms of the contract, it is a must that the water district has strong negotiation skills.

*Reference: Corporate Planning Department, MCWD*

*BOT Law and Implementing Rules and Regulations (please see attached)*

**2-4 Water distribution network and control system**

(1) Was installation of 50 district meters completed, which was scheduled in the year 2005?

(2) Have you done any works for improvement of water distribution network and establishment of telemeter remote control system for effective water distribution in last three years? If you have done, please describe it.

(3) Do you have any improvement plan of water distribution network and control system in the future? If you have, please describe your plans.

(4) Do you think what kind of technical assistance of JICA Study will be useful for you in improvement of water distribution network and control system for effective water distribution?

**2-5 Water supply to the vulnerable or the poor**

(1) Number of water connection to the communal reduced by 20 from 252 in 2003 to 232 in 2006. The reason why it reduced?

(2) Please describe your basic policy on water supply to the vulnerable or the poor and special measures, if you have

**3. Questions on sanitation and sewerage**

**3-1** According to the report “Basic Survey on Water Resources management by JICA 2007 March” by Woodfields Consultants Inc., there is no comprehensive sewerage system. However, the improvement of hygiene condition is necessary as well as supply safe water. How do you think about sewerage improvement method and its financial support?

回答:

It is of great significance to develop a Sewerage System for the provision of sewerage and the efficient collection, treatment and safe disposal of sewage in MCWD’s franchise areas and neighboring towns to support our company vision. This sewerage refers to a system or network of pipelines or conduits including pumping stations, life stations, and service connections which carries sewage (liquid human or animal wastes and other waste waters, excluding oil or oil wastes) for proper treatment. With this system in place, residences, building, industrial or commercial establishments shall be adhering to more desirable sanitary practices and thus contribute to the prevention of illnesses, maintenance of health and preservation of natural resources. And since the water district presently does not have any money appropriated for this type of project, financial support is always welcome - even necessary.

**3-2** According to the report “Basic Survey on Water Resources management by JICA 2007 March”, MCWD desires to study for sewerage planning by JICA. Which method is practical in your vision for the improvement in the area from “modular” or “communal type” or by “septic tank” system?

回答:

In our light research we would be more inclined to employ a “modular” type of a sewerage system. Most of the available modular systems are already prepackaged an also a pre-assembled unit. Meaning, this can be readily operated with easy start up procedures considering that MCWD does not have any firsthand experience on this yet. Also, it features to have low operational costs with capabilities to treat sewage with a consistent water quality output.

Septic Tank Sewage Treatment Systems treat sewage at its location, rather than transporting the sewage to a sewer system or larger treatment system nearby. Because many septic tank systems throughout the world are not functioning properly, they can cause serious environmental and human health problems.

The Communal Sewage System would have been conventionally correct, but not easily doable and practical since this shall entail a much larger budget because this involves a series of sanitary intercepting sewers or intercepting collecting sewers, pumping stations, sewage treatment plants, and associated pollution control facilities for the conveyance, treatment, and disposal of sewage operated by covering different municipalities.

**3-3** Please introduce us the person in charge in the city office to collect the data for water borne disease, infant mortality, water quality data of sewerage and sanitation facilities, future improvement plan, and septic tank toilet construction plan and method etc.

**3-4** Please provide us the information of NGOs regarding hygiene and sanitation improvement activities.

## 4. Questions on social and environmental issues

### 4-1 National Level

(1) Please provide us with the relevant documents for laws, regulations for (i) water issues and (ii) environment assessment?

(2) Please provide us with national policy papers and national program documents regarding (i) water and sanitation and (ii) poverty reduction.

(3) Please specify the organizational setting/ national framework in your government for sanitation and sewerage improvement.

Social condition stability and gender issue are key component for stable development of country. Do you have strategic program for regional development plan in proportional with urban developing area?

### 4-2 Regional Level (Cebu Urban City office level)

(1) Please provide us with regional policy papers and regional program documents regarding (i) water and sanitation and (ii) poverty reduction.

回答:

i. Water and Sanitation

The Regional Health Offices merely implement the plans and programs of the National Government on water and sanitation.

*Reference: Department of Health, Center for Health Development, Region 7*

ii. Poverty Reduction

*Please see attached: Partnership for Poverty Alleviation in Cebu City Philippines*

*Reference: www.napc.com.ph*

(2) Please explain MCWD's procedure of land acquisition, and compensation.

回答:

MCWD acquires lands through purchase and expropriation.

Acquisition through purchase:

1. MCWD, through its Right of Way (ROW) agents, negotiates with landowners as to the selling price of the lot/s.

2. Board passes resolution authorizing MCWD's purchase of the lot/s.

3. Processing of payment.

Acquisition through expropriation:

**Expropriation is being resorted to when there is refusal on the part of the landowner to sell the lot/s to MCWD or when there is no agreement reached between the two parties as to the selling price of the lot/s or other terms and conditions of sale.*

1. MCWD Board passes Resolution authorizing MCWD to expropriate the lot/s.

2. MCWD Legal Department files a verified complaint with the Regional Trial Court (RTC).

3. The court serves the complaint to the defendant (landowner).

4. MCWD Legal Department files a motion for writ of possession.

5. Bureau of Internal Revenue (BIR) makes an assessment of the value of the lot/s.

6. MCWD deposits an amount in court as payment for the estimated just compensation (initial selling price of the lot/s determined).

7. Court issues the writ of possession. *(At this point, MCWD can already make use of the lot/s.)*

*Reference: RA 8974 (please see attached)*

(3) Please name a few localities with sanitation problems under the MCWD service area? What are their particular problems?

回答:

*(The data can be gathered from the Provincial Health Office (PHO) which requires a letter requesting for such data. It will take some time before they could furnish the data as it still has to approve the request.)*

(4) Does MCWD or LGUs have special arrangement such as budgetary allocation and subsidies to supply water to poor localities? If so, what are they?

回答:

YES. The Department of Public Services of the Cebu City Government has an Artesian Well Division that delivers water to mountain barangays by water tankers at a very low rate. Another service of the division is the construction of artesian wells subject to request for any funding available.

*Reference: Artesian Wells Division, Department of Public Services*

*Cebu City Government*

(5) How is the budgetary arrangement for sanitation structure improvement, and sewerage infrastructure construction?

回答:

The sewerage infrastructure construction in Cebu City is JICA funded with a Cebu City Government counterpart. The budget is included in the LGU's budget for the City Planning and Development Office.

The North Reclamation Area- STP has its own ordinance with budget allocation but the budget has not been released yet. It will be part of the budget of the Cebu City Government's Department of Public Services.

Further construction of sewerage infrastructures will have to be discussed. Because of a large capital needed for their construction plus the maintenance and operation costs entailed, it is perceived that project implementation is of remote probability.

*Reference: Cebu City Mayor's Management Team, Cebu City Government*

(6) Please provide us with a list of NGOs that work for both sanitary improvement and poverty alleviation in Cebu.

回答:*(Please see attached list of NGO's.)*

*Reference: www.pngo.com.ph*

**4-3 Community Level**

The Team is planning to visit some localities to observe the situation and conduct interviews with residents. Could you kindly recommend us a few, say three, localities with sanitation problems? And could you explain why you choose them? In other words, what are their problems?

回答:

Localities with sanitation problem:

a.) Calamba, Cebu City - unsanitary toilet facilities

b.) Duljo, Cebu City - unsanitary toilet facilities

c.) Sawang Calero, Cebu City - unsanitary toilet facilities

*Reference: Report on West Health Area Water Sources and Toilet Facilities for 2005 (no report for 2006 yet), Department of Health, CHD 7*

## B. REQUIRED DATA AND INFORMATION

| No. | Item | Availability (Y/N) | Name of Materials |
|---|---|---|---|
| 1. | **Data and information regarding water supply system** | | |
| 1.1 | **Key indicator of water supply in the year 2004, 2005, & 2006** | | |
| | (1) Population of Metro Cebu w/in MCWD's service area namely: Talisay City, Cebu City, Mandaue City, Lapu-Lapu City, Compostela, Consolacion, Cordova, and Liloan | Y | NSO's Census |
| | **2004 1,504,700** | | |
| | **2005 1,660,228** | | |
| | **2006 1,638,922** | | |
| | ***Note: Population was based on 2000 NSO's Census w/ a projected annual growth rate of 1.3%*** | | |
| | (2) Number of the served population and coverage ***(w/in MCWD's service area)*** | Y | MCWD Data |
| | **2004 842, 700** | | |
| | **2005 902, 593** | | |
| | **2006 924, 708** | | |
| | (3) Number of water supply connection | Y | MCWD Data |
| | **2004 99,153** | | |
| | **2005 105,532** | | |
| | **2006 110,361** | | |
| | (4) Capacity of water production by source of water | Y | MCWD Data |
| | **2004 Groundwater** 49,635,950 | | |
| | **Surface** 1,636,350 | | |
| | **Bulk Supply** 3,272,700 | | |
| | ***Total*** **54,545,000** | | |
| | **2005 Groundwater** 46,648,289 | | |
| | **Surface** 1,590,283 | | |
| | **Bulk Supply** 4,770,848 | | |
| | ***Total*** **53,009,420** | | |
| | **2006 Groundwater** 50,171,447 | | |
| | **Surface** 1,709,963 | | |
| | **Bulk Supply** 4,682,843 | | |
| | ***Total*** **56,564,253** | | |

| | | | |
|---|---|---|---|
| | (5) Average daily water production | Y | MCWD Data |
| | **2004** 149,400 | | |
| | **2005** 145,400 | | |
| | **2006** 154,971 | | |
| | (6) Average daily water consumption (effective water) | Y | MCWD Data |
| | **2004** 102,538 | | |
| | **2005** 104,691 | | |
| | **2006** 109,733 | | |
| | ***Note: With Billing Adjustments*** | | |
| | (7) Ratio of effective water **(consumption / production)** | Y | MCWD Data |
| | **2004** 0.68 | | |
| | **2005** 0.72 | | |
| | **2006** 0.71 | | |
| | (8) Average water consumption per person per day | Y | MCWD Data |
| | **2004** 0.21 | | |
| | **2005** 0.20 | | |
| | **2006** 0.20 | | |
| | (9) Number of staff in MCWD | Y | MCWD Data |
| | **2004 Regular** 509 | | |
| | **Casual** 99 | | |
| | **Contractual** 128 | | |
| | **Job-Order** 235 | | |
| | ***Total*** **971** | | |
| | **2005 Regular** 487 | | |
| | **Casual** 95 | | |
| | **Contractual** 123 | | |
| | **Job-Order** 140 | | |
| | ***Total*** **845** | | |
| | **2006 Regular** 484 | | |
| | **Casual** 90 | | |
| | **Contractual** 279 | | |
| | **Job-Order** 77 | | |
| | ***Total*** **930** | | |

| | | | |
|---|---|---|---|
| 1.2 | **Data on water consumption**<br>(1) Number of water supply connection & daily water consumption by water user in the year 2004, 2005, & 2006 ***(Note: w/out billing adjustments)*** | **Y** | **MCWD Data** |

| **2004** | **No. of Supply Connection** | **Daily Water Consumption** |
|---|---|---|
| Residential | 98,239 | 84,700 |
| Commercial | 464 | 14,889 |
| Government | 190 | 1,851 |
| Communal | 258 | 1,183 |
| Subdivision/ Condominiu | 32 | 1,272 |
| ***Total*** | **99,183** | **103,895** |

| **2005** | **No. of Supply Connection** | **Daily Water Consumption** |
|---|---|---|
| Residential | 101,620 | 88,617 |
| Commercial | 3,442 | 15,180 |
| Government | 184 | 1,678 |
| Communal | 249 | 1,131 |
| Subdivision/ Condominiu | 37 | **1,646** |
| ***Total*** | **105,532** | **108,252** |

| **2006** | **No. of Supply Connection** | **Daily Water Consumption** |
|---|---|---|
| Residential | 106,541 | 93,576 |
| Commercial | 3,372 | 15,586 |
| Government | 179 | 1,869 |
| Communal | 230 | 1,056 |
| Subdivision/ Condominiu | 39 | 1,970 |
| ***Total*** | **110,361** | **114,057** |

| | | | |
|---|---|---|---|
| | (2) Water consumption data other than MCWD water - **see annex N**<br>1) Domestic use<br>2) Industrial use | **Y** | **Water Remind** |
| | (3) Tourism and hotel use - **see annex N** | **Y** | **Water Remind** |

| | | | |
|---|---|---|---|
| 1.3 | **Existing water facilities**<br>(1) The latest Inventory of wells and pumping stations with location map<br>**- already provided by EWRKC** | | |
| | (2) Water distribution network<br>1) The latest map of existing water distribution network - **See annex A** | **Y** | **MCWD Data** |
| | 2) Present monitoring & control system of water distribution network<br>3) Location map of installed district meters - **See annex B**<br>4) The latest map of the planned water distribution network<br>**- already provided by Engineering Department** | **Y** | **MCWD Data** |
| 1.4 | **Unaccounted for water** | | |
| | 1) The latest data on a ratio of unaccounted for water<br>**28.25% (as of 2006)** | **Y** | **MCWD Data** |
| | 2) Contents of unaccounted for water<br>**- Pilferage, Water Leakage, Water Loss by Meter Defect, etc.** | **Y** | **MCWD Data** |
| | 3) Present measurement system of ratio of unaccounted for water<br>$1 - \frac{\text{Total Accounted Water}}{\text{Total Water Produced}}$ | **Y** | **MCWD Data** |
| | 4) Present and planned program for reduction of unaccounted for water<br>**The following are MCWD's System Recovery Rate Programs that aims to reduce the unaccounted for water:**<br>**a) District Metering Area** - a tool w/c aids in identifying areas w/ leak occurences & most especially in tackling areas which have low SRR.<br>**b) Supply Distribution Improvement Project (SDIP)** - aims to improve the distribution efficiency & maximixe available water by bringing the water to areas where it is needed the most.<br>**c) Leak Repair Program** - this monitors the reaction time for leak repairs<br>**d) Meter Maintenance** - at the end of the meter's useful life, MCWD will pull out the meter for testing, repairm and calibration. If the meters are still useful, these will be installed again, however, will be pulled out after 5 years of preventive maintenace.<br>**e) Anti-Pilferage** - this aims to minimize water pilferage, as well as, theft of meters | **Y** | **MCWD Data** |
| | 5) Target for reduction of unaccounted for water - **25%** | **Y** | **MCWD Data** |

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| | 6) List of available water leakage detection devices & pipe repairing tools<br>**a) Water Leakage Detection Devices**<br>**- Water Leak Detector**<br>**- Pipe Locator**<br>**- Pipe Locator (Vibrator Type)**<br>**- Pressure Recorder**<br>**- Measuring Wheel**<br>**- Handheld Radio**<br>**b) Pipe Repairing Tools**<br>**- Pipe Threader Set**<br>**- Blinkers, Solar Powered**<br>**- Pipe Wrench (10", 12", 14", & 18")**<br>**- Adjustable Wrech (10" & 6")**<br>**- Pickmattock w/ Wooden Handle**<br>**- Concrete Cutter Blades**<br>**- Pipe Threader Die (1/2", 3/4", 1", & 2")**<br>**- Portable Jackhammer**<br>**- Mud Pump**<br>**- Concrete Mixer**<br>**- Tamping Rammer**<br>**- Portable Grinder**<br>**- Portable Welding Machine**<br>**- Thread Seal Tape "Teflon 1"**<br>**- Angle Meter Valve**<br>**- Bell Reducer, GI**<br>**- Bolts & Nuts**<br>**- Brass Coupling, GI**<br>**- Bushing, GI**<br>**- Butterfly Valve**<br>**- Cap plug**<br>**- Corps stop, ISO**<br>**- Cross Tee, GI**<br>**- Elbow**<br>**- Elbow red.**<br>**- Flange nipple**<br>**- Flexible Coupling** | **Y** | **MCWD Data** |

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| | **- G.I. pipe**<br>**- Meter union gasket**<br>**- Tailpiece**<br>**- Tapping saddle**<br>**- Tee Reducer, GI** | | |
| 1.6 | **Financial Status**<br>1) Collection ratio of water charge in the last 3 years<br>**2004** 95%<br>**2005** 93%<br>**2006** 91%<br>2) Annual report of the last 3 years - **see Annex C**<br>3) Audit report showing income statement and balance sheet of the year 2004, 2005, & 2006 - **see Annex D** | **Y**<br><br><br><br>**Y** | **MCWD Data**<br><br><br><br>**MCWD Data** |
| 1.7 | Water quality and groundwater monitoring<br>1) The latest water quality test records of raw water & treated water in dry & rainy seasons - **see Annex H**<br>2) List of equipment for water quality test in the MCWD's laboratory - **see Annex I**<br>3) The latest groundwater monitoring system (water level & chloride ion concentration)<br>1) Observation point<br>2) Database of the monitoring records<br>4) Current issues & problems on water quality<br>**a) High Nitrate Level in some areas**<br>**b) Presence of lead in the pipelines.**<br>**c) Yellowish water supplied in Mactan areas.**<br>**d) Some wells have no chlorinating equipment, only manual chlorination is done.**<br>**e) Dilapidation of water pipelines that result to positive in bacteriological testing.**<br>**f) There is no extensive water quality testing like organic constituents and some inorganic parameters due to lack of equipment, reagents, and analyst.**<br>**g) Presence of suspended solids in W13B.**<br>**h) Occasional rusting of water in some areas of Cebu City** | **Y**<br>**Y**<br>**Y**<br><br><br>**Y** | **MCWD Data**<br>**MCWD Data**<br>**MCWD Data**<br><br><br>**MCWD Data** |

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| 1.8 | Human resource development<br>1) Present training & retraining program in MCWD<br>**a) LWUA - WRRTC-RTC Year End Planning Conference**<br>**b) Seminar on Quality Standards in the Laboratory**<br>**c) Plumbing Seminar-Workshop**<br>**d) Industrial Maintenance Management Systems**<br>**e) GIS Re-Orientation**<br>**f) 14th International Conference & Exhibition on PHILWATER 2006**<br>**g) Project Evaluation & Financing**<br>**h) MCWD Bulk Metering Policy**<br>**i) Trace-up Plumber Training**<br>**j) Regional Conference of Master Plumbers Association of the Philippines**<br>**k) Safety Awareness Seminar Workshop**<br>**l) Temperature & Pressure Calibration Training**<br>**m) Workshop on the Review of SME Manual for LWDS**<br>**n) Water Environment Association of the Philippines (WEAP) Annual Convention**<br>**o) Training Workshop on Non-Revenue Water Reduction for SeaWater Utilities**<br>**p) Hydraulic Analysis Seminar-Workshop**<br>**q) California American Water System Forum**<br>**r) Project Management Seminar**<br>**s) PAWD Convention** | **Y** | **MCWD Data** |
| | 2) Kind of training & retraining course utilized outside of MCWD<br>**a) Multi-stakeholder Collaboration on Intergated Watershed Management**<br>**b) Dimensional Metereology (Basic Length Calibration with Uncertainty of Measurement**<br>**c) Water Supply Operation and Maintenance**<br>**d) Foresters' Convention**<br>**f) LWUA-ED Forum-Financing and Sustaining the Water Supply and Sanitation Sector in the Countryside**<br>**g) WEAP-2nd National Annual Convention: "Global Warming: Responding to Protect Water and Environment"**<br>**h) PhilWater 2007** | **Y** | **MCWD Data** |
| | 3) Budget for training & retraining in MCWD - **Php 3, 100, 117.00** | **Y** | **MCWD Data** |

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|---|---|---|---|
| 2 | Data & information regarding sanitation system ***(Note: MCWD has not yet implemented a sanitation system.)*** | | |
| 2.1 | Outline of existing sanitation facilities<br>1) General layout drawings of the exisitng sanitation system including treatment plant, pumping station, etc.<br>2) Inventory of the above sanitation system & year of construction | **N**<br>**N** | |
| | 3) Treatment plants<br>1) Location map of the plants<br>2) Layout plan & flow-diagram of the plants<br>3) Specification of the plants<br>4) Sewer pipeline network<br>1) The latest map of existing sewer network w/ boundary of each waste water district<br>2) Inventory of exisiting sewer network (piple length by kind of pipe & diameter)<br>3) Location map of pumping stations<br>4) Inventory of pumping stations<br>5) The latest map of the planned sewer network | **N**<br><br><br><br>**N** | |
| 2.2 | Sewerage tariff & financial status<br>1) The latest sewerage tariff<br>2) Present measurement system of waste water<br>3) Tariff collection system<br>4) Collection ratio in the last 3 years<br>5) Connection charge<br>6) Annual average income per household<br>7) Financial resouces for maintenance (past five years)<br>- Subsidy from the Cebu City<br>- Subsidy form the Cebu Provincial Gov.<br>- Waste water Tariff<br>- Transfer from the General Account<br>- Others<br>8) Annual report of the last 3 years - **see Annex C**<br>9) Audit report showing income statement, balance sheet, & cash flow statement of the year 2001, 2002, and 2003 - **see Annex E** | **N**<br>**N**<br>**N**<br>**N**<br>**N**<br>**N**<br>**N**<br><br><br><br><br>**Y**<br>**Y** | <br><br><br><br><br><br><br><br><br><br><br>**MCWD Data**<br>**MCWD Data** |

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| 2.3 | Water Quality<br>1) Water quality monitoring system - **see annex J**<br>1) Water sampling point<br>2) Frequency<br>3) Parameter of water quality test<br>2) The latest water quality records of raw water & treated water in dry & rainy seasons - **see Annex H**<br>3) List of equipment with specification for water quality test in the MCWD's laboratory - **see Annex I**<br>4) Current issues & problems on water quality | **Y**<br><br><br><br>**Y**<br><br>**Y** | **MCWD Data**<br><br><br><br>**MCWD Data**<br><br>**MCWD Data** |
| 2.4 | Rain water drainage system<br>1) General layout drawings of the existing drainage system<br>2) Inventory of the above system & year of construction<br>3) Responsible organization for maintenance | | |
| 2.5 | Operation & maintenace of the sanitation system<br>1) Organization chart of Operation & maintenace including number of administration, operation and maintenance<br>2) Number of MCWD staff for sanitation in MCWD<br>3) History of improvement or rehabilitation<br>4) Maintenace record<br>5) Present condition & problem with related to the function, operation & personnel, etc. (quantity, quality of raw & treated water, electric power shortage, ability of personnel & management, etc.) | **N** | |
| 2.6 | Human resource development<br>1) Present training and retraining program in MCWD<br>2) Kind of training & retraining course utilized in outside of MCWD<br>3) Budget for training & retraining in MCWD | **N** | |
| 3 | Socio-Economic, Environmental matters | | |
| 3.1 | Statisitic data<br>1) Census of the country - **see Annex K**<br>2) Census of the province - **see Annex K**<br>3) Social & economic index (both of the country & the province) - **see Annex L** | **Y**<br>**Y**<br>**Y** | **NSO**<br>**NSO**<br>**NSO** |

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|---|---|---|---|
| 3.2 | Others<br>1) Public Health<br>1) Statistical data of epidemic disease including water-borne disease in product are (for the last 5 years) **- see Annex F**<br>2) List of hospitals **- see Annex G**<br>2) Social environment<br>1) Administration border map<br>2) Information on distribution of low income people settlement | **Y**<br>**Y** | **Dept. of Health**<br>**Dept. of Health** |
| 4<br>4.2 | Others<br>Engineering and survey cost<br>1) Unit price of engineers<br>1) Principal Engineer C **- Php 19, 579.00**<br>2) Principal Engineer D **- Php 18, 471.00**<br>3) Engineering Assistant A **- Php 10, 933.00**<br>4) Principal Draftsman B **- Php 13, 801.00**<br>2) Unit price of survey and test<br>1) Topographic survey<br>2) Geological investigation<br>3) Hydrological investigation<br>4) Hydrological survey<br>5) Environmental survey<br>6) Social survey<br>7) Water quality test by parameter - **see Annex M** | <br><br>**Y**<br>**Y**<br>**Y**<br>**Y** | <br><br>**MCWD Data**<br>**MCWD Data**<br>**MCWD Data**<br>**MCWD Data** |

# 収 集 資 料 リスト

# 付属資料 5　収集資料リスト

| 番号 | 資 料 の 名 称 | 形態(図書、ビデオ、地図、写真等) | 収集資料 | 専門家作成資料 | JICA作成資料 | テキスト | 発行機関 | 取扱区分 | 図書館記入欄 |
|---|---|---|---|---|---|---|---|---|---|
| A | 法令・基準・統計資料 | | | | | | | | |
| A-1 | National Water Resources Board, Board Resolution No.004-0507, Policy Guidelines for Metro Cebu | コピー | * | | | | NWRB | ⓇCR( )・SC | |
| A-2 | The Public Bidding Process Under R.A.7718 (BOT Law) フィリピン共和国法第7718号（修正BOT法） | コピー | * | | | | The Republic of Philippines | ⓇCR( )・SC | |
| A-3 | Republic Act No. 8974 (2000) An Act to Facilitate the Acquisition of Right-of-Way, Site or Location For National Government Infrastructure Projects and For Other Purposes フィリピン共和国法第8974号 | コピー | * | | | | The Republic of Philippines | ⓇCR( )・SC | |
| | | | | | | | | | |
| B | 開発計画関連資料 | | | | | | | | |
| B-1 | Regional Development Plans (RDP's) 2004-2010 | コピー | * | | | | Regional Development Council | ⓇCR( )・SC | |
| B-2 | Comprehensive and Integrated Infrastructure Program (CIIP) CY2006-2010, Water Recources Sector | コピー | * | | | | NEDA | ⓇCR( )・SC | |
| | | | | | | | | | |
| C | 報告書・技術資料・図面（水資源開発関連） | | | | | | | | |
| C-1 | Water Resources Management Action Plan for Central Cebu (2005-2030) Main report & Annexes to main report | CD | * | | | | Water REMIND Project, University of San Carlos | ⓇCR( )・SC | |
| C-2 | 1980年2月、Groundwater Investigation for Metro Cebu Water District(地質柱状図・図面一式及び本文） | コピー | * | | | | Local Water Utilities Administration (LWUA) | ⓇCR( )・SC | |

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|---|---|---|---|---|---|---|---|---|---|
| C-3 | An Assesment: Land Development at Kang-Irang and Cebu Waterv Resources Potentials | コピー | * | | | | Dr. Z. B. Haman (Ayala Land Inc) | ⓇCR( )･SC | |
| C-4 | Salination Map for 79, 83, 85, and 2001 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| C-5 | Degital Data for Groundwater Balance Study by CEST & Fillipine Uni. | CD | * | | | | NWRB | ⓇCR( )･SC | |
| C-6 | Groudwater Balance Study Basic Data(Pumping test Data) | コピー | * | | | | NWRB | ⓇCR( )･SC | |
| C-7 | Geological Map ＆ Topographic Map of central Cebu | オリジナル | * | | | | San Carlos Uni （WRCセンタ） | ⓇCR( )･SC | |
| | | | | | | | | | |
| D | 報告書･技術資料･図面（上水道関連） | | | | | | | | |
| D-1 | Philippines Towns Water Utilities 2004 Data Book | 図書 | * | | | | World Bank, LUWA | ⓇCR( )･SC | |
| D-2 | Annual Report 2004 | 冊子 | * | | | | MCWD | ⓇCR( )･SC | |
| D-3 | Annual Report 2005 | 冊子 | * | | | | MCWD | ⓇCR( )･SC | |
| D-4 | Annual Report 2006用財務諸表及び主要水道指標の原稿抜粋 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| D-5 | 2007年のOperational Planの抜粋 | コピー | * | | | | MCWD | ⓇCR( )･SC | |

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|---|---|---|---|---|---|---|---|---|---|
| D-6 | Water Rates (Effective: July 1, 2006）最新の水道料金表 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| D-7 | MCWD 2007 Water Service Availability | 図面A3 | * | | | | MCWD | ⓇCR( )･SC | |
| D-8 | Project Status Report (As of April 2007), MCWDの上水道改善実施プログラム | 表A3 | * | | | | MCWD | ⓇCR( )･SC | |
| D-9 | MCWD Projects Location Map, 上記MCWDの上水道改善実施プログラムの位置図 | 図面A0大 | * | | | | MCWD | ⓇCR( )･SC | |
| D-10 | SDIP Capex Proposal for 2006 to 2009, SDIPの年度別実施プログラム | 表A4 | * | | | | MCWD | ⓇCR( )･SC | |
| D-11 | Water Demand Projections, MCWDの水需要量予測 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| D-12 | No.of MCWD deepwells operated/ abandoned in the period 1990-2004 & MCWD Production Summary Year 2006, MCWDの生産井の推移と2006年の生産水量実績 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| D-13 | Leak Detection Team Accomplishment for the Month of January to December 2006, 漏水探知ﾁｰﾑの2006年の実績 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| D-14 | 上記 D-7～D-13 のデジタルデータ | CD | * | | | | MCWD | ⓇCR( )･SC | |
| D-15 | Work Schedule and Shift assignment for August 2007, 2007年8月の加圧ポンプ場運転人員配置表 | コピー | * | | | | MCWD | ⓇCR( )･SC | |
| D-16 | Work Schedule April to June 2007, 2007年4月～6月の本部及びｻﾃﾗｲﾄ･ｵｯﾌｨｽの送配水施設運転管理人員配置表 | コピー | * | | | | MCWD | ⓇCR( )･SC | |

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|---|---|---|---|---|---|---|---|---|---|
| D-17 | PRV Location, 送配水管網上の減圧弁リスト | コピー | * | | | | MCWD | (R) CR( )・SC | |
| D-18 | Amara Subd./ Cebu Holdings Inc.,住宅団地の配水管網水理計算書（EPANETを使ったMCWDの配水管網水理計算の例） | コピー | * | | | | MCWD | (R) CR( )・SC | |
| D-19 | MCWDの水道事業に関する新聞記事切り抜き | コピー | * | | | | 地元新聞社 | (R) CR( )・SC | |
| D-20 | 節水啓蒙用各種冊子 | 冊子のコピー | * | | | | MCWD | (R) CR( )・SC | |
| D-21 | 節水キャンペーン用各種ステッカー | ステッカー | * | | | | MCWD | (R) CR( )・SC | |
| D-22 | 配水形態別（直接配水・配水池経由別）生産井位置図 | 図面A0大 | * | | | | MCWD | (R) CR( )・SC | |
| D-23 | Final Report, Basic Survey on Water Resources Management in Metro Cebu, March 2007 | コピー | | | * | | JICAフィリピン事務所（Woodfields Consultans, Inc) | (R) CR( )・SC | |
| D-24 | 平成17年度開発途上国民活事業環境整備支援事業（フィリピン・セブ都市圏水道局への給水民営化事業）報告書　平成18年2月 | コピー | * | | | | 経済産業省（委託先：三菱商事株式会社） | (R) CR( )・SC | |
| | | | | | | | | | |
| E | 環境・社会配慮関連資料（下水道・衛生含む） | | | | | | | | |
| E-1 | Socio-econimic Profiling and Environmental Study of the Four Protected Areas in Cebu Island, Volume 1 of 5, Genaral Topics, June 2001 Edition | 図書 | * | | | | DENR, University of San Carlos | (R) CR( )・SC | |

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|---|---|---|---|---|---|---|---|---|---|
| E-2 | Socio-econimic Profiling and Environmental Study of the Four Protected Areas in Cebu Island, Volume 3 of 5, Socio-Economic Profile, June 2002 Edition | 図書 | * | | | | DENR, University of San Carlos | ⓇCR( )・SC | |
| E-3 | Cebu, A Demographic and Socioeconomic Profile based on the 2001 Census | 図書 | | | * | | JICA SEED (Cebu Socio-Economic Empowerment and Development) Project | ⓇCR( )・SC | |
| E-4 | Cebu City/ CCSMPS/ CLUP, セブ市の各種統計資料 | CD | * | | | | Cebu City | ⓇCR( )・SC | |
| E-5 | Socio-Economic Baseline Survey CUSW 2,000-Hectare Research Area, 2004 | コピー | * | | | | Ramon Aboitiz Foundation Inc. under the Water Remind Project | ⓇCR( )・SC | |
| E-6 | Market Study on the Existing and Potential Real Water Demand of Metro Cebu, Final Report, 2007 | コピー | * | | | | Woodfields Consultans, Inc | ⓇCR( )・SC | |
| E-7 | Cabangcalan Sinkhole Study, Mandaue City, 2001 | コピー | * | | | | University of San Carlos, Water Resource Center | ⓇCR( )・SC | |
| | | | | | | | | | |
| F | 質問票回答の付属資料 | | | | | | | | |
| F-1 | Annex A 最新の送配水管網図 | 図面A0大 | * | | | | MCWD | ⓇCR( )・SC | |
| F-2 | Annex B 配水ブロック区分図 | 図面A0大 | * | | | | MCWD | ⓇCR( )・SC | |
| F-3 | 3.4. NGO's involved in hygiene and sanitation improvement activities | コピー | * | | | | Philippine Center for Water and Sanitation | ⓇCR( )・SC | |
| F-4 | 4.1.1(i) Relevant Documents for laws, regulations for WATER ISSUES | コピー | * | | | | DOH | ⓇCR( )・SC | |

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|---|---|---|---|---|---|---|---|---|---|
| F-5 | 4.1.1(ii) Relevant Documents for laws, regulations for ENVIRONMENT ASSESSMENT | コピー | * | | | | DENR | ⓇCR(　)・SC | |
| F-6 | 4.1.2(ii) National policy papers and national program documetns regarding POVERTY REDUCTION | コピー | * | | | | The National Anti-Poverty Commission | ⓇCR(　)・SC | |
| F-7 | 4.1.3 Organizational Setting/ National Framework in the government for sanitation and sewerage improvement | コピー | * | | | | DPWH | ⓇCR(　)・SC | |
| F-8 | 4.2 Social and Environmental Issues at the REGIONAL & COMMUNITY LEVEL | コピー | * | | | | LGUs | ⓇCR(　)・SC | |
| F-9 | Annex H 生産井の最新の水質検査データ（2007年7月） | コピー | * | | | | MCWD | ⓇCR(　)・SC | |
| F-10 | Annex I MCWD保有の水質試験機器リスト | コピー | * | | | | MCWD | ⓇCR(　)・SC | |
| F-11 | Annex J 水質検査における物理・化学検査と細菌検査の頻度 | コピー | * | | | | MCWD | ⓇCR(　)・SC | |
| F-12 | Annex K 人口推計資料 | コピー | * | | | | NSO | ⓇCR(　)・SC | |
| F-13 | Annex L 物価指数（2007年6月） | コピー | * | | | | NSO | ⓇCR(　)・SC | |
| F-14 | Annex M MCWDの水質検査項目別単価表 | コピー | * | | | | MCWD | ⓇCR(　)・SC | |
| F-15 | Annex N 市町及び産業別1ha当たりの水消費量推計 | コピー | * | | | | MCWD | ⓇCR(　)・SC | |

# Provisional Scoping

# Preparatory Study

Creation Date: 25 September 2007

Reception Date:

## 1. Title of the Cooperation Project and Name of the Project Proponent

### (1) Title of the Cooperation Project

The Study for Improvement of Water Supply and Sanitation in Metro Cebu

### (2) Name of the Project Proponent

Metro Cebu Water District (MCWD)

## 2. Outline of the Project

### (1) Location

Metro Cebu including the following 4 cities and 4 municipalities;

4 cities: Cebu, Mandawe, Talisay and Lapulapu

4 municipalities: Consolacion, Compostera, Cordova and Liloan

Total study area covers 677 $km^2$

### (2) Project Description

Phase-1: Analysis on the present water supply and sanitation conditions

1.1 Basic Study

1. Collection, review and analysis of related data and information
   a. Interpretation for study method, and basic concept of the study
   b. Laws, regulations and policies on water resources development, water supply and sanitation
   c. Confirmation of water supply and sanitation plan on the regional development plan etc.
   d. Data collection and analysis such as Barangay water supply condition.
   e. Existing wells and existing water supply facilities and services
   f. Core drilling and permeability test
   g. Investigation for groundwater contamination
   h. Analysis of hydrological data
   i. Data collection and analysis for water supply and sanitation
   j. Review of existing water demand data
   k. Review of water resources development plan and desalination plan
   l. Assistance of hydraulic model for water supply pipe system
   m. Investigation of present water supply system and inventory survey for water leakage from the system
   n. Social and economic conditions
   o. Satellite image interpretation

p. Establishment of basic groundwater model
q. Other projects relevant to the Study

2. Groundwater Model Analysis
a. Hydrological and hydro-geological investigation and existing data collection
b. Groundwater modeling
c. Simulation analysis of groundwater potential and optimum production well alignment
d. Outputting of the simulation result
e. Additional hydro-geological investigation to complete groundwater modeling
f. Review of future groundwater development plan

Phase- 2. Formulation of Water Supply and Sanitation Plan, and Groundwater Conservation

<Water Supply>

1. Hydraulic calculation for water supply pipe system
2. Water demand projection and interpretation for service area up to the year 2015
3. Technical evaluation of optimum water supply system considering new groundwater resources
4. Technical analysis for remote telemetering system for water supply system
5. Planning of rehabilitation, renewal and expansion of water supply system
6. Plan of action program for reduction of water leakage (non revenue)
7. Cost estimation and financial analysis for future water supply plan
8. Plan for future water demand control
9. Recommendation of institution for water supply improvement
10. Recommendation water supply for poor people

<Sanitation>

1. Recommendation for sanitation improvement
2. Recommendation for sewerage improvement method including institutional improvement

<Groundwater Conservation>

1. Analysis for groundwater contamination mechanism and countermeasures
2. Planning of groundwater conservation
3. Recommendation for groundwater conservation

## 3. Environmental and Social Considerations of the Country Concerned

### (1) Law

The following laws are the basis of the Philippines' environmental policy.

・ Presidential Decree No.984: 1976

Subject: Providing for the Revision of Republic Act No.3931, commonly known as the

Pollution Control Law, and for other purposes.

- Presidential Decree No.1151: 1977

  Subject: Philippine Environmental Policy

- Presidential Decree No.1152: 1977

  Subject: Philippine Environment Code

- Presidential Decree No.1586 Environmental Impact Statement System: 1978

  Subject: Establishing an Environmental Impact Statement System Including Other Environmental Management Related Measures and for Other Purposes

- Presidential Decree No.2146: 1981

- DENR Administrative Order No.34: 1990

  Subject: Revised Water usage and classification/Water quality criteria amending section Nos.68 and 69, Chapter Ⅲ of the 1978 NPCC rules and regulations.

- DENR Administrative Order No.35: 1990

  Subject: Revised effluent Regulations of 1990, Revising and Amending the Effluent Regulations of 1982.

  Pursuant to the provisions of Section 6 (i) of Presidential Decree No.984, otherwise known as the "Pollution Control Decree of 1976", and by virtue of Executive Order No.192, Series of 1987, the Department of Environment and Natural Resources hereby adopts and promulgates the following rules and regulations.

- Administrative Order No.42: 2002

  Subject: Rationalizing the implementation of the Philippine environmental Impact Statement (EIS) system and giving authority, in addition to the Secretary of the Department of Environment and Natural Resources, to the Director and Regional Directors of the Environmental Management Bureau to grant or deny the issuance of Environmental Compliance Certificates.

**(2) Competent Agency**

The competent agencies in charge of environmental administration in Philippines are Department of Environment and Natural Resources (DENR) and its subsidiary organizations namely Environment Management Bureau (EMB) and Environment and Protected Areas Services (EMPAS).

**(3) Procedure of EIA**

Procedure is shown in next page.

Drawing 2.7.1

Republic of the Philippines
Department of Enwironment and Natural Resources
**ENVIRONMENTAL MANAGEMENT BUREAU**
Region 7, Banilad, Mandaue City
Tel. Nos. 3469426 / 3461647

**INITIAL ENVIRONMENTAL EXAMINATION**
**(Annotated Outline)**

**A. Communication of Results**

1. Table of Contents
2. Executive Summary (follow the substantive content, B)
3. List of IEE preparers and their respective expertise area in the IEE
4. Sworn Accountability Statements of key preparers (Annex 4-E)
5. Sworn Accountability Statements of project proponent (attached at annex 4-E)
6. Process Documentation (Annex 6-B)
7. Proof of Social Acceptability (Annex 6-B), Barangay Resolution
8. Certificate of Location viability/locational clearance or zoning certificate for areas that have already been zoned
9. Reference/Bibliography

**B. Substantive Content**

1. Project-related information on:

- Name/Address/Tel. No. of the project proponent
- Project location-delineation and mapping of project site relative to political jurisdiction boundaries (Barangay, Municipality, Province, Region) ECA location (Annex 5-C)
- Project purposes/rationale
- Project description including components, process of operation and phasing
  - ⇨ Pre-construction/construction phase (facilities development)
  - ⇨ Operation Phase (Technology, raw materials/production output [volume and process])
  - ⇨ Abandonment Phase (abandonment plan)

2. Environmental setting and receiving environment:

- Delineation/mapping of primary and secondary impact areas of the project
- Primary/secondary and baseline data gathered, where relevant, on and sources:
  - Land - Air - Water

3. Socio-economic information on the following:

- Population to be effected in the direct and indirect impact areas including women
- Socio-cultural characteristics, particularly those that concern indigenous communities
- Economic and socio-cultural activities that would be affected
- Community/local perceptions if the project to determine socio-economic issues and social acceptability
- Public Consultations and documentation of consultative processes (formal or informal)
  - evaluation of Issues Raised by the Oppositors/stakeholders on the ECC application of the proposed project (Annex 6-A)

4. Description of Environmental Effects/Impacts

Based on the relevant information gathered, identification and assessment of impacts will be carried out by either any or combination of the following:

- applying objective judgement of their magnitude based on qualitative description;
- quantifying impacts (where possible) or
  - ⇨ attaching economic or monetary values on the impacts

**Fig. 2.7.1 : Annotated Outline of the IEE**

Drawing 2.7.2

**SUPPORTING DOCUMENTS FOR**
**ENVIRONMENTAL COMPLIANCE CERTIFICATE (ECC) APPLICATION**
**Pursuant to P.D. 1586 (The Environmental Impact Statement System)**

**I. MANDATORY REQUIREMENTS:**

[ ] 1. Request Letter of Intent

[ ] 2. Initial Environmental Examination (IEE) document, (attached annotated outline to include the following:

(i) Site Development plan (blue print) showing the ff.:
- a) tree planting areas/buffer zone
- b) wastewater treatment facility (WTF) and separate plan showing WTF scheme
- c) cistern or rainwater collection tank
- d) drainage system lay-out indicating its connection to ~~any receiving body of water or disposal~~ point
- e) solid waste disposal area
- f) water system lay-out
- g) eroded ~~areas/levelling~~/excavation activities
- h) deepwell to be installed

(ii) Colored pictures (panoramic view) of the ~~project area preferably~~ with captions

(iii) Vicinity, Sketch and Topographic Maps with geographical coordinates (Scale 1:10,000)

(iv) Proof to establish ownership/right over the area (OCT/TCT/Tax Dec./Contract of Lease)

(v) Sworn Accountability Statement (A/S) of project proponent duly notarized (Annex 4-E)

(vi) Sworn Accountability Statement of IEE preparer/consultant with their Bio-data ~~duly notarized (attached~~ to Annex 4-E)

[ ] 3. Locational Clearance from Housing and Land Use Regulatory Board (HLURB) or Zoning Certificate from the Deputized Municipal/City Zoning Officer/Locational Variance

[ ] 4. DTI Certification/SEC Registration (with last page indicating the incorporators)

[ ] 5. Process Documentation/Public Consultations and documentation of consultative processes (formal or informal)
- a) Evaluation of Issues Raised by the Oppositors/Stakeholders on the ECC application of the proposed project, if any
- b) Pictures/Attendance sheets/Minutes or summary of proceedings

[ ] 6. Drainage Clearance from the City/Municipal Engineers Office (for subdivision, landfilling and other land development projects), if necessary

[ ] 7. Area Status and Clearance from Mines Geo-Sciences Bureau (MGB) for SAG/SSQ projects

[ ] 8. Geological Scoping request to Mines and Geo-Sciences Bureau for subdivision, land development or selected infrastructure projects or Engineering and Geohazard Identification Report

[ ] 9. Environmental Guarantee Fund (EGF) consisting of surety bond or cash fund with Memorandum of Agreement (MOA) and Environmental Monitoring Fund (EMF), if necessary.

[ ] 10. FEES: (B1 Category-New Single Project)

| | | |
|---|---|---|
| Procedural Screening Fee: | ₱ 300.00 | *Check payments should be in cashiers or manager's check payable to EMB-7 |
| Database Management Fee | 1,000.00 | |
| Processing Fee: | 2,700.00 | |
| Total | ₱ 4,000.00 | |

**II. REGULATORY REQUIREMENTS:**

[ ] 11. Proof of Social Acceptability of the project:
a) Barangay Council Resolution b) City/Municipal Council Resolution
c) Protected Area and Management Board (PAMB) Resolution for projects located within protected area

[ ] 12. Initial Clearance from Department of Health (DOH) and Site Development plan approved by DOH for Memorial Park projects

[ ] 13. Certification from CENRO identifying that the land to be developed is within Alienable and Disposable land, outside watershed, timberland and NIPAS areas, if proof of ownership is Tax Declaration only

[ ] 14. Registration Agreement between MEPZ and the project proponent (projects within PEZA)

[ ] 15. Certification of Lumber Supply contract or Wood processing Permit from FMS for existing lumberyard/ resaw mill or furniture processing plant.

[ ] 16. Separate application for Authority to Construct (A/C) EMS-FN-AC for Air/Water pollution sources/ control facilities in duplicate copies or latest Permit to Operate (P/O) for existing industrial plant.

Number of Copies to be submitted - **two (2) copies each using Short size bondpaper (8"x11") to be compiled in a folder with fastener or hardbound**

Please address your letter request to:

The Regional Director
DENR-EMB-7, Banilad, Mandaue City
Tel. Nos. 3461-647 / 3469-426/ 3453-905

Jobic\mydocuments\forms\checklist\mandatory

**Fig. 1 : Environmental Compliance Certificate**

## FLOW CHART of SCOPING PROCESS

Drawing 2.7.3

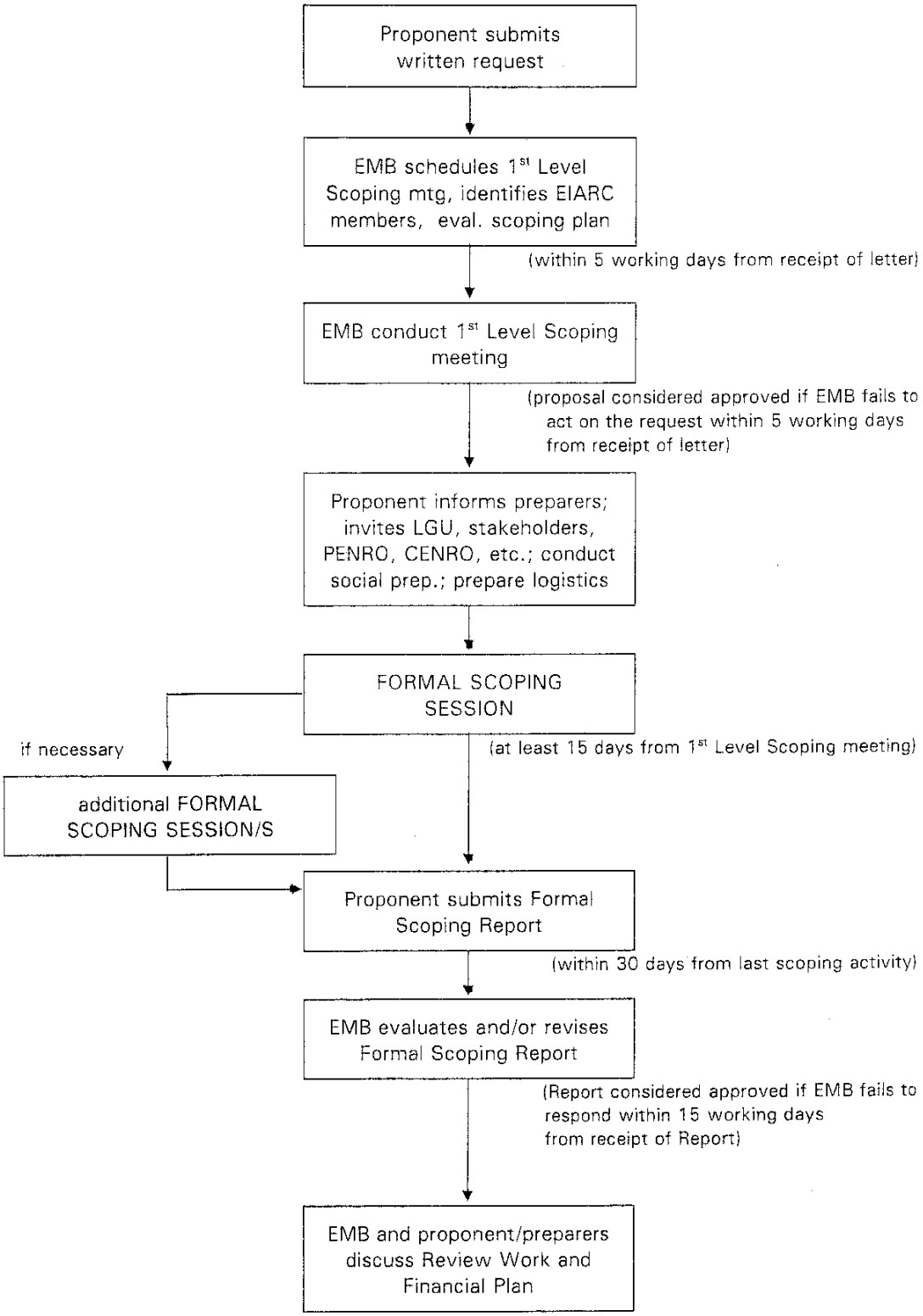


**Fig. 2 : Scoping Process**

EIS Preparation and Submission

Drawing 2.7.4

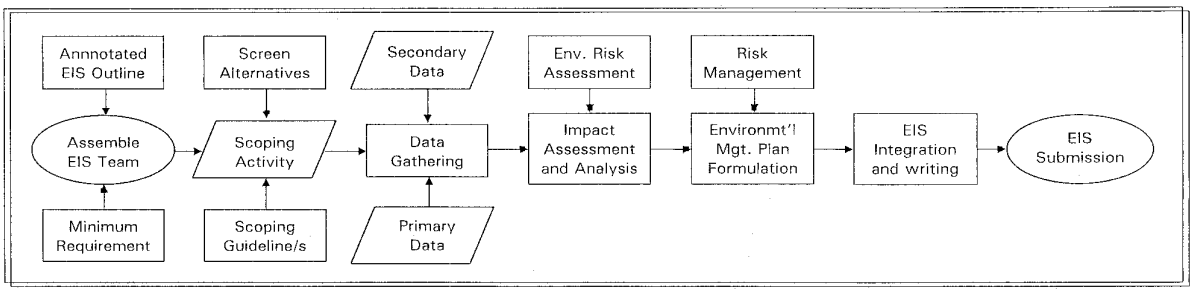


**Fig. 3：EIS Preparation and Submission**

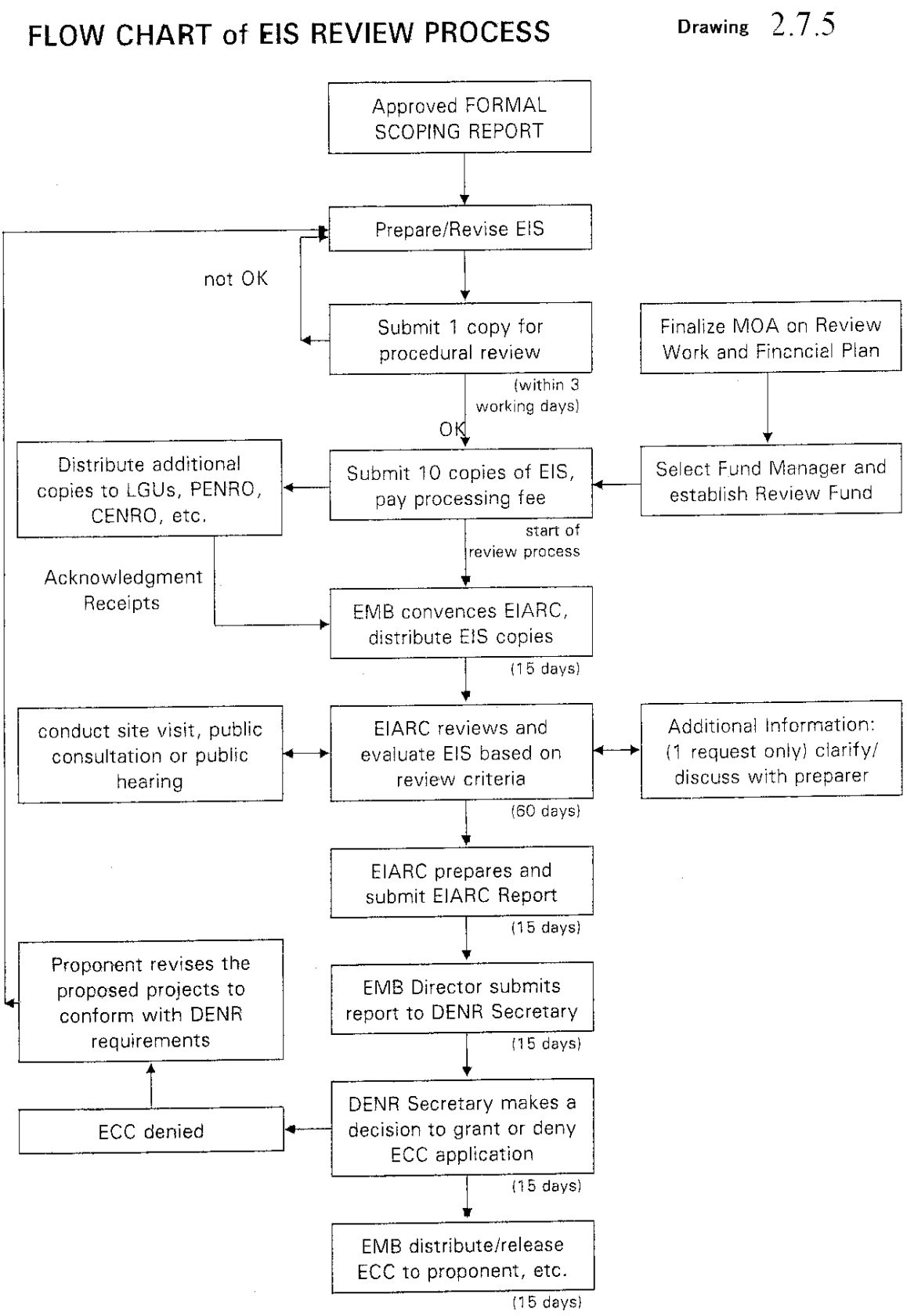


**Fig. 4 : EIS Review Process**

## FLOW CHART of IEE REVIEW PROCESS

Drawing 2.7.6

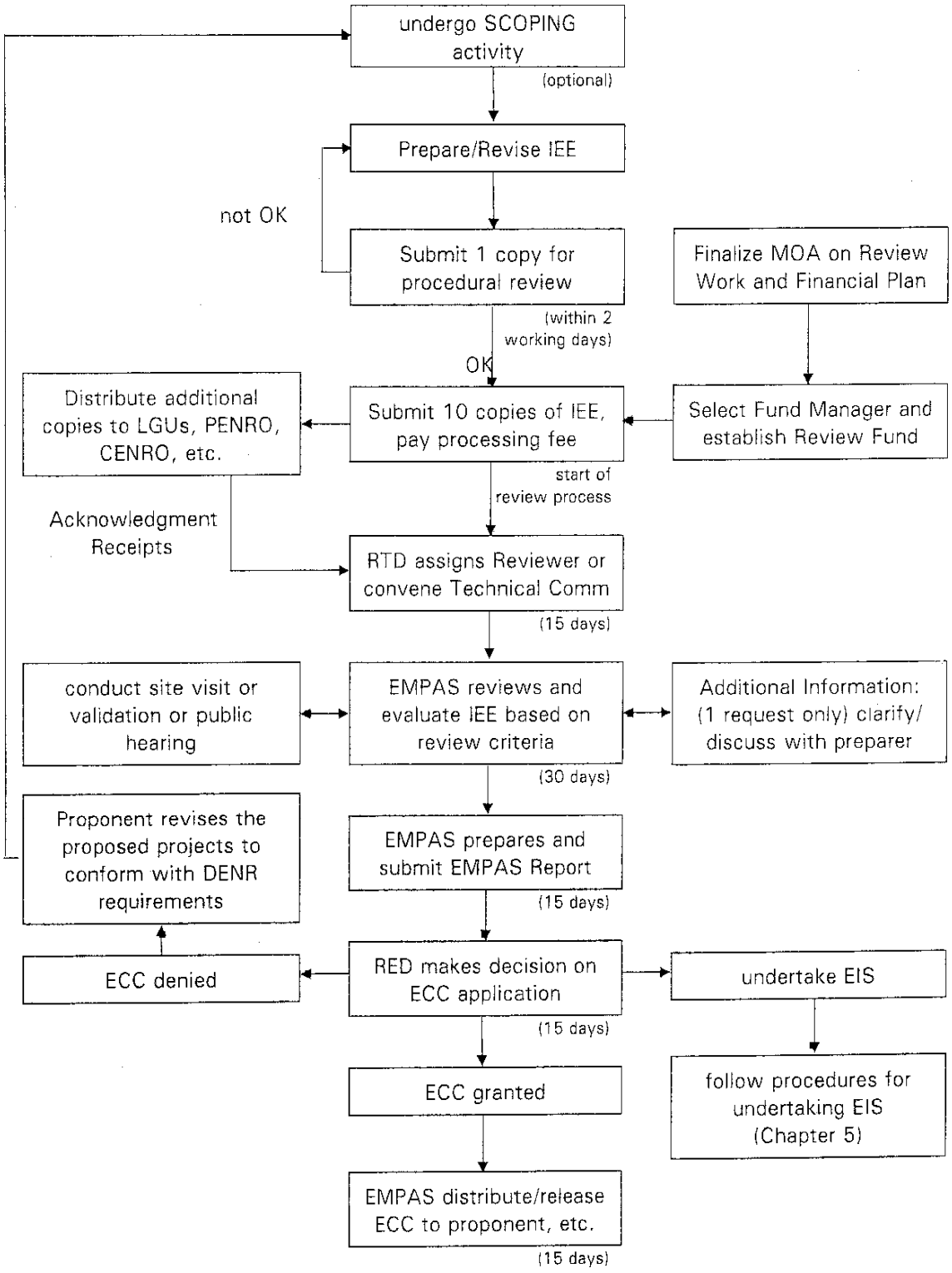


**Fig. 5 : IEE Review Process**

### (4) Information Disclosure

Although the government of Philippines has not presented any definite information disclosure laws at present, it has agreed to cooperate on disclosing information in accordance with JICA Guidelines for Environmental and Social Considerations.

### (5) Stakeholders Participation

When the government of Philippines implements projects for the development of water supply and sewerage facilities, it establishes the opportunities for local governments, experts, the press, relevant companies, local residents and NGOs to speak up in order to make active use of their opinions and solve the problems.

According to the interview to MCWD, the president of MCWD said that if this project is implemented, MCWD will request relevant stakeholders to have constructive opinions by sharing common view with revealing each interest, not insisting but local or individual ones.

## 4. Outline of the Location

### (1) Location, Climate and Geography, and Natural Condition

Cebu Island has the area of 4870km$^2$ ranging 210km in N-S direction with average 23km in width. The highest altitude is 1013m of Mt. Cabalasan located at Balamban of Central Cebu. Average temperature of Cebu city is 27.4℃. Variation of temperature are within 5℃ from average temperature. Annual rainfall reaches some 1,800mm with rain season from June to November.

Major stream are Luyang River, Danao River, Kotkot River, Butuanon River, Mananga River, Lusaran River and so on from north to south. Their catchments are 50 to 80 km$^2$ only, which are instable discharge in dry season of December to May.

Bedrocks are mainly of Tertiary sedimentary and volcanic rocks trending from NE-SW with folded. Pleistocene to Pliocene limestone is distributed at the foot portion of the bedrocks. Boreholes and shallow dug wells are constructed in the limestone where its elevation is lower than 150m. Before urbanizing, it is said that considerably large caverns are outcropped frequently at the boundary between the bedrocks and the bottom of the limestone. Most of them are filled and covered by urbanization. However, all surface water are infiltrating at several areas of caverns located.

### (2) Population

Cebu City, the center of Metro Cebu, has a population of 718,000, which responds to half of the whole population of Metro Cebu. Approximately 90% of the population in Metro Cebu is concentrated in industries, such as tourism, in cities namely Cebu, Mandawe, Lapu-Lapu and Talisay.

**Table-1 Population of Metro Cebu (after NSO)**

| City/Town | Population | Area (km2) | Density | Estimated Population Growth (05-10) |
|---|---|---|---|---|
| Cebu city | 718,821 | 284.90 | 2,523 | 2.29/year |
| Talisay city | 148,110 | 47.39 | 3,125 | 3.24/year |
| Mandaue city | 259,728 | 29.83 | 8,707 | 4.08/year |
| Laplap city | 217,019 | 60.60 | 3,581 | 3.94/year |
| Compostela town | 31,446 | 51.69 | 608 | 2.85/year |
| Consolacion town | 62,298 | 33.78 | 1,844 | 1.69/year |
| Liloan town | 64,970 | 55.21 | 1,177 | 2.68/year |
| Cordoba town | 34,032 | 10.11 | 3,366 | 2.12/year |
| **Total** | **1,536,424** | **574** | | |

### (3) Race

90% of people in Philippines are Malay mixed with Mongolian and Chinese. The rests of them are descended from Spanish or American.

### (4) Economics

The major industrial activities in Central Cebu include tourism, industrial parts assembly, seafood processing, gift, toys, house wares, coal and dolomite mining and ceramic industry. Big industry in Cebu is tourism.

### (5) Education

In Philippine, literacy rate is considerably high. However, poor level children cannot go to school sometimes.

### (6) Land Use

Total surface area of the Metro Cebu is 166,692 ha, of which, forestland occupies 88,387 ha (53%), and agricultural, residential land and other lands occupy 34,172 ha (21%), 16,669 ha (10%). 27,504 ha (17%), respectively. Detailed digital map for land use, soil classification, geological maps etc., are available.

### (7) The Environment Protected Area

In mountainside area, several protected zones are distributed. But no particular restricted area is distributed in housing and industrial area.

## 5. Categorization and its Reason

Categorization: C

This is categorized, as C because of the predicted impact on the groundwater will be examined by the study of groundwater modeling to reduce the impacts. As the Philippines' Environmental Law of requires, it is necessary to submit IEE report in order to be examined by EIS before the study survey.

## 6. Provisional Scoping (Adverse impacts and their mitigation measures)

### (1) Adverse impacts

In case of acquiring water supply from ground water and reconstruction of water supply, sewerage and sanitary facilities, the following items are concerned to have minus impacts during the planning and the construction and after starting the operation.

**Table 2 Scoping Check List**

| Items | | Rating[1][2] | Reason(s) |
|---|---|---|---|
| 1 | Resettlement | D | - In case the construction of water supply and sewerage facilities, during the acquisition of lands resettlement of residents may result from the acquisition. |
| 2 | Economic Activities | D | - No adverse impact is considered. |
| 3 | Traffic and Public Facilities | D | - No constructions would block traffic. |
| 4 | Split of Communities | D | - None |
| 5 | Cultural Property | D | - No adverse impact is considered though Magellan monument is in Lapu Lapu. |
| 6 | Water Rights and Right of Common | D | - None |
| 7 | Public Health Condition | D | - None |
| 8 | Waste | D | - In case the implementation of water supply and sewerage facility construction, during the implementation the construction works cause waste soil and other waste materials with very small quantities by drilling work. |
| 9 | Hazards | D | - Drilling of production boreholes will not affect damage |
| 10 | Topography and Geology | D | - None |
| 11 | Soil Erosion | D | - None |
| 12 | Groundwater | C | - In case the water resource would depend on groundwater, during the construction and after starting the operation, its contamination, caused by infiltration of polluted water, and backward flow of salt water may be issues of concern. |
| 13 | Hydrological Situation | D | - None |
| 14 | Coastal Zone | D | - Inland construction works would not affect coastal zones. |
| 15 | Flora and Fauna | D | - Water supply and sewerage facility construction will not affect reservations. |
| 16 | Meteorology | D | - None |
| 17 | Landscape | D | - None |
| 18 | Air Pollution | D | - None |
| 19 | Water Pollution | D | - Maintenance of pipelines and cleaning rivers are expected to improve quality of water. |
| 20 | Soil Contamination | D | - None |
| 21 | Noise and Vibration | D | - Noise and vibration by drilling work is very limited. |
| 22 | Ground Subsidence | C | - During the construction of wells, ground subsidence may happen. |
| 23 | Offensive Odor | D | - None |

[1] Rating category

A: Serious impact is anticipated

B: Some impact is anticipated

C: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)

D: No impact is expected. IEE/EIA is not necessary

### (2) Overall Evaluation and Study Plan

**Table 3 Overall Evaluation Form**

| Environmental Items | Evaluation | Envisioned Mitigation Measures | Notes |
|---|---|---|---|
| Groundwater level lowering and sea water intrusion | C | Preliminary groundwater potential study shall be conducted based on the previous study and existing information/study. Groundwater flow and contaminant transport shall be analyzed using some groundwater modeling software. The results shall be reflected on the determination of groundwater abstraction amount. | |
| Fauna and flora<br>Nature reserve | D | IEE procedure will be implemented by environmental impact assessment after the planned area and contents of the project will be confirmed. | |
| Water pollution | D | Present conditions of waster water discharge in the study area, such as manner of discharge, amount of discharge, treatment and so on, will be investigated in the Socio-economic survey. If the increment of wastewater is supposed to be large, the construction of treatment facilities may be included in the plan. | |
| Land subsidence | C | Long-term groundwater level lowering by groundwater abstraction shall be investigated by long-term groundwater level recording survey. | |
| Noise and vibration | D | To examine construction methods and equipment (backfilling equipment, etc.), and adopt the one with as low vibration as possible. | |

[1] Rating category
A: Serious impact is anticipated
B: Some impact is anticipated
C: Extent of impact is unknown (Examination is needed. Impact may become clear as study progresses.)
D: No impact is expected. IEE/EIA is not necessary

### (3) Alternative

#### 1) Without Project Alternative

Most of people in Cebu will have to depend on scarce water resources available from hand-dug wells or water venders, which are scare in dry seasons and at risk of infection. Otherwise most of people have to buy drinking water, with high cost from water vendor.

Without proper water supply plan, water vendor will develop groundwater without any plans or supervisions. This will accelerate the groundwater depletion and saline intrusion.

#### 2) Alternatives

The water supply systems in Metro Cebu (MCWD), which statistics of the water supply systems are available, have been established by groundwater source system (borehole system), desalination plant system. If groundwater development is difficult from environmental consideration, surface water development need to start as soon as possible by strong financial support from central government by clear a very complicated problem of social environmental condition and land acquisition.